Wellington Central Library

Building Services Design Features Report

Wellington City Council

Reference: 253267

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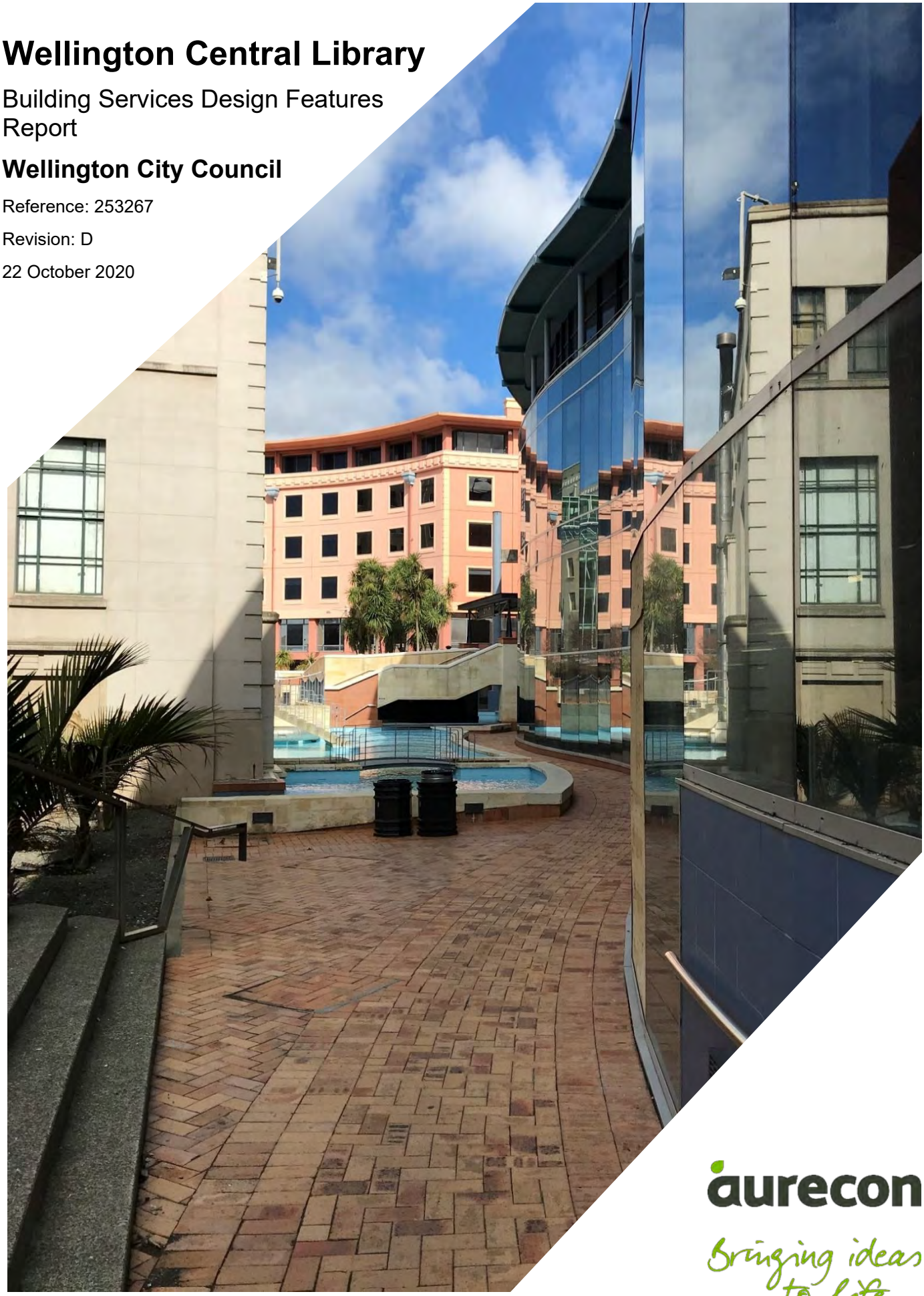
22 October 2020



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Contents

1 Introduction

1.1 Project Overview

In 2019 Aurecon NZ Ltd were engaged by the Wellington City Council (WCC) to investigate the seismic risks associated with the Central Library building in particular those associated with the hollow-core (Dycore) floors.

Section C5 of the MBIE Assessment Guideline, published on 30 November 2018, provides a systematic assessment methodology for assessing precast concrete floor systems. This methodology was used to assess the building and the outcome was an NBS rating of less than 33% NBS Importance Level 3 (IL3).

Following consultation with WCC and the wider engineering fraternity, three options have been proposed to remediate the building to a suitable IL3 level, as follows:

A. A minimum upgrade to 40% NBS (IL3) including making good the interior of the building
B. A mid-level upgrade to 80% NBS (IL3) including a refresh of the interior of the building
C. An “Enduring” 100% NBS (IL3) upgrade incorporating base isolation, remodelling of the building (internally and externally), connections with Civic Square, adjacent buildings and streets

The purpose of this stage of the design is for Aurecon to provide engineering services, for the three options listed above, to a sufficient level of design to allow for more detailed pricing by the project quantity surveyor. This pricing will be used to provide more accurate project budgets and allow selection of the appropriate option for WCC to proceed with.

The option currently approved to move forward with is option C and therefore this is the scheme we will be providing the most detail for. The other 2 schemes will be limited to commentary on the differences associated with these options.

It should be noted that numbers devices indicated on the Aurecon documents (smoke detectors, power outlets, fan coil units etc) are indicative and subject to design development.

1.2 Scope

The Aurecon documentation for these three options will be at a level indicatively between preliminary and developed design. The level of documentation will likely vary between services.

Our engineering services will be limited to the Central Library building only and have not allowed to review the peripheral works required (connections to adjacent buildings etc) as there will be insufficient time to investigate and detail these works.

The engineering services that are documented by Aurecon are:

- Structural
- Building Services
- Fire Engineering (with Fire HQ as a sub-consultant)

This DFR is limited to building services only.

Building Services covered within this document include:

- Mechanical
- Electrical
- ICT and Security (noting inputs from WCC ICT team will be required to confirm any changes required to meet WCC operational requirements for the building)
- Hydraulic (plumbing and drainage)
- Fire Protection
- Vertical Transport

The implications of the proposed separation of services works will also be considered for all options and Aurecon will co-ordinate these works with the architectural and structural teams. These works will likely include for the Central Library:

- New chilled water plant
- New ground level transformer location. It is proposed these transformers will serve both Library and City Gallery

This scope is limited to the work required to separate the Library from the Central Civic Campus systems and does not cover in detail the works necessary for the rest of the Campus.

Engineering services not within scope and not covered within this document include:

- Audio Visual (assume WCC have their own provider)
- Acoustic Engineering Services

1.2.1 Deliverables

The building services deliverables will generally be as follows:

- Design features report; and
- Marked up Building Services layout drawings
- Design change register

The Aurecon documentation has used the Athfield Architects layouts and model dated 14 August 2020. The Athfield design has continue to evolve after this date and the key differences and implications of this design development will be captured in the design change register.

Additionally, a separate memo will be provided detailing the proposed ‘rattle gap’ interactions with existing services.

1.2.2 Key Assumptions

We have made the following assumptions in the preparation of this document:

- No change to the functional performance requirements within each space, e.g. types of services supplied to each floor will generally be the same as existing to deliver the same level of service.
- The existing installation generally meets current code requirements, unless otherwise specifically noted within the report / drawings.
- All upgrade schemes require separation of the Library services from the Central Civic Campus infrastructure.

1.3 Reference Documents

This report provides a high-level summary of the condition of the existing building services within the Central Library building. Aurecon has previously completed a detailed condition assessment review of this building as part of a wider campus review:

- Wellington Civic Campus Condition Assessment Report dated 28 September 2016 (Reference: 253267), including appendices.

2 Separation of Services

2.1 Chilled Water

2.1.1 Current Campus Plant

The existing chilled water generation plant consists of three plantrooms; two chiller plantrooms (located in the basement) and a cooling tower plant space (located on the roof of the City Gallery).

A total of 5 chillers are installed on-site. Chillers 1 to 4 are designated System A. This system supplies chilled water into the site wide reticulation system and serves the various water risers LIB (Library), CAB (Civic Administration Building), MOB (Municipal Office Building), Town Hall and MFC (Michael Fowler Centre). Chiller 5 is designated as System B and serves the City Art Gallery (CG).

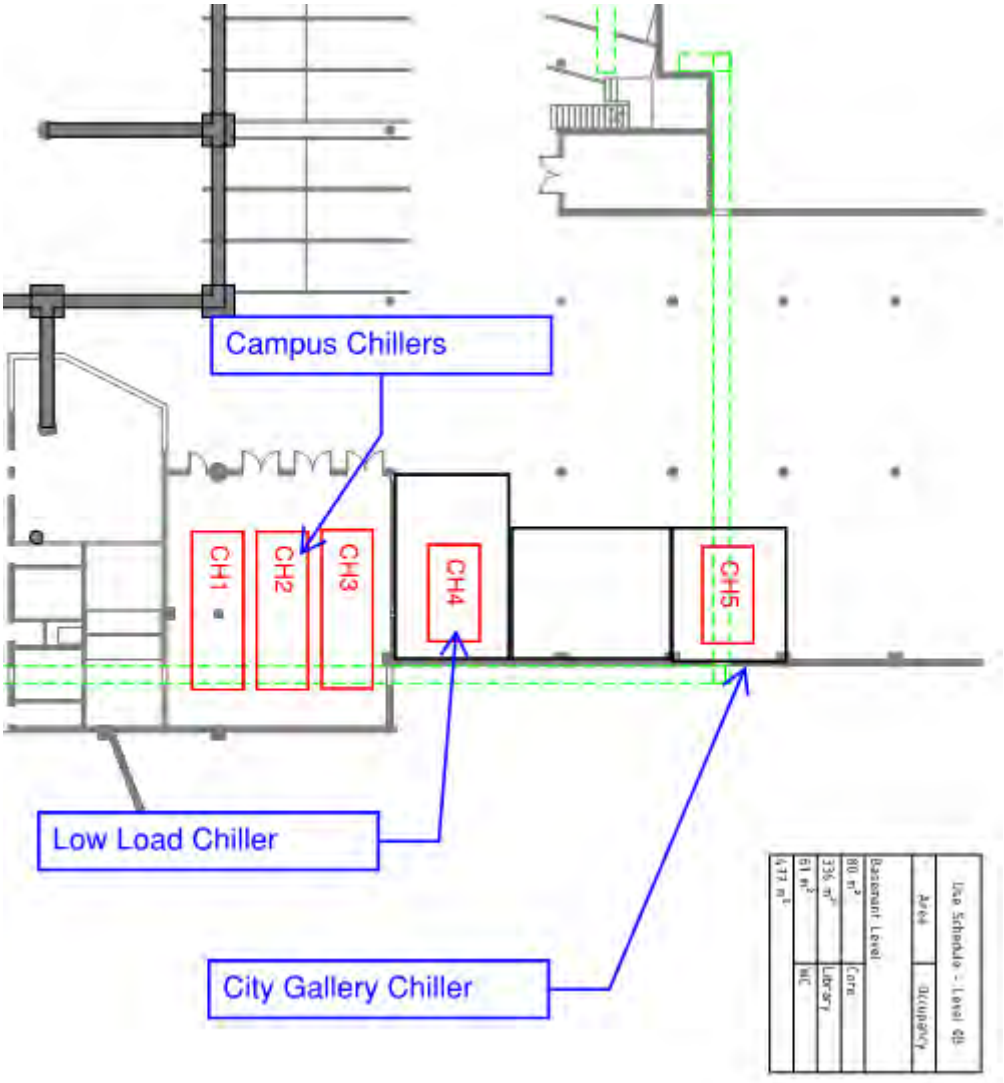
The chilled water generation plant consists of three MYCOM water cooled chillers of nominal capacity as listed in Table 1: Chillers and Chiller Capacities, designated CH1, CH2 and CH3, one Century water cooled chiller designated CH4, and one York chiller designated CH5. All are located in the basement plant rooms.

- Chillers 1-3 installed circa 1990 are approaching 30 years of service. The refrigerant type used is R22.
- Chiller 4 installed circa 2002 is approaching 18 years of service. The refrigerant type used is R22.
- Chiller 5 installed circa 2009 is approaching 11 years of service. This unit is dedicated to the City Gallery, using R410A refrigerant.

Table 1: Chillers and Chiller Capacities

Equipment	**Nominal Cooling Capacity** (kW)	**Age** (Years)	**Anticipated Service life** (Years)	**Comment**
CH1	800 kW	30	20	Unit is end of life. Runs on R22 – Already phased out and replacement will be hard to find.
CH2	1400 kW	30	20	Unit is end of life. Runs on R22 – Already phased out and replacement will be hard to find.
CH3	1400 kW	30	20	Unit is end of life. Runs on R22 – Already phased out and replacement will be hard to find.
CH4	430 kW	18	20	Unit is nearing end of life. Runs on R22 – Already phased out and replacement will be hard to find.
CH5 (CG)	460 kW	11	20	Still in good working order.

An indicative drawing showing the approximate chiller layout is below.



The cooling towers on the Art Gallery roof have been reviewed, and it is understood that these have been replaced at some stage and appear to be suitable for reuse.

More detail on the above and the condition of the associated plant is detailed within the Aurecon 2016 condition survey. Generally, most plant is at or nearing the end of its operational life. However, a small number of pumps have been replaced within the last 5 years including the Library chilled water network pumps.

2.1.2 Library Proposed Works

It is proposed that the Library project will incorporate separating the Library building chilled water generation plant from the rest of the campus network.

The Library chilled water plant may continue to utilise the cooling towers on the City Gallery roof and connect to the existing stainless-steel pipe condenser water network. It is also possible for the rest of the Campus to continue utilising these cooling towers or to be completely separated from the condenser water network.

Additional options for generating chilled water could include:

- Air cooled chillers – these would be more exposed to the elements and are therefore likely to have a shorter life span.
- Heat pumps or chillers utilising a ground, sea water or other medium for rejecting (and potentially absorbing) heat – this option would require further investigation and a feasibility analysis.

Of the three strengthening options, the base isolation option, option C, has the most significant impact on the existing plant. For this option the base isolation rattle zone will likely pass through the existing main chiller plant room, which houses chillers 1 – 3, rendering this space unusable in its current form.

To allow this option to occur it will likely be necessary to strip out the majority of the plant within this plant room including switchboards and Chillers 1 – 3. We understand currently 2 of these chillers are not operational. However, the Campus, with the exception of the City Gallery, is currently served by the remaining unit and the separate low load chiller (Chiller 4).

Therefore, if strengthening option C was to be adopted, prior to the Library construction beginning, new plant would need to be in place for the Campus network. This could take the form of distributed plant (e.g. separate plant for MFC, Town Hall and MOB) or new central plant serving the remaining buildings on the Campus network. We recommend WCC undertakes a feasibility study on the future chiller plant solutions covering options and location for plant. We have assumed this work is separate to the Library project.

For the building strengthening options A and B, with the exception of the chiller power supplies, the existing chiller plant rooms are likely to not be heavily impacted by the proposed strengthening. In these scenario's the upgrade to the existing chiller plant could happen independently to the Library upgrade project.

The requirements around the plant power supplies is covered in more detail within the electrical section of this report.

We have assumed should CAB be retained it will have its own new chiller plant, potentially located at roof level.

2.1.3 City Art Gallery

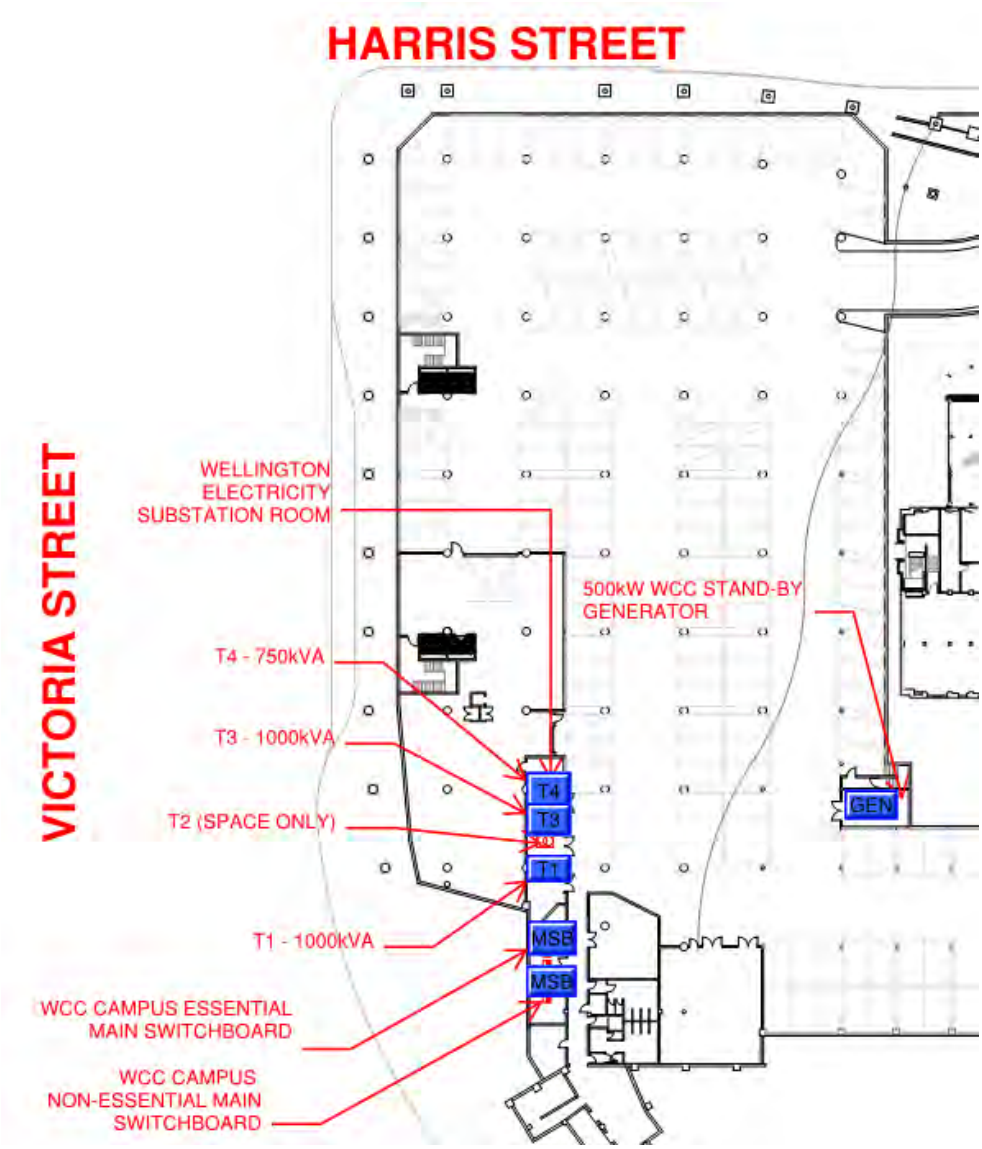
Aurecon detailed in the 2019 Building Services Recommendations Memo recommendations regarding the relocation or replacement of the CG chilled water plant.

As this plant is separate to the Campus plant it does not appear to generally be impacted by the proposed Library strengthening works. The exception to this is the CG power supply which is fed from the basement transformers.

It is therefore likely any resilience upgrades required to the City Art Gallery chilled water network could generally happen independently to the Library project.

2.2 Electrical Services

The existing Library basement location houses electrical supply infrastructure that supplies multiple buildings on the Civic Square, as shown indicatively below:



2.2.1 Transformers and Generator

The current site transformers serving CAB, Central Library, City Art Gallery and associated Civic Campus Cooling chiller plant are located within the basement directly below the Library structure. There is also a standby generator located within the basement supplying the above buildings and also MOB and the Town Hall.

2.2.2 Library Proposed Works

All of the Library upgrade options require additional building structure in the basement that currently impacts the viability of the existing basement transformer room. The two existing transformers (T3 & T4?) are proposed to be replaced with new transformers on the ground floor to supply the Central Library and City Art Gallery as a resilient supply for these buildings into the future (addressing the basement flooding risk).

For the base isolation option, the base isolation rattle zone will likely pass through the existing CAB / Campus main switchboard room, main chiller plant room (affecting supplies to the chillers) and behind the basement generator room.

The remaining basement transformer (T1?) and associated supplies serving CAB will need to be relocated to retain power to this building. If the CAB building is to be retained this may require a new transformer room and switchboard room within the ground floor of this building.

Subject to further investigation, ideally the TH and MFC transformers would supply power to the chilled water plant serving these buildings (along with MOB). Note, MFC has previously had its own chiller plant.

To allow the proposed Library options to occur, prior to construction, new electrical supplies to the CAB and any remaining central chiller plant will need to be re-instated in a new location. In addition, the basement generator may also be required to be relocated, or otherwise temporarily relocated during the proposed works.

To ensure continuity of supply to the City Gallery power supply it will be necessary for the transformer installation, within the ground floor of the Library, to occur prior to decommissioning of the basement transformers, at the beginning of the Library strengthening construction.

In regard to other buildings, the following notes are made:

- CAB – no electrical supply is required to be maintained to the building from the basement transformers;
- MOB – the HV (high-voltage) supply to the MOB from the HV switch room within the Library ground floor space may be impacted by the structural works (base isolation), and may require some outage associated with re-routing the cables across the base-isolation zone;
- Generator – there is no requirement for a generator backup supply to the Library or Art Gallery. Backup supply to MOB and Town Hall will need to be confirmed, which is outside the scope of this project.

2.2.3 Existing Campus Main Switchboard

The existing campus main switchboard will be impacted by the base isolation zone as noted above. There is no requirement to maintain this switchboard based on alternate supplies to the basement chillers and generator supplies to other buildings as noted above.

2.2.4 Existing ICT Room

There is an existing ICT Room in the basement adjacent the campus main switchboard. It is understood that all equipment in this room is obsolete and not required to be maintained.

2.3 Conclusion

With the exception of the cooling towers and City Gallery plant, the existing chilled water plant for the Campus is generally at the end of its operational life.

It is understood that the replacement of this plant is separate to the Library strengthening project.

It is assumed should CAB be retained it will have its own ground floor transformer and main switchboard, and new chiller plant located at roof level.

To allow for the three strengthening options to occur, prior to the Library construction, new electrical supplies to CAB and any remaining civil campus chiller plant will need to be re-instated in a new location. In addition, the basement generator may also be required to be relocated, or otherwise temporarily relocated during the proposed works.

Subject to further investigation, ideally the TH and MFC transformers would supply power to the chilled water plant serving these buildings (along with MOB). Note, MFC has previously had its own chiller plant.

To ensure continuity of power supply to the City Gallery it will be necessary for the transformer installation, within the ground floor of the Library, to occur prior to the decommissioning of the basement transformers at the beginning of the Library strengthening construction.

If strengthening option C, base isolation of the Library, is undertaken the Civic Campus chilled water network upgrade will need to occur prior to the Library strengthening construction beginning. This will include new chilled water plant in a new location for MOB, TH, and MFC. It is possible that this solution could incorporate the existing low load chiller in its current location, however, this chiller will require a new power supply and control interfacing if it is to be retained.

For option C, basement electrical services including the campus main switchboard, chiller distribution board, and generator will be impacted and required to be replaced to suit new supply arrangements.

For strengthening options A and B, upgrading of the campus chilled water plant could be independent of the Library project.

It is recommended that WCC undertakes a feasibility study on the Campus chiller replacement and develops a masterplan for replacing this plant. This will need to include all associated electrical and controls work required.

3 Mechanical Services

3.1 Overview

The Mechanical Services documentation is documented in accordance with the option C base isolation requirements. We have also included commentary, within this DFR, on the alternate requirements should option A or B be adopted.

The documentation has also considered the implications of the 2016 Aurecon Condition Survey and the key findings from this survey are documented below.

3.2 2016 Condition Assessment Recommendations

As described in the *HVAC Services Review Condition Assessment Report* (appended), most of the mechanical services equipment is aged and near the end of its economic and expected design life.

Based on the condition assessment observations, key recommendations for the replacement of mechanical equipment were:

- Replace all chilled water pipework in the building;
- Replace existing boilers with new higher efficiency boilers or heat pumps;
- Replace all heating water pipework and associated equipment;
- Replace all eight Library air handling units;
- Replace all return air fans;
- Replace all fan coil units;
- Replace all VAV (variable air volume) boxes;
- Replace the majority of on-floor ductwork and replace all ductwork components such as motorised dampers;
- Replace the toilet extract fans and potentially replace all toilet extract ductwork;
- Replace all (nine) basement carpark fans;
- Replace the BMS in its totality including all associated cabling and equipment.

A detailed description of the observations and recommendations from the condition assessment can be found in the following sections.

3.2.1 Chilled Water System

Chilled water for the Library is generated by the Central Civic Campus cooling plant. The central cooling plant is in the common basement near the Civic Administration Building (CAB). Due to the seismic risk, access to the central cooling plant is restricted. This plant has operational issues and is at the end of its economic life; as described in the condition assessment report.

Aurecon has also been requested by WCC to investigate de-centralisation of the Civic Campus Cooling plant. To provide decentralised cooling for the library Aurecon recommends allowance to be made for 2 x 540kW dedicated water-cooled chillers on the roof of the Library, along with its ancillary equipment such as chilled water pumps, condenser water pumps, buffer tanks etc.

The roof of the Library will require strengthening to accommodate the chilled water plant installation. The roof strengthening will need to accommodate required acoustic treatment, along with access and safety provisions such as platforms, handrails etc. A plant room (approximately 165m²) will need to be built at roof level to accommodate the chilled water system ancillary plant including pumps, switchboards, etc.

It is anticipated that all chilled water pipework within the building will need to be replaced.

3.2.2 Heating Water System

The Library heating water system is served by gas boilers located within a roof level plant room. The boilers had their gas burners replaced in 2010 and appear (along with their associated primary pumps) to still be in an acceptable working condition and therefore, could be retained.

Table 2 Condition Assessment Boiler Summary

Equipment	Model	Nominal Heating Capacity (kW)	Age (Years)	Anticipated Service Life (Years)	Comment
Boiler 1	Aquatherm A770	750	26	20	Gas burners replaced in 2010
Boiler 1	Aquatherm A770	750	26	20	Gas burners replaced in 2010

However, to increase the building energy efficiency, it was recommended to consider:

- Replacing the boilers with high efficiency condensing boilers (cost benefit analysis required)
- Replacing the boilers with heat pump chillers (this would have much higher CAPEX, a shorter working life and may not be economic, once again cost benefit analysis required).

It is anticipated that all the heating water pipework and associated equipment will need to be replaced.

3.2.3 Air Handling Units (AHUs)

The condition assessment indicates the AHU components are aged and at the end of their economic and design life. Aurecon recommends utilising the current opportunity to replace all 8 of the AHUs. The final design for the upgraded Library building may alter the configuration and number of AHUs

The replacement AHU's should be selected to be more energy efficient and consideration should be given to inclusion of heat recovery where possible which will provide energy savings and lower OPEX costs.

Table 3 Condition Assessment Air Handling Unit Summary

Equipment	Air Flow (L/s)	Design Cooling Conditions (DB°C/WB°C)	Age (Years)	Anticipated Service Life (Years)	Comment
AHU.LIB.1.1.1	8,900	Entering: 22.2 / 16.0 Leaving: 10.4 / 9.5	26	20	Corrosion is visible on the air handling unit casing
AHU.LIB.1.1.2	8,900	Entering: 22.2 / 16.0 Leaving: 10.4 / 9.5	26	20	Corrosion is visible on the air handling unit casing
AHU.LIB.1.2.1	8,900	Entering: 19.6 / 14.5 Leaving: 9.8 / 9.3	26	20	Corrosion is visible on the air handling unit casing
AHU.LIB.1.2.2	8,900	Entering: 21.1 / 15.3 Leaving: 10.1 / 9.8	26	20	Corrosion is visible on the air handling unit casing
AHU.LIB.2.1	9,100	Entering: 18.8 / 14.0 Leaving: 10.7 / 9.8	26	20	Corrosion is visible on the air handling unit casing
AHU.LIB.2.2	9,000	Entering: 18.7 / 14.0 Leaving: 10.0 / 9.6	26	20	Corrosion is visible on the air handling unit casing
AHU.REN.1.1	9,600	Entering: 17.4 / 13.0 Leaving: 12.0 / 11.0	26	20	Corrosion is visible on the air handling unit casing
AHU.REN.1.2	9,700	Entering: 17.4 / 13.0 Leaving: 12.3 / 11.5	26	20	Corrosion is visible on the air handling unit casing
Fan guards are to be installed for all AHU fans					

3.2.4 Return Air Fans

The return air fans were designed to draw air from the various spaces back to the main plantroom at roof level.

The condition assessment indicated the return air fans are well maintained and are in a relatively good condition, however these units have reached the end of their intended design life. Aurecon recommends utilising the current opportunity to replace the fans.

Table 4 Condition Assessment Return Air Fan Summary

Equipment	Air Flow (L/s)	Age (Years)	Anticipated Service Life (Years)	Comment
EF.LIB.1	28,300	26	15	The fan will need replacement in the next 2-5 years
EF. LIB.2	28,300	26	15	The fan will need replacement in the next 2-5 years
EF.REN.1.1	7,700	26	15	The fan will need replacement in the next 2-5 years
EF.REN.1.2	7,800	26	15	The fan will need replacement in the next 2-5 years

3.2.5 On-floor Air Conditioning Systems

The on-floor air conditioning equipment for the Library consists of local 4-pipe fan coil units (FCU) serving ground floor, level 1 and level 2 and VAV boxes serving the office floors (Levels 3 and 4).

3.2.6 Fan Coil Units

Additional FCUs have been added throughout the life of the building to suit building alterations, however, the majority of the FCUs are aged and have had 28 years of service life, with an anticipated service life for these units of only 20 years.

Aurecon recommends using this opportunity to replace the FCUs with modern units incorporating EC motors. These new EC motored FCUs are likely to provide energy savings as they have better fan speed control.

3.2.7 Variable Air Volume Boxes

The various VAV boxes installed on Level 3 and 4 were not inspected during the condition assessment, however, based on feedback from the maintenance contractor, at the time the condition assessment was carried out, the units are functional but would require new actuators, new BMS controllers, and re-balancing.

Additionally, a large number of the VAV boxes are fan assisted. These units are aged and have had 28 years of service life, the anticipated service life for these units is only 20 years. These units should be replaced.

Aurecon recommends that full allowance for replacing all of the VAV boxes is made as the majority are likely to need to come down for the strengthening works. It is unlikely to make economic sense to store these units for extended periods and then test and upgrade them at a later stage. Additionally, the structural strengthening scheme may not allow space for a VAV system to be reinstalled; a VAV system requires large duct sizes compared to other air conditioning systems. If these ducts are required to be routed below structural strengthening works, it may mean that the suspended ceiling will need to be reinstalled at a lower height than existing. This lowered ceiling height will need to be discussed with the client to determine whether it is acceptable.

Due to the strengthening works it is likely the on floor ductwork will require replacement. All the motorised dampers and other components on this ductwork are likely to be end of life and unsuitable for reuse.

It may be possible to reuse the riser ductwork, but this will be subject to the strengthening and design requirements. For ductwork that is able to be reused, an allowance will need to be made for cleaning the ductwork prior to reinstatement.

3.2.8 Toilet Exhaust Systems

The toilet exhaust system consists of two separate ducted extract systems located on either side of the building. These systems extract air from the various toilet blocks and discharge at roof level.

Each system is provided with a duty/standby extraction fan providing 100% redundancy. As these fans have exceeded their anticipated service life, Aurecon recommends replacing these fans.

It is possible that the main duct work could be retained and reused if the toilet block locations are not altered. For ductwork that is able to be reused, an allowance will need to be made for cleaning the ductwork prior to reinstatement.

Table 5 Condition Assessment Toilet Exhaust Fan Summary

Equipment	Air Flow (L/s)	Age (Years)	Anticipated Service Life (Years)	Comment
TE.LIB.1.1	1,020	26	15	Corrosion is visible on the units
TE. LIB.1.2	1,020	26	15	Corrosion is visible on the units
TE.LIB.2.1	1,020	26	15	Corrosion is visible on the units
TE.LIB.2.2	1,020	26	15	Corrosion is visible on the units

3.2.9 Basement Supply and Exhaust Ventilation System

The Library basement levels are provided with car park ventilation fans and also supply and extract fans for various areas. There are nine basement level fans in total, of which four fans are supply air fans and five others are exhaust air fans. As these basement level fans have exceeded their anticipated service life, Aurecon recommends replacement.

Additionally, the ductwork in this space is likely to be significantly affected by the strengthening works and should be assumed as needing replacement for budgeting purposes.

Table 6 Condition Assessment Basement Supply Fan Summary

Equipment	Air Flow (L/s)	Age (Years)	Anticipated Service Life (Years)	Comment
SF.LIB.B.WS.1	1,650	26	15	Fresh air for the Library workshop areas
SF.LIB.B.PR.1	7,350	26	15	Fresh air for the plantroom toilets and gym and also carpark make-up air
SF.LIB.B.CP.1	5,850	26	15	Carpark make-up air
SF.LIB.B.CP.2	5,850	26	15	Carpark make-up air

Table 7 Condition Assessment Basement Exhaust Fan Summary

Equipment	Air Flow (L/s)	Age (Years)	Anticipated Service Life (Years)	Comment
EF.LIB.B.CP.1	9,670	26	15	Carpark exhaust air fan
EF.LIB.B.CP.2	7,370	26	15	Carpark exhaust air fan
EF.LIB.B.CP.3	2,870	26	15	Carpark exhaust air fan
EF.LIB.B.CP.4	7,700	26	15	Carpark exhaust air fan
EF.LIB.B.WS.1	430	26	15	Workshop / carpenters extract air fan

3.2.10 Building Management System (BMS)

The existing Library BMS system is dated and will need to be replaced in its totality, this includes the master controllers down to the Local Terminal Units (LTU) equipment including field cable wiring.

Aurecon recommends checking and replacing the control valves and control dampers on any mechanical equipment retained.

3.3 Option C Seismic Upgrade Mechanical Services Design

3.3.1 Basis of Design

Aurecon carried out high level energy modelling to assess options for system selection. A memo on this is attached within the appendices.

Aurecon has selected what we believe to be the most appropriate equipment for costing purposes. Alongside energy efficiency, we have also considered buildability and look and feel. Within the Library itself it is considered important to maintain the building's look and feel and keep as true to the original design intent as possible.

The mechanical system will significantly reduce the ongoing operational carbon footprint of the building with the adoption of the following technologies:

- Replacement of gas boilers with heat-pump chillers (subject to a cost-benefit analysis)
- The use of high efficiency water cooled chillers with VSD (variable speed drive) controlled compressors
- Adoption of high efficiency EC (electronically commutated) fans for plant
- Heat recovery on dedicated outdoor air plant
- Adding the ability to locally vary the volume of air being delivered by the Central Library air handling systems
- New BMS (building management system) with high levels of control and monitoring

There are further options to increase the efficiency of the chilled and heating plant and these are discussed further within the ESD (environmentally sustainable design) section of this report. However, these are not considered part of the base design.

3.3.2 Building Thermal Envelope Performance

It is not currently within the project budget to significantly enhance the building thermal envelope. However, there will likely be opportunities to improve the insulation levels of the roof and floor slab as part of the works proposed to these areas.

Additionally, any new glazing units that are installed, including those to suit the north and south architectural changes, are expected to be high performance double glazing.

Table 8: Thermal Envelope Performance

Thermal Envelope Performance			
Construction	**Minimum Building Code Thermal Properties**	**Existing**	**Proposed R Values to Achieve Green Star 2-4 Points**
Roof	R1.9	R2.0	R3.0
External Walls	R1.2	R1.4	R2.0
Floor	R1.3	R0.24	R2.0
Glazing	No Requirements	R0.18	R0.43 (Thermally Broken, Low E, Double Glazed)

***R-values in m2 °C/W**

***Existing values are approximate based on limited site survey**

***Green Star points subject to detailed thermal modelling.**

3.3.3 Outdoor Design Conditions

Air conditioning systems shall be designed to achieve prescribed indoor conditions at selected outdoor design conditions. The selected outside air conditions determine the cooling and heating capacity required for air conditioning plant, which directly relates to the initial capital cost of the new air conditioning systems.

The chosen design conditions are based on the following values for Wellington atmospheric temperatures:

Summer ambient: 24.2°Cdb / 19.4°Cwb

Winter ambient: 3.7°Cdb

These being the NIWA 1.0% conditions for Wellington (Kelburn).

Condenser selection of central plant will be based on 30.0°Cdb (summer) & 0.0 °Cdb (Winter).

3.3.4 Indoor Design Conditions

The internal spaces of the building will be designed so that the following indoor conditions can be achieved:

Table 9: Indoor Design Conditions

Zone / Space	Indoor Condition Temperature		Control Tolerances / Comments
Description	Summer	Winter	Degrees Celsius
Entrance lobbies and adjacent areas	23°C	20°C	± 2.0°C / RH not actively controlled
Library, Office spaces & Meeting Rooms	22°C	22°C	± 1.5°C / RH not actively controlled
Comms rooms	23°C	23°C	± 2.0°C / RH not actively controlled
Rare Books room	18°C	18°C	± 2.0°C / RH 50% ± 10%
Toilet / Ablution areas	Uncontrolled	Uncontrolled	Exhaust ventilation only
Plant rooms	Uncontrolled	Uncontrolled	Natural ventilation only
Storerooms	Uncontrolled	Uncontrolled	Extract ventilation only
Car park area	Uncontrolled	Uncontrolled	Extract ventilation only

3.3.5 Ventilation Design Criteria

Table 10: Ventilation Design Criteria

Zone / Space	Design Criteria
Outdoor Air	
Offices	10 l/s/person @ 9 m^2/person
Library (average)	10 l/s/person @ 30 m^2/person
Board room, meeting room, conference room	10 l/s/person with 50-100% diversity will be applied for intermittent usage (occupied less than 3hrs)
Reception Areas	10 l/s/person
Corridors	1.0 l/s/m^2
Extract Air	
Car park area	To AS1668.2
Storage rooms, kitchenettes, etc.	5.0 l/s/m^2
Toilets & ablutions	Larger of 25 l/s/fixture or 10.0 l/s/m^2
Infiltration	0.25 air change per hour (ACH) 1.0 air change per hour (ACH) for ground floor lobby area

3.3.6 Internal Load

The air conditioning systems will be designed based on the following:

- Plug and Lighting Load (Office): 10 W/m²
- Plug and Lighting Load (Library): 20 W/m²
- People load:
  - Sensible: 70W/person
  - Latent: 55W/person.

3.3.7 Design Codes and Standards

The mechanical services for the building shall be designed and installed to comply with the following codes, standards, and reports identified below:

- New Zealand Building Code - G4 Ventilation
- New Zealand Building Code – H1 Energy efficiency
- NZS 4303:1990 Ventilation for acceptable indoor air quality
- AS/NZS 1668.1:1998 The use of ventilation and air conditioning in buildings; Part 1: Fire and smoke control in multi-compartment buildings
- AS/NZS 1668.2:2002 The use of ventilation and air conditioning in buildings; Part 2: Ventilation for indoor air contaminant control
- AS/NZS 1668.4:2012 The use of ventilation and air conditioning in buildings; Part 4: Natural ventilation of buildings
- NZS 4219:2009 Seismic performance of engineering systems in buildings
- AS 1324.1 Filtration
- AS 3500 Plumbing and drainage
- NIWA Design temperature for air-conditioning
- The requirements of the fire report

3.3.8 Seismic Restraint

The mechanical services will be seismically restrained in accordance with the requirements NZS 4219.

Any plant or equipment that is retained will need to be checked by the Contractor and the seismic restraint upgraded where necessary.

Wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide a high level of resilience.

3.3.9 Car Park

To allow the structural strengthening to occur we would expect the ventilation systems for the car park level to be fully replaced. The new systems required for this level will include:

- Car park exhaust system with CO (carbon monoxide) control
- Make up air supply for the car park
- Tempered outdoor air supply for any occupied areas
- Exhausts systems for shower, toilets, change areas, etc.

While not currently indicated on the drawings, it is highly probable that the basement will house rubbish rooms or similar service areas. An allowance should be made for provision for an extract system catering for this requirement.

Currently no heating and cooling plant has been shown within the basement. However, it is expected that this area will be at least partially fitted out with occupied spaces requiring temperature control. It is recommended an allowance is made for a nominal 5 fan coil units along allowance for connection to one of the outdoor air systems for the building.

3.3.10 Library Levels

It is proposed that the existing library level mechanical services will be replaced with new due to the existing FCUs generally being end of life and the amount of upgrade, cosmetic, and remediation work (including improved seismic restraint) required to the existing ductwork to allow the redevelopment of the Library and the proposed strengthening works to occur.

It is proposed that the future air conditioning for the Library levels will be provided by a mixture of fan coil units and air handling units that will give a similar look and feel to the existing installation.

The internal zones will be served by new air handling units in a similar arrangement to the existing air handling units. All new air handling units will include EC fan motors. The duct work served by these air handling units will incorporate heating water re-heat coils and motorised dampers to vary the air volume to match demand.

Where the façade is glass curtain wall, FCUs will be provided at either low level (ground to Level 1) or high level (Level 2), in a similar configuration to the existing FCU arrangements, to distribute conditioned air directly onto the face façade internally. This will include any areas of new glass curtain wall. These fan coil units will recirculate air only. They will also incorporate EC fan motors and have the ability to vary their air volume to match demand.

New recirculating FCUs will also be installed around the outside of the north and central atriums matching the exiting central atrium arrangement.

Fan coil units have also been proposed for a number of other spaces including meeting rooms, general office areas, and other similar spaces. These fan coil units will also incorporate EC fan motors and have the ability to vary their air volume to match demand, along with an outdoor air connection supplied by AHUs incorporating high efficiency heat recovery, tempering coils and EC fan motors.

The existing commercial kitchen extract duct was designed for a much smaller hood than currently installed. Additionally, the ductwork currently installed does not appear to have sprinkler protection and may not fully comply from a fire engineering perspective.

The existing duct may be able to be reused if a high efficiency capture hood is utilised, access panels are added for cleaning, and the duct is upgraded to meet fire requirements. However, we recommend an allowance is made to fully replace with an appropriately sized and compliant commercial extract duct. It is expected any fans and the hood for this system would be installed as part of a tenancy fitout to suit equipment served.

The communications room on the ground floor will be served by two independent dedicated split systems. The outdoor units for these split systems will be located within the basement at high-level.

The proposed ground floor café at the north western corner of the building has been assumed as being fitted out as a shell only, and plant for this area would be installed as part of a tenancy fitout.

3.3.11 Rare Books Area

The proposed rare books area will be served by dedicated process coolers, two for the collection area and one for a buffer zone / air lock where you enter the rare books space. The outdoor units for these process coolers are proposed to be located on the Level 3 roof level.

The rare books area would be a close controlled with environmental control of the space constantly kept within the proposed design limits for temperature and humidity. The proposed space conditions are 50% +/- 10% RH and 18 +/- 2^0C. These conditions are not highly onerous and are inline the ASHRAE A grade class of control for collection storage.

Between the rare books collection area and the Library space would be a buffer zone / air lock with environmental control to the same level as the close controlled space. However, it would be acceptable for this area to temporarily fall outside of the proposed environmental control range. Note, that the buffer zone has not been indicated on the drawings.

It is expected that these rooms will be heavily insulated and will incorporate a vapour control barrier.

3.3.12 Office Levels 3 and 4

Options for the office area space conditioning were investigated and FCUs are the proposed solution.

The space is currently conditioned by fan assisted VAV boxes and VAV boxes. It is not recommended that fan assisted VAV boxes are used as these offer very little advantage over a modern FCU. A VAV system was considered for the office levels, however, once the seismic upgrades, appropriate zoning, the addition of cable trays and cable baskets, and seismic compliance with NZS 4219 were considered, there appeared to be insufficient space for a VAV solution with the current ceiling level of 2.680m. Standard ceiling heights for modern office space is generally 2.7m and we therefore consider it unlikely that this ceiling will be significantly dropped in height to provide more space for services.

Chilled beams were discounted as we did not wish to add the complexity of a different air-conditioning system, humidity control, and an additional water loop, for a system only serving a small part of the building.

VRF solutions were not considered due to their short operational lifespan and because there is already heating and chilled water for the building.

Therefore, FCUs were selected. Whilst FCUs appeared to be less energy efficient than chilled beams and VAV solutions, with further more detailed modelling it is believed the difference will reduce as zone diversity was not modelled with the VAV system, and the FCU system modelling did not account for the ability to vary the airflow to match demand. The office levels are also a relatively small percentage of the building floor area.

These fan coil units will incorporate EC fan motors and have the ability to vary their air volume to match demand, along with an outdoor air connection supplied by AHUs incorporating high efficiency heat recovery, tempering coils and EC fan motors.

3.3.13 Toilet Exhaust System

There will be two new toilet exhaust systems that will serve the majority of the building, one in the northern core and one in the southern core. The basement will be served by a separate exhaust for this floor only.

The two main toilet exhaust systems will each utilise a duty and a standby fan arrangement (similar to the existing system) to provide redundancy and shall operate whenever any of the associated supply air systems are operating.

3.3.14 Plant Level

It is proposed that the Library building will be served by two new water-cooled chillers utilising the existing cooling towers on the City Gallery roof. These units are currently sized to each be able to provide approximately 75% of the expected building cooling capacity.

The existing cooling towers have been surveyed and appear in good condition and are relatively new. It is proposed the new condenser water pipework serving the new water-cooled chillers would be stainless-steel, matching existing.

The new chillers would be high efficiency units incorporating VSD compressor control. It is proposed a new plant room would be constructed to house these units along with the associated plant including pumps and buffer tanks.

It is proposed to remove gas from the building and remove the existing gas fired boilers. These would be replaced with three new air-cooled heat pump chillers sized to each be able to provide approximately 50% of the expected building heating capacity.

Alternatively, the above heating and cooling plant could be replaced with one of the proposed heat pump solutions mentioned within the ESD section of this report. However, this will be subject to further investigation and the above solutions should be considered as the base option.

The existing AHUs and associated ductwork will be completely stripped out and replaced with new air handling units to suit the systems in the preceding sections. A suitable allowance shall be made for access provisions within the plant room to provide safe access to double stacked AHUs.

The plant room will also incorporate acoustically treated return air fans drawing return air from the centre atrium. These fans will discharge into the plant room. Any air not returned to the Library levels will discharge out of the plant room via wall mounted louvres. Existing louvres are already installed for this purpose and may be able to be refurbished and reused. This will be confirmed during the next design phase.

The plant room and Level 3 roof will incorporate smoke exhaust systems drawing air from the two atriums in accordance with the requirements of the fire memo. It is proposed the Northern atrium will have two dedicated smoke exhaust systems for this purpose. For the central atrium it is proposed to utilise the return air, in a suitable arrangement, to achieve these requirements.

3.3.15 BMS

A new BMS will be installed to control all the mechanical equipment. This BMS will include extensive energy metering in line with NABERS NZ requirements, water metering of the incoming water supply (and flushing water supply if rainwater harvesting is provided) and additional metering where deemed appropriate.

It is also proposed that the BMS will provide a high level of energy management reporting and tools.

3.3.16 Acoustic Treatment

Acoustically there are several locations within the proposed works where noise levels could exceed acceptable levels. We recommend that an Acoustic engineer be engaged to review and comment on this.

Areas of immediate concern acoustically include:

- Areas adjacent to plant rooms
- Proposed office space directly below any chiller deck
- Roof plant deck
- Air intakes and exists via weather louvres on the ground floor and roof plant rooms
- Down duct noise from HVAC systems

3.4 Risks and Assumptions

The project team should be aware of the following risks and assumptions:

- Where equipment has been identified as suitable for reuse, measures need to be taken to remove the equipment in a careful and systematic manner to prevent damage, clean the item, and to store the equipment properly to prevent any further degradation prior to them being reinstated.
- Any ductwork that is identified as being able to be reused; an allowance shall be made for the cleaning of this ductwork prior to reinstatement.
- Allowance needs to be made for passive fire stopping of services that penetrate fire separations.
- We have assumed that the office level ceiling will be maintained at 2680mm.

3.5 Option A and B Seismic Upgrade Mechanical Services Design

3.5.1 Option A

For option A the scope will be adjusted as follows:

- It may be possible to reuse the existing air handling units and associated plant room ducting for this option if the AHUs are refurbished and the existing motorised dampers are also replaced or refurbished.
- It is possible to reuse the existing gas boilers for this option; however, they should be refurbished, and allowance should be made for new pumps, expansion vessels and a buffer tank.
- If the northern atrium is not included under this option, the smoke exhaust systems and FCUs for this atrium can be deleted.
- If the mezzanine extension is not installed under option A, the proposed systems for under the extension can be deleted.
- If the glass curtain wall façade changes do not occur under option A, the additional FCUs associated with these areas can be deleted.

3.5.2 Option B

For option B the scope will be adjusted as follows:

- We are proposing the same scope for option B and C.

4 Fire Protection Services

4.1 Overview

The Fire Protection Services documentation is documented in accordance with the option C base isolation requirements. We have also included commentary, within this DFR, on the alternate requirements should option A or B be adopted.

This design is based upon the requirements of the September 2020 Fire HQ Preliminary design advice.

The documentation has also considered the implications of the 2016 Aurecon Condition Survey and the key findings from this survey are documented below.

4.2 2016 Condition Assessment Recommendations

As described in the *Fire Protection Services Review Condition Assessment Report* (appended), Aurecon's observations and recommendations on the fire protection system are as follows below.

4.2.1 Fire Sprinkler System

The condition assessment report indicates the fire sprinkler system for the Library building was installed pre-1996 and most of the sprinkler system does not meet the current NZS 4541 requirements. The fire sprinkler system is likely to require replacement to allow the strengthening works to occur.

Further details are as follows:

- The extra light hazard sprinklers used within the office and Library areas of the building generally appeared to be 10mm (3/8 BSPT). NZS 4541 now limits the use of these sprinklers to alterations or extensions. Although the 10mm sprinklers can stay if the ceilings are not being modified the strengthening requirements are likely to lead to replacement of the ceilings. More commentary on this item is included below.
- Sprinklers installed into any new ceiling will need to meet the current seismic requirements and will need to incorporate flexible droppers.
- A detailed check and upgrade on the seismic restraint of any sprinkler equipment or pipework retained would be required.
- The existing sprinkler system has floor isolation valves and flow switches. These isolation valves and flow switches are not located at an accessible height in accordance with the current requirements of 4541 and therefore replacement is recommended with the equipment installed at an accessible level.
- The backflow prevention does not meet current code.

4.2.2 Fire Alarm System

The fire alarm system for the Library building consists of analogue addressable smoke detectors (in limited locations around the atrium), manual call points, strobe lights, audible alarms, and main alarm panel.

As part of the works required for the seismic strengthening, it is recommended that an allowance is made to fully replace this system.

4.2.3 Hydrant System

As per the condition assessment report, the fire hydrant for the Library building is suspected to be a dry riser. The current code requires all the hydrants to be charged.

Aurecon recommends a detailed check and upgrade be carried out.

Charging this system will require a 25mm water supply connection, complete with backflow prevention unit, to the current dry riser inlets located within the sprinkler valve room. A feed could be taken from the sprinkler incoming main located within the same space for this purpose.

It is likely remedial work will be required to the existing pipework as dry risers normally leak at the joints when charged for the first time.

The hydrants are located within both the central stairs and are likely to require test facilities in the form of 100mm return pipes reticulated back to the sprinkler valve room, terminating at a test outlet.

4.3 Option C Seismic Upgrade Fire Protection Services Design

4.3.1 Basis of Design

This design is based upon the requirements of the September 2020 Fire HQ Preliminary design advice.

For fire protection services this includes:

- Fire sprinkler system
- Fire detection system (note, this includes upgrading the building from a limited number of smoke detectors to full smoke detection throughout)
- Hydrant system
- Handheld fire protection in the form of fire hose reels to the north eastern corner of Levels 1 and 2 only.

4.3.2 Design Codes & Standards

The Fire Protection services for the building will be designed in accordance with the following codes, Fire Reports, and standards identified below:

- New Zealand Building Code – F7 Warning Systems
- NZS4512: Automatic Fire Alarm Systems
- NZS4541: Automatic Fire Sprinkler Systems
- NZS4510: Fire Hydrant Systems for Buildings
- Fire HQ Fire Report (not yet documented)

4.3.3 Seismic Restraint

Fire Protection services will be seismically restrained in accordance with the requirements of NZS4541, NZS4510 and NZS 4219 as applicable.

Any sprinkler pipework or hydrant pipework that is retained will need to be checked by the Contractor and the seismic restraint upgraded where necessary.

However, wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide higher resilience.

4.3.4 Fire Sprinkler System

It is proposed that the fire sprinkler system will generally be replaced throughout the building with specific acceptations.

In accordance with NZS4541 the proposed hazard classes for the building are as follows:

Area	Proposed Hazard Class
Car Park	OH2
Library and Office Areas	ELH
North east corner to meet FENZ requirement	OH1
Café areas	OH2
Retail areas	OH3
Plant areas	OH2

Details around the proposed works is as follows:

4.3.5 Water Supply

The water supply for the Library sprinkler system incorporates two independent connections to the town's main water supply.

Under the current code a single connection would be sufficient, however, it is recommended to retain both connections if possible. It is assumed these pipes are suitable for reuse, but it is recommended that this is confirmed; see risks below. If pipework was found to be unsuitable for reuse, it is recommended to be replaced with a single town's main connection only.

Both of these connections will require flexible joints to be added where they cross the base isolation zone.

The existing water supplies do not have backflow prevention compliant with current code requirements and it is recommended that new backflow prevention devices, located in the basement, are added.

4.3.6 Sprinkler Valve Room

It is proposed that the equipment within the fire sprinkler valve room will generally remain.

There are three type X control valves served by a single brigade inlet located within this room. These valve-sets serve the following areas:

- 1 – Basement
- 2 – Levels ground, mezzanine and 1
- 3 – Levels 2 – 4 and plant level

The water supply within the valve room indicates that the system static water pressure is around 800 kPa. This is the borderline between a type X and a type Y control valve set. As the existing control valve sets are type X, which tend to have a lower risk of false alarms, it is proposed to retain these sets in their current form.

An allowance should be made, however, to refurbish the control valve-sets including new DBAs if necessary.

4.3.7 Car Park

The sprinkler system within the basement is generally assumed to require full replacement to allow the strengthening works to occur. The exception to this is the south eastern corner of the carpark which is remaining untouched and would be complex to replace due to the other services in the basement.

The sprinkler pipe work to be retained is indicated on the Aurecon drawings.

Additionally, the sprinkler pipework within the carpark will need to cross the base isolation zone in a single location.

4.3.8 Library Levels

The Library levels utilise 10mm sprinklers. These are now prohibited for use except for existing systems and extensions to existing systems and we would recommend full replacement for the following reasons:

- Limited future availability of these sprinklers.
- Sprinklers to ceilings would incorporate flexible drops with 15mm orifices and it is not recommended to mix 10mm and 15mm sprinklers.

While it is assumed that all range pipes will be replaced on the Library levels, it may be possible to retain the sprinkler main pipe runs for reuse.

Fire and Emergency NZ have requested a higher sprinkler density in the north east corner of the Library floors to compensate for the lack of hydrant coverage in this area. It is proposed to uplift the sprinkler coverage in this area from extra light hazard to ordinary hazard.

It should also be noted that any existing pipework that is retained will need to be checked by the contractor and the seismic restraint upgraded where necessary.

The sprinkler riser will require modification to ensure the floor isolation vales are in a stairway fire cell at a suitable height.

The existing commercial kitchen extract system does not currently have sprinkler protection and is likely undersized for any future commercial kitchen. Sprinkler protecting a new commercial kitchen shall be allowed for including suitable access for future cleaning of the sprinklers.

4.3.9 Office Levels and Plant Level

To allow the strengthening to occur on Levels 3 and 4 a full strip out and replacement of the sprinkler system on these levels is proposed.

Allowance should also be made for full replacement of the sprinkler system on the plant level as it will likely be necessary to remove the pipework to allow for replacement of the plant. Additionally, there is evidence of pipework corrosion on this level.

4.3.10 Fire Alarm System

The fire detection for the building is being expanded from limited smoke detection around the atrium to full smoke detection throughout the building.

The existing fire alarm panel is approaching end of life and will not be suitable for reuse.

It is proposed to fully replace the fire detection throughout the building. This will include smoke detection, manual call points, and alerting devices.

It should be noted that smoke detection will not be required in car parking areas or plant areas within the basement.

4.3.11 Hydrant System

The existing hydrant system does not meet the current code (NZS4510:2008). The current shortfalls include:

- The pipework is not charged with water.
- There is only one outlet at each floor landing instead of two.
- There is a shortfall in coverage on the floors.

It is proposed that the existing system is modified and brought up to the current code levels with the exception of the shortfall in coverage on the floors. Fire and Emergency NZ have agreed that the shortfall is acceptable providing hose reel coverage and increased sprinkler density is provided in the north east corner of the building.

The proposed hydrant works will include the following scope:

- Charging this system with a 25mm water supply connection, complete with backflow prevention unit, to the current dry riser inlets located within the sprinkler valve room. A feed could be taken from the sprinkler incoming main located within the same space for this purpose.
- Rerouting the basement hydrant pipe runs to the stairwells as necessary to co-ordinate with the strengthening works.
- Adding a second hydrant outlet on each floor and replacing the current outlets with modern outlet assemblies. Note, this may require builders work as the existing assemblies are in an enclosure.
- It is likely remedial work will be required to the existing pipework as dry risers normally leak at the joints when charged for the first time.
- The Contractor will also need to review and where necessary upgrade the seismic restraint on any retained pipework.
- Currently it is assumed that this system can be tested onto the office roof however this will be confirmed in the next design phase.

4.3.12 Handheld Fire Protection

There is existing handheld fire protection throughout the Library. This is not required under current codes. However, due to the shortfall in hydrant coverage on the floors, Fire and Emergency NZ have requested that hose reel coverage is provided in the north east corner of the building. New fire hose reels on Levels 1 and 2 (and potentially the mezzanine) will be provided to

It is recommended that any other existing hose reels that are compliant and can easily be retained are kept. Fire hose reels that are difficult to retain can be removed.

It is recommended that extinguishers are provided to plant rooms and in the main switchboard room. It is not recommended full handheld fire protection coverage is provided throughout the building.

4.4 Risks and Assumptions

The project team should be aware of the following risks and assumptions:

- The town's mains water connections are generally assumed to be suitable for reuse. It is possible given the age of these pipes that they are steel. It is not expected that there are any issues with the bore of the pipe, however, it is recommended that where these pipes buried, they are checked in a typical location to ensure significant corrosion has not occurred.

4.5 Option A and B Seismic Upgrade Fire Protection Services Design

4.5.1 Option A

For option A the scope will be adjusted as follows:

- Flexible joints are not required to the incoming town's main connections.
- The existing sprinkler system could largely be retained in the basement with minor modifications where necessary.
- The plant room sprinkler system may be able to be retained with remediation to any pipework with corrosion.
- Hydrant system could be retained in its current form with minor modifications as required for co-ordination purposes.

4.5.2 Option B

For option B the scope will be adjusted as follows:

- Flexible joints are not required to the incoming town’s main connections

5 Hydraulics Services

5.1 Overview

The Hydraulic Services is documented in accordance with the option C base isolation requirements. We have also included commentary, within this DFR, on the alternate requirements should option A or B be adopted.

The documentation has also considered the implications of the 2016 Aurecon Condition Survey and the key findings from this survey are documented below.

5.2 2016 Condition Assessment Recommendations

As described in the 2016 *Hydraulic Services Review Condition Assessment Report* (appended) most of the hydraulics services equipment is original and was installed around 1991. In summary, the passive systems such as pipework and storage tanks are in reasonable condition and do not require replacement. Active components such as water heaters and fixtures should be replaced.

Below are Aurecon's observations and recommendations regarding the hydraulics services components.

5.2.1 Water Supply Pipework

The water supply system consists of a single 50mm diameter connection from the public water main in Victoria Street. Mains pressure water is piped to storage tanks in the upper roof plant room. Low pressure water is then reticulated from the tanks to the plumbing fixtures. The kitchenette sinks and drinking fountains adjacent to the cores are supplied directly with mains pressure cold water.

The water supply pipework is generally copper and has served approximately half of its indicative service life so does not require replacement. *2020 Update* ***– During the preliminary design stage, 5 sections of copper pipework from various domestic hot and cold-water services were removed for inspection. It was found that the internal condition of pipe work was in good visual condition with no apparent defects or undue signs of wear or corrosion. Based on current observations, the 2016 assessment above stands, and the water supply pipework does not require replacement.***

There have been issues identified with some seized isolating valves and leaking mechanical joints. All valves and mechanical joints should be inspected with seized valves replaced and any leaks repaired.

5.2.2 Water Storage Tanks

The potable water storage system consists of six 3000 litre polyethylene tanks. The typical lifespan would be 20-30 years; however, these tanks are in a non-aggressive environment and appear to be in a reasonable condition. On that basis, they do not require replacement. The connections, isolating valves and fill valves should be inspected and serviced or replaced as necessary.

However, seismic restraints for the tanks are required.

5.2.3 Water Heaters

Most of the domestic hot water is supplied from two separate plantrooms on the Ground Floor. Each of these plantrooms contain two 250 litre electric hot water cylinders. Given their age, these cylinders should be replaced. Consideration could be given to replacing these with heat pump hot water cylinders to improve energy efficiency.

The water is currently circulated at 45°C which does not comply with the NZBC requirements for circulating systems to be maintained at not less than 60°C to prevent the spread of Legionella. The circulating temperature should be increased to at least 60°C or UV sterilisation systems installed. If the circulating temperature is raised, new tempering valves will be required for each group of fittings to ensure the hot water delivery temperature at the taps is within acceptable limits.

5.2.4 Sanitary Pipework

The sanitary plumbing pipework within the Library primarily consists of Solvent Cement Jointed uPVC. Much of the uPVC sanitary plumbing pipework appears to be in reasonable condition and is likely to remain serviceable well beyond the CIBSE indicative life expectancy of 20 years.

5.2.5 Sanitary Fixtures

The sanitary fixtures and fittings are of average condition and consistent with the age of the building. Some have been replaced due to failures.

It is recommended that all the existing fixtures and fittings should be replaced with modern and more water efficient fixtures and fittings.

5.2.6 Stormwater

The stormwater system drains from the gutters through 200 mm diameter solvent cement jointed PVC downpipes. These appear in reasonable condition and are likely to remain serviceable well beyond the CIBSE indicative life expectancy of 20 years. On this basis, the downpipes do not require replacement.

5.3 Option C Seismic Upgrade Hydraulic Services Design

5.3.1 Basis of Design

The hydraulic services design comprises of a plumbing and drainage system including all soil, waste and ventilation pipework to serve all fixtures, fittings and appliances. Refer to architectural documentation for the fixture schedule.

This design is based on retaining the use of as much of the existing pipework as practical. Only that pipework that needs to be removed to allow access for structural strengthening works or is redundant due to revised architectural layouts shall be removed and replaced with new.

A proposed option is to retain the existing low-pressure cold-water system to be utilised as a flushing water system supplied from a rainwater harvesting system to be located in the basement. Description of this is provided in this report as a pricing option but has not been detailed on the drawings.

5.3.2 Design Codes and Standards

All hydraulic services work shall comply in every respect with the regulations and bylaws of any and every Authority having jurisdiction over the installation at the location where the work is being carried out, including:

- New Zealand Building Act 2004
- New Zealand Building Code
- Hazardous Substances and New Organisms Act 1996
- Dangerous Goods Regulations 1980
- Health and Safety at Work Act 2015
- Fire Safety (Evacuation of Buildings) Regulations 1970
- The Electricity Regulation Act
- Wiring Rules AS/NZS 3000:2000
- Territorial Authority Requirements
- Fire HQ Fire Report (not yet documented).

The Hydraulic Services plumbing works shall be constructed to comply with the requirements of the New Zealand Building Code as follows:

- Section B1 Verification methods 1: Item 1.1.2.
- Section B2 Specified intended life of building: indefinite being not less than 50 years. All below-slab plumbing services shall be considered as being difficult to access or replace and a minimum 50-year durability is required.
- Section E1 Surface water.
- Section E3 Internal moisture.
- Section F3 Hazardous Substances and processes
- Section G1 Personal hygiene.
- Section G3 Food preparation and prevention of contamination.
- Section G10 Piped services.
- Section G12 Water supplies.
- Section G13 Foul water.

5.3.3 Seismic Restraint

All equipment and pipework forming part of the Hydraulic systems installed under this contract shall be seismically restrained in accordance with the requirements of NZS4541, NZS4510 and NZS 4219 as applicable.

Any existing pipework that is retained will need to be checked by the contractor and the seismic restraint upgraded where necessary.

Wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide higher resilience.

5.3.4 Sanitary Drainage

Sanitary drainage shall be supplied and installed to the point of connection with the basement drainage system in accordance with AS/NZS 3500.2.

Soil, waste (for conveying wastewater at less than 60°C) and vent pipework shall be in uPVC complying with the requirements of AS/NZS 1260:2009 with solvent cement joints. Waste pipes shall be wrapped in Denso tape and sealed with a Denso overwrap where buried.

5.3.5 Domestic Water

Hot and cold water supply pipework systems shall be supplied and installed in accordance with AS/NZS 3500.

Domestic water supply pipework shall be copper to NZS3501.

The systems are designed as mains pressure cold and hot water supplies.

Mains pressure cold water shall be reticulated to all fixtures, fittings and appliances. Note, new mains risers in north and south cores are described below.

5.3.6 Description of Works

- Demolition and removal of all existing plumbing and drainage systems, fixtures, and fittings as detailed on the hydraulics services drawings. With the following exceptions:
  - Retain incoming water supplies.
  - Retain all mains pressure cold water risers, low-pressure cold-water (LPCW) feeds, sanitary drainage stacks, and vents in the north and south risers cores.
  - Retain domestic water heating flow/return pipework systems in north and south cores.

- Retain water storage tanks in plantroom (Level 5).
- Retain all existing basement drainage.
- Retain all existing stormwater drainage.

- Provide new hot and cold-water supply pipework systems in accordance with AS/NZS 3500 and the hydraulic services drawings, to serve all new fixtures, fittings, and appliances within the building. Including water supplies for mechanical services, fire hose reels and hose taps, also for future fitout of a ground floor café.
- The existing incoming domestic water supply shall be upgraded to include a backflow prevention device in compliance to New Zealand Building Code requirements.

Backflow prevention for the domestic water supply shall be provided by a 50 mm backflow prevention device installed in the location indicated on the hydraulic services drawings. Install a Y-pattern strainer upstream of the backflow prevention device and install isolation valves each side of the assembly.

- Install vacuum breakers on all hose taps included in the hydraulic services drawings.
- Install backflow prevention to water supplies for mechanical services.
- Allow for testing and inspection by a registered IQP of all testable backflow preventers, with completion certificates provided to the Local Authority.

- Provide two (north and south core) new 50mm mains pressure cold water (HPCW) supply pipe risers to replace the LPCW supplies on each level. (Note, the existing LPCW system to be retained as a flushing water system).
- Provide a new electric mains pressure hot water cylinder in the locations shown on the hydraulic services drawings. Provide all necessary valves to install the hot water cylinders in accordance with NZBC clause G12/AS1.
- Provide new sanitary drainage in accordance with AS/NZS3500.2 and the hydraulics services drawings, from all fixtures, fittings, and appliances. Including connection points for mechanical condensate drains, and connection for fitout of a ground floor café.
- Supply install all new fixtures and fittings as per the architect's schedules.
- Upgrade the Library basement drainage with new sewage and sump pumps.
- A new grease trap shall be allowed for the commercial kitchen.

5.3.7 Associated Work and Interfaces

Works by Hydraulics Contractor

For mechanical services:

- Water supplies to Process Units on level 1 (Rare Books area) and for heating and chilled water systems in the Level 5 plantroom.
- Condensate drain connection points on each floor in north and south cores, also at new ground floor toilet stack, about grid F2, and at the Rare Books area for new process coolers.

For fire protection services:

- Retain existing test drain and sprinkler drain down connections.

Works by Building Contractor

The building contractor shall provide:

- Normal builder's attendance including positioning wall framing and fixings for fixture supports.
- Provide all weather sealing and flashings to work associated with this trade.
- Provision of access panels in builder's ducts and ceilings where required to access hydraulic system components.

Works by Main Electrical Contractor

The Hydraulic Services Contractor shall supply and install the following items for the Main Electrician to complete the electrical installation:

- Hot water cylinder installation including hot water return pumps.

Works by Mechanical Contractor

The Hydraulic Services Contractor shall supply and install the following items for the Mechanical Contractor to complete connections to the BMS:

- Water meters.
- Water Storage Tanks (level indication required as detailed in the mechanical specification).
- Change-over valves on rainwater harvest system (tank to mains supply).

5.4 Risks and Assumptions

The project team should be aware of the following risks and assumptions:

- It is assumed that the selection, supply, and installation of all sanitary fixtures and fittings is to be per the Architect's schedules.
- There is the potential that the rising mains, drainage stacks, vent risers and the like will be able to be retained and that new pipework at each floor level will utilise the existing connection points at each level. However, this will be dependent of the structural strengthening methodology and how it is implemented.

5.5 Option A and B Seismic Upgrade Hydraulics Services Design

5.5.1 Option A

For option A the scope will be adjusted as follows:

- The LPCW system will be retained its current location. New mains pressure risers in north and south cores are not required.

5.5.2 Option B

For option B the scope will be adjusted as follows:

- No change from option C.

5.6 Pricing Option (Options A, B, and C)

- Provide rainwater harvest system.
  - New 180,000 litre rainwater storage tank to basement.
  - Collection of existing stormwater downpipes to feed into tank.
  - Pump and pipework to roof to supply flushing tanks.
- Provide flushing system, utilising existing water storage tanks at roof level. Existing LPWC risers in north and south cores to be retained for this system.
- Provide mains water supply to tanks with change-over valve to swap between tank and mains supply.
- Mechanical contractor to provide level monitoring of rainwater harvest tank and flushing water tanks and control of the change-over valve, all via BMS.

5.7 Schedule of Equipment

5.7.1 Electric Hot Water Cylinders

- North Core – Two 250 litre mains pressure manifolded electric hot water cylinders. 2x3kW – 2 phase 415V
- South Core – Two 250 litre mains pressure manifolded electric hot water cylinders. 2x3kW – 2 phase 415V
- Café – One 315 litre heavy duty mains pressure electric hot water cylinder. 6x4.8kW – 3 phase 415V

5.7.2 Hot Water Return Pumps

- Two 3-speed inline circulating pumps.

5.7.3 Sewage Pumps

- Two sewage pumps with cutter type impellers. Duty 2.5L/s @ 6.8m head.

5.7.4 Sump Pumps

- Two submersible sump pumps with non-clogging impellers. Duty 7L/s @ 8.5m dynamic/5.6m static head.
- Two dual arrangement sump pumps with non-clogging impellers. Duty 7L/s @ 8.5m dynamic/5.6m static head.

6 Electrical Services

6.1 Overview

The Electrical Services documentation is documented in accordance with the option C base isolation requirements. We have also included commentary, within this DFR, on the alternate requirements should option A or B be adopted.

The documentation has also considered the implications of the 2016 Aurecon Condition Survey and the key findings from this survey are documented below.

6.2 2016 Condition Assessment Recommendations

6.2.1 Power Supply

The Library building is part of the WCC Campus comprising of six buildings; Civic Administration Building (CAB), Municipal Office Building (MOB), Town Hall (TH), City Art Gallery (CG) and Michael Fowler Centre (MFC) – excluding the Capital E component of the Civic Square. The Library is supplied from multiple shared 1MVA Wellington Electricity transformers located in Substation #1 on the common basement level. These transformers supply the Art Gallery and CAB in addition to the Library, as well as the centralised chiller plant also located in the basement.

The adequacy of the existing transformer capacity with regards to the proposed work and existing buildings are not addressed in this report.

Aurecon recommends dedicated transformers be provided to the Library and Art Gallery as part of the services separation from the Campus precinct. Ideally these transformers should be located above ground as there are concerns around the flood risk of the basement.

6.2.2 Standby Diesel Generator

The Library building is supplied with standby (essential) power from an existing 500kW (1000kVA unmatched alternator arrangement) standby diesel generator located in the common basement level. This generator also supplies essential power to CAB, Art Gallery, MOB and Town Hall buildings.

The existing generator is approximately 26 years old. The life expectancy of a standby generator is in the order of 30 years.

The adequacy of the existing generator capacity with regards to the proposed work is not addressed in this report.

Aurecon recommend a dedicated standby diesel generator to be provided to the Library as part of the services separation from the Campus precinct. It is recommended that this generator is located above ground as there are concerns around the flood risk of the basement.

6.2.3 Main Switchboard

The Library is supplied from WCC Campus main switchboard (MSB) MSB.CP located in the common basement level. This main switchboard provides non-essential power to the Library, CAB, Art Gallery, and limited essential power supply to Library, CAB, Art Gallery, MOB and Town Hall. The Library does not have a dedicated main switchboard.

The non-essential 1600 Amp circuit breakers on MSB.CP have been recently upgraded. These circuit breakers are in excellent condition and expected to operate reliably for the foreseeable future.

Aurecon recommend a dedicated main switchboard to be provided (above ground) to the Library as part of the services separation from the Central Civic Campus.

6.2.4 Automatic Transfer Switch

The existing circuit breaker automatic transfer switch (ATS) is from the original construction in the 1990s. The life expectancy of low voltage (LV) switchgear is approximately 25 years and its nearing the end of its serviceable life. Aurecon recommend testing and maintenance of the ATS.

6.2.5 Distribution Boards

Each Library floor is served by essential and non-essential distribution boards located within the North and South electrical riser cupboards. The North riser cupboard contains the essential and non-essential distribution boards while the South riser only contains the non-essential distribution boards.

The floor distribution boards comprise of main switch, tap-off box, modern miniature circuit breakers (MCB) for final power sub-circuit protection and lighting control sections.

The circuit breakers do not appear to be provided with residual current protection devices (RCD).

The floor distribution boards are from the original construction in the 1990s and approximately 26 years old. The life expectancy of low voltage (LV) switchgear is approximately 25 years. Aurecon recommend replacing the existing switchboards complete with new switchgear and RCDs where required as part of the structural strengthening works.

6.2.6 General Lighting and Emergency Lighting

The lighting to the Library floor is provided via suspended fluorescent luminaires with direct and indirect light distribution. This lighting is supplemented with up-lighting floodlights located on central structural columns through the spaces, and local 150W halogen lighting mounted directed to the lighting shelves.

The lighting to Level 3 and 4 office floors is generally provided via recessed 600x600mm fluorescent luminaires with prismatic diffusers.

The light fittings generally appear to be from original construction. The life expectancy of internal lighting systems is approximately 20 years. Aurecon suggest replacing the existing fluorescent and halogen lighting with energy efficient LED lighting system as part of the structural strengthening. The Library levels may include LED refurbishment of the existing custom lighting solutions within the spaces, particularly if required for architectural or heritage elements.

The Library and office floors are not provided with self-contained emergency luminaires. The emergency lighting is presently provided by normal lighting connected to the essential supply (generator backup). This type of emergency lighting does not comply with the latest Building Code. Aurecon recommend providing self-contained emergency lighting to comply with Building Code and fire engineering report as part of the structural strengthening works.

6.2.7 Small Power

Power distribution to the Library and office floors are via existing wall-mounted switched power outlets on wall or columns, and floor boxes. Skirting trunking along the perimeter wall are installed in some areas. The life expectancy of switched socket outlets are approximately 15 years. Aurecon recommend replacing switched socket outlets as part of the structural strengthening works.

The floor boxes are extensive through the Library area floors (Ground, Level 1, and Level 2) supplied from cable trays running along the underside of the floor / lower ceiling space and rising up through local power and data penetrations into each floor box. The floor boxes appear to be custom, approx. 230mm x 230mm x 60mm, generally with twin power and single data. These are not compliant to carry CAT6a data cabling.

However, the floor boxes are generally in good condition. It is recommended to generally maintain the existing floor boxes including power outlets and to delete data outlets. It is assumed a quantity of power outlets within the floor boxes will need to be replaced, and some floor boxes may require data outlets in some locations. For the latter, new floor boxes will need to be installed, including minor increases in width / depth to the existing floor box recess to accommodate installation of new floor boxes.

6.3 Option C Seismic Upgrade Electrical Services Design

6.3.1 Basis of Design

The electrical services design comprises of transformer, switchboards, electrical cabling, lighting and small power. This design is based on new electrical systems to support the Library space, including modification of the incoming supply infrastructure.

6.3.2 Design Codes & Standards

- To AS/NZS3000: Australian/New Zealand wiring rules.
- AS/NZS1680: Interior lighting.
- AS2293: Emergency escape lighting and exit signs.
- To AS3013: Electrical installations – classification of the fire and mechanical performance of wiring systems.
- To AS/NZS 61439: Low voltage switchgear and control gear assemblies - type tested and partially type-tested assemblies.
- On completion submit a Certificate of Electrical Safety.
- Comply with the requirements of AS/NZS 3000.
- Local Supply Authority requirements.
- NZECP 35 Power system Earthing.
- System design, installation and operation: To AS 2293.1.
- Inspection and maintenance: To AS/NZS 2293.2.
- New Zealand Building Code: NZBC F6, F8.
- General: To AS/NZS 60598.1.
- Road lighting luminaires: To AS/NZS 1158.
- Electromagnetic Compatibility: To AS/NZS 61000.
- Quality assurance: To AS/NZS ISO 9001.

6.3.3 Seismic Restraint

All equipment and cable tray part of the Electrical systems installed under this contract shall be seismically restrained in accordance with the requirements of NZS4541, NZS4510 and NZS 4219 as applicable.

Wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide higher resilience.

6.3.4 Power Supply

Power supply to the Library will be via two new 1MVA transformers located in a new transformer room on the ground floor level. The transformer is connected to Wellington Electricity 11kV supply.

The HV supply to the Civic Square is through a HV switch room located on the Library ground floor. This room is to be maintained, with no structural / building upgrade works occurring within the room. The incoming HV cables will require to be amended to cross the new base isolation rattle space/seismic gap.

The 1MVA transformers will connect to the Library MSB, Mechanical supply and Art Gallery building.

The generator supply and essential switchboard (MSB.CP) in the basement is existing to remain and any movement to suit structural strengthen forms outside this project scope of works.

The new supply to central chiller plant is outside this project scope of works.

6.3.5 Power Supply – Staging of Works

The proposed building works will impact other surrounding buildings, including the CAB, MOB and Art Gallery buildings. In addition, the HV substation located within the Library ground floor is part of the supply ring into the wider Wellington urban network, and so any works on this substation will affect other users.

As part of the works, a staging plan will be required to minimise the impact to surrounding operational buildings. In particular, the following staging is assumed to be required:

a. CAB – not occupied, nil impact.

b. MOB – not occupied, but the loss of supplies (HV supply from the Library HV switch room to the MOB transformer room) may impact building upgrade works. Potentially an alternative supply permanent HV supply to the MOB transformer may be required in advance of any works on the Library building, alternatively, a temporary generator is assumed to be required for the MOB to cover the outage works.

c. Art Gallery – occupied. Potentially an alternative supply (LV or transformer substation) may be provided to separate out the Art Gallery from the Library. Alternatively, a temporary generator is assumed to be required for the Art Gallery to cover the outage works.

d. Central Chiller Plant – Currently the basement central chiller plant provides cooling water to all buildings in the Civic Square. However, as identified separately in the mechanical section, this plant requires substantial upgrade works. Depending on the final arrangement for the civic square, a new supply may be required to be installed for the central chiller plant. This is outside the scope of this project but has been separately scoped for WCC.

Maximum demand

The estimated site maximum demand is as shown below:

LIBRARY		
Level	Power(kVA)	Current
Basement	68	98
Ground	113	164
Mezzanine	43	62
01	114	165
02	124	180
03	48	69
04	48	69
Total	557	807
Total Area	14,678 m2	
VA/m2	38	
MECHANICAL (MSSB)		
All levels	805	1166
ART GALLERY		
Basement	30	43
Ground	118	171
01	28	40
Total	176	254
Total Area	3,497m2	
VA/m2	50	

The total new Library MSB electrical maximum demand is approx. 1,540kVA.

6.3.6 Main Switchboard

The new Library main switchboards will supply the Library, Art Gallery, and mechanical plant dedicated to the Library building, via two separate buses. Each bus will be supplied from a separate transformer, connected via a normally open bus-tie.

Switchboard bus one will provide general power, lighting, localised mechanical supply, and the Art Gallery space. Switchboard bus two will provide supply to the Library mechanical heating and cooling plant load.

6.3.7 General Switchboards

Basement through to Level 2 will have a general switchboard located at each end of the building.

Levels 3 and 4 will have switchboards that are separately metered from the Library space.

The City Art Gallery will be separately metered at the MSB.

The two proposed retail café spaces will be separately metered at the MSB.

6.3.8 Generator Supply

The existing generator in the basement is to remain and provide backup supply to Town Hall, MSB.CAB, MSB.Art Gallery, and MOB, through the existing MSB.CP located in the basement (nominally under CAB).

Relocation of the existing generator to suit structural strengthening is outside this project scope of works

6.3.9 Cable Containment

Generally, incoming mains and submains to be run concealed within conduits and reticulated in the basement space using cable ladders.

Incoming / outgoing HV cables will be required to cross the new base-isolation rattle space and will be required to be modified to allow for sufficient length / flexibility across this zone.

HV supply cables routed to the new site transformers in the ground floor will be routed through the basement (existing cable pathway from the existing HV switch room into the basement) and then via new cable trays up in the new transformer location.

LV supply cables from the ground floor transformer to the new mezzanine level Main Switchboard will be through cable trays run through the ground floor ceiling space.

LV cables (sub-mains) to distribution boards will be routed through exposed cable ladders / trays located at high level through the mezzanine floor, to the existing riser locations (1x riser in each of the northern and southern end of the building).

LV cable (sub-mains) to the Art Gallery existing main switchboard will be routed through the basement on cable ladders.

Surface cabling in plant rooms and basement shall be enclosed in PVC conduit. Cabling in conduits connecting to light fittings must be run to facilitate ease of light fitting maintenance or replacement and therefore must not be run through respective light fittings.

6.3.10 Cable Trays

For general Ground, Mezzanine, Level 1 and 2 spaces, cables are to reticulate using the new cable trays (exposed services).

For Levels 3 and 4, cable trays will be within the ceiling void.

Cable trays to be sized to allow 20% future expansion. Cabling in other ceiling spaces shall be neatly clipped to battens or tied to catenary wires with nylon cable ties.

6.3.11 Submains

Refer to electrical drawing for submain supplies and cabling sizing.

6.3.12 General Lighting

Luminaires considered in the design shall be energy efficient, robust in construction, and be installed in locations that are easy to maintain without the need for sophisticated access equipment. Where diffusers are used, they shall be tight fitting and be appropriately Ingress Protection (IP) Rated to prevent the ingress of dust and insects.

Lighting is to adopt power saving solution using LED light source.

Once lights are installed, aiming and adjusting the light fittings to suit final orientation is part of the contract. This shall be done during commissioning phase. The Contractor shall ensure that light fittings are accessible via scaffolding during this period of time.

Façade lighting is to be documented at a later date. QS to allow for 4 off RGBW projection type lights mounted on each column.

Lighting to Library bookshelves will be mounted directly to the lighting shelving and be supplied from local floor boxes as per the existing installation. The existing shelving lighting will be refurbished, replacing the existing halogen lighting with LED-type systems within the existing housings.

Below are our lighting level requirements to suit the space:

Table 11 - Lighting level requirements

Area	Lux level requirements (min)
Office space (Levels 3 and 4)	320 lux at workstation height
General Library space	320 lux
Basement space	160 lux
Small meeting rooms	320 at workstation height
Rare book space	320 lux
Retail tenancy space	160 lux (base build lighting)
Plant rooms	160 lux
Switch rooms	160 lux
Stairs and Escalator	80 lux
Toilet space	80 lux
Disabled toilets	200 lux

6.3.13 Emergency and Exit Lighting

Emergency and exit lighting circuits shall be wired direct from distribution switchboards and shall be labelled with engraved plastic labels.

Single Point emergency lighting are to be provided through out to meet NZBC F6/AS1 requirements. The egress routes will be determined in co-ordination with the fire engineering report.

Emergency lighting shall consider anti-panic performance for public areas, over and above minimum code requirements. Emergency light fittings will be selected to minimise energy consumption and to be as discrete as possible.

Installation of the emergency lighting system shall comply with AS/NZS 2293 and clause F6 of New Zealand Building Code. Generally, the emergency lighting system may include the following fitting types:

- Maintained illuminated LED EXIT signs
- Non-maintained Single Point Unit – spitfire emergency luminaire & spot lighting for larger areas
- Typically, the system shall have separate 24V interface to connect to a fire alarm signal
- Emergency and exit signs to be connected to centralised Zoneworks XT Hive system (or similar)

6.3.14 Lighting Controls System

Aurecon's approach to a good practice lighting control solution revolves around providing the building with a cost-effective solution that meets operational requirements.

Below is our lighting control methodology to suit the spaces:

Area	Control strategy
Office space (Levels 3 and 4)	Lighting control system (KNX/Dynalite/CBUS/Casambi). Base build lighting control to be operational via motion detector
General Library space	Lighting control system (KNX/Dynalite/CBUS/Casambi). During operational hours: To be operational via timer After hours: Operational via motion detectors
Basement space	Lighting control system (KNX/Dynalite/CBUS/Casambi) During operational hours: To be operational via timer After hours: Operational via motion detectors
Small meeting rooms	Lighting control system (KNX/Dynalite/CBUS/Casambi) To be operational via wall switch and motion detectors
Rare book space	Lighting control system (KNX/Dynalite/CBUS/Casambi) To be operational via wall switch and motion detectors
Retail tenancy space	Lighting control system (KNX/Dynalite/CBUS/Casambi) During operational hours: To be operational via timer After hours: Operational via motion detectors
Plant rooms	To be operational via wall switch and motion detectors
Switch rooms	To be operational via wall switch and motion detectors
Toilet space	Lighting control system (KNX/Dynalite/CBUS/Casambi) During operational hours: To be operational via timer After hours: Operational via motion detectors
Disabled toilets	Lighting control system (KNX/Dynalite/CBUS/Casambi) During operational hours: To be operational via timer After hours: Operational via motion detectors

6.3.15 Small Power

Placement of outlets should be designed so as not to create obvious and potential trip hazards when users have power devices connected to them.

The small power shall consist of:

- Cleaner outlets.

- Floor box with two GPOs generally throughout Library spaces (existing floor boxes will be re-used where possible).
- Power for workstations (within Library floors only, Level 3 and 4 base-build only).
- Power for AV equipment (LCD, projectors, projector screens, VC units) (within Library floors only, Level 3 and 4 base-build only).
- Power for FIP, Access Control Panel, Data Racks.
- Power for hand dryers in the amenities.
- Power for kitchen equipment (within Library floors only, Level 3, 4 and cafés base-build only).
- Power for Automatic doors – Power to automatic doors shall be via a standard 230-volt switch socket mounted at a high level external to the door pelmet. It must be possible to isolate the door without removing the pelmet.
- Power for vertical transportation (escalators and lifts).

6.3.16 Skirting Ducts

Selection of skirting trunking to be PDC VYNCO type skirting/wall trunking. The Skirting duct is to be two compartment and compatible with CAT 6a cable reticulations. The length is as shown on the drawings.

6.3.17 Floor boxes

Floor boxes are existing and are to remain. New sub circuit cabling is to be reticulated from the local switchboard to each floor box. The QS is to allow additional pricing to replace 20% of floor boxes (240mm x 240mm x 70mm CAT6A compliant).

6.3.18 RCD

For safety considerations, 30mA RCBO are to be provided for small power supplies within all Library floors (Levels Ground, Mezzanine, Levels 1 and 2).

Requirements for RCBO on lighting supplies and Levels 3 and 4 generally, to be confirmed.

6.3.19 Earthing

The earthing system shall be a multiple earthed neutral system and meet the approval of the local Supply Authority. Where entering or leaving the main switchboard and along its route length, the earth cable shall be protected by means of PVC conduit.

Additionally, earthing for the new Library Main Switchboard shall comprise of:

- New Building earthing point (multiple earthing stakes).
- Wricon connections to steel reinforcement.
- Bonding of metallic water mains, fire mains, and gas mains to Equipotential Earth Bar in the local distribution board.
- Bonding of all metal enclosures containing electrical services, sheathing of metal cables, cable trays, conduits, and similar to the earthing system.
- 10mm earth bonding the communication cabinet.
- 10mm earth bonding the lifts.
- Bonding earthing from transformers to Main Switchboard main earth bar.
- Transformer earthing.

All earthing requirements are subject to approval once earthing resistive testing/reading is finalised.

All earth cables to be coloured Green/Yellow.

Earthing electrodes shall be provided with covered and removable inspection pits. The connection of the earthing conductor to the earth electrodes shall be by 'cad-weld' or equal approved.

Gatic lids shall be fitted with an approved brass engraved label reading – “Earth Stake Cover”.

6.3.20 Lightning Protection

It is assumed there is no requirement for dedicated lightning protection to the building, to be confirmed in the future design phase.

Surge protection to be provided on all switchboards.

6.4 Option A and B Seismic Upgrade Electrical Services Design

6.4.1 Option A

For option A the scope will be adjusted as follows:

- Transformer and Switch Gear Room – Nil change. Aurecon recommend a dedicated transformer to be provided to the Library as part of all schemes. The proposed strengthening works cannot be carried out without removing HV switchgear and transformers from their respective ground and basement plant rooms. Equipment within these spaces is owned and maintained by Wellington Electricity. Further review of the structural works in these spaces will be refined in future design phases, to understand if the impact to these services can be reduced, with implications to be worked through with Wellington Electricity.
- Main Switchboard – Nil change. Required for separation of the building from the Civic Square central services.
- Electrical Distribution Boards – Re-use existing floor distribution boards. Distribution boards are generally able to be re-used but are considered at end of life and unreliable. In addition, it is proposed that residual current protection is provided generally for small power throughout the Library floors for safety for children, as well as good practice for new installations – the existing distribution boards will not be able to accommodate the upgraded installation. Aurecon recommends replacing the existing switchboards complete with new sub-mains from the proposed new Main Switchboard.
- Containment – Nil change. Existing containment systems carry both power and data services, without minimum separation requirements being met. Containment systems require to be replaced or otherwise supplemented with additional cable containment systems. Given it is recommended all containment systems are removed to allow for more ready structural access, as well as seismic bracing requirements for maintaining any existing systems, it is more appropriate to replace with single larger systems (particularly in the open Library areas to maintain the architectural vision for clean exposed services).
- Small Power - Nil change. All existing electrical and communications circuits to be removed and replaced with new.
- Lighting – Re-use partial installation. Allow to re-lamp and clean existing fluorescent lighting throughout the Library floors (ground, mezzanine, level 1 & 2). New recessed fittings required for Levels 3 & 4. New exit & emergency lighting throughout - exit and emergency lighting generally not compliant with current codes.

6.4.2 Option B

For option B the scope will be adjusted as follows:

- Transformer and Switch Gear Room – Nil change. Aurecon recommend a dedicated transformer to be provided to the Library as part of all schemes. The proposed strengthening works cannot be carried out without removing HV switchgear and transformers from their respective ground and basement plant rooms. Equipment within these spaces is owned and maintained by Wellington Electricity. Further review of the structural works in these spaces will be refined in future design phases, to understand if the impact to these services can be reduced, with implications to be worked through with Wellington Electricity.
- Main Switchboard – Nil change. Required for separation of the building from the Civic Square central services.
- Electrical Distribution Boards – Nil change. Distribution boards are generally able to be re-used but are considered at end of life and unreliable. In addition, it is proposed that residual current protection is provided generally for small power throughout the Library floors for safety for children, as well as good practice for new installations – the

existing distribution boards will not be able to accommodate the upgraded installation. Aurecon recommends replacing the existing switchboards complete with new sub-mains from the proposed new Main Switchboard.

- Containment – Nil change. Existing containment systems carry both power and data services, without minimum separation requirements being met. Containment systems require to be replaced or otherwise supplemented with additional cable containment systems. Given it is recommended all containment systems are removed to allow for more ready structural access, as well as seismic bracing requirements for maintaining any existing systems, it is more appropriate to replace with single larger systems (particularly in the open Library areas to maintain the architectural vision for clean exposed services).
- Small Power - Nil change. All existing electrical and communications circuits to be removed and replaced with new.
- Lighting – Nil change. All lighting is generally at end of life, with exit and emergency lighting generally not compliant with current codes. It is recommended to replace all lighting including exit and emergency lighting throughout the building.

7 Building Technologies (ICT & Security Services)

7.1 Overview

The Building Technology services documentation is documented in accordance with the option C base isolation requirements. Also included is commentary, within this DFR, on the alternate requirements should option A or B be adopted.

The documentation has also considered the implications of the 2016 Aurecon Condition Survey and the key findings from this survey are documented below.

7.2 2016 Condition Assessment Recommendations

7.2.1 Structured Cabling Systems (SCS) and Telecommunication Spaces

The Library has two fibre optic backbone connections to the rest of the WCC Campus precinct.

The Library has two main telecommunication cabling risers similar to the electrical submain distribution in North and South risers.

The distribution cabling is a mixture of Category 5e (CAT5e) U/UTP, CAT5 U/UTP and CAT6 U/UTP twisted pair. The structured cabling appears to have been partly replaced recently based on the type of cabling.

The Library has the telecommunication spaces and communication cabinets noted on the table below. The make of the cabinets is a mixture of Modempak, Dell, Rittal, and Europak suggesting some of the cabinets from original construction have been replaced at some point. Generally, the existing cabinets have between 5 and 15RU spare capacity.

Floor Level	Telecommunication Space Name	Cabinet
Ground	East	1 x 42 RU
	West	1 x 42 RU
Mezzanine	West	1 x 6 RU
Level 1	East	1 x 42 RU
	West	1 x 42 RU
Level 2	East	1 x 42 RU
	West	1 x 42 RU
Level 3	East	1 x 42 RU

The existing telecommunication cabling may be reused if the extent of the structural work is limited and telecommunication outlet locations remain unchanged. If the structural work is extensive involving removal of floor slabs, Aurecon recommends replacing all twisted pair telecommunication cabling with CAT6A F/UTP.

Aurecon recommends any new cabling to be CAT6A F/UTP to ensure cabling will be future proofed and provide better performance with the increasing demand of power over ethernet (PoE) devices and electromagnetic interference.

New CAT6A telecommunication cabling may not be accommodated within existing cable pathways such as skirting and cable trunking due to increase fill capacity and bending radius, and as such there will be need to be some replacement of cable containment systems.

7.2.2 Access Control and Intruder Detection (ACID)

The security system is based on a Gallagher FT system with various controllers throughout the Library building floors. The main security control equipment is located in Level 1 of the MOB building and monitoring is carried out in the security control room.

Most of the devices are connected to the field controllers on the same level. The card readers are generally between Gallagher make. The passive infrared (PIR) detector make varies and dependent on the type of area covered.

The cabling consists of CAT5 and CAT6 twisted pair connected to the nearest dedicated security controller.

The CCTV cameras are centralised through the various network video recorders (NVR) with video management systems in the MOB building and report to control room operator desk monitors and wall monitors inside the MOB building Level 1 security control room. The CCTV camera coverage, make, and condition is unknown.

7.3 Option C Seismic Upgrade ICT Services Design – Structured Cabling Systems (SCS)

7.3.1 Basis of Design

The complete Building Technology / ICT infrastructure will be designed in a manner that recognises the working requirements of the Central Library redevelopment.

It will provide the maximum operational functionality and reliability without compromising the space and service requirements.

The design will support integration with the telecommunications service provider requirements, systems, and applications, and include provision for increased network traffic, increased network speeds, and a greater variety of network-based applications.

Finally, the network will be designed, commissioned, and inspection tested with confirmation of installation quality and performance checked, and meticulous documentation provided, allowing for rapid restoration of services in the event of network problems.

7.3.2 Design Codes & Standards

The SCS will be designed and constructed with reference to existing national and international standards and reference guidelines. The following key documents are references:

- AS/NZS 3000, Wiring Rules.
- AS/NZS 11801.1, Information technology - Generic cabling for customer premises Part 1: General requirements.
- AS 11801.6, Information technology – Generic Cabling for Customer premises Distributed Building services.
- AS/NZS 3085, Telecommunications installations – Administration of Communications cabling systems.
- AS/NZS 1367, Coaxial cable and optical fibre systems for the RF distribution of analogue and digital television and sound signals in single and multiple dwelling installations.
- AS2201, Intruder Alarm Systems, Parts 1 to 5 as appropriate.
- AS4806, Closed Circuit Television (CCTV), Parts 1 to 3 as appropriate.
- ANSI/BICSI 005-2013 – Electronic Safety and Security (ESS) Design and Implementation Best Practices
- AS 1428.1, Design for Access and Mobility – General requirements for access – New building work.
- New Zealand Building Code.

Standards and publications are continuously being reviewed and frequently are updated. The latest published versions of the standards at each stage of the design, and of construction tender release will be referenced.

7.3.3 Seismic Restraint

All equipment and cable tray part of the Electrical systems installed under this contract shall be seismically restrained in accordance with the requirements of NZS4541, NZS4510, and NZS 4219 as applicable.

Wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide higher resilience.

7.3.4 Decommissioning

All SCS cabling in this area is to be removed and will be replaced with the work identified in the following scope of work.

Existing catenaries may be retained; however, they should be re-tensioned and fixed with long runs fitted with vertical support at intervals of not more than 3m. Note requirement to install the ICT services catenaries on a different vertical plane from the electrical catenaries.

7.3.5 General

A single vendor Structured Cabling System (SCS) solution will be provided, incorporating both the copper and fibre optic products. The SCS will be supported by a single vendor warranty for a minimum of 20 years. The SCS will support analogue and digital voice applications, data, local area network, wireless local area network, audio and video, and low voltage devices for building control and management on a common cabling platform.

The SCS contractor shall be certified by the manufacturer of the equipment used in the solution as a qualified installer of that equipment and shall provide proof of current certification.

Incoming Voice and Data Services

7.3.6 Incoming Service Pathways

The SCS contractor shall provide pits, trenching, and conduits connecting the Entrance Facility (EF) to the site boundary pit (meet me pit). Communications conduits shall be shared by all communications service providers from the meet me pit to the Entrance Facility (EF). *(Note: The main telecommunication room on the Mezzanine floor will incorporate EF, BD, FD and ER into one room)*

All ICT cabling pathway components shall be approved by the Structured Cabling System manufacturer as suitable and approved within the warranty requirements of the vendor's system.

All required external conduits and pits are to be coordinated with other contractors (Electrical and Civil) during the civil works.

Underground pathways shall be designed and constructed in accordance with current industry guidelines. Where underground pathways enter the interior of the building, they should be rodent proofed and sealed from the ingress of water.

Conduits will be allowed for as follows:

Between primary boundary "meet me pit" and main telecommunication room:

- 4no Ø100mm conduits.

7.3.7 Incoming Service Cabling

The nominated service provider will run optic fibre from their nearest POP (point of presence) to the main comms room into the building.

7.3.8 Data Connection Application

Provision of data services requires the client to complete an application with their preferred service provider, sign a contract directly with the service provider, and may need to provide payment dependant on the scope.

The Client shall be responsible for:

- Making an application with their preferred service provider.
- Managing liaison between themselves, their preferred service provider, and the contractor.
- Provide to the project team any special requirements the service provider may note with the application.

7.3.9 Contractor Work

The SCS contractor must coordinate with the services provider to relocate the fibre into the new communication room.

7.3.10 Telecommunication Spaces

A Distributed Cabling Architecture (DCA) will be deployed. Telecommunication spaces will be provided to support the SCS. The following spaces should be provisioned in the layout design:

Table 12 Telecommunication spatial requirements

Level	Space	Room Size	Function
Basement	Wall mounted unit	600x600 mm	Floor distributor.
Mezzanine	East - Telecommunication room	4x3 m.	Main telecommunication room will function as an Equipment room (ER), Building Distributor (BD), Entrance Facility (EF) and Floor Distributor (FD) in one room. This room is the centralised room for housing the core (Head-end) equipment. The backbone cabling originates from this room and serves the entire building. The incoming service provider will terminate fibre in this room.
Mezzanine	West - Telecommunication room	3x2 m.	Telecommunication Room (TR) will function as a floor distributor.
Level 1	East - Telecommunication room	3x2 m.	Telecommunication Room (TR) will function as a floor distributor.
Level 2	East - Telecommunication room	3x2 m.	Telecommunication Room (TR) will function as a floor distributor.
Level 3	East - Telecommunication room	3x2 m.	Telecommunication Room (TR) will function as a floor distributor.
Level 4	East - Telecommunication room	3x2 m.	Telecommunication Room (TR) will function as a floor distributor.

Telecommunication spaces will house cabinets to support the horizontal cabling on both floors. Appropriately sized cabinets will be specified to support the new requirements of the building.

Close coordination will be undertaken with other building services and external consultants to provide a fully functional telecommunication space with appropriate lighting, power, and environmental requirements.

7.3.11 Communications Cabinets

The SCS Contractor shall liaise with providers of other services and shall provide and install communications cabinets for the ICT (SCS) and AV Systems. The Security System will be housed within its own enclosures mounted directly to one of the walls within the communications room.

Table 13 Communication frame details

Floor Distributor	Quantity	Frame Details
Basement	1	Wall-mounted 12RU
Mezzanine, East - Telecommunication room	3	42RU Floor standing Racks
Mezzanine, West - Telecommunication room	1	42RU Floor standing Rack
Level 1, East - Telecommunication room	1	42RU Floor standing Rack
Level 2, East - Telecommunication room	1	42RU Floor standing Rack
Level 3, East - Telecommunication room	1	42RU Floor standing Rack
Level 4, East - Telecommunication room	1	42RU Floor standing Rack

The SCS shall allow for the following components for a complete install:

- Horizontal jumper bars (1 per 2 patch panels)
- Vertical cable management
- Telecommunications earth from cabinets to TMBG within the FD
- Placed to allow further racks to be added through subsequent expansion works

7.3.12 Cabinet Power Supply

Floor standing racks shall be provided with power rails as follows:

- Provide 2x vertical mount at the back of rack each with 20x IEC C-13 outlets and 6x 16A IEC-C19 outlets.
- Refer to the IFC drawings for TR layout and cabinet orientation, these will be confirmed in IFC.

7.3.13 Rack Layouts

Rack layout diagrams shall be provided by Client IT representatives within IFC drawings.

The Electrical Contractor will provide power to the telecommunication space and to the racks. Input to each PDU supplied and installed by the Electrical Contractor will be by 2x 20A single-phase PDL56 style sockets above each rack.

The SCS Contractor shall arrange for all power distribution, reticulation, outlets and other requirements within the telecommunication rack from the supplied sockets above the rack.

Cabling and Pathways

7.3.14 Intra-Building Pathways

The design will allow for cable pathways for the distribution of backbone and horizontal cabling within the building. Welded mesh basket tray will be provided for the main horizontal and vertical distribution routes. Catenary and conduit will be installed on-site as required to support distribution cabling on secondary routes. Fill ratios, and pathway sizes are to be determined by the designer during detailed design but will not exceed 50% at the time of the first installation providing space for MACs (Moves/Adds/Changes) that may be required over the operational lifetime of the SCS.

7.3.15 Intra-Building Cabling

Backbone Cabling

Intra-building backbone cabling will include the fibre-optic cable for all IP application. The backbone cabling will originate from the main telecommunication room (Equipment room) and connect to the TRs (Floor Distributors) on each floor in the building.

Horizontal Cabling

All horizontal cables used for IP applications (voice and data) will be Category 6A shielded and support PoE and PoE+ requirements.

Horizontal cabling extends from the TR rooms (Floor Distributor) to the work area/outlet location. The horizontal cabling system includes telecommunication outlets, patch, jumper, MUTO and CPs.

7.3.16 Telecommunication Outlet (TO)

Telecommunication Outlets will be provided in the Work Area (WA) for connection of IP devices. TOs will be Category 6A shielded outlets and terminated in 8P8C (RJ45) modular jacks connected in accordance with the TIA/EIA T568A wiring pattern.

7.3.17 Wireless Networking

The WCC Library redevelopment will be supported by a Wireless LAN network providing support for staff and visitors throughout the building. The key features of the Wireless LAN are:

- Initial WAP density is expected to be in the order of one WAP per 30m2. The final WAP locations will be determined by predictive RF-Wi-Fi mapping as the building enters the detailed design stage and the materials and construction is known.
- The WAP density and locations will be confirmed during the detailed design and Wi-Fi mapping.
- A post-installation and commissioning heat test will be undertaken to ensure the Wi-Fi meets the design expectations.
- Wireless LAN will be the primary connection method in open and flexible spaces to reduce or avoid the requirement for transient cabling and patch cables.
- Wireless LAN Access Points (WAPs) will be installed on ceiling tiles or on walls with the connecting cable TO concealed in the ceiling or wall cavity to reduce the risk or vandalism or interference. A dual TO will be provided at each TO allowing for new equipment to be added to the structured cabling system when required without invasive re-cabling being needed.
- WAPs will support the current Wireless networking protocols up to 802.11ac wave-2 wireless networking.

7.3.18 Networking equipment and configuration

Networking equipment including the network distribution switches, campus interconnection (aggregation switches), Wireless Access Points (WAPs) and servers will be provided and installed by client ICT personnel and their representatives.

System design will be coordinated to ensure:

- Requirements for convergence, VLAN, network segregation, physical security of assets, and connectivity are accommodated where required.
- Library selected equipment can be installed and supported in the BD and FD areas with power and operating environment requirements considered in the design of the facility.

7.4 Option C Seismic Upgrade ICT Services Design – Security Systems

7.4.1 Basis of Design

Security will play a vital part in both buildings, and people safety and the electronic security system (ESS) will need to be flexible to cater for a wide range of uses envisaged for the WCC Library redevelopment.

Electronic security systems, including access control and intrusion detection, voice/video intercoms, and CCTV will be provided and selected to provide interoperability with each other and other systems at the WCC Library.

The ESS Contractor is legally required to be authorised to undertake security works and hold a PSPLA accreditation. They must also be approved by the Security System components vendor.

7.4.2 Seismic Restraint

All equipment and cable tray part of the Electrical systems installed under this contract shall be seismically restrained in accordance with the requirements of NZS4541, NZS4510, and NZS 4219 as applicable.

Wherever the services are crossing the base isolation zone, the seismic restraints will generally be designed to the SLS2 1/250-year requirements to provide higher resilience.

7.4.3 Access Control and Intrusion Detection (ACID)

A fully integrated ACID system will be provided to accommodate the facility's security requirements.

The ACID system will provide:

- The means to control access through nominated doors.
- Access control in elevators enabling access to any combination of floors over specified time periods.
- A fully functional intruder alarm and duress system including entry and exit delays where intruder detection sensors are connected to system inputs.
- An integrated software facility for view, managing and changing of the system and system components.

7.4.4 Access Control System

The security control panels and associated hardware will be wall mounted in a metal panel enclosure in the TR's. Field controllers i.e. URI's and I/O's will be mounted in a suitable enclosure within the ceiling cavity where required.

The Security Control Panel will be provided with a high-quality power supply unit incorporating Battery Backup support that allows full operation of the system and components in the event of a power failure for a minimum of 4 hours. The Security Control Panel will to be connected to the essential power supply.

Electronic door hardware will be provided in coordination with the architect and door supplier to suit the specific door specification and operation. (It has been noted that there is a preference for electronic mortice locks with auto flush bolts for pair doors).

New MIFARE security access cards will be provided for the highest standard of security.

7.4.5 Intruder Detection System

Intruder detection will be provided in critical un-manned areas and will include a local keypad, siren, door reed contacts, and passive infrared detectors. The intrusion detection system shall be an extension of the access control system and will provide full integration between systems.

Final requirements will be determined in developed and detailed design once architectural spaces, workflow and operation requirements and security requirements have been confirmed.

7.4.6 Closed Circuit Television (CCTV) System

Video Management System (VMS)

A VMS will be provided on a dedicated workstation installed in the primary ER. The VMS will be used to view and manage recordings. The VMS will integrate with the ACID system to support inter-operation with the access control and duress systems on one platform.

Network video server

The network video server will be installed in the primary ER. The video server will record images from all cameras for a period of not less than 31 days without overwriting of data. Images shall be stored in RAID disk array (usually RAID-10) supporting hot-swap replacement of faulty disk drives.

The video server shall be accessible through a network connection to allow control and viewing by local staff or by operators located remotely throughout the facility by authorised users or by permitted operators from remote locations.

CCTV Cameras

All cameras will be IP cameras suitable for direct connection to the SCS network. WCC Library ICT will provide PoE network switches at the TR for connection to the ICT Network.

As the CCTV system is not likely to be permanently manned, PTZ cameras will not be used.

Cameras will be capable of Edge recording, providing another layer of redundancy and backup.

Cameras will be minimum high definition 3MP cameras selected subject to the area being viewed with H.264 or similar compression encoding. Digital zoom of the recorded images shall provide adequate recognition of individuals and trouble spots for evidentiary purposes.

CCTV Cabling

The cabling from the FD to the camera outlet shall be installed by the SCS Contractor. The digital (IP) cameras will be connected to the Category 6A (Class-EA) cabling system supported by PoE power supply to the cameras.

7.5 Option A and B Seismic Upgrade ICT Design

7.5.1 Option A

For option A the scope will be adjusted as follows:

- All existing communications circuits to be pulled back to local floor distribution frames, removed and replaced with new. New cable tray and containment generally required due to insufficient separation generally from power on existing. Aurecon recommends all cabling to be CAT6A F/UTP to ensure cabling will be future proofed and providing better performance with the increasing demand of PoE devices and electromagnetic interference. There is a risk that new CAT6A telecommunication cabling may not be able to be accommodated within existing cable pathways such as skirting and cable trunking due to increase fill capacity and bending radius, and as such there may be a need to be some replacement of cable containment systems.
- Existing communications floor distributors may be able to be re-used, but it is generally recommended to replace with new. Based on this recommendation, it would be recommended to complete the replacement of all existing structured cabling within the building, including distribution frames.
- The building currently has no main communications room, with systems connected back into the campus in a campus network. It is recommended that a new main communications room is allowed for the building.
- Hardware including CCTV cameras and controllers to be removed to allow for strengthening works to be carried out and re-instated. The security systems generally will be replaced to accommodate new layout arrangements.

Note: should any communication equipment or cabling be maintained, there may be a risk with the compatibility with any existing equipment with new cabling and systems.

7.5.2 Option B

For option B the scope will be adjusted as follows:

- There is nil change proposed for option B from option C. The existing installation is not currently fit for purpose and requires substantial upgrade to make it suitable to the intended new installation.

8 Vertical Transport

8.1 Overview

The Vertical Transportation Services documentation is documented in accordance with the option C base isolation requirements. We have also included commentary, within this DFR, on the alternate requirements should option A or B be adopted.

Aurecon do not have a condition assessment report for the vertical transport systems. However, we have obtained copies of a previous traffic analysis report and had discussions with the manufacturer. Based on this information an assessment of the current installation is provided in section 8.2 below.

8.2 Current Assessment

The current vertical transport installation at the Central Library comprises:

- Four 1350kg capacity lifts with a speed of 1.75m/s and conventional controls. The lifts are arranged in two groups of two cars serving 7 levels, (Basement, Ground, Mezzanine and Levels 1 to 4). It is noted that currently not all lifts serve every floor, with some landing push buttons and indicators concealed behind wall linings.
- Three pairs of escalators are installed to serve Ground, Level 1, and Level 2.
- One book lift, serving 7 levels.

A description and recent history of the installation at the Library has been provided by the manufacturer as follows:

- Lifts 1 & 2
  - Controllers and VSD's along with the shaft wiring etc were upgraded in 2011.
  - The door operators were upgraded in 2012.
  - The car and landing push buttons and indicators were upgraded in 2016.
- Lifts 3 & 4
  - Controllers and VSD's along with the shaft wiring etc were upgraded in 2007.
  - The door operators were upgraded in 2012.
  - The car and landing push buttons and indicators were upgraded in 2016.

In summary, the lifts have been upgraded to current equipment except for the landing door headers and hoist machines. The landing door headers are still original and should be upgraded to ensure on going reliability.

The lifts have been upgraded with the required equipment to serve all the floors except the landing push buttons and indicators on the landing that have been plasterboarded over.

The escalators are at the end of their design life and are not designed to meet current seismic requirements.

No comment from the manufacturer was received regarding the book lift.

8.3 Option C Seismic Upgrade Vertical Transportation Services Design

8.3.1 Basis of Design

The vertical transportation services specified for the Library shall provide the minimum performance requirements for the installation. The specialist installer shall be totally responsible for the design and performance of the lift systems within the design parameters specified.

8.3.2 Design Codes and Standards

The installation is to be in full compliance with NZBC D2 and NZS4142, '*Design for Access and Mobility – Buildings and Associated Facilities*'.

The Contractor shall comply with the New Zealand Building Code and all relevant New Zealand Standards pertaining to the contents of this Contract and in particular NZS 4332 or EN81.1 and any other pertinent lift rules, regulations and codes of practices.

The Contractor shall comply in full with the current NZ Electrical Code of Practice.

8.3.3 Seismic Restraint

All parts of the passenger lift installation, including guide rails, shall be designed to withstand earthquake forces as required by NZS 1170 and 4332.

8.3.4 Scope of Works

- The supply, installation, upgrade, refurbishment and commissioning of the four existing passenger service lifts as described in the vertical transportation services specification and detailed by the architect.
- The existing lift installation to be seismically isolated below the ground floor and shall no longer serve the basement.
- Lift shaft and pit structure shall be suspended from the ground floor structure.
- The supply and installation of one new accessible passenger lift to serve between the basement carpark and ground floor.
- The supply, installation and commissioning of new escalators as detailed on the architectural drawings (i.e. six new escalators, three that travel up and three that travel down).
- Remove and dispose of all redundant plant and equipment, including the existing escalators and book lift.
- Provide automatic rescue devices on all lifts.
- Provide two sets of protective blankets for the lift car interiors.

8.4 Option A and B Seismic Upgrade Vertical Transportation Services Design

8.4.1 Option A

For option A the scope will be adjusted as follows:

- New basement lift not required.

8.4.2 Option B

For option B the scope will be adjusted as follows:

- No change from option C.

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