ATTACHMENT B

Nanaimo Fire Station 1

Business Case Analysis : Renovation vs Replacement - April 25, 2017

Contents


FAST FRAMES
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Executive Summary

Nanaimo Fire Station 1 is a critical component of the emergency management system for the City of Nanaimo and currently houses the main fire station, emergency coordination centre and emergency dispatch centre.

While the existing fire station has served the community well, it is presently over fifty years old and many parts of the building are in poor condition or well past their useful life. Additionally, several life safety deficiencies exist within the building including the absence of a sprinkler system, the absence of fire alarms and an exiting system that does not meet current code.

Due to the critical nature of operations taking place within the facility, it is imperative that it remain fully functional after a major seismic event, to provide essential services to the community. Though the existing building was seismically upgraded in 2000, seismic codes have evolved considerably since then due to information gathered from major earthquakes in Chile and Japan. As a result, the seismic performance of the building is much lower than what is anticipated in the upcoming version of the British Columbia Building Code (BCBC). It is expected that the building could provide life safety to its occupants but would likely suffer too much damage to remain operational after a major seismic event.

Funding for the replacement of a few parts that were deemed urgent was approved by Nanaimo City Council in 2016. Prior to completing these upgrades, it was decided that a review of the future of the ageing building was prudent, to ensure that this expenditure provided the best value for money in the long term. HCMA Architecture + Design along with a team of specialist consultants were thus engaged to provide a condition assessment of the existing building and develop varied strategies for its renewal.

This report contains the critical discoveries and observations from the study conducted and outlines several alternative approaches for the renewal of Fire Station 1. These scenarios include the renovation or reconstruction the fire station on the existing or adjacent site.

It has been concluded that a scenario that proposes the construction of a new fire station on the site of the existing building (Scenario 3) provides the best balance between benefit to the citizens of Nanaimo, operational efficiency and costs to construct and maintain the building over its life.

We seek Council's endorsement of this recommendation.

1 Project Description

1.1 Background and Primary Objective

In 2016, Nanaimo Fire Rescue requested Nanaimo City Council to authorize funding for several critical upgrades to Fire Station 1 including replacement of the boiler, roofing, flooring and repainting the exterior of the building. Per this request, funding for these upgrades were included in the annual budget for the City of Nanaimo.

Prior to completing these upgrades, the City of Nanaimo and Nanaimo Fire Rescue determined that it would be prudent to look at the bigger picture regarding the future of the ageing building. This review was intended to explore other opportunities for the renewal of the existing building, that would address the future direction of the department and address other existing deficiencies.

Based on this, the primary objective of this project was to explore alternatives for the renewal of Fire station 1 and test if they provide better value for money in the long term.

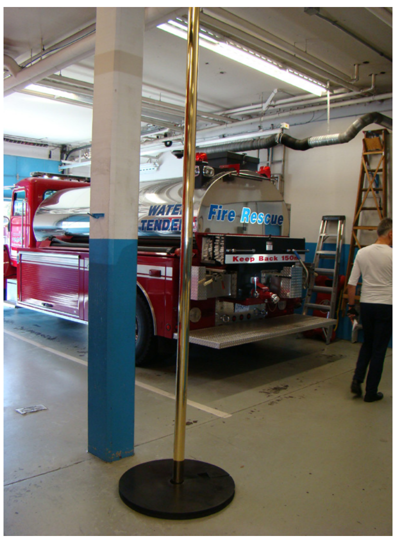
1.2 The Existing Fire Station

Fire Station 1 was constructed in 1966 as the only fire station serving the City of Nanaimo. After the amalgamation of the City over the 1960s and 1970s, Nanaimo Fire Rescue built three additional fire stations to effectively serve its expanded area, reducing the response load on Fire Station 1. Due to this change in demand, the existing building is currently larger than is needed to efficiently contain the functions that are housed within it.

The building as constructed in 1966 consisted of the one storey south wing, three apparatus bays and facilities for the crew at the upper level. At a later date, two additional apparatus bays were constructed to the north of the existing bays with the emergency coordination centre above.

Several renovations over the years have led to the current building configuration that includes five apparatus bays along with their support spaces at the first level. The upper level now contains reduced crew facilities, the emergency coordination centre for Nanaimo and the emergency dispatch centre.

A seismic retrofit was performed on the existing building in 2000 that brought its seismic capacity up to the post disaster level of the 1998 British Columbia



Apparatus bays

Front facade of existing building

East face of building and parking lot

Emergency coordination centre

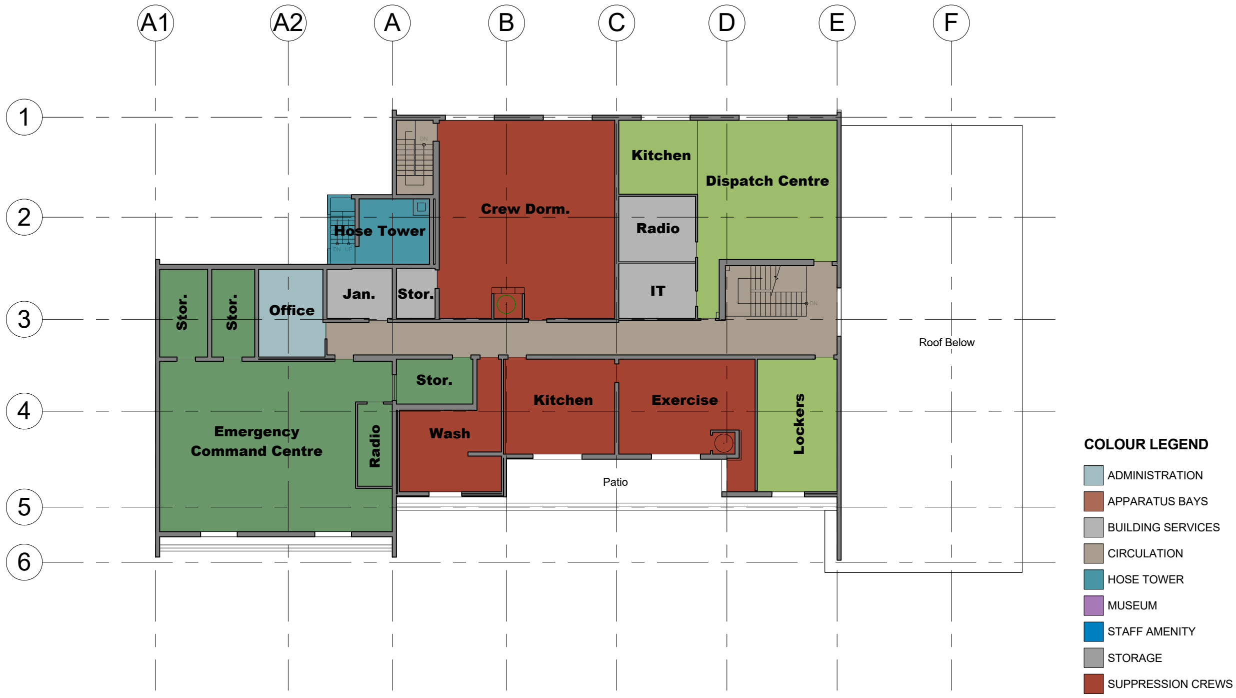
Images of the Existing Fire Station Building

Building Code (BCBC). This included the addition of new concrete shear walls around the exterior of the building, upgrades to the roof deck, improvements to connections between horizontal and vertical structural elements and the reinforcement of interior concrete masonry walls.

However, the existing building is ageing, several systems need urgent replacement and several deficiencies exist when compared with current building codes. A summary of these is below and details regarding the existing condition of the building can be found in section 2 of this report.

Current Deficiencies

- Seismic capacity of the building is deficient when compared to the loads specified in the 2015 National Building Code of Canada (NBC) and anticipated in the 2017 British Columbia Building Code (BCBC).
- No Sprinkler and fire alarm systems are present.
- Mechanical ventilation is not present in all spaces as would be required by current codes.
- Egress systems within the building do not meet the current building code.
- The boiler and associated components are well beyond their service life and are in need of urgent replacement.
- Electrical systems are past their useful life
- There is minimal spare electrical capacity within the building.
- The roofing membrane needs urgent replacement.
- Several barriers exist for persons with disabilities including the absence of an elevator and no accessible washrooms.
- The hose tower structure and concrete facing needs repair to fix spalling and exposed reinforcement.



The Existing Fire Station - Level 2 Plan

The Existing Fire Station - Level 1 Plan

1.3 The Surrounding Context

Fire Station 1 is located half a kilometer from Downtown Nanaimo and within a zone that contains several other public safety facilities including the Royal Canadian Mounted Police (RCMP) and BC Ambulance Services. Many of the adjacent properties and buildings are owned by the City of Nanaimo.

A few of the adjacent sites and buildings that were of interest to the study are listed below.

① Community Services Building (CSB) located at 285 Prideaux Street
The Community Services Building is owned by the City of Nanaimo who lease the spaces within it to a variety of community groups. Notable amongst the current tenants is the Nanaimo 7-10 Club that provides free meals to those in need and operates its breakfast program out of the auditorium at the first floor of the building.

The location of the building made it a good alternative site for the fire station, with the understanding that demolishing the existing building would have a significant impact on the current tenants and affect services being provided from within the building.

①

② Fire Rescue Command and Business Centre (CBC) Building located at 580 Fitzwilliam Street
The Command and Business Centre is a recently restored historic building, owned by the City of Nanaimo, that currently houses the administration and prevention divisions of Nanaimo Fire Rescue.

②

As one of the stated goals of this study was to integrate these functions within a new or renovated facility, this building presented an opportunity for sale, to recover a portion of capital costs or rent, as a continued source of income for the City.

③

③ BC Ambulance Services Building located at 231 Prideaux Street
BC Ambulance services currently operates a three bay ambulance facility from a building located at 231 Prideaux Street. Integration of ambulance services with the fire station was briefly discussed during the early stages of the project but it was decided that adequate time to fully explore the partnership was not available within the period of this study.

④

④ Police Operations Building located at 303 Prideaux Street
The Police Operations Building is owned by the City of Nanaimo and rented to the Royal Canadian Mounted Police (RCMP) detachment that serves the city.

Surrounding Context - Ownership

City Owned Property

Privately Owned Property

Surrounding Context - Alternate Sites Reviewed

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5 Downtown Transit Centre

The transit centre is currently located on city owned property shared with the 575 Fitzwilliam Building. An alternate location for the transit centre within Downtown Nanaimo is currently being reviewed by the City and it is anticipated that this land may be available for other uses in the near future.

6 City Owned Parking Lots

Two parking lots are located in the vicinity of the existing fire station building. These lots are currently under utilized and were considered as possible locations for a new or temporary fire station.

1.4 Project Scope

While the primary focus of this study was on the renewal of Fire Station 1, the study was intended to look at a range of options and not remain limited to its current site.

Adjacent buildings and sites described in Section 1.3 were considered to be part of the study and were tested to determine whether they provide opportunities relevant to the renewal of the fire station.

Additionally, the project scope included the following items:

- A condition assessment of the existing fire station building undertaken by Structural, Mechanical, Electrical and Code consultants to identify existing deficiencies.
- A review of the current space utilization within the fire station and explore possibilities for integration of fire operations, administration and prevention.
- A review of opportunities for other programs outside the purview of the Fire Department to be integrated with a new or renovated facility.
- A review of alternate locations for the fire station and the impact of these on response times.

1.5 Project Methodology

The diagram below documents the overall approach adopted for this project.

Within these broad categories, the following critical steps and activities took place to understand needs, formulate strategies and critically analyze these.

1. CLIENT ENGAGEMENT WORKSHOP

This initial stage was structured as a two day workshop that took place at Fire Station 1 and was attended by representatives from Nanaimo Fire Rescue and the City of Nanaimo.

The workshop began with a session attended by all participants, where the goals and possible outcomes of the project were reiterated, issues within the existing building were reviewed and the long term goals and direction of Nanaimo Fire Rescue were discussed. The surrounding context including adjacent public safety facilities and under utilized city owned properties were also reviewed as alternate locations for the fire station.

This was followed by a tour around the existing building and site, guided by members of Nanaimo Fire Rescue. HCMA Architecture + Design (HCMA) were joined by Herold Engineering (Structural consultant), Rocky Point Engineering (Mechanical consultant) and RB Engineering (Electrical consultant). The intent of this was to observe and record the existing building condition and fire operations taking place within it.

Information gained through the opening session and site tour were compiled by HCMA into a presentation that was made to a core group of staff from Nanaimo Fire Rescue and the City of Nanaimo at the end of the second day of the workshop. The presentation summarized the information that had been collected and outlined key next steps for the team.

2. PROGRAM DEVELOPMENT AND CONDITION ASSESSMENT

The building areas occupied by the various functions within the existing fire station were compiled during the two day workshop. These areas were then compared to industry standards for the different functions and an optimized program for the fire station was developed. Administration and Prevention functions that are currently located in the adjacent CBC Building were also documented to develop a total functional area required for all fire divisions. All the consultants involved in the project also compiled reports detailing their observations regarding the condition of the existing fire station building.

3. DEVELOPMENT OF SCENARIOS FOR RENEWAL

Based on the observations and information gathered during the client engagement workshop, HCMA developed several scenarios for the renewal of Fire Station 1. The scenarios included options that renovated the existing building and others that required the construction of a new fire station on the existing or adjacent sites.

All scenarios considered the possibility of consolidating fire administration and prevention with operations, in the expanded or reconstructed facility. It was also critical to note that operations need to be uninterrupted during construction and phasing to achieve this was a key consideration. If demanded by the project phasing, the requirement for temporary facilities to house operations during construction or renovation were considered.

4. DESIGN SPRINT

The scenarios developed by HCMA were presented and reviewed further during a two day Design Sprint that took place at Fire Station 1, that was attended by representatives of Nanaimo Fire Rescue and the City of Nanaimo.

During an initial interactive session, the benefits and challenges for each of the presented scenarios were carefully reviewed by all those present. Several scenarios were selected to be reviewed further through the project.

After the initial meeting, a detailed study was undertaken to review several alternate sites in the vicinity of the existing fire station as temporary or permanent locations for a new fire station. Information regarding the operational impacts of each was provided by Nanaimo Fire Rescue while the feasibility of the property to accommodate a temporary or permanent fire station was reviewed by HCMA.

At the end of the design sprint the selected and modified scenarios were once again presented to the group and a decision was made regarding which ones to develop further for cost analysis. A schedule of upcoming milestones for the project was also presented and agreed upon.

5. SCENARIO REFINEMENT AND COST ANALYSIS

The selected scenarios were studied in further detail by HCMA and the consultant team and information needed for the cost analysis for each prepared.

A life cycle cost analysis was performed for each scenario by the Advicas Group Consultants Inc., who were retained as Quantity Surveyors for the project. Details regarding costs for each scenario are included in Section 4 and Appendix 05 of this report.

6. SELECTION OF A PREFERRED SCENARIO FOR RENEWAL

Once the cost analysis was complete, several discussions took place that included representatives of Nanaimo Fire Rescue, City of Nanaimo and HCMA to review the financial impacts of each scenario against its benefits.

Through these discussions, a preferred scenario was selected that was deemed to provide the best balance of financial investment, operational optimization and benefit to the citizens of Nanaimo.

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2 Building Condition Assessment

2.1 General Deficiencies

In addition to engaging HCMA for this study, the City of Nanaimo hired a team of specialist consultants to provide input regarding the condition of the existing building and provide guidance regarding systems to be integrated into a new or renovated building.

The existing building is ageing and several items need urgent upgrades or replacement, as discussed through this chapter. Amongst the major building elements, the existing roofing membrane needs urgent replacement as there are currently leaks within the building. The building envelope is leaky and not performing well, leading to high energy usage within it. Concrete on the hose tower stair has degraded and needs to be patched.


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1. Existing roofing needs urgent replacement.
2. Existing gear room is not large enough.
3. Degraded concrete at hose tower.
4. Gear stored in apparatus bay environment

Images from the Existing Building

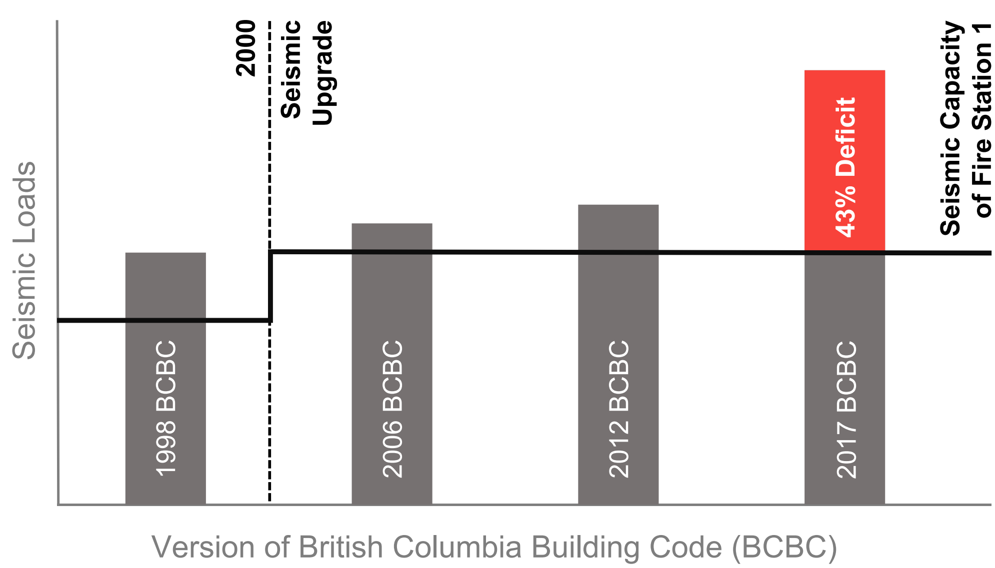
While there is a general surplus of space within the building, there is not enough space available for apparatus support functions in close proximity to the bays. This has led to the storage of gear and other supplies in any available spaces around the apparatus bay floor.

2.2 Seismic Stability

The fire station building originally consisted of a concrete floor slab above the first level that was supported on concrete walls and columns. Above this, the upper floor consisted of steel joist roof supported on unreinforced concrete block walls.

A seismic retrofit was completed in 2000 that brought the seismic capacity of the building up to the post disaster level of the 1998 BCBC. The structural design for this was provided by Herold Engineering who were also retained to provide insights into the current structural condition of the building. The seismic retrofit included the addition of new concrete shear walls, reinforcing concrete block walls, backing non load bearing interior walls and upgrades to the foundations, roof sheathing and connections between walls and floors.

While this seismic retrofit met the requirements of the building code at the time, our understanding of the impact of earthquakes on buildings and the resulting seismic requirements have evolved through subsequent versions of



Evolution of Seismic Codes

the code. The upcoming 2017 BCBC takes into account the unique nature of subduction earthquakes and significantly increases the seismic loads that a building must withstand.

In spite of the building undergoing a seismic retrofit around twenty years ago, it's seismic capacity is significantly deficient when compared to the anticipated seismic capacity in the upcoming 2017 BCBC. As the Fire Station 1 is an extremely critical part of the emergency response strategy following a major seismic event, the current situation represents a significant risk to the ability of the city to respond to such a disaster.

Details regarding the evolution in seismic codes and the impact of this on the existing building are contained within a report by Herold Engineering that is included as part of Appendix 01 of this report.

2.3 Life Safety Deficiencies

A code review against the 2012 BCBC was carried out by GHL Consultants Ltd., that documented several life safety elements that needed further review. The complete report provided is included as part of Appendix 04.

The existing building does not currently have a fire alarm or sprinkler system. While these systems are not specifically required by the current building code for a building of this size and occupancy, it is considered good practice to provide these due to the critical nature of activities taking place within it. Additionally, the current exit stairs have several deficiencies including the lack of rated separation from the remainder of the floor, non-compliant guards, non-complaint floor finishes and absence of emergency lighting and exit signage.

The existing building also contains many barriers to access for persons with disabilities including the absence of an elevator to access the second floor and the absence of accessible washrooms. While it can be assumed that fire operations would be excluded from these requirements, the building currently contains several spaces that could be used by someone with a disability including the emergency coordination centre and the dispatch centre. An equivalent building constructed today would require the inclusion of both an elevator and a universal toilet room.

While the building code does not specifically require that existing buildings be brought into compliance with its current version, this building is a critical piece of public safety infrastructure and these deficiencies need to be carefully reviewed in this light.

2.4 Mechanical Deficiencies

The mechanical review of the existing building was carried out by Rocky Point Engineering Ltd. and the detailed mechanical report has been included as part of Appendix 02 of this report.

Several items were identified as needing urgent replacement including the existing boiler, heating system and most of the existing supply, drainage and storm water piping.

Additionally, the building is currently ventilated through a combination of operable windows, window air conditioners and a heat pump serving the dispatch area. This does not meet the requirements for healthy ventilation included in the current building code which would require a forced air ventilation system for all spaces.

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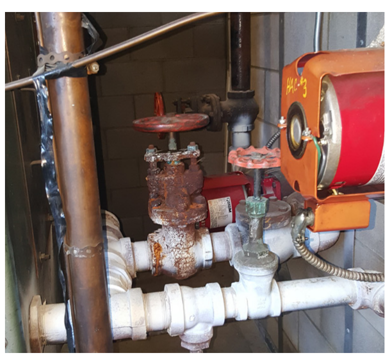

3

1. Existing ventilation system does not meet code requirements.
2. Boiler needs replacement.
3. Existing piping and valves need replacement.

Mechanical Deficiencies

2.5 Electrical Deficiencies

The electrical review of the existing building was carried out by RB Engineering Ltd. and the detailed electrical report has been included as part of Appendix 03 of this report.

Several items were identified as needing urgent replacement including the panels and cables. Failure of any of these elements is anticipated to leave parts of the building without power till new equipment can be installed. The electrical system also does not have any spare capacity and it is recommended to not add any new loads to the building prior to upgrades.

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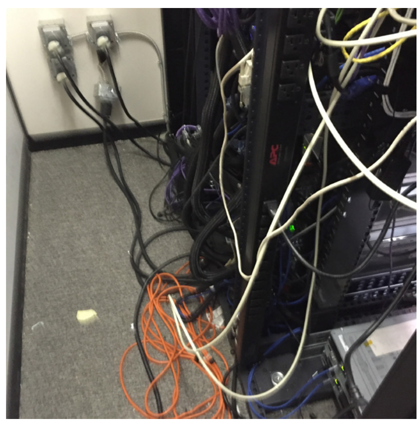

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1. Radio equipment in existing radio room.
2. City of Nanaimo backup server in existing IT room.
3. Hazardous materials are present within the building.
4. Existing electrical service is ageing and has no spare capacity

Electrical Deficiencies and Hazardous Materials

Electrical service to the backup server and radio equipment located within the building was observed to have some deficiencies including the absence of redundant uninterrupted power supply (UPS) backup and surge suppression. These deficiencies pose the risk of potential failure and damage to data equipment and electronics.

Additionally, the server and radio rooms were generally considered to be too small for the equipment located within them.

2.6 Presence of Hazardous Materials

The hazardous material review of the existing building was carried out by Total Safety Services, Inc. and the detailed report provided has been included as part of Appendix 06 of this report.

Several building elements were found to contain asbestos, lead, Polychlorinated Biphenyls (PCBs) and Silica. While the presence of these materials was not deemed to pose any immediate health risks to the occupants of the building, demolition and disposal of these materials will need to be done in accordance with relevant standards.


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3 Other Considerations for Scenarios

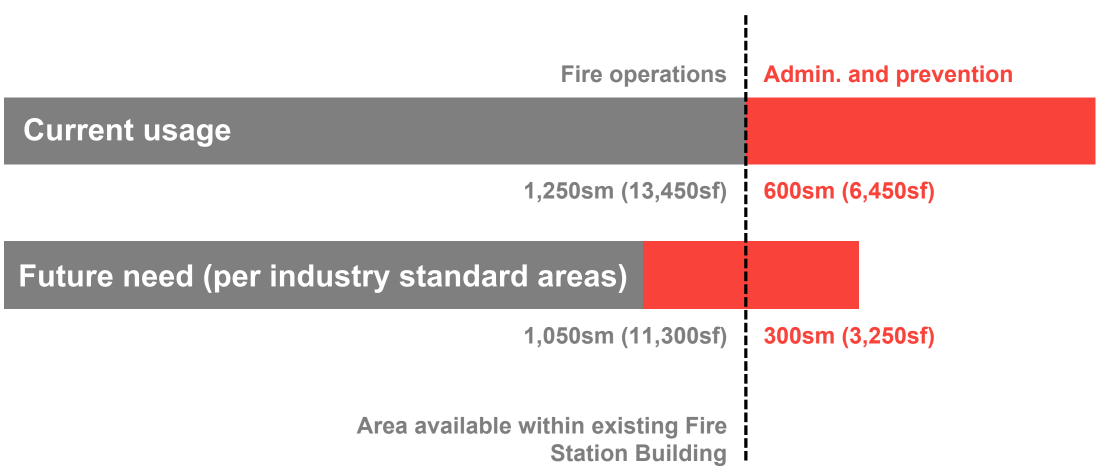
3.1 Program Consolidation

While fire operations, the dispatch centre and the emergency coordination centre are currently located at Fire Station 1, the fire administration and fire prevention divisions are housed in the CBC building. A desire to consolidate these programs was expressed during the workshops and was integrated into the scenarios for renewal.

Beyond the operating efficiency that is anticipated through the consolidation of all divisions in a single building, a long term financial saving can also be anticipated. The City is currently paying for the operation and maintenance (O&M) of two buildings that contain more area than is required for the program contained within them. Consolidating the program into a correctly sized building will thus reduce the current O&M costs and free up the CBC Building as a potential source of revenue.

Divisions located in the existing fire station building currently occupy 1,250m² (13,450sf) while administration and prevention divisions currently occupy 600m² (6,450sf) within the CBC building. A review of the space requirements of these divisions against current industry standards indicates that the divisions currently within the fire station building could be accommodated within 1,050m² (11,350sf) while administration and prevention could be accommodated within 300m² (3,250sf).

The consolidated program would thus need a total area of 1,350m² (14,500sf), which is higher than the area currently available within the fire station building. An expansion to the existing building would thus be required to house all the consolidated program.



Consolidation of Program

3.2 Alternate Sites

The scope of the project included a review of alternate sites for the fire station and tests to check if they provide any advantages from an operational standpoint.

1. Existing Fire Station 1
2. 340 Wentworth Street
3. Parks Yard at 73 Prideaux Street
4. Downtown Transit Exchange at 350 Prideaux Street
5. Curling Rink at 106 Wall Street
6. 9 Esplanade
7. Parking Lot at 295 Selby Street
8. Parking Lot at 580 Fitzwilliam Street

Only City owned sites have been included in the list above, other sites were considered but not listed.

Alternate Sites Considered

Information regarding the operational impact of each site under consideration was provided by Nanaimo Fire Rescue and based on a four minute drive time from that location. The number of incidents that took place between 2011 and 2013 that could be reached within this time was reviewed and included in the table below. Additionally, HCMA reviewed the size of each of these sites and their ability to accommodate the building footprint and parking required for a new fire station.

Operational Impact of Alternate Sites		
Number	Location Description	Total Number of 2011-2013 Incidents within 6 Minute ResponseTime
1	Current Fire Station 1	6465
2	Wallace and Wentworth	6425
3	Parks Yard	6384
4	Transit Exchange	6316
5	Curling Rink	6250
6	Esplanade and Front	5957
7	Selby and Fitzwilliam Parking Lot	Same as 1
8	CBC Building Parking Lot	Same as 1

The above numbers indicate that moving the fire station away from its current location leads to a reduced number of calls falling within a four minute drive time. This drop was considered to be within an acceptable range for sites in close proximity to the existing location but unacceptable for some of the outlying locations.

A closer review of the sites in close proximity to the existing fire station suggested that it was preferred to have apparatus exit onto Milton Street. It was thus agreed that the current location and orientation of the fire station represents the ideal condition and the only alternate site to be studied was the adjacent property currently housing the Community Services Building.

3.3 Parking

Nanaimo Fire Rescue currently uses the parking lot to the east of the fire station building to park both operational and personal vehicles. The existing lot is currently used to park around 23 vehicles in a manner that does not meet the current parking standards of the City of Nanaimo.

With a small reduction to the lawn area to the east of the building, a similar number of vehicles could be accommodated on the existing site in a layout that meets the City of Nanaimo zoning standards. The above number is however considerably lower than the anticipated need for operational and personal vehicles which was estimated to be around 40 stalls.

Several strategies for covering this shortfall were reviewed during the two workshops. Other paid and free parking lots currently exist in the near vicinity of the site which could be used for staff parking. Strategies to reduce parking demand and encourage the use of public transport or bicycles were also discussed. Additionally, sharing parking with the adjacent Community Services Building was also considered, though this would reduce the number of stalls available for their use.

Some of the strategies above will need to be considered in detail for scenarios that include the renewal of the fire station on its existing site, as there is not enough room to accommodate the number of stalls required. The scenario that includes a new fire station on the CSB site can accommodate the required number of parking stalls.

Parking Lots for Existing Fire Station and CSB

3.4 Temporary Facilities

Any scenario that required the renovation of the existing fire hall building or the construction of a new facility over its existing footprint would require a temporary fire station to be constructed for the anticipated construction period. This usually consists of a temporary shed to house critical apparatus along with a portable trailer containing temporary crew quarters and amenities.

Many of the locations reviewed as part of the study of alternate sites for the fire station were considered as possible locations for a temporary fire station. It was however decided that the parking lot and unused land to the east of the CBC building was the ideal location for this. Crew quarters could then be accommodated in the basement of the CBC building and offices currently housed there could be accommodated on the level above. Additionally, the basement currently contains kitchen, washroom and shower facilities that could be temporarily be used by the crew. This option would considerably reduce the costs of a temporary fire station.

The above option was the most cost effective as it used space within an existing building and worked well from an operational standpoint as the administration would be occupying the remainder of the building. Costs for the construction of temporary apparatus bays and modifications to the CBC building are included in all scenarios where this is required.

3.5 Phasing for Renovation or New Construction

The Emergency Coordination Centre and Dispatch Centre are able to operate from a temporary location for a maximum period of seven days. This makes it beneficial to maintain these function in their current location till a new permanent location for them is complete. The temporary location would only be used during the short period when furniture and equipment are being moved from the old to new permanent locations.

Due to this, scenarios that involve renovating the existing building or constructing a new facility at its current location need to be carefully configured and phased to allow this to happen.

3.5 Impact on Surrounding Context

Scenarios that include the renovation of the existing building or the construction of a new fire station over its existing footprint are not expected to have any significant impact on the surrounding context. A reduction in parking available at the Community Services Building, if that was chosen as the preferred strategy to accommodate staff parking, would be the only change from the existing situation.

However, one scenario has been developed that includes the construction of a new fire station in the current location of the Community Services Building and the social impacts of its removal need to be carefully considered. The building currently houses a dozen non profit community groups including the Nanaimo Brain Injury Society, 7-10 Club, Nanaimo Citizens Advocacy Association and Options for Sexual Heath. The tenants in the building benefit from competitive rents and being a one stop shop for various services. The removal of these services or their relocation may have a significant impact on those currently using them.

Additionally, the construction of a new fire station over the CSB location would require adjustments to the traffic controls along Prideaux Street and Fitzwilliam Street and coordination of control with the adjacent rail crossing.

4

4 Scenarios for Renewal

4.1 Summary of Scenarios

The broad goal for the scenarios was to explore a variety of approaches for the renewal of Fire Station 1 that included renovation and new construction on the existing or adjoining sites.

The scenarios below were short listed for further review and a detailed cost analysis was undertaken for each of them. In addition to these, maintaining the status quo was also studied in detail and a cost analysis undertaken for it.

Status Quo - Complete Currently Budgeted Upgrades and Rebuild in 10 Years.

Scenario 1 - Expand and Renovate Existing

Scenario 2 - Build new on Adjacent Site

Scenario 3 - Build New at Existing Location

4.2 Summary of Project and Life Cycle Costs

Advicas Group Consultants Inc. were retained as the Quantity Surveyors for the project to conduct a project and life cycle cost analysis for the selected scenarios. A cost analysis was also conducted on the status quo option as a point of reference for all scenarios, with replacement of the building assumed to take place after 10 years (2028).

Project costs for each scenario include the construction costs for renovation or new construction required to complete each scenario, including any temporary facilities required. Soft costs that encompass contingencies, consultant fees, completion costs and financing costs are also included. An allowance for escalation has also been included, for an anticipated construction start date in 2019.

The life cycle cost analysis was conducted over a 45 year time frame that includes a full replacement cycle of most finishes and systems at the end of their useful life. This is considered to provide a fair comparison of life cycle costs between the different scenarios and is often used as a standard for such analysis. The list below includes the replacement cycle assumed for each scenario.

- Flooring and Paint - 10 Years
- Roofing - 25 Years
- Major Mechanical and Electrical Upgrades - 20 Years
- Lighting - 30 Years
- Mechanical Equipment - 35 Years

All life cycle costs included in this report are a culmination of the cash flow values at the end of the 45 year period of the study. The detailed cost report provided by Advicas Group Consultants Inc. has been included in Appendix 05 of this report.

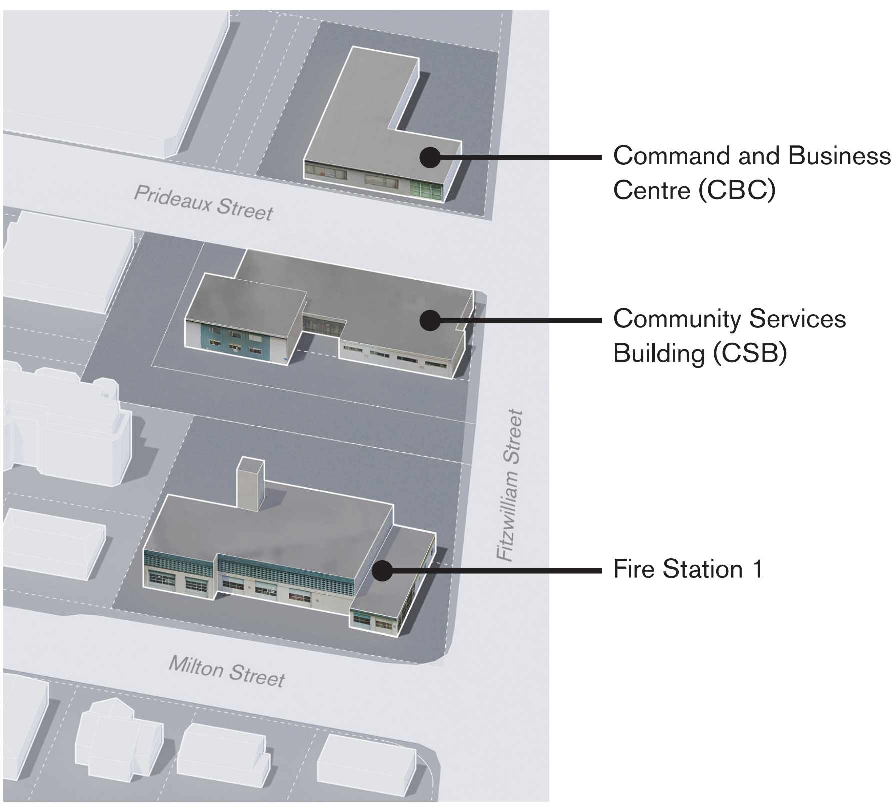
4.3 Status Quo

DESCRIPTION

Since funding for a few upgrades has been included in the City's annual budget, completing these upgrades with no other changes to the building configuration in the near future was considered in detail as a point of comparison for all other scenarios.

The upgrades in the budget include replacement of the roof, a new boiler, replacement of the flooring and painting the exterior of the building. These upgrades were assumed to be completed immediately. The interior layout of program in the existing fire station would remain the same and the administration and prevention divisions would continue to remain separated and located in the CBC Building.

Since it was unlikely that the ageing building would continue to be used through the 45 year period of the life cycle costing, it was assumed that a new fire station would be constructed in its place after 10 years.



Existing Configuration Maintained

BENEFITS AND CHALLENGES FOR STATUS QUO

Capital cost - The primary benefit of maintaining the status quo is that it entails the lowest level of capital investment at the current time. However, reconstruction of the building after the 10 year period assumed for the study is anticipated to be approximately 50% more expensive than building an equivalent facility today.

Life cycle costs - While this option saves money in the short term, it is anticipated to be the most expensive over the 45 year life cycle cost projection. This is due to a combination of the higher cost to rebuild in 10 years combined with the high O&M costs anticipated in the period prior to reconstruction.

Seismic Stability - The existing building is anticipated to provide basic life safety in a major seismic event. It however does not meet the post disaster requirements of the 2017 BCBC and emergency operations could be compromised after a major seismic event. The reconstructed building would meet the requirements of the applicable seismic code of the time and would meet the requirements of a post disaster facility.

Risk - Since only select building elements are replaced as part of the building upgrades, the risk of fire operations being compromised by system failure remains high till the building is reconstructed.

Building program and size - Prior to reconstruction, the various divisions will continue to occupy their existing footprint that is considerably larger than what is needed for their efficient operation. Administration and prevention would continue to remain separated. The reconstructed facility would consolidate all program into a single building.

Operational configuration - The current operational configuration, with apparatus exiting onto Milton Street is retained, which is considered to be optimal for response.

Phasing and construction length - Building upgrades would take place while operations continue within the existing fire station building. Reconstruction of the fire station would need to be phased and would require a temporary facility to be constructed to maintain continuity of operations.

Impact on surroundings - No impacts are anticipated as the status quo is maintained.

PROJECT AND LIFE CYCLE COSTS FOR STATUS QUO

The Order of Magnitude Estimate has been developed by Advicas Group Consultants Inc. in current (December, 2016) dollars. The estimated capital construction costs associated soft costs and life cycle costs are as follows:

Total Project Cost for Upgrades	**$ 1.1 M**
Total Project Cost for a New Facility at Year 10[+]	**$23.1 M**
Life Cycle Costs Over 45 Years*	**$46.6 M**

[+] Based on project costs for scenario 3 escalated over a 10 year time line.

* Life cycle cost is the total annual cash flow at the end of the 45 year period of the study and represents the total cost incurred by the City for the particular scenario. This includes project costs incurred for the construction or renovation of the facility, annual operation and maintenance costs and periodic upgrades to building elements based on their replacement cycle. Escalation has been factored to all costs based on the time they are incurred. Borrowing costs have been excluded from the calculations.

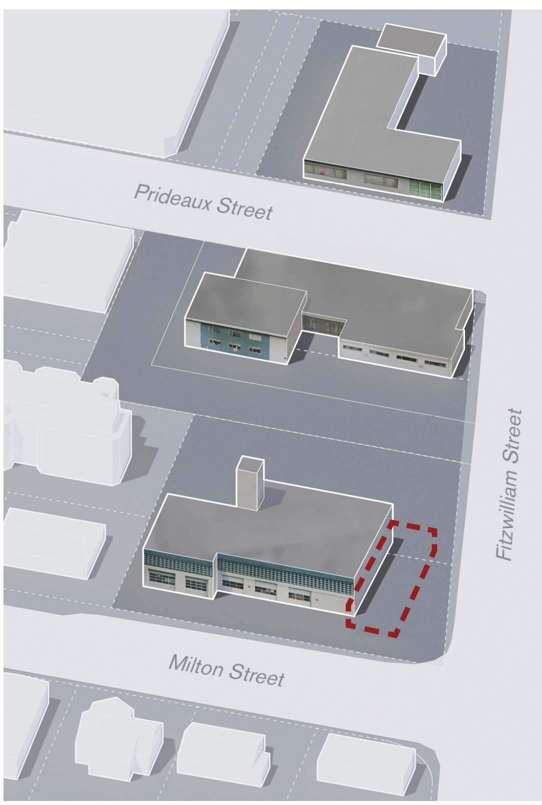
4.4 Scenario 1 - Expand and Renovate Existing

DESCRIPTION AND PHASING

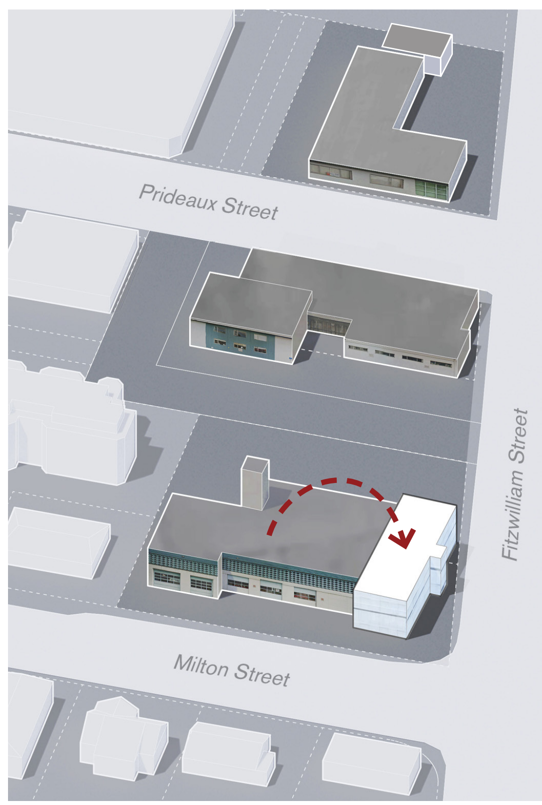
This scenario seeks to retain and renovate most of the existing fire station building and expand it to accommodate the consolidated program. The project would be structured to consist of the following phases:

Phase 1 - A temporary fire station is constructed and fire operations move into this building. Once this is complete, the south wing of the existing building is demolished.

Phase 2 - A new expansion to the building is constructed over the footprint of the demolished south wing. Since this is constructed to the full seismic requirement of the 2017 BCBC, it is intended to house critical functions such as the emergency coordination centre and the dispatch centre. Once complete, these two programs move into their new locations within the building.



Phase 1 - Build temporary fire station and demolish south wing of existing fire station



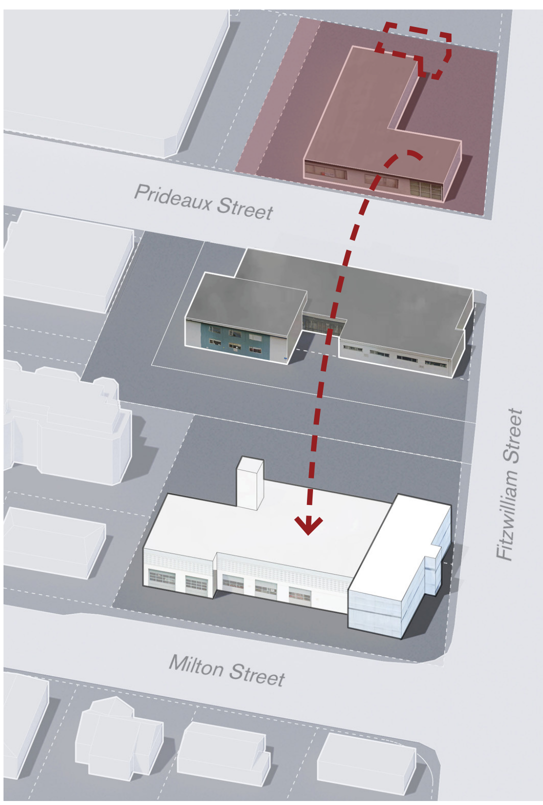
Phase 2 - Construct new expansion to fire station

Scenario 1 Sequence Diagram

Phase 3 - Once the emergency coordination centre and dispatch centre are operational at their new locations, the remainder of the existing fire station is renovated. This includes a seismic upgrade to the post disaster requirement of the 2017 BCBC and upgrades to all systems and finishes.

The interior upgrade includes the creation of spaces to house fire administration and prevention. These functions along with operations move back into the newly renovated building once complete and the temporary fire station is removed.

The CBC Building is vacated in this scenario and is available for sale to offset some of the capital costs or for lease as a source of revenue for the City.



Phase 3 - Renovate remainder of existing fire station and remove temporary facility

BENEFITS AND CHALLENGES FOR SCENARIO 1

Capital cost - This scenario includes the highest capital costs of all the scenarios, which is primarily based on the complexity of seismically upgrading the existing building.

Life cycle costs - Though most systems and finishes are upgraded, the building structure and non glazed parts of the exterior envelope are retained, resulting in higher operation and maintenance costs than scenarios with a new building.

Seismic Stability - The new and renovated parts of the building are designed to meet the seismic capacity required by the post disaster level of the 2017 BCBC. Seismically upgrading the retained portion of the building is anticipated to be more complex than building new and will thus incur higher structural costs.

Risk - Since this scenario includes a complete replacement of most systems within the existing building, it presents a much lower level of risk of fire operations being compromised due to the failure of ageing systems, when compared to the status quo. However, the renovation of an existing building carries a higher risk of unknown conditions when compared to a new building.

Building program and size - Retention of the existing building results in the program being spread through the area that is currently available within it, resulting in the same program occupying a slightly larger area than a custom configured new building. The consolidation of administration and prevention alongside operations is anticipated to yield efficiencies both from a functional perspective and a cost perspective, with all functions consolidated into a more compact area.

Temporary facility - A temporary fire station would need to be constructed to ensure continuity of operations in this scenario.

Operational configuration - This scenario maintains the current operational configuration, with apparatus exiting onto Milton Street, which is considered to be optimal for response.

Phasing and construction length - Construction and renovation would need to be carefully phased to ensure a single move for the emergency coordination centre and dispatch centre resulting in lengthened construction time and higher costs.

Impact on surroundings - The impact on the surroundings is minimal as CSB is retained and apparatus continue to exit onto Milton Street.

PROJECT AND LIFE CYCLE COSTS FOR SCENARIO 1

The Order of Magnitude Estimate has been developed by Advicas Group Consultants Inc. in current (December, 2016) dollars. The estimated capital construction costs, associated soft costs and life cycle costs are as follows:

Total Project Costs	**$17.0 M**

Life Cycle Costs Over 45 Years*	**$41.3 M**

* Life cycle cost is the total annual cash flow at the end of the 45 year period of the study and represents the total cost incurred by the City for the particular scenario. This includes project costs incurred for the construction or renovation of the facility, annual operation and maintenance costs and periodic upgrades to building elements based on their replacement cycle. Escalation has been factored into all costs based on the time they are incurred. Borrowing costs have been excluded from the calculations.

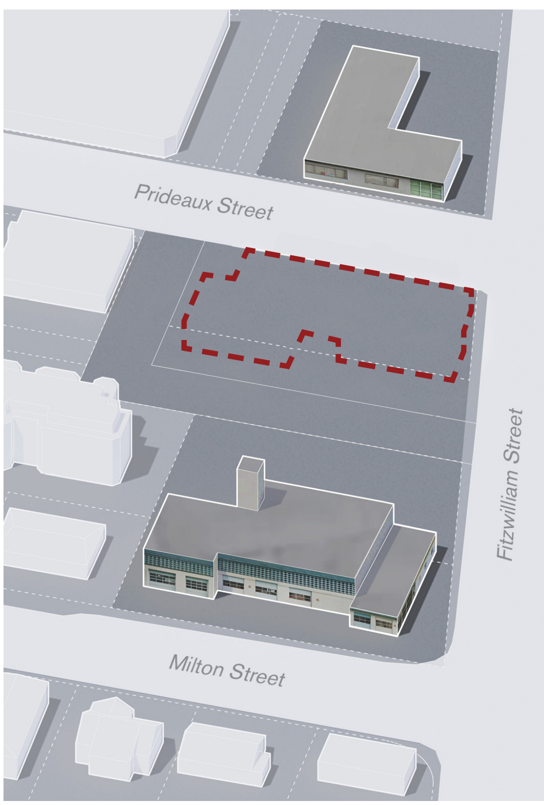
4.5 Scenario 2 - Build New on Adjacent Site

DESCRIPTION AND PHASING

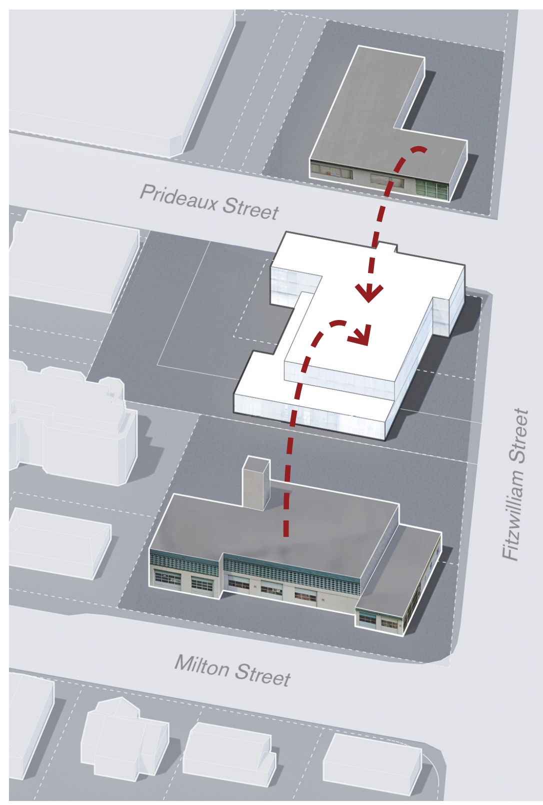
This scenario seeks to build a new fire station on the site of the existing Community Services Building. The new building is sized to accommodate the consolidated program. Depending on operational preference, the new building could be oriented to allow apparatus to exit onto Fitzwilliam Street or Prideaux Street. The project would be structured to consist of the following phases:

Phase 1 - Current tenants within the Community Services Building are relocated and the building is demolished.

Phase 2 - A new fire station is constructed over the footprint of the demolished Community Services Building. It is constructed to the post disaster level of the 2017 BCBC. Due to the continued operation of the existing fire



Phase 1 - Demolish Community Services Building



Phase 2 - Construct new fire station on CSB site

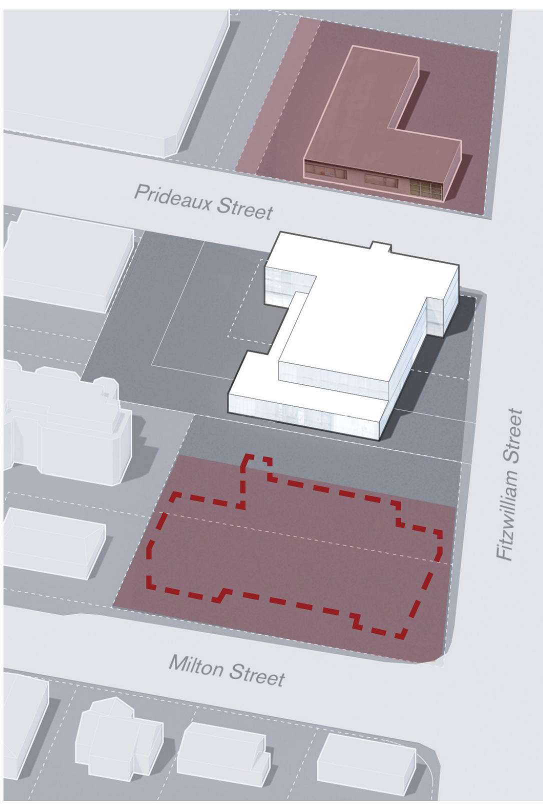
Scenario 2 Sequence Diagram

station, construction is completed as a single phase. All fire services move to their locations in the new building once construction is complete.

The new fire station is of the same size and configuration as the one in scenario 3.

Phase 3 - The existing fire station building is demolished leaving its property available for reuse or sale.

The CBC Building is also vacated in this scenario and is available for sale to offset some of the capital costs or for lease as a source of revenue for the City.



Phase 3 - Demolish existing fire station building

BENEFITS AND CHALLENGES FOR SCENARIO 2

Capital cost - This scenario has the lowest capital cost of the three scenarios as there are no temporary facilities required and the construction process does not need to be phased.

Life cycle costs - Being a brand new building, this scenario has the lowest life cycle costs over the 45 year period studied.

Seismic Stability - The entire building is built to the post disaster standard of the 2017 BCBC.

Risk - This scenario includes the lowest level of risk as it is comprised entirely of newly constructed elements.

Building program and size - This scenario assumes that all program is consolidated into a compact and efficient building. Being a new building, the layout and organization of spaces can be carefully configured to the programmatic needs and within a smaller area than scenario 1.

Temporary facility - As operations would continue out of the existing fire station building till construction of the new building is complete, this scenario does not require the construction of a temporary facility.

Operational configuration - This scenario changes the operational configuration and will require apparatus to exit onto Prideaux Street or Fitzwilliam Street, which are considered slightly less efficient for response.

Phasing and construction length - As the emergency coordination centre and dispatch centre would remain operational at their current locations till the completion of construction, no phasing is required. The length of construction would also be shortened due to this.

Impact on surroundings - This scenario has significant social impact as the Community Services Building is demolished and tenants within it would need to be relocated. Additionally, traffic control changes would be required due to the change in operational configuration.

PROJECT AND LIFE CYCLE COSTS FOR SCENARIO 2

The Order of Magnitude Estimate has been developed by Advicas Group Consultants Inc. in current (December, 2016) dollars. The estimated capital construction costs, associated soft costs and life cycle costs are as follows:

Total Project Costs	**$15.6 M**

Life Cycle Costs Over 45 Years*	**$37.8 M**

* Life cycle cost is the total annual cash flow at the end of the 45 year period of the study and represents the total cost incurred by the City for the particular scenario. This includes project costs incurred for the construction or renovation of the facility, annual operation and maintenance costs and periodic upgrades to building elements based on their replacement cycle. Escalation has been factored into all costs based on the time they are incurred. Borrowing costs have been excluded from the calculations.

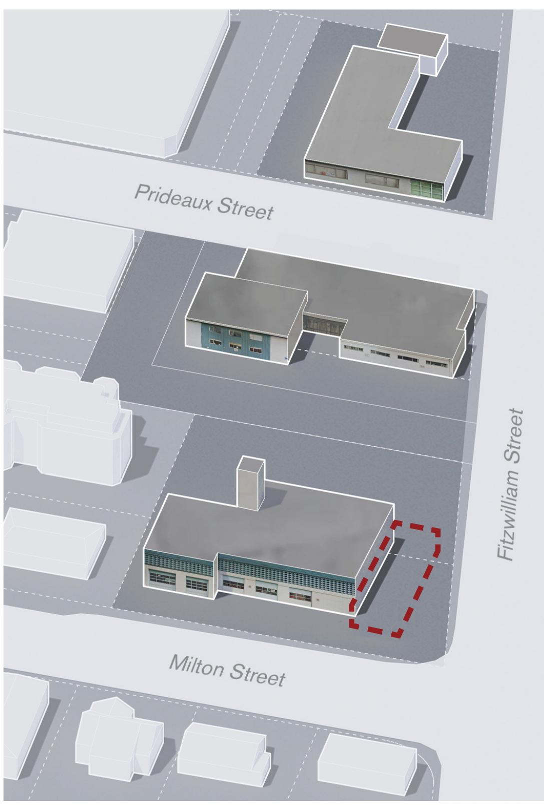
4.6 Scenario 3 - Build New at Existing Location

DESCRIPTION AND PHASING

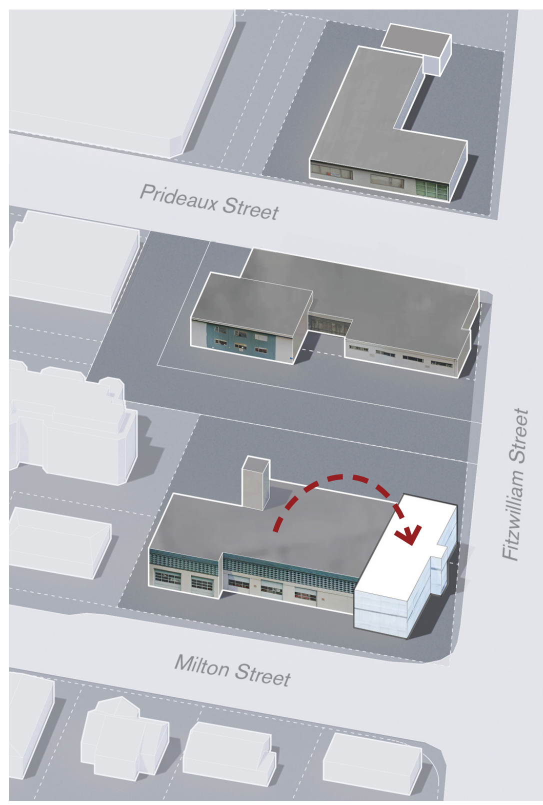
This scenario seeks to build a new fire station over the footprint of the existing fire station building, that would be sized to accommodate the consolidated program. The project would be structured to consist of the following phases:

Phase 1 - A temporary fire station is constructed and fire operations move into this building. Once this is complete, the south wing of the existing building is demolished.

Phase 2 - A new expansion to the building is constructed over the footprint of the demolished south wing. The emergency coordination centre and dispatch centre move into their new locations within the expansion once it is complete.



Phase 1 - Build temporary fire station and demolish south wing of existing fire station



Phase 2 - Construct new expansion to fire station

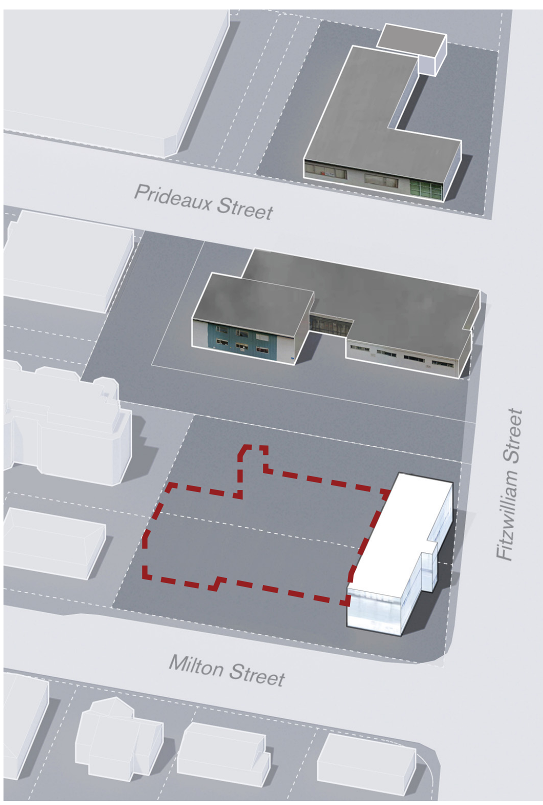
Scenario 3 Sequence Diagram

Phase 3 - Once the emergency coordination centre and dispatch centre are operational at their new locations, the remainder of the existing fire station is demolished.

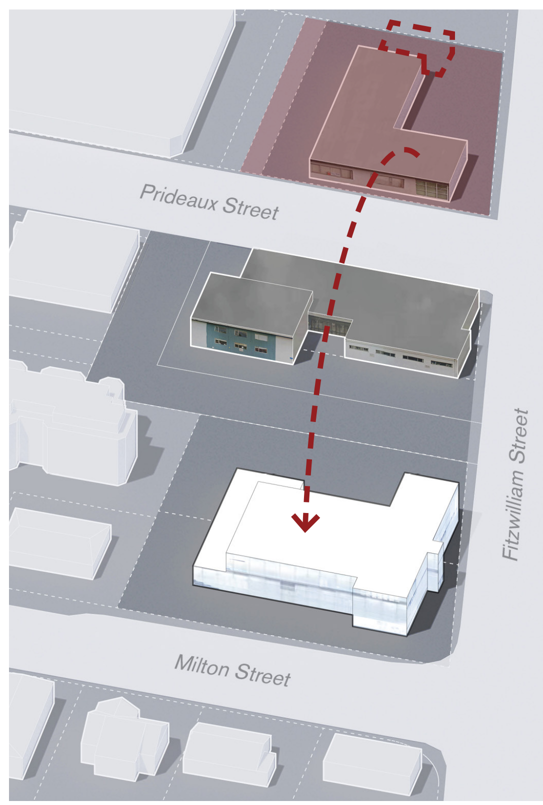
Phase 4 - The remainder of the fire station is constructed adjacent to the new south wing. The fully constructed fire station is of the same size and configuration as the one in scenario 2.

Once construction is complete, both sections of the building are connected to function as a single facility. All fire services move to their new locations in the building.

The CBC Building is vacated in this scenario and is available for sale to offset some of the capital costs or for lease as a source of revenue for the City.



Phase 3 - Demolish remainder of fire station building



Phase 3 - Construct remainder of new fire station and remove temporary facility

BENEFITS AND CHALLENGES FOR SCENARIO 3

Capital cost - This scenario has a capital cost that is approximately 1.5 million dollars higher than scenario 2, primarily due to the need for temporary facilities and phased construction.

Life cycle costs - Being a brand new building, this scenario has the lowest life cycle costs over the 45 year period studied.

Seismic Stability - The entire building is built to the post disaster standard of the 2017 BCBC.

Risk - This scenario includes the lowest level of risk as it is comprised entirely of newly constructed elements.

Building program and size - This scenario assumes that all program is consolidated into a compact and efficient building. Being a new building, the layout and organization of spaces can be carefully configured to the programmatic needs and within a smaller area than scenario 1.

Temporary facility - A temporary fire station would need to be constructed to ensure continuity of operations in this scenario.

Operational configuration - This scenario maintains the current operational configuration, with apparatus exiting onto Milton Street, which is considered to be optimal for response.

Phasing and construction length - Construction and renovation would need to be carefully phased to ensure a single move for the emergency coordination centre and dispatch centre resulting in lengthened construction time and higher costs.

Impact on surroundings - The impact on the surrounding is minimal as CSB is retained and apparatus continue to exit onto Milton Street.

PROJECT AND LIFE CYCLE COSTS FOR SCENARIO 3

The Order of Magnitude Estimate has been developed by Advicas Group Consultants Inc. in current (December, 2016) dollars. The estimated capital construction costs, associated soft costs and life cycle costs are as follows:

Total Project Costs	**$16.9 M**

Life Cycle Costs Over 45 Years*	**$39.1 M**

* Life cycle cost is the total annual cash flow at the end of the 45 year period of the study and represents the total cost incurred by the City for the particular scenario. This includes project costs incurred for the construction or renovation of the facility, annual operation and maintenance costs and periodic upgrades to building elements based on their replacement cycle. Escalation has been factored into all costs based on the time they are incurred. Borrowing costs have been excluded from the calculations.


5
Nanaimo Fire

5 Scenario Comparison and Conclusions

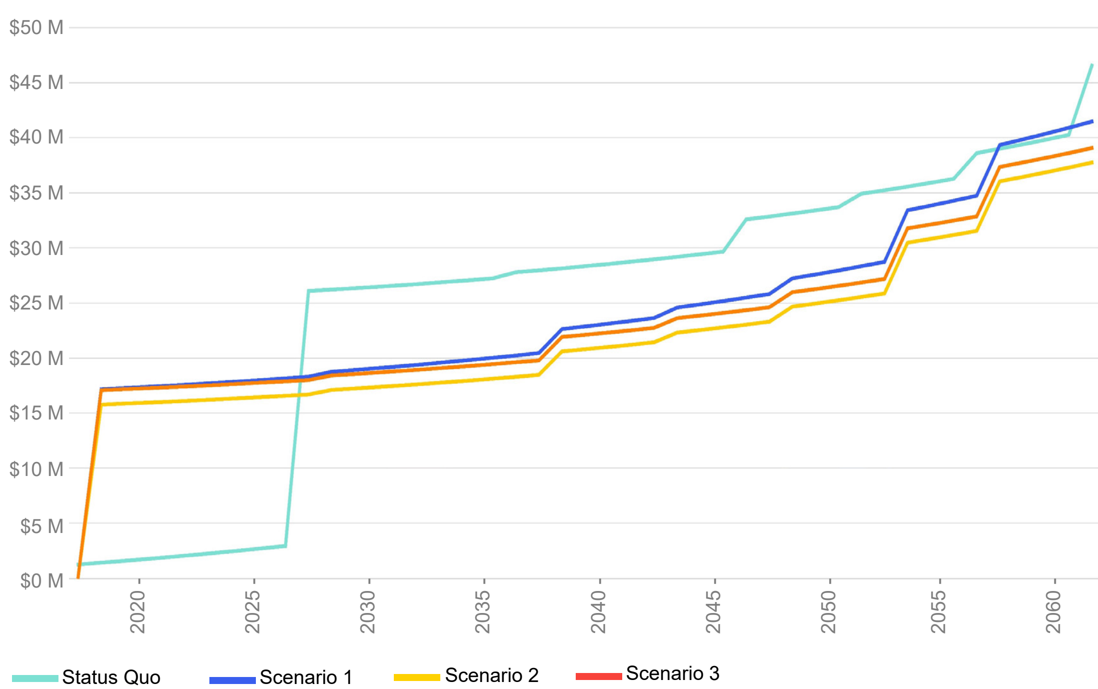
5.1 Critical Considerations

In consultation with Nanaimo Fire Rescue and the City of Nanaimo a preferred scenario was selected, that was seen to provide the best balance between benefits to the citizens of Nanaimo, operational efficiency and costs to build and maintain.

When reviewing benefits to the public provided by any of the scenarios, the primary factor that has been considered is their safety. Fire Station 1 is a critical hub of public safety functions that need to be fully operational after a major seismic event to serve their purpose of assisting the public.

With respect to project and life cycle costs, initial capital investment has been carefully weighed against life cycle costs over the 45 year period of the cost analysis.

The risk associated with operations being impacted due to the failure of systems within the ageing building and the operational configuration of the fire station have also been reviewed as important but secondary considerations. Additionally, the social and physical impact of the scenarios on the adjoining buildings and services being provided from them has been carefully considered.



Comparison of Costs Incurred Through the Period of the Study

5.2 Comparison of Scenarios

As the scenarios were compared by HCMA in consultation with Nanaimo Fire Rescue and the City of Nanaimo, the following questions were carefully investigated to arrive at a preferred scenario.

1. STATUS QUO OR RENEWAL?

The fundamental question arising from this study is whether the status quo is acceptable or whether the risks associated with it are too great to be ignored and a comprehensive renewal of the fire station is required in the near future.

This building is the main emergency response centre for the city that contains the main fire station, emergency coordination centre and emergency dispatch centre. Its ability to remain fully operational after a major seismic event is critical. The structural review performed by Herold Engineering has determined that the existing building would provide life safety to its occupants, due to its prior seismic upgrade, but would likely suffer damage that would prevent its ongoing operation. Since the status quo assumes that the building would be rebuilt in 10 years, the above risk should be weighed against the likelihood of a catastrophic seismic event occurring in that time period, which is quite low.

	Major Rehabilitation	Capital Investment	Total Life Cycle Cost	Seismic Stability	Risk of system failure
Status Quo	$1.1 M (2018)	$23.1 M (2028)	$46.6 M	No upgrade till reconstruction	High (till reconstruction)
Scenario 1	NA	$17.0 M (2019)	$41.3 M	2017 BCBC post disaster	Low
Scenario 2	NA	$15.6 M (2019)	$37.8 M	2017 BCBC post disaster	Low
Scenario 3	NA	$16.9 M (2019)	$39.1 M	2017 BCBC post disaster	Low

Decision Matrix

However, maintaining the status quo would lead to higher costs to the City over the life of the building. Initial capital investment in the near future would be quite low but rebuilding a new facility in 10 years (2028) would be considerably more expensive than building the same facility now.

The higher costs along with the risks associated with the existing facility, up to the point that it is rebuilt, suggests that renewal of the fire station soon provides the best value over the long term.

2. RENOVATE OR BUILD NEW?

A renovation to the existing facility requires the highest capital investment of all the scenarios, primarily due to the complexity of seismically upgrading the existing building. The renovated building has higher life cycle costs, primarily due to the inefficiency of the existing building envelope and the fact that it is not as compact as a custom designed new building. Additionally, renovations to an existing building are considered to have a higher level of risk when compared to new construction.

The higher costs of renovating the existing building coupled with lower operational performance make it less attractive than building a new fire station.

3. WHICH BUILD NEW SCENARIO IS OPTIMAL?

Both build new scenarios include the construction of a new fire station of the same size and configuration. Scenario 2 (Build New on Adjacent Site) requires the removal of the Community Services Building and changes to the operational orientation of the fire station. However, it does not require temporary facilities to be constructed and can be built in a single phase, making it less expensive.

Scenario 3 (Build New at Existing Location) keeps the existing operational configuration and does not impact the Community Services Building. However, construction of the new building needs to be phased to maintain operations at the emergency coordination centre and dispatch centre. A temporary fire station must also be constructed to maintain fire operations during construction, making it more expensive than scenario 2.

As O&M costs for both scenarios is anticipated to be very similar, the difference in the total life cycle cost of both these scenarios is less than 1.5 million dollars. It was thus decided that this cost difference was small enough to not make it the primary consideration when selecting a preferred option.

5.3 Preferred Scenario

With the cost difference between scenario 2 and scenario 3 being small, the factors used to determine the preferred option are the operational configuration and impact on surrounding buildings and services.

Scenario 3 is considered to be optimal from an operational standpoint as apparatus exiting onto Milton Street provides the best response times.

Scenario 2 requires the removal of the Community Services Building and this is anticipated to have a significant social impact due to the loss of services being provided from within it. The reorientation of the fire station would also require changes to fire operations and modification to traffic controls along Fitzwilliam and Prideaux streets.

Scenario 3 (Build New at Existing Location) is thus considered to be the preferred option for the renewal of Nanaimo Fire Station 1.


6
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CITY OF NANAIMO
Fire Rescue

6 Appendix

Appendix 01

Structural Consultant's Report

Nanaimo Fire Station No. 1
Renewal / Replacement Business Case
December 9, 2016

History

The Nanaimo Fire Station No. 1 was constructed in 1966 and had a subsequent Apparatus Bay addition on the north/west elevation.

The existing building was originally constructed using timber T&G wood deck on the roof supported by open web steel joists spanning north/south. The steel joists were supported by interior and exterior concrete or concrete block walls and the non-bearing walls on the east and west walls were double wythe unreinforced masonry walls.

The second floor is cast-in-place concrete slab and slab band construction supported by exterior and interior concrete walls and concrete posts. Foundations were cast-in-place concrete.

A seismic upgrade to the requirements of the 1998 British Columbia Building Code (BCBC) was completed in 2000 by Herold Engineering Limited and included the following:

- Adding plywood sheathing to upper and lower roof decking
- Reinforcing concrete block walls
- Adding new exterior concrete shear walls and moment frames
- Adding steel stud backing to interior non-load bearing corridor walls
- Upgrading roof connections to shear walls
- Upgrading foundations.

Site Inspection

We completed a general site inspection of the building during our workshop at the station on October 5, 2016 and the building appeared to be in good structural condition for its age and has performed well for its service loads over the past 50 years. There was some evidence of water ingress into the reinforcing steel on the concrete hose tower on the east elevation with indications of concrete spalling and exposed rebar but only minor in nature.

Seismic Considerations

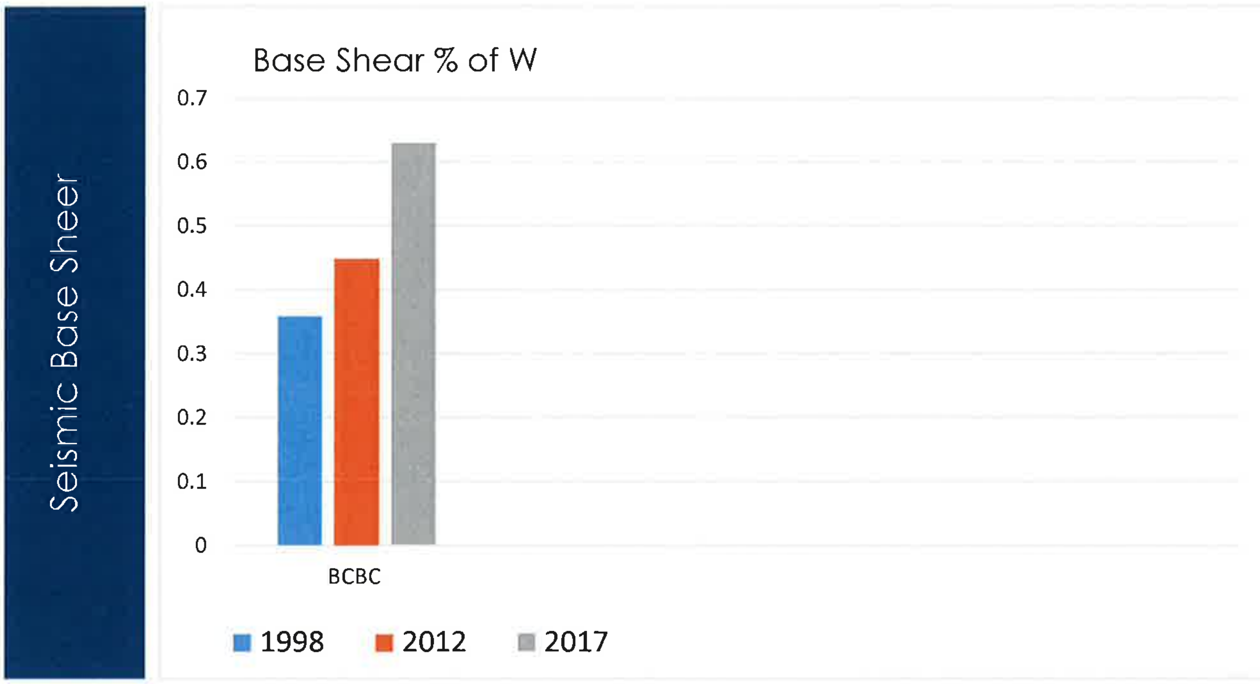
Fire halls are considered Post Disaster buildings as per the British Columbia Building Code and as such are required to remain operational subsequent to a major seismic event. Accordingly, the new code requires Post Disaster buildings to be designed for seismic forces 50% higher than normal buildings. The building was originally designed to a code prior to 1966 that did not put a lot of significance into seismic design.

Over the years the Building Codes have upgraded their requirements for designing buildings to meet an increasing demand on the structure due to seismic events.

The building was seismically upgraded in 2000 to the requirements of the 1998 British Columbia Building Code (BCBC) which has changed to todays 2012 BCBC and will change again in the next edition of the BCBC expected to be released in 2017.

To illustrate the increase in seismic design loads from 1998 to 2017, the following table and graph compares seismic base shears between the three codes. Seismic base shears are an indication of the seismic forces or energy that are imparted on building structures and are represented as a percentage of a structures dead weight and 25% of its code required snow load (W).

British Columbia Building Code (BCBC)	**Base Shear % of W**
1998 BCBC	0.36W
2012 BCBC	0.45W
2017 BCBC	0.63W



It is noted that the design base shear of the 2012 BCBC is 10% higher than the 1998 BCBC and the 2017 BCBC is 75% higher than the 1998 BCBC.

The 2000 seismic upgrade brought the 1966 building up to 1998 BCBC seismic requirements. The 2017 BCBC requires design loads 75% higher than what the structure was upgraded to.

A detailed seismic assessment would be needed to determine what the current capacity of the building is for seismic loads compared to the upcoming 2017 BCBC which is beyond the scope of our work on this assignment. While there could be some extra capacity in the building beyond the 1998 upgrade, this could only be determined with a detailed assessment.

Seismic Assessment

With the proposed new seismic requirements of the next edition of the British Columbia Building Code due to be released in 2017, the existing Fire Hall is seismically deficient to meet the Post Disaster requirements of this code. Even though it was seismically upgraded in 2000 to the requirements of the 1998 BCBC, new code seismic loading will be 75% higher than its previous upgrade requirements.

A detailed seismic analysis would need to be completed to determine the extent of the further upgrade to meet the seismic requirements of the next code.

A budget cost estimate for this study would be $17,500.00.

Summary of Options

As discussed at our Options Meeting of October 31, 2016, Herold Engineering Limited is commenting on the various options for the No. 1 Fire Hall in order for the Cost Consultant to prepare OM cost estimates for each option. The various options are as follows:

Scenario 1	Break and Fix option
Scenario 2	Renovate and Consolidate Operations into Existing and Expansion
Scenario 3a	New Fire Hall on Existing Site

Scenario 1 - Break and Fix Option

This option is basically do nothing unless absolutely necessary and to this end nothing would be required structurally except cleaning and patching of any exposed reinforcing steel on the hose tower to mitigate any further spalling of concrete and further deterioration of the reinforcing steel. This work is not critical and very minor in nature.

The risk of this option is that you have a Fire Hall that likely would not be operational subsequent to a major seismic event. A detailed seismic assessment would provide a better understanding as to what extent the station needs to be upgraded to meet the next edition of the code.

Scenario 2 – Renovate and Consolidate Operations into Existing and Expansion

This scenario is divided into four components with three of the components incorporating structural requirements.

1. Build Temporary Fire Hall

   This option will require a temporary building on the site like a tent structure or other type of structure requiring minimal footings or hold down anchors on an existing asphalt site. Some levelling of the existing asphalt for drainage may be required.

2. Building New Addition to Fire Hall

   This will require demolition of the existing single storey building and construction of a new two storey building on the south end of the Hall. This new addition could be structurally designed to help with the seismic upgrade of the existing Hall and potentially minimize the seismic construction upgrade costs of the existing building.

3. Renovate Existing Fire Hall

   This will require a complete seismic upgrade to the existing building to the seismic and gravity requirements of the 2016 BCBC.

   While Herold Engineering has not completed a detailed seismic assessment of the existing building to determine what exact upgrading would be required, we have reviewed the existing structure and determined what likely would need to be upgraded to meet the new code.

   It is noted that upgrading is required not only for the increase in seismic loads but also for building irregularity requirements and specific detailing requirements for concrete and masonry elements to meet Moderate Ductility requirements for a Post Disaster Building.

   The following is a description of what would be required to upgrade the existing building assuming that the single storey area on the south elevation has been removed.

   1. Construct new 250 mm reinforced concrete exterior walls on the outside of the existing exterior walls on all four elevations and connect existing exterior walls to the new concrete walls. New exterior walls to be constructed from new concrete foundations to existing roof level. New concrete walls on the west elevation on the upper floor to align with new concrete walls at the lower level eliminating current offset.
   2. Excavate and construct new foundations for new exterior walls.
   3. Demolish hose tower and rebuild a new hose tower and foundations if hose tower needed.
   4. Complete a design check on the existing open web steel roof joists to determine if they can support a 25% increased snow loading for a Post-Disaster building which is a requirement of the new code. Add new roof joist between each existing joists if capacity inadequate.
   5. Temporarily support the existing open web steel roof joists on the two interior support lines and remove existing concrete block walls. Re-support existing joists with a line of steel post and beam construction with steel columns lining up with concrete columns on the main floor.
   6. Add new open web steel joists at location of existing exterior bearing wall along west elevation.
   7. Install new 18 gauge steel roof deck over total roof area.
   8. Demolish all non-bearing concrete block walls on main and upper floors. Replace with reinforced concrete walls or steel stud walls on lower floor and steel stud walls on upper floor.

Scenario 3a – New Fire Hall on Existing Site

1. Build Temporary Fire Hall

   This option will require a temporary building on the site like a tent structure or other type of structure requiring minimal footings or hold down anchors on an existing asphalt site. Some levelling of the existing asphalt for drainage may be required.

2. Build Phase 1 of new Fire Hall on Site

   This will require demolition of the existing single storey building on the south elevation and reconstruction of Phase 1 of the new Fire Hall. Design and construction to accommodate subsequent Phase 2 addition.

3. Build Phase 2 of New Fire Hall on Site

   Phase 2 construction of the balance of the new Fire Hall. There may be some onerous or extra costs associated with the phasing of construction since this Phase 1 construction must be a stand-alone design if occupied until the Phase 2 construction is complete.

Scenario 3b – New Fire Hall on Adjacent Site

This option reduces the risk of disruption to operations and eliminates the requirement of a temporary facility during the construction process, however construction costs include two (2) demolitions and one (1) new build.

Appendix 02

Mechanical Consultant's Report

PURPOSE OF THE REPORT:

Rocky Point Engineering has been retained by the City of Nanaimo to prepare a mechanical assessment condition report to support the Business Case Analysis for Fire Station #1. The purpose of this report is to provide information to all relevant parties to assess the impact of the existing mechanical infrastructure as it relates to all options proposed by the assessment team.

This assessment takes into account the 2012 BC Building, Plumbing and Fire Codes, American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) standards and guidelines, and a visual inspection of existing conditions.

HEATING, VENTILATION AND AIR CONDITIONING (HVAC) SYSTEMS

Heating

The existing heating system is hydronic and served by an 840 MBH Bryan Water Tube Boiler, originally installed in 1967. The hydronic heating system mainly serves hydronic baseboard heaters in each space and unit heaters in the garages. The boiler uses fuel oil from an above ground storage tank located just outside of the boiler mechanical room. The above ground fuel oil storage tank was installed in 1999, with an older abandoned underground fuel oil tank left in place on the southeast side of the building.

The boiler and heating system components are well beyond their useful service life (typically 30 years). A full replacement is recommended in the immediate short term.

Based on current heating system technologies we would recommended an upgrade to a central heating hybrid boiler system including a dual fuel (oil and natural gas) boiler, along with condensing natural gas boilers that allow full heating capacity redundancy and a back-up fuel source. A new natural gas service to the building would be required in this case.

Alternative strategies should be considered for the hydronic heating system in lieu of, or addition to, hydronic baseboard, with connection to future upgraded ventilation systems.

Ventilation

Much of the building did not include a ventilation system which would meet current 2012 BC Building Code and ASHRAE 62.1 ventilation standards. Many spaces relied on operable windows with the effectiveness of a natural ventilation strategy limited by space layout. Current standards and industry recommended practices for this type of facility would include direct ventilation into each occupied space.

Recent building upgrades have improved building conditions in a few areas, such as:

- The truck bays provided with suitable exhaust air ventilation systems, upgraded in 2004.
- The radio and server rooms were provided with dedicated air conditioning systems installed in 2004. These systems do not include redundancy in cooling capacity, which would be recommended in this application.
- The dispatch room included a new heat pump air conditioning unit installed in 2004. It does not appear that this unit included sufficient ventilation air as the room felt stuffy during our site visit, which is common with poorly ventilation spaces.

As part of a building mechanical upgrade, we would recommend addition of a dedicated ventilation system for all spaces based on type of area and usage. Some options for this could be in the form of a central or distributed ducted fan coil units, or packaged rooftop heat pump with ducting into each separate thermal zone and occupancy type. Ventilation air heat recovery could be considered for improved building energy performance.

Air Conditioning

A few spaces had window mounted air conditioners, including the dormitory, and lounge areas. Most were in poor condition. For this type of facility window mounted air conditioners are not recommended.
As part of a building mechanical upgrade, we would recommend addition of a dedicated air conditioning system for all occupied spaces. This could be in the form of a chilled water to central or distributed fan coil units, refrigerant based fan coil units, or packaged rooftop air-air heat pumps serving each separate thermal zone and occupancy type. Chilled water could be provided by a central air-water heat pump. A refrigerant based system could be from central variable refrigerant flow (VRF) heat pumps serving multiple fan coil units.

Controls

The building currently has stand-alone controls for each individual heating, ventilation and air conditioning component. A central direct digital control (DDC) system was not in place.

As part of the future upgrades we would recommend that all new HVAC system components be provided with DDC control to help improve user interface and optimize building operating efficiency.

PLUMBING AND DRAINAGE SYSTEMS

Domestic Water

A 50mm domestic water service is supplied to the building within the mechanical room on the east side of the building. This service size is adequate based on current plumbing codes. Piping distribution within the building is copper type.

Most the domestic water piping is at the end of its expected useful service life, with much of the piping being in use for 50 years. Commonly copper domestic piping systems have a useful life expectancy of between 40-50 years. Major failures of the domestic water piping system would be expected past the age.

All of the visible domestic water piping either had no insulation, or the insulation condition and thickness would not meet the current ASHRAE 90.1 energy standard requirements. New insulation is recommended for the full piping system, when piping is being replaced.

Full replacement of the domestic water piping system is recommended in the immediate short term. New plumbing systems are to be installed in accordance with the 2012 BC Plumbing Code and American Standard of Plumbing Engineers (ASPE) design guidelines.

Sanitary Drainage

A 100mm sanitary main services this building from Milton Street on the west side of the building. This service size is adequate based on current plumbing codes. Piping distribution within the building is copper type.

Most the sanitary piping is at the end of its expected useful service life, with much of the piping in use for 50 years. Some of the sanitary piping along the west side of the building was replaced in coordination with the seismic upgrade completed in 1999. Commonly sanitary drainage piping systems have a useful life expectancy of between 40-50 years. Major failures of the sanitary drainage piping system would be expected past the age.

Full replacement of the sanitary piping system is recommended in the immediate short term, except for the sections replaced in 1999. New plumbing systems to be installed in accordance with the 2012 BC Plumbing Code and American Standard of Plumbing Engineers (ASPE) design guidelines.

Storm and Footing Drainage

A 150mm storm main services this building from Milton Street on the west side of the building. This service size is adequate based on current plumbing codes.

Most the storm and footing drainage piping is at the end of its expected useful service life, with much of the piping being in use for 50 years. Some of the storm and footing drainage piping along perimeter of the building was replaced in coordination with the seismic upgrade completed in 1999. Commonly storm drainage piping systems have a useful life expectancy of between 40-50 years. Major failures of the storm drainage piping system would be expected past the age.

Full replacement of the storm and footing drainage piping system is recommended in the immediate short term, except for the sections replaced in 1999. New plumbing systems to be installed in accordance with the 2012 BC Plumbing Code and American Standard of Plumbing Engineers (ASPE) design guidelines.

Plumbing Fixtures

Many of the plumbing fixtures witnessed appeared in worn condition. The fixtures included flush tank toilets, flush tank floor mounted urinals, lavatory sinks, kitchen sinks, janitors sinks and showers.

If plumbing systems are being replaced it would be recommended to replace the associated plumbing fixtures at the same time.

FIRE PROTECTION SYSTEMS

The building currently does not have a sprinkler system. Further review by the consultant team and client is required to confirm if the building should be upgraded to include a full sprinkler system. A new 100mm water service dedicated for fire service and full building sprinkler piping distribution would be required in this case.

New fire protection systems would be designed and installed in accordance with the 2012 BC Fire Code and related National Fire Protection Association (NFPA) standards, such as the NFPA 13-2013 Standard for Installation of Sprinkler systems

RENEWAL VERSUS REPLACEMENT - SCENARIO REVIEW

The following scenarios correspond with the options outlined in the Design Sprint prepared by HCMA on November 1st, 2016. The impacts to mechanical systems for each option is described below.

Scenario 1 – No Upgrades – Repairs only when require

Since the majority of the mechanical systems are at the end of their useful there are a number of risks associated with this option. Some of these risks include:

- Failure of the heating system with a boiler failure. In this case the boiler would need to be replaced immediately and may take a minimum of two weeks to be replaced and operational. This may case freezing conditions in some parts of the building, which could case domestic or heating water pipes to burst. As a minimum it would be an inconvenience to the staff using this facility.
- Failure of the domestic or heating water piping systems, due to age of piping. This would create water damage in the area of leakage and the extent of damage would be dependent on how quickly the leak was noticed and addressed. Structural components may be impacted by flooding and moldy areas may require remediation.

- Failure of the sanitary or storm water piping systems, due to age of piping. This would create water damage in the area of leakage and the extent of damage would be dependent on how quickly the leak was noticed and addressed. As much of the piping is below grade there is a significant chance of below slab leakage which could adversely affect the building foundation.
- Lack of outdoor air ventilation and general air circulation in compliance with current code and health recommendations. Maintaining the status quo without upgrade of the ventilation system would have adverse effects on the health of the occupants using the building, which would not be present in a building with ventilation levels meeting todays codes.
- No Redundancy for mechanical systems in critical areas of the building, such as air conditioning for the server and communications rooms, presents a risk where failure of these system could disable, or limit, these operations,

Scenario 2 – Renovate and Consolidate Operations into Existing + Expansion

With this option all mechanical and plumbing systems would be replaced, with the exception of the truck bay vehicle exhaust system installed in 2004.

Demolishing the west wing of the existing fire hall will be the first phase and provision will need to be made to reconnect existing services from the remainder of the building which extend through this area, such as the hydronic heating piping and underground storm piping. Domestic water piping and sanitary piping serving the west wing would be cut and capped to keep the existing systems functional.

Building a new addition to the fire hall will require new sanitary, storm and domestic water piping services independent of the services connected to the remainder of the building. The new mechanical systems installed would not be connected to the existing building. Some other provisions may include

- Fire sprinkler system which would be extended to the remainder of the building when renovated.
- Boiler heating system which would be sized for the full fire hall and extended to the remainder of the building when renovated. Estimated size of 1x 500 MBH condensing natural gas boilers, and 1x 500 MBH dual fuel (oil & natural gas) central boiler system, which would provide redundant heating capacity and fuel source.
- Cooling may be provided by Air-Water Heat Pump(s) sized for an estimated cooling load of 30 tons and which can supplement the heating load in shoulder seasons. Provision of 2x 30 ton air-water heat pumps would provide redundancy for air conditioning as well as allow servicing without system downtime.
- Ventilation may be through distributed four pipe fan coil units for individual zone control in all spaces requiring air conditioning. A dedicated exhaust air energy recovery ventilator can pre-condition fresh air supplied to each fan coil unit.
- Dedicated gas-fired make-up air, general exhaust and hydronic unit heaters will be required in the truck bay area, in addition to the retained vehicle exhaust system.
- DDC system for central control of the building mechanical systems.

Renovation of the remaining portion of the building will require complete demolition and replacement of all sanitary, storm and domestic water piping with service sizes to match existing. New HVAC systems would be provided throughout to meet current code requirements and industry standard practices, as well as provide redundancy for critical areas, such as air conditioning

Scenario 3A – New Fire Hall on Existing Site

The mechanical work in this option would be similar to the requirements of Scenario 2 with the exception of the existing truck bay vehicle exhaust systems being removed and reinstalled in coordination with the demolition and re-build of the main fire hall building area. The phased approach for building demolition and new work for the west wing first, would be the same.

Scenario 3B – New Fire Hall on Adjacent Site

With the option the building construction could be completed in one phase simplifying the installation of the mechanical systems, where temporary provisions would not be required for accommodate each phase.

The new building would be constructed with all new mechanical and plumbing systems to meet current code requirements and industry standard practices.

DISCLAIMER OF LIABILITY

The material in this report reflects our professional opinion based on information available to us, a site walk-through, visual observations of the mechanical systems/equipment, and building operators comments. Any use which a third party makes of this report or reliance on decisions made based on it, are the responsibilities of such third parties. Rocky Point Engineering Ltd. accepts no responsibility for damages, if any suffered by any third party as a result of decisions made or actions based on this report.

A visual review has been carried out by Rocky Point Engineering Ltd. on readily accessible mechanical systems and equipment. No physical testing of systems/equipment capacities have been undertaken to ascertain the capacities to meet mechanical requirements or compliance with current code requirements.

Report prepared by,

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Appendix 03

Electrical Consultant's Report

ELECTRICAL ASSESSMENT

.1 Overview

RB Engineering has been retained by City of Nanaimo to prepare an electrical assessment condition report to support the Business Case Analysis for Fire Station #1. The purpose of this report is to provide information to all relevant parties in order to assess the impact of the existing electrical infrastructure as it relates to all options proposed by the assessment team.

The assessment takes into account the Building Owners' and Managers' Association (BOMA) guidelines, Canadian Electrical Code (CEC), Illuminating Engineers Society (IES), BC Building Code (BCBC), and visual inspection of existing conditions.

.2 Power Service

The building electrical power service consists of a 400 amp, 120/240 volt, 1 phase BC Hydro service fed underground from a pole mounted transformer on Fitzwilliam Street. This main service and majority of the sub branch circuit panels appears to be original to the 1967 construction of the building. A 105 kW diesel fired back up generator was installed in 2004 which provides power to the entire service. With this generator, one automatic transfer switch was provided which does not meet the requirement of the CEC to provide transfer switches for BCBC life safety and non-life safety distribution. No Transient Voltage Surge Suppression (TVSS) devices are provided to ensure power quality for data systems.

The City provided two years of BC Hydro information to determine the maximum power load of the main service but since this is a single phase service, there is no demand readings provided with this information. Given the size of this main service we have determined that the service is fully loaded and no additional loads are to be added for new square footage or new mechanical systems requiring electrical power.

BOMA estimates for Building Systems Useful life for power distribution is as follows:

- Switchgear and service entrance equipment 40 years
- Lighting and power distribution panels 30 years
- Wire and cable under 600 volts 40 years
- Generators 20 years
- Automatic transfer switch 20 years

.3 Lighting

The interior lighting throughout the facility consists predominantly of fluorescent fixtures with the exception of incandescent track lights in the Dispatch space. Based on visual inspection, the majority of light fixtures appear to have been upgraded approximately 10 years ago with new ballast and lamps, some fixtures have missing lenses and non-functioning lamps. The general lighting levels as recommended per IES standards for fire halls, meeting rooms and common areas is average to poor. BOMA estimates light fixtures useful life to be 20 years.

The exterior lighting around the building consists of high density discharge (HID) and Light Emitting Diode (LED) type lights fixtures. The lighting levels as per IES around the perimeter is average but the light fixtures at the exits provide poor light levels.

The lighting controls for the interior consist of on/off switches, no automatic controls are present in majority of the spaces.

.4 Data Systems

The current wiring methods throughout the building does not meet the standards as per TIA-EIA 586 – Building Telecommunications Cabling Standard.

The Dispatch Server Room was observed to have the following deficiencies:

- No TVSS protection at the panel board
- Panel board in this secured room feeds other circuit outside the server room
- No redundant UPS back up
- No room for expansion
- Inadequate accessibility around equipment

The Radio Room was observed to have the following deficiencies:

- No TVSS protection
- No room for expansion

.5 Life Safety

Currently there is no automatic sprinkler system or fire alarm system install in this building. The requirements for emergency lighting is provided by the generator but since there is only one transfer switch this configuration is not compliant with the CEC. The exit signage does not meet the current BCBC requirement of pictogram exit signs.

.6 Scenario #1 - Break and Fix Option

This scenario assumes keeping the existing electrical infrastructure and just maintaining the infrastructure. The following are the main electrical impacts for this scenario:

1. The existing power service, distribution and cabling is beyond their useful life expectancy. If a power failure occurs at the main service entrance equipment the facility would be powered by the back-up generator until new equipment is installed. If the failure occurs between the generator transfer switch and sub-distribution panels then parts of the facility would be out of power until this failure can be fixed.

2. No additional power loads can be added to the existing power service. This service is fully loaded.

3. The existing power service is currently not protected from Transient Voltage Surge's, this exposes data equipment and electronics to damage.

4. The existing lighting can be replaced and/or repaired as needed.

5. The existing data system configuration poses potential failure due to the fact the server room is not constructed to industry standards.

.7 Scenario #2 – Renovate Existing Hall

This scenario assumes all electrical infrastructure will be replaced in the renovations areas. The following are the main electrical impacts for this scenario:

1. The existing power service will be replaced with a larger service (1200 amp, 120/208 volt, 3 phase) to accommodate all requirements. A new larger generator (250 kw) will be provided to back-up the entire building.

2. The existing lighting will be replaced with new energy efficient LED light fixtures with automatic controls for optimum energy conservation.

3. The existing data systems will be replaced with new infrastructure ensuring a strong robust system.

4. The existing life safety systems will be replaced with new which will bring these systems up to current BC Building Code requirements.

.8 Scenario #3 – New Fire Hall

This scenario is the same either on the same or adjacent site options. The electrical impacts are similar to Scenario #2 in which all the electrical systems are new and will meet todays codes and standards.

Appendix 04

Code Consultant's Report

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APPROACH TO BUILDING CODE COMPLIANCE

For

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666 FITZWILLIAM STREET
NANAIMO, BC

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Victoria, BC
V8W 1M2

April 18, 2017

GHL FILE HCM-6074.00

TABLE OF CONTENTS

Page

PURPOSE

This report outlines the existing condition of the Nanaimo Fire Hall #1 building at 666 Fitzwilliam Street, Nanaimo, BC with regard to Building Code compliance.

This report is based on review of information provided by the client and our site visit of September 23, 2016. Our review was visual in nature and did not include disassembly of systems or assemblies or any destructive testing. The review was made on a random basis, with no attempt made to review or inspect every element or portion of the building; however, the review is believed to be representative of conditions throughout the building. This report addresses fire protection, occupant safety and access for persons with disabilities, it does not address structural, electrical, mechanical, building envelope or energy conservation other than as specifically described in this report and relative to Division B, Part 3 of the Building Code.

EXECUTIVE SUMMARY

Overall, the building complies with the requirements of the current Building Code with regard to fire protection and occupant safety. The building is small and the occupant load low; the Building Code dos not require fire resistance rating at the roof, sprinklers, exit signage or a fire alarm system. Most of the items described in this report relate to day-to-day operation; storage and maintaining safe egress routes.

The one significant item is egress; the first storey is served by the main entry in the office area and an unmarked door from the apparatus bays. The second storey is served by an open stair leading to the first storey office area (not an exit) and an exit stair located outside the circulation space that discharges outdoors between the building's generator and an area used to store fuel containers.

APPLICABLE BUILDING CODE

The current Building Code is the BC Building Code 2012 and references are to this edition unless otherwise noted.

PROJECT DESCRIPTION

The fire hall consists of an existing two storey building containing primarily offices, including the main dispatch center, apparatus bays, subsidiary fitness rooms, training room, service and storage rooms. The original sleeping room (dormitory) remains at the second storey; however, we understand this is not used - staff do not sleep in the building. We understand the second storey training room is occasionally used by other City of Nanaimo staff. The building is unsprinklered, of mixed construction; concrete walls and floors and an open web steel joist roof with wood decking. The apparatus bay is integral to the function of the building; it is a *storage garage* per the definition in the Building Code. We understand there is no repair or fuelling of vehicles in the apparatus bays.

BUILDING CHARACTERISTICS AND CONSTRUCTION REQUIREMENTS

The existing building's characteristics are as follows:

Occupancy	Group D (office) and Group F, Division 3 (apparatus bays)
Building Area	858m^2 (up to 1000m^2 permitted)
Building Height	2 storeys
Sprinklered	No
Streets Facing	2
Construction Type	Mixed noncombustible and combustible

If constructed today, under Articles 3.2.2.60 and 3.2.2.83, the building could be unsprinklered and of combustible construction. Noncombustible floors do not require a fire resistance rating under these articles; however, Sentence 3.3.5.6.(1) prescribes a fire resistance rating of 1½h at the apparatus bay and the office on the basis that the apparatus bay is parking garage. No fire resistance rating is required at the roof.

APPLICATION OF BUILDING CODE TO EXISTING BUILDINGS

There are no specific requirements, under either the Building or Fire Code, to bring existing buildings into compliance with the current Building Code, unless changes are proposed that would otherwise increase risk. Division A, Sentence 1.1.1.2.(1) requires that "…*where a building is altered, renovated, rehabilitated or repaired, the level of life safety and building performance shall not be decreased below a level that already exists*." The Building Code makes allowances for existing buildings and enables their useful life to be extended through renovations or changes of occupancy.

New construction is required to comply with the Building Code and existing conditions require a practical approach. Appendix A-1.1.1.1.(1) describes application of the Building Code to existing buildings and states that consideration of the level of safety required, similar to the method for alternative solutions, is necessary. The successful application is a matter of balancing cost with the importance of the requirement to the overall Building Code objectives. The User's Guides published with the National Building Code are referenced as sources for further information. The User's Guide commentary on application of Part 3 to existing building states that:

> "*… an appropriate level of performance is considered to be achieved if the level of safety is adequate to ensure the safety of occupants should they be exposed to a hazardous situation. Under these circumstances, some requirements affecting property protection and items that do not directly affect occupants may not meet the standard intended by the current Building Code.*"

The User's Guide describes the key elements for consideration as follows:

- general day-to-day safety of occupants (design of stairs, guards, handrails etc.),
- knowledge of fire (fire detection and alert),
- the ability to move to a safe place (number of exits, travel distance, fire separations),
- control of fire by building elements (fire separations, closures, firestopping), and
- protection of property (fire compartmentation, sprinklers and spatial separation).

Other than protection of property, all of the elements relate to evacuation of the building in an emergency. The focus of the Building Code in existing buildings is occupant safety.

1.0 General Day-to-Day Safety

It is rarely feasible to change the design of existing interior stairs such as their shape, width, rise and run or headroom, and existing stairs can typically continue to be safely used. Additional measures such as increased normal and emergency lighting, marking of treads and improvements to handrails have been shown to reduce the potential for falls.

For this project, width, headroom and slip resistance appear to comply with the requirements of Articles 3.4.6.5 and 3.4.6.6 at the existing open stair. Handrails are noncompliant with regard to continuity and extensions and the stairs are without the required tactile warnings and contrasting markings at treads.

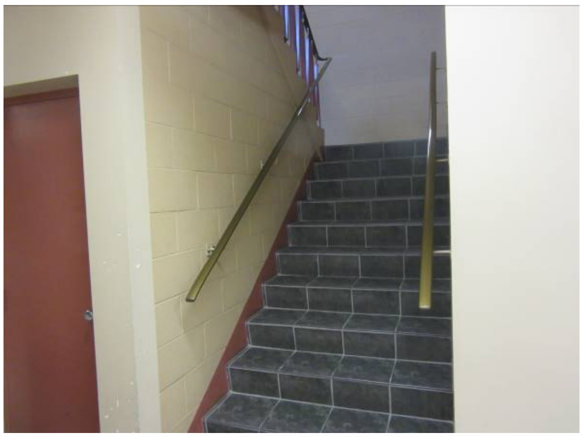

Photo 1: Open Stair

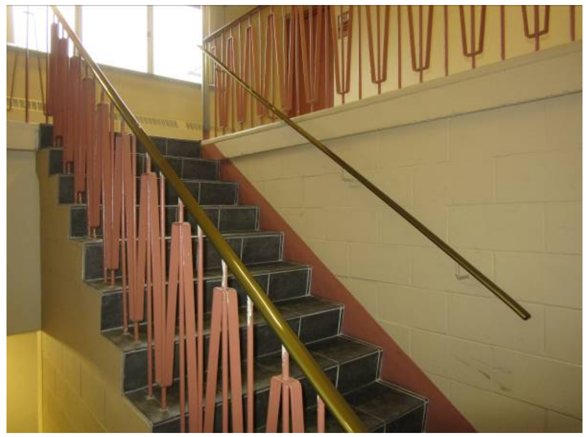

Photo 2: Open Stair

Thus, at the open stair, we recommend:

- Handrails, slip resistance, tactile warnings and contrasting markings at treads be added to comply with the requirements of Articles 3.4.6.5 and 3.4.6.6 at the interior open stair.
- The existing guard has openings greater than the 100mm limit in Sentence 3.4.6.6.(5) and appears to meet the 200mm limit in the Building Code at time of construction for other than residential or child specific occupancies. Guard height is less than the heights described in the Building Code; 920mm at stairs and 1070mm at landings. Thus, we suggest that the existing guards be replaced as part of the building’s regular maintenance in future.
- Review of emergency light levels and additional lighting, if necessary, to increase light at the tread level at the interior open stair.

The second storey exit is discussed in the section on exits; this stair is intended for emergency exit only and not subject to requirements for tactile warning.

2.0 Knowledge of Fire

The building is not equipped with a fire alarm system. Based on its low occupant load, per Subsection 3.2.4 of the current Building Code, the building is not required to be served by a fire alarm system. There appear to be local smoke alarms at the second storey corridor.

3.0 Moving to a Safe Place

3.1 *Exits*

The first storey is served by the main entry door and one door from the apparatus bay.

The second storey is served by the open stair leading to the first storey and a single exit from the former dormitory room. The second storey is large enough that it requires two exits.

The Building Code does not anticipate egress through another floor area; however, the existing condition provides a reasonable level of performance on the basis that floor areas are small and travel distances to exits are short. In the event of smoke migration via the open stair to the second storey, occupants of the second storey have an alternate exit.

The existing combination of one exit and egress through the first storey via the open stair was permitted under the National Building Code in effect at time of construction (1960 or 1965). The open stair would have been permitted to lead through the first storey lobby, hall or foyer provided the lobby was at grade, the path of travel was not more than 15m and adjacent rooms were separated from the lobby by noncombustible construction in which all glazing was wired. This may explain the wired glass at the walls between the entry and the adjacent apparatus bay and offices. It appears that a wall was removed at the area between the lobby and the museum room and a sprinkler installed in the opening as an equivalency. Thus, the existing condition is reasonable subject to improvements at the second storey exit.

The second storey exit is in an obscure area, unmarked, poorly lit and the exit door does not fully open as it hits the guard on the landing. The stair discharges outdoors behind the building's diesel generator and adjacent an enclosure used to store portable fuel containers. The stair is 914mm wide and rise and run are 216mm and 250mm respectively and guard height is less than the heights described in the Building Code; 920mm at stairs and 1070mm at landings.

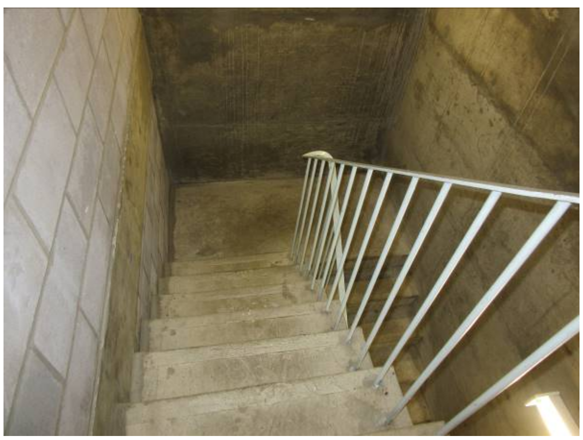

Photo 3: Second Storey Exit

Photo 4: Second Storey Exit

We recommend the following:

- Altering the door or the stair landing to allow the door to open fully.
- Providing normal lighting without the need to activate a switch.
- Review of emergency light levels and additional lighting, if necessary, to increase light at the tread level.
- Adding a second handrail on the wall per the Building Code's prescriptive requirements for height, extensions, graspability, clearance etc.
- Marking the treads with a contrasting colour at nosings.
- Adding directional signage in the second storey corridor and in the former dormitory room to indicate the route to the exit.
- Relocating the gas can storage away from the exit path.
- The existing guards be replaced in future, as part of the building's regular maintenance.

3.2 *Exit Signage, Emergency Lighting and Power*

Subsection 3.4.5 does not require exit signage on the basis that the building is two storeys in height and the occupant load is low; however, as the exits are unmarked and, in the case of the second storey, located in a room rather than in the corridor, we recommend signage in the corridor and through the room to direct occupants to this exit.

Subsection 3.2.7 requires emergency lighting in corridors, exit stairs, service rooms and in open floor areas such as the apparatus bays.

Emergency power capable of providing supervisory power for 24h and emergency power under full load for a period of not less than 30min is required to serve emergency lighting and exit signs.

Additional lighting is recommended, as noted previously, to address existing stair configurations.

3.3 *Fire Extinguishers*

Fire extinguishers are in place have been recently tested and tagged.

3.4 *Control of Fire by Building Elements*

The User's Guide describes control of fire spread by fire separations, including closures (self-closing and latching), firestopping, fire suppression, construction type and control of hazards or combustible contents. It is significant that the building's construction is for the most part noncombustible where combustible construction would be permitted. In this case, the required fire separations are as follows:

Fire Separation	*Fire Resistance Rating (hours)*
Floor between first and second storey (Subsection 3.2.2)	Unrated
Between office and apparatus bays	1½
Second storey exit	¾
At service rooms containing fuel fired equipment such as the boiler	1
At janitor's rooms	1

The fire separation between storeys and between the first storey office and apparatus bays appear to be in good condition. We recommend review and improvements as necessary to continuity, including door hardware, firestopping and fire dampers.

The fire separation between the second storey exit and the hose tower includes penetration by flanges of steel joists. The annular spaces are packed with mineral wool. Installation of a listed firestop system that includes caulking or other means of smoke seal is recommended.

Photo 5: Penetration of Fire Separations between Second Storey Exit and Hose Tower

3.5 *Chemical and Gas Storage*

Sentence 3.3.1.21.(1) prescribes a 1h fire resistance rating at janitors' rooms on the basis that cleaning supplies may include dangerous goods such as bleach, ammonia or solvents, in small quantities. The building includes multiple storage rooms at both storeys that contain items that should be stored in a janitors' room. We recommend consolidating the storage of cleaning supplies into one or two dedicated janitor's rooms enclosed by fire separation and equipped with self-closing doors having a ¾h fire protection rating.

Photo 6: Storage of Cleaning Supplies

Photo 7: Storage of Cleaning Supplies

The building contains stored cylinders of compressed medical gases; oxygen (O_2) and nitrous oxide (N_2O). O_2 and N_2O are (primary) Class 2.2 non-toxic, non-flammable gasses and (subsidiary) Class 5.1 oxidizing agents; this means that while they are not flammable they will, by yielding oxygen, contribute to combustion of other materials.

Photo 8: Oxygen Cylinders in Apparatus Bay

The Building and Fire Codes permit 250kg or 250L of Class 5.1 oxidizing agents outside of a storage room. Requirements for storage of greater volumes, both indoors and outdoors are summarized as follows:

Location	Quantity	BCBC and BCFC Storage of Compressed Gas Requirements	Reference
Outdoors	No Limit	Located as follows: ▪ On concrete or other noncombustible raised platform. ▪ Within an enclosure 1.8m in height and having a lockable gate. ▪ Protected from mechanical damage including valve damage. ▪ Not beneath exterior exit stairs, passages, ramps or fire escapes.	BCFC Articles 3.3.5.2 and 3.1.2.4
Indoors	≤ 150kg N_2O or O_2	In a room: ▪ Separated from the remainder of the building by a gas tight fire separation having a 1h fire resistance rating. ▪ Located on an exterior wall with an entry from the exterior. ▪ Vented to the outdoors. ▪ Doors to the interior that are self-closing and weather-stripped. ▪ Signage prohibiting smoking and the storage of combustibles in the room. ▪ At least 1m from exits and not in an exit or corridor providing access to exit.	BCFC Article 3.2.8.3 BCBC Sentence 3.3.6.3.(2)

Location	Quantity	BCBC and BCFC Storage of Compressed Gas Requirements	Reference
	> 150kg N_2O or O_2	In a room: ▪ Separated from the remainder of the building by a gas tight fire separation having a 1h fire resistance rating where the building is sprinklered and 2h where the building is unsprinklered. ▪ Having a noncombustible floor. ▪ Located on an exterior wall with an entry from the exterior. ▪ Vented to the outdoors. ▪ Doors to the interior that are self-closing and weather-stripped. ▪ Signage prohibiting smoking and the storage of combustibles in the room. ▪ At least 1m from exits and not in an exit or corridor providing access to exit.	BCFC Articles 3.2.7.9, 3.2.7.8, and 3.2.8.3 BCBC Sentence 3.3.6.3.(2)

3.6 *Openings in Floor Assembly*

The floor between the first and second provides the required fire separation at the apparatus bays. There are two fire poles that penetrate the floor assembly. These have been enclosed although it was not readily apparent whether the enclosures were constructed as fire separations; one of the enclosures is fitted with a self-closing door having a fire protection rating and the other is not. Both enclosures include smoke or carbon monoxide detectors that have been disabled. The greater concern is carbon monoxide protection and we recommend improving the existing enclosures through provision of self-closing doors that are tightly sealed with a gasket to limit migration of smoke or carbon monoxide from the apparatus bays below.

3.7 *Provisions for Persons with Disabilities*

Improvements to access for persons with disabilities are prescribed at existing buildings with alterations. It is expected that access is provided where persons with disabilities could "…*reasonably be expected to use the building and where providing access is practical*." In this case, access is provided to the first storey from the main entry; there are no wheelchair accessible washrooms. The second storey is under 600m² and specifically exempt under Sentence 3.8.2.1.(2) provided it does not contain facilities *integral to the function of the accessible storey*.

Elements related to other disabilities such as visual impairment can be addressed by tactile warning strips, handrail extensions and nosing markers at stairs as described previously.

3.8 *Exposure to Adjacent Properties*

The building faces a street at the south, east and west and is both set away from the property line and constructed of concrete without openings at the north. Thus, the potential for exposure to adjacent properties appears to comply with the requirements of the current Building Code.

SUMMARY

This report summarizes a review of the level of Building Code compliance relative to fire protection and occupant safety at the existing Nanaimo Fire Hall #1 building at 666 Fitzwilliam Street, Nanaimo, BC. In terms of the requirements of the Building Code regarding fire protection and occupant safety the one significant item is egress, primarily from the second storey. Please contact our office with any questions or comments on the foregoing.

Prepared by,
GHL CONSULTANTS LTD

Frankie Victor, EngL, BCQ

Reviewed by,

David W. Graham, P Eng, CP, FEC

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA D. W. D. J. GRAHAM # 14604

17.04.18

* Limitation of Liability *

This technical report addresses only specific Building Code issues under the GHL/Client agreement for this project and shall in no way be construed as exhaustive or complete. This technical report is issued only to the Authority Having Jurisdiction, the Client, Prime Consultants and Fire Suppression Designer to this project and shall not be relied upon (without prior written authorization from GHL) by any other party.

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Appendix 05

Cost Report

Professional Quantity Surveyors
Sustainability Consultants

CONCEPT ESTIMATES – DEVELOPMENT OPTIONS REVISED

NANAIMO FIRE STATION 1, 666 FITZWILLIAM STREET

NANAIMO, BC

April 25, 2017

Prepared by
Advicas Group Consultants Inc.

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TABLE OF CONTENTS

INTRODUCTION

This interim report sets out the estimate of project costs for the development options considered to the Nanaimo Fire Station 1 located at 666 Fitzwilliam Street, Nanaimo, BC.

The report provides estimates for the following development scenarios:

- Status Quo - New roof covering and refinish exterior envelope, electrical upgrade and boiler replacement to existing Fire Station. Fire Station to be used for 10 years and after that a new Fire Station on the same site will be constructed.

- Scenario #1 – Temporary Fire Station including demolition upon completion of Scenario #1 work; demolition of south wing of existing Fire Station and construction of new; seismically upgrade including renovations to remaining existing Fire Station; allowance for exterior paving and landscaping..

- Scenario #2 – Demolition of existing Community Services building located on adjacent site (285 Prideaux Street); construction of new Fire Station Building on Prideaux Street site; demolition of existing Fire Station on completion of Scenario #2 work; allowance for exterior paving and landscaping.

- Scenario #3 – Temporary Fire Station including demolition upon completion of Scenario #3 work; demolition of south wing of existing Fire Station and construction of new; demolition of remaining existing Fire Station and construction of new; allowance for exterior paving and landscaping.

Gross Floor Areas

The gross floor area of remaining existing and new, as applicable to each Scenario is as follows:

Status Quo	1,973 m^2
Scenario #1	1,651 m^2
Scenario #2	1,583 m^2
Scenario #3	1,583 m^2

ESTIMATE COSTS

The estimate costs have been developed in current (April, 2017) dollars. The estimated project costs are:

Status Quo	$1,130,000	$572.73/$m^2$
Scenario #1	$17,019,000	$10,308.30/$m^2$
Scenario #2	$15,628,000	$9,872.39/$m^2$
Scenario #3	$16,940,000	$10,701.20/$m^2$

A breakdown of the project cost estimates, in sequence, is included in Appendix A.

A breakdown of the capital construction costs is included in Appendix B.

Taxes

GST is excluded from the estimate.

PST at 7% is included in the estimate.

Escalation

The estimate is priced at current market price levels, with a separate allowance for escalation incurred from now up to the anticipated construction start date of 2019 for all scenarios except Status Quo. Status Quo renovations will start in 2017.

It is common knowledge that Vancouver Island was not immune to the major market downturn and saw a major correction in market price levels during the latter part of 2008 and early 2009. A further downward correction occurred in Spring 2010 driven by pressure on pricing levels from mainland contractors pursuing work on the Island.

Since the downturn of 2008/2009 Nanaimo has seen a gradual recovery to a return to the Island historical escalation norm of 3 to 4% per annum. In 2016 construction activity has increased with several projects under construction, bringing with it an inherent labour shortage, and an upward pressure on market price levels.

The continued weakening of the Canadian dollar will cause increases in US sourced materials. We believe the weakening dollar, and increased construction activity will result in cost increases beyond the above historical escalation norm. The following provisions for escalation are included in the project budgets for the all scenarios:

- 2017 – 5.0%
- 2018 – 4.0%
- 2019 – 4.0%

BASIS OF THE ESTIMATE

We have assumed that the work will be tendered competitively in one contract.

In all cases the estimates are based upon our assessment of fair value for the work to be carried out. We define fair value as the amount a prudent contractor, taking into account all aspects of the project, would quote for the work. We expect our estimate to be in the middle of the bid range to ensure that funding for the work remains adequate for the duration of the project.

It should be noted that Advicas Group Consultants Inc. does not have control over the cost of labour, materials, or equipment, over the Contractor's methods of determining bid prices, or over competitive market conditions. We define competitive conditions in the project as attracting a minimum of four general contractors' bids with a minimum of two sub-trade tenders within each of the sub-trade categories. Accordingly, Advicas Group Consultants Inc. cannot and does not warrant or represent that bids will not vary from the estimate.

General Risk Exposure

Risk is a part of any construction project and while many risks are intangible and unquantifiable, those risks can be identified and managed to reduce detrimental impact on the project. Our experience with renovation projects has indicated that the risk of the unknown increases when working within existing structures compared with the construction of a completely new building. Our assessment of the unknown risk inherent in existing buildings is reflected in the 15% Design Contingency which is added to the estimated cost of quantifiable work within the existing buildings under Status Quo and Scenario #1.

As a general observation, we would attach a higher level of risk to Status Quo and Scenario #1 as both are renovation projects. Scenario #3 and Scenario #2 are new construction and would likely be perceived to have a lower risk profile.

Contingency Reserves

Contingency is an allowance specifically identified within our elemental cost analysis to meet unforeseen circumstances, and represents an assessment of the financial risk relating to this project. As detailed design information becomes available, this risk will diminish and the contingency allowances will accordingly reduce.

Design contingency is introduced into the estimated cost at the earliest estimate stage and is a measurement of the amount and detail of the design information available. As the design develops and systems and material selections are fixed, the amount of the contingency allowance is reduced and is absorbed into the measured elements. On completion of contract documents, at tender stage, the allowance is normally reduced to zero.

Our determination of this risk level and the amount of the contingency allowance is the result of many years of cost planning, on over 4,000 construction projects, and of monitoring the increasing design information that occurs during the design phase. The design contingency is not a discretionary cost element.

A design contingency allowance has been included calculated at 15% of the net construction cost. This provides for costs of unknown conditions, unforeseen items, and development of design detail in the completion of the project design phase.

A construction contingency allowance has been included calculated at 7.5% of the construction cost. This typically provides for unforeseen items arising during the construction period – such as field conditions, coordination discrepancies – which will result in change orders and extra costs to the contract, other than changes in scope.

A project contingency allowance has been included calculated at 10% of the project cost. This is a contingency, held by the Client, to be used at his discretion, to mitigate risk and fund specific Client driven changes to the project scope, conditions, etc.

LIFE CYCLE COSTING

A likely Life Cycle Cost profile for Operations and Maintenance Costs for each strategy over 45 years has been projected for Status Quo, Scenarios # 1, #2, and #3.

The Operations and Maintenance costs for the fire station are based on the total operations and maintenance expenses for year ending December 31, 2016 for four existing fire stations and one fire headquarters. The total 2016 O&M cost per square foot for these buildings is $4.90 (Energy $2.36, Maintenance $1.57 and Operations $0.97). This cost is then escalated to the proposed life cycle study start date of 2020 at $5.73 per square foot and is the average O&M cost for the study.

The probable facility costs for renovated and new space have been derived from the above average O&M cost for the five buildings of various ages ranging from 1967 to 2008. We have assumed that for renovated space, the O&M will be 20% more than the above average O&M rate whereas for new space the O&M will be 20% less than the above average O&M rate.

Life Cycle Costing Assumptions

- The Life Cycle is calculated for a 45 year period for all scenarios, and allows for average costs for typical Operations and Maintenance facility costs.
- The cost of property taxes is excluded.
- Annual Operation and Maintenance facility costs are based on the 2016 cost data received for five buildings in Nanaimo and the average Operation and Maintenance cost is $5.73 per square foot ($61.66/m^2). We make the assumption that it is more expensive to operate and maintain renovated space when compared with new space.
- The combined escalation rate for Operations and Maintenance, and Energy has been assumed at 4.00% per year.
- The discount factor is assumed at 2.0% per year.

Life Cycle Costing Summary

The Life Cycle Costing exercise produces the following results, measured in terms of the cumulative annual cash flow of each development option. The cumulative annual cash flow represents the annual cost of maintaining and operating the completed facility of each development option in future dollars.

Status Quo	$45,423,125
Scenario #1	$24,299,980
Scenario #2	$22,128,311
Scenario #3	$22,128,311

CLOSING

A graphical summary of the Life Cycle Costing is presented in Appendix C.

The total development cost for Status Quo is the highest among the four scenarios due to having to renovate and then maintain the existing Fire Station for ten years before subsequently replacing the building with a new Fire Station after year 10. The combination of life cycle costs for a renovated building plus the escalated capital cost for the new replacement building later on has resulted in the highest development cost for this approach despite the low operations and maintenance cost of a new facility from year 11 onwards.

The total development cost for Scenario #1 is the second highest among the four options because of the high capital cost required to upgrade part of the Fire Station and increased operations and maintenance cost resulting from an old albeit upgraded existing Fire Station.

As can be seen in Appendix C, Scenario #2 and #3 are the most cost effective in terms of life cycle costs. These scenarios are new construction and command a high initial capital investment but their operational and maintenance costs throughout the 45 year life cycle are still less than Status Quo and Scenario #1.

Our findings are summarized in the following table:

STRATEGY	BUILDING AREA (m²)	Project Cost	Operations & Maintenance Annual Cash Flow (45 Years)	TOTAL DEVELOPMENT COST	
Status Quo	1,973	$1,130,000	$45,423,125	$46,553,125	*123%*
Scenario #1	1,651	$17,019,000	$24,299,980	$41,318,980	*109%*
Scenario #3	1,583	$15,628,000	$22,128,311	$37,756,311	*100%*
Scenario #2	1,583	$16,940,000	$22,128,311	$39,068,311	*103%*

Exclusions

The following items are excluded from the capital construction cost:

- Storage costs
- Clerk of Works
- Out of hours working
- Accelerated construction schedule
- In ground contamination
- GST

Documentation

The estimate is based on the following:

- HCMA
  - Drawings SK03a, SK03b, SK03c, SK03d — Received November 10, 2016
  - Revised areas received at meetings — Received January 30 & 31, 2017
  - Emails re. adjusting LCC — Received March 20, 21, 27 & April 3, 2017
  - Emails re. revisions to concept report dated April 6, 2017 — Received April 18 & 24, 2017
- Herold Engineering Ltd
  - Renewal/Replacement Business Case — Received November 10 & December 09, 2016
  - Drawings SK#1, SK#2, SK#3
- Rocky Point Engineering Ltd
  - Mechanical Report — Received November 10, 2016
- R B Engineering Ltd
  - Electrical Assessment Report — Received November 10, 2016
- Total Safety
  - Hazardous Materials Survey Report — Received November 10, 2016
- Cunningham & Rivard Appraisals Ltd
  - Appraisal Report — Received November 30, 2016
- Briefing meeting with HCMA on November 15, 2016 and subsequent emails/telephone discussions
- Meeting at HCMA and Client on February 8, 2017 and subsequent emails/telephone discussions

APPENDIX A

PROJECT COST ESTIMATE BREAKDOWNS – STATUS QUO, SCENARIOS #1, #2, & #3

Nanaimo Fire Station #1				6-Apr-17
666 Fitzwilliam Street, Nanaimo, BC.				
Project Cost - STATUS QUO			1,973 m²	

Planning & Design	$90.80 per m²			
Pre-planning			$50,000	
Planning & Design Fees		10.00%	$67,030	
LEED® documentation				
LEED® administration				
LEED® registration and certification fees				
Energy modelling				
Thermal modelling				
Geotechnical investigation				
Independent commissioning agent				
Envelope consultant			$15,000	
Environmental assessment/monitoring				
Asbestos abatement consultant			$15,000	
Geothermal test drilling				
Archeologist				
Survey fees				
Project Manager		3.00%	$20,109	
Disbursements			$12,000	$179,139
Construction	$339.74 per m²			
Existing Building Renovation			$582,902	
Design Contingency		15.00%	$87,400	$670,300
Reserves	$55.50 per m²			
Construction Escalation - Renovation		5.00%	$33,517	
Furniture & Equipment Escalation				
Construction Contingency		10.00%	$67,030	
Planning Contingency		5.00%	$8,957	$109,504
Completion Costs	$19.39 per m²			
Furniture & Equipment				
Permits, DCCs			$5,127	
Administration costs		1.00%	$6,703	
Legal costs		0.50%	$3,352	
Insurance costs		0.70%	$4,692	
Public art		1.25%	$8,379	
Moving/Operation/start up costs			$10,000	$38,252
Goods and Services Tax	per m²			
GST			excl	
Financing	$0.60 per m²			
Financing		3.00%	$29,916	$29,916
Land Acquisition	per m²			
Land acquisition/sale			excl	
Contingencies	$2.07 per m²			
Client project contingency		10.00%	$103,336	$103,336
PROJECT COST PLAN	$572.73 per m²			$1,130,000

advicas
Professional Quantity Surveyors
Sustainability Consultants

Nanaimo Fire Station #1 6-Apr-17
666 Fitzwilliam Street, Nanaimo, BC.

Project Cost - SCENARIO #1 1,651 m²

Planning & Design	$1,244.79 per m²			
Pre-planning			$50,000	
Planning & Design Fees		16.00%	$1,625,392	
LEED® documentation				
LEED® administration				
LEED® registration and certification fees				
Energy modelling				
Thermal modelling				
Geotechnical investigation			$5,000	
Independent commissioning agent				
Envelope consultant			$3,000	
Environmental assessment/monitoring				
Asbestos abatement consultant			$15,000	
Geothermal test drilling				
Archeologist				
Survey fees			$2,000	
Project Manager		3.00%	$304,761	
Disbursements			$50,000	$2,055,153
Construction	$6,153.06 per m²			
Demolition			$489,666	
Seismic upgrade			$1,312,008	
Temporary Fire Hall			$544,942	
New South Wing & Existing Building Renovations			$6,486,679	
Design Contingency		15.00%	$1,325,393	$10,158,700
Reserves	$1,214.31 per m²			
Construction Escalation		11.00%	$1,117,457	
Furniture & Equipment Escalation		5.00%	$22,703	
Construction Contingency		7.50%	$761,903	
Planning Contingency		5.00%	$102,758	$2,004,821
Completion Costs	$485.40 per m²			
Furniture & Equipment		7.00%	$454,068	
Permits, DCCs			$99,557	
Administration costs		0.30%	$30,476	
Legal costs		0.20%	$20,317	
Insurance costs			$20,000	
Public art		1.25%	$126,984	
Moving/Operation/start up costs			$50,000	$801,402
Goods and Services Tax	per m²			
GST			excl	
Financing	$9.01 per m²			
Financing		3.00%	$450,602	$450,602
Land Acquisition	per m²			
Sale of 580 Fitzwilliam St				
Contingencies	#DIV/0! per m²			
Client project contingency		10.00%	$1,547,853	$1,547,853
PROJECT COST PLAN	$10,308.30 per m²			$17,019,000

Nanaimo Fire Station #1 6-Apr-17
666 Fitzwilliam Street, Nanaimo, BC.

Project Cost - SCENARIO #2 1,583 m²

Planning & Design	$1,215.70	per m²			
Pre-planning				$50,000	
Planning & Design Fees			15.00%	$1,369,965	
LEED® documentation				$100,000	
LEED® administration				incl	
LEED® registration and certification fees				incl	
Energy modelling				$30,000	
Thermal modelling				$15,000	
Geotechnical investigation				$10,000	
Independent commissioning agent					
Envelope consultant				$7,000	
Environmental assessment/monitoring					
Asbestos abatement consultant				$15,000	
Archeologist					
Survey fees				$3,500	
Project Manager			3.00%	$273,993	
Disbursements				$50,000	$1,924,458
Construction	$5,769.49	per m²			
Demolition				$1,024,343	
New Fire Hall				$6,917,111	
Design Contingency			15.00%	$1,191,618	$9,133,100
Reserves	$1,143.43	per m²			
Construction Escalation			11.00%	$1,004,641	
Furniture & Equipment Escalation			5.00%	$24,210	
Construction Contingency			7.50%	$684,983	
Planning Contingency			5.00%	$96,223	$1,810,056
Completion Costs	$584.78	per m²			
Furniture & Equipment			7.00%	$484,198	
Permits, DCCs				$86,686	
Administration costs			0.30%	$27,399	
Legal costs			0.20%	$18,266	
Insurance costs				$20,000	
Traffic controls				$100,000	
Public art			1.25%	$114,164	
Moving/Operation/start up costs				$75,000	$925,713
Goods and Services Tax		per m²			
GST				excl	
Financing	$8.28	per m²			
Financing			3.00%	$413,800	$413,800
Land Acquisition		per m²			
Sale of 580 Fitzwilliam St					
Land sale - Cunningham & Rivard Appraisals Ltd					
Contingencies	$1.04	per m²			
Client project contingency			10.00%	$1,421,093	$1,421,093
PROJECT COST PLAN	$9,872.39	per m²			$15,628,000

Nanaimo Fire Station #1 | 6-Apr-17
666 Fitzwilliam Street, Nanaimo, BC.

Project Cost - SCENARIO #3 | 1,583 m²

Planning & Design	$1,313.38	per m²		
Pre-planning			$50,000	
Planning & Design Fees		15.00%	$1,498,815	
LEED® documentation			$100,000	
LEED® administration			incl	
LEED® registration and certification fees			incl	
Energy modelling			$30,000	
Thermal modelling			$15,000	
Geotechnical investigation			$10,000	
Independent commissioning agent				
Envelope consultant			$7,000	
Environmental assessment/monitoring				
Asbestos abatement consultant			$15,000	
Archeologist				
Survey fees			$3,500	
Project Manager		3.00%	$299,763	
Disbursements			$50,000	$2,079,078
Construction	$6,312.13	per m²		
Demolition			$455,032	
Temporary Fire Hall			$544,942	
New South Wing & New Remaining Building			$7,689,099	
Design Contingency		15.00%	$1,302,968	$9,992,100
Reserves	$1,250.41	per m²		
Construction Escalation		11.00%	$1,099,131	
Furniture & Equipment Escalation		5.00%	$26,912	
Construction Contingency		7.50%	$749,408	
Planning Contingency		5.00%	$103,954	$1,979,404
Completion Costs	$569.04	per m²		
Furniture & Equipment		7.00%	$538,237	
Permits, DCCs			$92,699	
Administration costs		0.30%	$29,976	
Legal costs		0.20%	$19,984	
Insurance costs			$20,000	
Public art		1.25%	$124,901	
Moving/Operation/start up costs			$75,000	$900,798
Goods and Services Tax		per m²		
GST			excl	
Financing	$8.97	per m²		
Financing		3.00%	$448,541	$448,541
Land Acquisition		per m²		
Sale of 580 Fitzwilliam St				
Contingencies	$1.03	per m²		
Client project contingency		10.00%	$1,540,348	$1,540,348
PROJECT COST PLAN	$10,701.20	per m²		$16,940,000

APPENDIX B

CAPITAL CONSTRUCTION COST ESTIMATE BREAKDOWNS – STATUS QUO, SCENARIOS #1, #2, #3

Order of Magnitude Estimate Revised DATE: 06-Apr-17

STATUS QUO	QUANTITY	UNIT	RATE	COST
SUMMARY	**1,973**	**m²**	**$5,404.36**	**$10,662,800**
Existing Building Renovation				$486,400
Phased Replacement Building - As Scenario #3				$7,250,600
Site Overheads		12%		$928,440
Office Overheads & Profit		7%		$606,581
Design Contingency		15%		$1,390,803
GST				Excluded
Escalation				Excluded
Existing Building Renovation	1,973	m²	$246.53	$486,400
Architectural:				
Repaint exterior of existing building	468	m²	$35.00	$16,380
Scaffolding allowance	468	m²	$65.00	$30,420
Remove existing membrane roof and flashings	830	m²	$30.00	$24,900
New membrane roof system, insulation, underlay board, vapour barrier	830	m²	$175.00	$145,250
Dress membrane over parapet including new cap flashing	190	m	$125.00	$23,750
Mechanical:				
Remove existing boilers and equipment	1	sum	$20,000.00	$20,000
Boilers and boiler equipment	1	sum	$100,000.00	$100,000
Electrical:				
Existing service and distribution needs to be replaced	1	no.	$35,920.00	$35,920
Data systems poses potential failure	1	no.	$10,776.00	$10,776
Allowance for lighting/emergency to be fixed and replaced	1	no.	$58,370.00	$58,370
Feeder/Conduit:				
3#12 21mm	15	m	$24.80	$372
allowance for terminations, splicing etc.	1	sum	$37.20	$37
allowance for corners, couplings etc.	1	sum	$40.90	$41
General Conditions:				
testing and commissioning of above systems	1	sum	$9,496.44	$9,665
electrical contractor general conditions - early design	1	sum	$10,351.12	$10,535
Phased Replacement Building - As Scenario #3	1,583	m²	$4,580.29	$7,250,600
Demolition Phase 2:				
Existing South Wing:		item		$51,475
Demolition Phase 3:				
Existing Building:		item		$307,250
Demolition Phase 4:				
Temporary Fire Hall:		item		$21,000
Architectural/Structural:				
Phase 1 Temporary Fire Hall		item		$281,175
Phase 1 Temporary Crew Quarters		item		$50,000
Phase 2 New South Wing		item		$1,372,450
Phase 3 Rebuild Existing building		item		$2,660,240
Mechanical Phase 1:				
Temporary Fire Hall:		item		$73,550
Mechanical Phase 2 & 3:				
New South Wing & Existing Building Retained		item		$1,002,620
Electrical Phase 1:				
Temporary Fire Hall:		item		$50,000
Electrical Phase 2 & 3:				
New South Wing & Existing Building Retained		item		$1,380,827

SCENARIO #1	QUANTITY	UNIT	RATE	COST
SUMMARY	**1,651**	**m²**	**$6,153.06**	**$10,158,700**
Demolition				$408,600
Seismic Upgrade - Structural				$1,094,800
Architectural/Structural				$3,359,300
Mechanical				$1,062,700
Electrical				$1,445,500
Site Overheads		12%		$884,508
Office Overheads & Profit		7%		$577,879
Design Contingency		15%		$1,325,393
GST				Excluded
Escalation				Excluded
Demolition	1,651	m²	$247.49	$408,600
Phase 1:				
Minor demolition to basement of adjacent building	200	m²		see Arch below
Phase 2:				
Existing South Wing:				
Demolish South Wing of existing building	167	m²	$225.00	$37,575
Hazardous Material Abatement for South Wing demolition	167	m²	$50.00	$8,350
Interface between South Wing and Existing Building	111	m²	$50.00	$5,550
Phase 3:				
Existing Building Retained:				
Hazardous Material Abatement for existing building renovation	1,268	m²	$50.00	$63,400
Demolish existing millwork	1	sum	$25,000.00	$25,000
Demolish partitions and interior doors of existing building	908	m²	$50.00	$45,400
Demolish existing floor and ceiling finishes to existing building	1,268	m²	$35.00	$44,380
Take out existing exterior doors:				
- bay doors 4200 x 3500mm	1	no	$800.00	$800
- bay doors 3500 x 3500mm	6	no	$750.00	$4,500
- bay doors 2500 x 2500mm	1	no	$600.00	$600
- single man doors	4	no	$125.00	$500
Take out existing windows:				
- 1650 x 1500mm	3	no	$200.00	$600
- 1750 x 1500mm	2	no	$210.00	$420
- 2250 x 1500mm	6	no	$250.00	$1,500
Take out glazed wall	24	m²	$50.00	$1,200
Seismic Upgrade:				
Remove existing exterior screen to west elevation	34	m	$200.00	$6,800
Remove exterior cladding	791	m²	$50.00	$39,550
Take up existing roof membrane and flashings	575	m²	$25.00	$14,375
Demolish hose tower	1	sum	$50,000.00	$50,000
Demolish load bearing concrete block walls including temporary support	126	m²	$75.00	$9,450
Demolish non load bearing concrete block walls	352	m²	$50.00	$17,600
Remove fittings and fixtures to walls being demolished	1	sum	$10,000.00	$10,000
Phase 4:				
Temporary Fire Hall:				
Remove temporary shelter, reinstate existing parking lot	210	m²	$100.00	$21,000

SCENARIO #1	QUANTITY	UNIT	RATE	COST
Seismic Upgrade - Structural	1,651	m²	$663.11	$1,094,800
Existing Building Retained:				
New concrete foundation outboard of existing exterior foundation including break up paving, excavation, concrete, formwork, reinforcement bar, backfill, make good	113	m	$750.00	$84,750
New concrete exterior walls	981	m²	$500.00	$490,500
New concrete interior walls	205	m²	$500.00	$102,500
Infill roof setback to line of new exterior wall	20	m²	$1,000.00	$20,000
Concrete parapet including tie in to existing	93	m	$400.00	$37,200
New hose tower	1	sum	$200,000.00	$200,000
Additional open web steel joists to roof for increased snow loading	1	sum	$15,000.00	$15,000
Concrete pad footings including break up concrete slab on grade, saw cutting, excavation, concrete, formwork, reinforcement bar, backfill, make good slab	4	no	$1,000.00	$4,000
Steel base plates	4	no	$500.00	$2,000
Steel columns	2,268	kg	$15.00	$34,020
Steel beams	3,232	kg	$15.00	$48,480
Steel decking	675	m²	$50.00	$33,750
Perimeter angle	113	m	$200.00	$22,600
Architectural/Structural	1,651	m²	$2,034.71	$3,359,300
Phase 1:				
Temporary Fire Hall:				
Strip vegetated area, site levelling	190	m²	$100.00	$19,000
Construct new 2 vehicle bay temporary shelter as per 4/SK03b c/o:				
- concrete foundations	207	m²	$75.00	$15,525
- concrete slab on grade including reinforcement and edge thickening	207	m²	$200.00	$41,400
- pre engineered steel frame building, metal siding and roofing, foil backed batt insulation, 2 no. 4250 x 4250mm roller doors, automatic openers with manual override.	207	m²	$750.00	$155,250
- miscellaneous equipment pads, site fencing, paving	1	sum	$50,000.00	$50,000
Temporary Crew Quarters:				
Minor renovations to existing building basement for temporary crew quarters	1	sum	$50,000.00	$50,000
Phase 2:				
New South Wing:				
Standard strip and pad footings including concrete, formwork and reinforcement, excavation, backfill and perimeter insulation - Level 1	183	m²	$200.00	$36,600
Concrete slab on grade including placement and finish, screed and cure, reinforcement, moisture barrier, expansion and contraction joints and structural fill	183	m²	$75.00	$13,725
Granular bed	27	m³	$70.00	$1,890
Suspended concrete floor structure including columns, beams, and slab bands, reinforcement and formwork	280	m²	$375.00	$105,000
Concrete stairs structure including finishes and handrails:				
- 2500mm wide with intermediate landing - Level 1 to Level 2	7	m	$3,200.00	$22,400
Suspended steel roof structure including columns, beams, slab bands, open web steel joists, decking	280	m²	$350.00	$98,000
Concrete exterior shear walls	69	m²	$350.00	$24,308
Panelized wall system including steel studs, insulation and gypsum board backup	320	m²	$800.00	$256,000
Aluminium curtain wall in thermally broken low E double glazing	160	m²	$850.00	$136,000
Scaffolding allowance	534	m²	$60.00	$32,040
Aluminium double glazed thermally broken windows, low E, tinted, including flashings, caulking and installation	53	m²	$750.00	$39,750
Insulated single metal door and frame including hardware and paint	3	lvs.	$1,200.00	$3,600
Aluminum double glazed thermally broken doors and frame including hardware	1	prs.	$3,600.00	$3,600
Automatic button press door opener	1	no	$3,500.00	$3,500

SCENARIO #1	QUANTITY	UNIT	RATE	COST
2 ply SBS roof membrane, protection board, rigid insulation and vapour barrier membrane	280	m²	$175.00	$49,000
Perimeter parapet including membrane upturn and flashings	62	m	$400.00	$24,800
Expansion/interface upstand including membrane upturn and cap flashing	19	m	$250.00	$4,750
Allowance for roof anchors etc.	1	sum	$10,000.00	$10,000
Finish to roof overhangs	97	m²	$650.00	$63,050
Canopy to main entrance	1	sum	$10,000.00	$10,000
Interface between South Wing and Existing Building	191	m²	$100.00	$19,100
Stud and gypsum partitions, include batt insulation:				
- Levels 1-2 - Interior Walls	388	m²	$117.00	$45,396
Concrete shear walls to staircase, elevator	210	m²	$350.00	$73,500
Solid core wood doors in metal frame including hardware and finish	15	lvs.	$1,200.00	$18,000
Aluminum glazed doors and frame including hardware	1	prs.	$2,800.00	$2,800
Automatic button press door opener	1	no	$3,500.00	$3,500
Floor finishes	417	m²	$80.00	$33,360
Ceiling finishes	417	m²	$80.00	$33,360
Wall finishes	1,309	m²	$12.00	$15,708
Fitting and equipment - Allowance	1	sum	$46,300.00	$46,300
2 stop passenger elevator	1	sum	$65,000.00	$65,000
Phase 3:				
Existing Building Retained:				
Panelized wall system including steel studs, insulation and gypsum board backup as infill to former bay door openings	15	m²	$1,000.00	$15,400
Aluminum framed double glazed thermally broken windows and make	45	m²	$800.00	$35,640
Aluminum framed double glazed thermally broken curtain walling and make good	24	m²	$50.00	$1,200
Aluminum framed double glazed thermally broken curtain walling as infill to bay door opening and make good	12	m²	$1,000.00	$12,250
New aluminum framed glazed bay doors 3500 x 4000mm	4	no	$15,000.00	$60,000
Insulated single metal door and frame including hardware and paint	4	lvs.	$1,300.00	$5,200
Refinish existing decorative metal screens at West face of building	150	m²	$50.00	$7,500
Miscellaneous making good to exterior envelope	1	sum	$10,000.00	$10,000
Form opening in existing structural wall including saw cutting:				
- 3100 x 2700mm	1	no	$5,000.00	$5,000
- 2700 x 2700mm	1	no	$4,500.00	$4,500
Make good interior partitions and interior doors	1	sum	$10,000.00	$10,000
New floor finishes	1,188	m²	$80.00	$95,040
New ceiling finishes	1,188	m²	$75.00	$89,100
New wall finishes	2,901	m²	$12.00	$34,812
New/make good fittings and fixtures	1	sum	$20,000.00	$20,000
Non structural code upgrade requirements	1	sum	$50,000.00	$50,000
New paved yard	36	m²	$300.00	$10,800
Allowance for Exterior Work and Landscaping	1	sum	$248,500.00	$248,500
Architectural Associated with Seismic Upgrade:				
New panelized wall system	981	m²	$750.00	$735,750
Premium for returns to existing door and window openings	1	sum	$50,000.00	$50,000
2 ply SBS roof membrane, protection board, rigid insulation and vapour barrier membrane	675	m²	$175.00	$118,125
Membrane upturn and parapet cap flashing	93	m	$200.00	$18,600
New stud partitions and make good:				
- previous load bearing concrete block walls	126	m²	$150.00	$18,900
- previous non-load bearing concrete block walls	352	m²	$150.00	$52,800
Reinstall existing fittings and fixtures including modify as required	1	sum	$25,000.00	$25,000

SCENARIO #1	QUANTITY	UNIT	RATE	COST
Mechanical	1,651	m²	$643.67	$1,062,700
Phase 1:				
Temporary Fire Hall:				
Mechanical services to temporary Apparatus Bay, with relocated vehicle exhaust	1	sum	$20,000.00	$20,000
Temporary Crew Quarters:				
Mechanical services to temporary Crew Quarters	1	sum	$53,550.00	$53,550
Phase 2 & 3:				
New South Wing & Existing Building Retained:				
New foundation drainage	1	sum	$6,600.00	$6,600
New roof drains	1	sum	$6,300.00	$6,300
New sanitary fixtures	1	sum	$31,500.00	$31,500
New gas piping	1	sum	$6,500.00	$6,500
New fire sprinkler system	1	sum	$60,900.00	$60,900
Boilers and boiler equipment	1	sum	$100,000.00	$100,000
Tie oil piping to existing oil tank	1	sum	$5,000.00	$5,000
Gas piping and connection	1	sum	$3,500.00	$3,500
Air-water heat pumps (30 tons each)	2	no.	$90,000.00	$180,000
Fan coil units	10	no.	$8,000.00	$80,000
CHWS/R and HWS/R piping and connections	1	sum	$112,200.00	$112,200
Gas fired make-up air unit	1	sum	$15,000.00	$15,000
General exhaust	1	sum	$4,500.00	$4,500
Ductwork and accessories	1	sum	$69,240.00	$69,240
Remove and replace all plumbing and drainage in existing fire hall	1	sum	$70,000.00	$70,000
Hydronic unit heaters	1	sum	$10,000.00	$10,000
Mechanical controls	1	sum	$62,900.00	$62,900
Mechanical contractor's general condition	1	sum	$65,000.00	$65,000
Allowance for mechanical sitework	1	sum	$100,000.00	$100,000
Electrical	1,651	m²	$875.53	$1,445,500
Phase 1:				
Temporary Fire Hall:				
Electrical services to temporary Apparatus Bay including lighting, switching, mechanical connections	1	sum	$35,000.00	$35,000
Temporary Crew Quarters:				
Electrical modifications for temporary Crew Quarters	1	sum	$15,000.00	$15,000
Phase 2 & 3:				
New South Wing & Existing Building Retained:				
Service and Distribution - 1200A	1	sum	$45,000.00	$45,000
Mechanical connections	1,651	m²	$15.00	$24,765
Lighting	1,651	m²	$65.00	$107,315
Receptacles/switching	1,651	m²	$130.00	$214,630
Fire Alarm	1,651	m²	$30.00	$49,530
Data/Tel	1,651	m²	$15.00	$24,765
Generator - 250kW	1	sum	$68,550.00	$68,550
Site lighting	1	sum	$40,000.00	$40,000
Fibre optic infrastructure reconnection	1	psum	$100,000.00	$100,000
Relocate Emergency Control Centre	1	psum	$500,000.00	$500,000
General Conditions:				
testing and commissioning of above systems	1	sum	$105,709.95	$105,710
electrical contractor general conditions - early design	1	sum	$115,223.85	$115,224

Order of Magnitude Estimate Revised DATE: 06-Apr-17

SCENARIO #2	QUANTITY	UNIT	RATE	COST
SUMMARY	**1,583**	**m²**	**$5,769.49**	**$9,133,100**
Demolition				$870,300
Architectural/Structural				$3,267,500
Mechanical				$1,044,400
Electrical				$1,565,000
Site Overheads		10%		$674,720
Office Overheads & Profit		7%		$519,534
Design Contingency		15%		$1,191,618
GST				Excluded
Escalation				Excluded
Demolition	1,583	m²	$549.78	$870,300
Phase 1:				
Demolish existing Community Services building	1,553	m²	$200.00	$310,600
Hazardous Material Abatement for Community Services demolition	1,553	m²	$50.00	$77,650
Prepare site for new construction	1,553	m²	$50.00	$77,650
Phase 2:				
All new				
Phase 3:				
Demolish existing fire hall building	1,348	m²	$200.00	$269,600
Hazardous Material Abatement for existing building demolition	1,348	m²	$50.00	$67,400
Prepare site for future development	1,348	m²	$50.00	$67,400
Architectural/Structural	1,583	m²	$2,064.12	$3,267,500
Phase 2:				
New Fire Hall:				
Standard strip and pad footings including concrete, formwork and reinforcement, excavation, backfill and perimeter insulation - Level 1	893	m²	$200.00	$178,600
Concrete slab on grade including placement and finish, screed and cure, reinforcement, moisture barrier, expansion and contraction joints and structural fill	893	m²	$135.00	$120,555
Allowance for trench drains	28	m	$800.00	$22,000
Granular bed	134	m³	$70.00	$9,380
Suspended concrete floor structure including columns, beams, and slab bands, reinforcement and formwork	690	m²	$375.00	$258,750
Concrete stairs structure including finishes and handrails:				
- 2500mm wide with intermediate landing - Level 1 to Level 2	13	m	$3,200.00	$41,600
Suspended steel roof structure including columns, beams, open web steel joists, decking	690	m²	$350.00	$241,500
Concrete exterior shear walls	237	m²	$350.00	$83,108
Panelized wall system including steel studs, insulation and gypsum board backup	882	m²	$280.00	$246,960
Aluminium curtain wall in thermally broken low E double glazing	441	m²	$850.00	$374,850
Scaffolding allowance	1,470	m²	$60.00	$88,200
Aluminium double glazed thermally broken windows, low E, tinted, including flashings, caulking and installation	147	m²	$750.00	$110,250
Insulated single metal door and frame including hardware and paint	3	lvs.	$1,200.00	$3,600
Aluminum framed glazed bay doors 3500 x 4000mm	5	no	$15,000.00	$75,000
2 ply SBS roof membrane, protection board, rigid insulation and vapour barrier membrane	690	m²	$175.00	$120,750
Perimeter parapet including membrane upturn and flashings	185	m	$400.00	$74,000
Upstand and flashing	44	m	$70.00	$3,080
Premium for deck area	59	m²	$75.00	$4,425
Perimeter handrail and upstand	20	m	$650.00	$13,000
Allowance for roof anchors, etc.	1	sum	$20,000.00	$20,000
Concrete aprons to apparatus bay doors	220	m²	$225.00	$49,500
Stud and gypsum partitions, include batt insulation:				

SCENARIO #2	QUANTITY	UNIT	RATE	COST
- Levels 1-2 - Interior Walls	2,470	m²	$117.00	$288,990
200mm thick concrete shear walls to staircase, elevator	263	m²	$300.00	$78,900
Solid core wood doors in metal frame including hardware and finish	38	lvs.	$1,200.00	$45,600
Metal door and frame including hardware and paint	15	lvs.	$1,500.00	$22,500
Floor finishes	1,583	m²	$80.00	$126,640
Ceiling finishes	1,583	m²	$80.00	$126,640
Wall finishes	5,270	m²	$12.00	$63,240
Fittings and equipment - Allowance	1,583	m²	$105.00	$166,215
Allowance for Exterior Work and Landscaping	1	sum	$209,700.00	$209,700
Mechanical	1,583	m²	$659.76	$1,044,400
Phase 2:				
New Fire Hall:				
Plumbing and drainage	1,583	m²	$150.00	$237,450
Fire Protection	1,583	m²	$30.00	$47,490
HVAC	1,583	m²	$350.00	$554,050
Controls	1,583	m²	$35.00	$55,405
Mechanical sitework	1	sum	$150,000.00	$150,000
Electrical	1,583	m²	$988.63	$1,565,000
Phase 2:				
New Fire Hall:				
Service and Distribution - 1200A	1	sum	$45,000.00	$45,000
Mechanical connections	1,583	m²	$15.00	$23,745
Lighting	1,583	m²	$65.00	$102,895
Receptacles/switching	1,583	m²	$130.00	$205,790
Fire Alarm	1,583	m²	$30.00	$47,490
Data/Tell	1,583	m²	$15.00	$23,745
Generator - 250kW	1	sum	$68,550.00	$68,550
Electrical sitework	1	sum	$200,000.00	$200,000
Fibre optic infrastructure reconnection	1	psum	$100,000.00	$100,000
Relocate Emergency Control Centre	1	psum	$500,000.00	$500,000
General Conditions:				
testing and commissioning of above systems	1	sum	$118,549.35	$118,549
electrical contractor general conditions - early design	1	sum	$129,218.76	$129,219

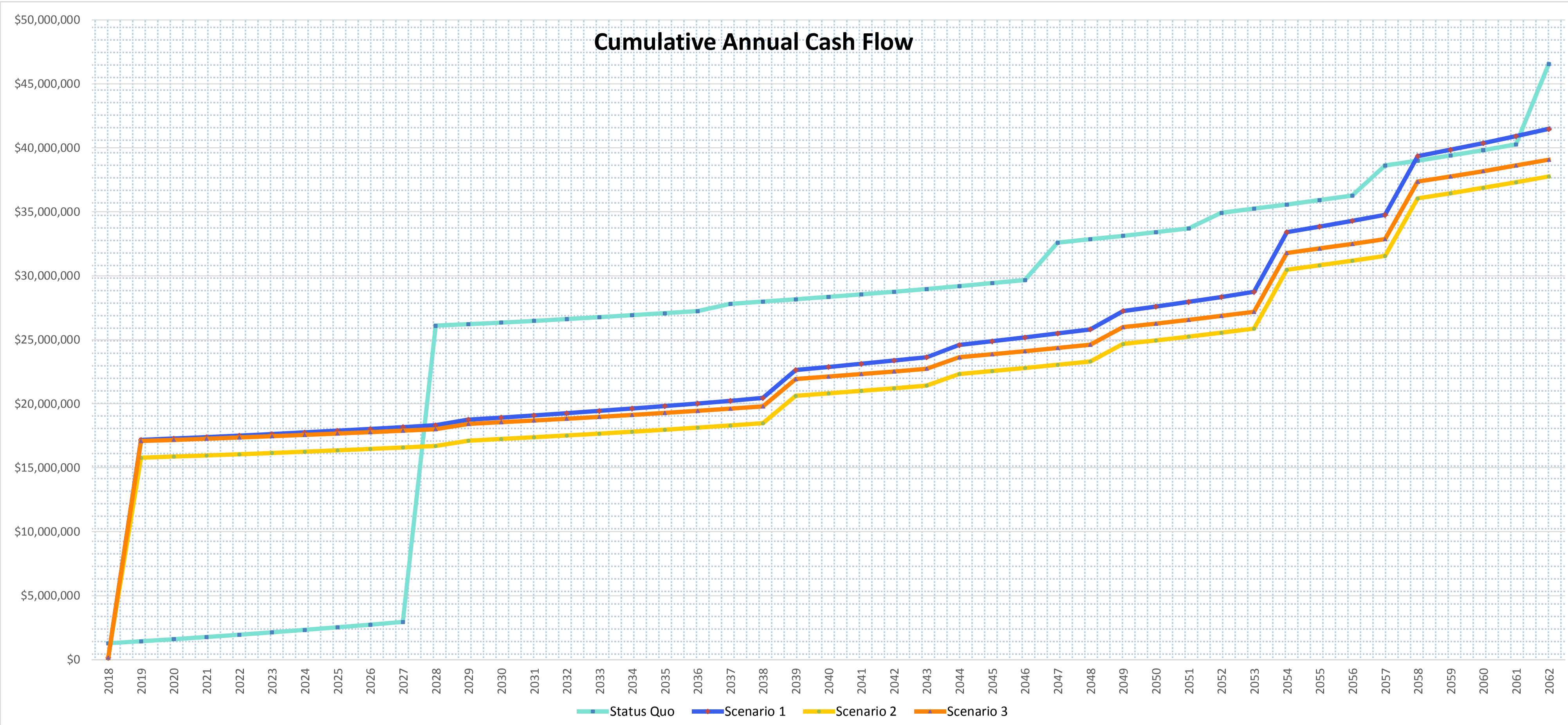
SCENARIO #3	QUANTITY	UNIT	RATE	COST
SUMMARY	**1,583**	**m²**	**$6,312.13**	**$9,992,100**
Demolition				$379,700
Architectural/Structural				$4,363,900
Mechanical				$1,076,200
Electrical				$1,430,800
Site Overheads		12%		$870,072
Office Overheads & Profit		7%		$568,447
Design Contingency		15%		$1,302,968
GST				Excluded
Escalation				Excluded
Demolition	1,583	m²	$239.86	$379,700
Phase 1:				
Minor demolition to basement of adjacent building	200	m²		see Arch below
Phase 2:				
Existing South Wing:				
Demolish South Wing of existing building	167	m²	$225.00	$37,575
Hazardous Material Abatement for South Wing demolition	167	m²	$50.00	$8,350
Interface between South Wing and Existing Building	111	m²	$50.00	$5,550
Phase 3:				
Existing Building:				
Demolish existing building	1,229	m²	$200.00	$245,800
Hazardous Material Abatement for Existing Building	1,229	m²	$50.00	$61,450
Phase 4:				
Temporary Fire Hall:				
Remove temporary shelter, reinstate existing parking lot	210	m²	$100.00	$21,000
Architectural/Structural	1,583	m²	$2,756.73	$4,363,900
Phase 1:				
Temporary Fire Hall:				
Strip vegetated area, site levelling	190	m²	$100.00	$19,000
Construct new 2 vehicle bay temporary shelter as per 4/SK03b c/o:				
- concrete foundations	207	m²	$75.00	$15,525
- concrete slab on grade including reinforcement and edge thickening	207	m²	$200.00	$41,400
- pre engineered steel frame building, metal siding and roofing, foil backed batt insulation, 2 no. 4250 x 4250mm roller doors, automatic openers with manual override.	207	m²	$750.00	$155,250
- miscellaneous equipment pads, site fencing, paving	1	sum	$50,000.00	$50,000
Temporary Crew Quarters:				
Minor renovations to existing building basement for temporary crew quarters	1	sum	$50,000.00	$50,000
Phase 2:				
New South Wing:				
Standard strip and pad footings including concrete, formwork and reinforcement, excavation, backfill and perimeter insulation - Level 1	244	m²	$200.00	$48,800
Concrete slab on grade including placement and finish, screed and cure, reinforcement, moisture barrier, expansion and contraction joints and structural fill	244	m²	$75.00	$18,300
Granular bed	37	m³	$70.00	$2,590
Suspended concrete floor structure including columns, beams, and slab bands, reinforcement and formwork	279	m²	$375.00	$104,625
Concrete stairs structure including finishes and handrails:				
- 2500mm wide with intermediate landing - Level 1 to Level 2	7	m	$3,200.00	$22,400
Suspended steel roof structure including columns, beams, open web steel joists, decking	280	m²	$350.00	$98,000
Concrete exterior shear walls	69	m²	$350.00	$24,308

SCENARIO #3	QUANTITY	UNIT	RATE	COST
Panelized wall system including steel studs, insulation and gypsum board backup	356	m²	$800.00	$284,800
Aluminium curtain wall in thermally broken low E double glazing	178	m²	$850.00	$151,300
Scaffolding allowance	593	m²	$60.00	$35,580
Aluminium double glazed thermally broken windows, low E, tinted, including flashings, caulking and installation	59	m²	$750.00	$44,250
Insulated single metal door and frame including hardware and paint	3	lvs.	$1,200.00	$3,600
Aluminum double glazed thermally broken doors and frame including hardware	1	prs.	$3,600.00	$3,600
Automatic button press door opener	1	no	$3,500.00	$3,500
2 ply SBS roof membrane, protection board, rigid insulation and vapour barrier membrane	279	m²	$175.00	$48,825
Perimeter parapet including membrane upturn and flashings	62	m	$400.00	$24,800
Expansion/interface upstand including membrane upturn and cap flashing	19	m	$250.00	$4,750
Allowance for roof anchors etc.	1	sum	$10,000.00	$10,000
Finish to roof overhangs	97	m²	$650.00	$63,050
Canopy to main entrance	1	sum	$10,000.00	$10,000
Interface between South Wing and Existing Building	191	m²	$100.00	$19,100
Stud and gypsum partitions, include batt insulation:				
- Levels 1-2 - Interior Walls	388	m²	$117.00	$45,396
Concrete shear walls to staircase, elevator	210	m²	$350.00	$73,500
Solid core wood doors in metal frame including hardware and finish	15	lvs.	$1,200.00	$18,000
Aluminum glazed doors and frame including hardware	1	prs.	$2,800.00	$2,800
Automatic button press door opener	1	no	$3,500.00	$3,500
Floor finishes	471	m²	$80.00	$37,680
Ceiling finishes	471	m²	$80.00	$37,680
Wall finishes	1,368	m²	$12.00	$16,416
Fitting and equipment - Allowance	1	sum	$46,300.00	$46,300
2 stop passenger elevator	1	sum	$65,000.00	$65,000
Phase 3:				
Rebuild Existing building:				
Standard strip and pad footings including concrete, formwork and reinforcement, excavation, backfill and perimeter insulation - Level 1	650	m²	$200.00	$130,000
Concrete slab on grade including placement and finish, screed and cure, reinforcement, moisture barrier, expansion and contraction joints and structural fill	650	m²	$135.00	$87,750
Allowance for trench drains	28	m	$800.00	$22,000
Granular bed	97	m³	$70.00	$6,790
Suspended concrete floor structure including columns, beams, and slab bands, reinforcement and formwork	650	m²	$375.00	$243,750
Concrete stairs structure including finishes and handrails:				
- 2500mm wide with intermediate landing - Level 1 to Level 2	7	m	$3,200.00	$22,400
Suspended steel roof structure including columns, beams, open web steel joists, decking	650	m²	$350.00	$227,500
Concrete exterior shear walls	195	m²	$350.00	$68,250
Panelized wall system including steel studs, insulation and gypsum board backup	476	m²	$800.00	$380,800
Aluminium curtain wall in thermally broken low E double glazing	238	m²	$850.00	$202,300
Scaffolding allowance	794	m²	$60.00	$47,640
Aluminium double glazed thermally broken windows, low E, tinted, including flashings, caulking and installation	79	m²	$750.00	$59,250
Insulated single metal door and frame including hardware and paint	3	lvs.	$1,200.00	$3,600
Aluminum framed glazed bay doors 3500 x 4000mm	5	no	$15,000.00	$75,000
2 ply roofing membrane, protection board, rigid insulation and vapour barrier membrane	411	m²	$175.00	$71,925
Perimeter parapet including membrane upturn and flashings	124	m	$400.00	$49,600
Allowance for roof anchors, etc.	1	sum	$20,000.00	$20,000
Concrete aprons to apparatus bay doors	220	m²	$225.00	$49,500
Stud and gypsum partitions, include batt insulation:				
- Levels 1-2 - Interior Walls	1,261	m²	$117.00	$147,537
Concrete shear walls to staircase	210	m²	$350.00	$73,500
Solid core wood doors in metal frame including hardware and finish	30	lvs.	$1,200.00	$36,000

SCENARIO #3	QUANTITY	UNIT	RATE	COST
Metal door and frame including hardware and paint	10	lvs.	$1,500.00	$15,000
Floor finishes	954	m²	$80.00	$76,320
Ceiling finishes	954	m²	$80.00	$76,320
Wall finishes	2,734	m²	$12.00	$32,808
Fittings and equipment - Allowance	1,300	m²	$125.00	$162,500
Allowance for Exterior Work and Landscaping	1	sum	$272,200.00	$272,200
Mechanical	1,583	m²	$679.85	$1,076,200
Phase 1:				
Temporary Fire Hall:				
Mechanical services to temporary Apparatus Bay, with relocated vehicle exhaust	1	sum	$20,000.00	$20,000
Temporary Crew Quarters:				
Mechanical services to temporary Crew Quarters	1	sum	$53,550.00	$53,550
Phase 2 & 3:				
New South Wing & Existing Building Retained:				
New foundation drainage	1	sum	$6,600.00	$6,600
New roof drains	1	sum	$6,300.00	$6,300
New sanitary fixtures	1	sum	$31,500.00	$31,500
New gas piping	1	sum	$6,500.00	$6,500
New fire sprinkler system	1	sum	$62,000.00	$62,000
Boilers and boiler equipment	1	sum	$100,000.00	$100,000
Tie oil piping to existing oil tank	1	sum	$5,000.00	$5,000
Gas piping and connection	1	sum	$3,500.00	$3,500
Air-water heat pumps (30 tons each)	2	no.	$90,000.00	$180,000
Fan coil units	10	no.	$8,000.00	$80,000
CHWS/R and HWS/R piping and connections	1	sum	$112,200.00	$112,200
Gas fired make-up air unit	1	sum	$15,000.00	$15,000
General exhaust	1	sum	$4,500.00	$4,500
Ductwork and accessories	1	sum	$70,520.00	$70,520
Remove and replace all plumbing and drainage in existing fire hall	1	sum	$70,000.00	$70,000
Remove and reinstall existing vehicle exhaust	1	sum	$10,000.00	$10,000
Hydronic unit heaters	1	sum	$10,000.00	$10,000
Mechanical controls	1	sum	$64,000.00	$64,000
Mechanical contractor's general condition	1	sum	$65,000.00	$65,000
Allowance for mechanical sitework	1	sum	$100,000.00	$100,000
Electrical	1,583	m²	$903.85	$1,430,800
Phase 1:				
Temporary Fire Hall:				
Electrical services to temporary Apparatus Bay including lighting, switching, mechanical connections	1	sum	$35,000.00	$35,000
Temporary Crew Quarters:				
Electrical modifications for temporary Crew Quarters	1	sum	$15,000.00	$15,000
Phase 2 & 3:				
New South Wing & Existing Building Retained:				
Service and Distribution - 1200A	1	sum	$45,000.00	$45,000
Mechanical connections	1,583	m²	$15.00	$23,745
Lighting	1,583	m²	$65.00	$102,895
Receptacles/switching	1,583	m²	$130.00	$205,790
Fire Alarm	1,583	m²	$30.00	$47,490
Data/Tel	1,583	m²	$15.00	$23,745
Generator - 250kW	1	sum	$68,550.00	$68,550
Site lighting	1	sum	$45,000.00	$45,000
Fibre optic infrastructure reconnection	1	psum	$100,000.00	$100,000
Relocate Emergency Control Centre	1	psum	$500,000.00	$500,000
General Conditions:				
testing and commissioning of above systems	1	sum	$104,599.35	$104,599
electrical contractor general conditions - early design	1	sum	$114,013.29	$114,013

APPENDIX C

LIFE CYCLE COST – ANNUAL CUMULATIVE COST OF STATUS QUO, SCENARIOS #1, #2, #3



Cumulative Annual Cash Flow
$50,000,000
$45,000,000
$40,000,000
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062
Status Quo
Scenario 1
Scenario 2
Scenario 3

Appendix 06

Hazmat Report

November 9, 2016 Ref: 200790– HMS R1

City of Nanaimo
2020 Labieux Road
Nanaimo, BC, V9T 6J9

Attention: Jan Mongard

E-mail: Jan.Mongard@nanaimo.ca

Reference: Hazardous Materials Survey of the Nanaimo Fire Hall, 666 Fitzwilliam Street, Nanaimo, BC

Introduction

TSS Total Safety Services, Inc. (Total Safety) has, in accordance with your request, completed a hazardous materials survey at the above referenced locations on October 6th, 2016. The purpose of the survey was to identify hazardous materials such as asbestos containing materials, lead containing paints, PCBs, mercury, mould, ozone depleting substances (ODS), silica, rodent/avian feces and/or radioactive sources in the areas that may be disturbed during planned demolition/renovations.

Scope of Work

The scope of this hazardous materials survey included all areas accessible by non-destructive means in the fire hall including drywall, flooring, butyl tape, pipe joint compound, ceiling material, furnace room mastics and insulating materials, and surface coatings. Additionally, exterior and roofing surfaces were surveyed.

Building Description

The building is a multi-level structure of primarily concrete construction. The first floor consisted of several rooms; lunch room, operations room, change room, public restroom, display area, training area, as well as the truck bay that contained several storage rooms and a boiler room. The second level contained the dispatch office, crew quarters, crew restroom, gymnasium, and several storage areas. Finishes throughout the building were generally drywall or painted concrete, suspended ceiling, carpet and sheet vinyl flooring. The first floor contained a large amount of piping layered with insulation; parts of the system were marked with green and red stickers. The interior rooms in the truck bay were mainly cinder block walls, painted wood, and drywall.

Methodology

Asbestos Containing Material

Thirty six (36) bulk samples of building materials typically suspected of containing asbestos were collected for analysis. Please see Appendix A for a complete list of materials sampled. Sample quantities and materials sampled were selected based on our experience and guidelines provided by WorkSafeBC and their publication *"Safe Work Practices for Handling Asbestos"*, 2012. All of the bulk samples were analyzed at the in-house laboratory of Total Safety in accordance with the National Institute for Occupational Safety and Health (NIOSH) Analytical Method 9002, *"Asbestos (bulk) by Polarized Light Microscopy."*

Total Safety laboratories are deemed proficient by the American Industrial Hygiene Association (AIHA) and participate in the quarterly rounds of proficiency testing to maintain registration. All samples will be stored at our laboratory for a period of one month before being disposed of. Should you wish to keep these samples for longer please notify us within this period.

Lead

Eight (8) representative samples of paint were collected to test for the presence of lead. The samples were submitted in labelled and sealed containers to Maxxam Laboratories for lead analysis using Inductively Coupled Plasma Spectroscopy Atomic Emission Spectroscopy (ICP-AES).

Other Hazardous Materials

The presence of mercury containing thermostats, ODS, PCBs, radioactive sources, silica, rodent/avian feces and mould was determined by visual inspection. No sampling of these materials was carried out.

Findings

Asbestos Containing Materials

WorkSafeBC considers asbestos containing materials as those materials, other than vermiculite, that contain at least 0.5% asbestos by weight. For vermiculite, WorkSafeBC determines that vermiculite is asbestos containing if it contains any detectable amount of asbestos. Table 1 below shows identified asbestos containing building materials. For a complete record of analysis refer to Appendix A for the Bulk Sample Analysis Report. For photos of asbestos containing materials, refer to Appendix B. For a site plan showing sample locations, refer to Appendix C. An interpretation of these results is provided in the discussion section.

<u>Table 1 – Summary of Asbestos Containing Materials [1,2]</u>

Sample No.	Location	Material	Asbestos Type (%)	Est. Quantity
3	1st floor, main entry door	Butyl tape	Chrysotile (1%)	~100 windows
13	1st floor, furnace exhaust pipe	Pipe insulation	Chrysotile (2%)	~1000 ft
1	1st floor, display room, east wall	Pipe elbow	Chrysotile (40%)	~250 pipe elbows
15	1st floor, truck bay, east heat radiator pipe	Pipe elbow	Chrysotile (30%)	
22	2nd floor, janitor closet and hallway	Vinyl floor tile white 12"x12"	Chrysotile (1%)	~200 ft

Notes:

1. Estimated quantities refer to the entire building
2. Sample quantities are estimates only and are intended only for the purpose of assessing the risks associated with removal or other disturbance, not for budgeting purposes.

Although not sampled, bell and spigot joints were visually identified in the truck bay, and it is possible that they are asbestos containing. This material was not sampled at the time of this survey as to do so would necessarily involve rupturing the pipe to gain access to the packing materials.

Lead

Sampling results identified four (4) of the collected paint samples to have concentrations above 90µg/g lead (Table 2). The Canada Consumer Products Containing Lead (Contact with Mouth) Regulations defines lead containing paint as paint that contains in excess of 90 mg/kg (µg/g) of lead; this criterion is also recognized by WorkSafeBC. . For a site plan showing sample locations, see Appendix C.

<u>Table 2 – Summary of Lead in Paint Analysis</u>

Sample No.	Location	Material	Lead Concentration µg/g
Pb01	**Main floor, display room floor**	**Grey paint**	**1240**
Pb02	Main floor, hallway entry to office	Beige Paint	<3.0
Pb03	Main floor, public washroom	White paint	<3.0
Pb04	**Main floor, truck bay pillar**	**Blue paint**	**128**
Pb05	Main floor, east wall truck bay pillar	White paint	53.8
Pb06	**Second floor, east parking lot, stairway by water tower**	**White paint**	**615**
Pb07	**Second floor, exterior door to water tower**	**Light blue paint**	**1800**
Pb08	Second floor, south west room, north corner	White paint	6.7

Notes:

1. < = Less than the laboratory's reportable detection limit of analysis
2. Samples in **BOLD** are considered lead-containing

Although not sampled, bell and spigot joints were visually identified in the truck bay, and there is a high likelihood that they are lead containing. Lead flashings and exhaust vents are present on the roof.

The door to the furnace room had a lead weight attached as ballast for automatically closing. The lead weight can be recycled at a facility that accepts metals.

Lead - Toxicity Characteristic Leaching Procedure (TCLP) Analysis

Under the BC Hazardous Waste Regulations 63/88 a waste material is considered to be a *leachable toxic waste* if when subject to the extraction procedure described in the US EPA Method 1311 the waste produces an extract with a contaminant concentration greater than those prescribed in Table 1 of Schedule 4. For lead the waste material would be considered to be a toxic waste if the concentration of lead leached from the material by a Toxicity Characteristic Leachate Procedure (TCLP) test is greater than 5 mg/L.

The results of the TCLP analysis did not identify any of the tested paint to be hazardous waste (Table 3). Please refer to Appendix A, for the complete laboratory results.

Table 3 – Summary of TCLP Analysis

Sample No.	Location	Material	Lead Content in Waste Extract (mg/L)
TCLP1	Exterior stairs	Concrete	<0.01
TCLP2	North east truck bay (to furnace room)	Drywall	0.03
TCLP3	South east truck bay (to storage room)	Wood Panel	<0.01

Notes:

1. < = Less than the laboratory's reportable detection limit of analysis

Note – in additional to leachate regulations for lead, the level of leachate for other metals that might be present in paint is regulated, these include: Cadmium, Chromium, Copper, Mercury, Silver and Zinc. If a full metals scan is done, the above table will need to be adjusted.

Mercury

Mercury thermostats were not observed in the property. Fluorescent light tubes and compact bulbs, which contain mercury, were noted in the truck bay, offices, washrooms and all second floor rooms.

Ozone Depleting Substances (ODS)

Refrigerator/freezers, which may contain ozone depleting substances such as Chlorofluorocarbons (CFCs), were observed in the main and second floor kitchens.

Polychlorinated Biphenyls (PCBs)

Fluorescent light fixtures, which may contain PCBs in the ballasts, were observed throughout the fire hall.

Radioactive Materials
Smoke detectors, which may contain radioactive materials, were observed throughout the fire hall.

Rodent/Avian Feces
Rodent/avian feces were not observed in the areas surveyed.

Mould
Mould contaminated building materials were not observed in the areas surveyed.

Silica
Silica is present in concrete and may be present in drywall, both of which were observed in the property.

Discussion and Recommendations

Asbestos Containing Materials

All samples of drywall, ceiling tile, and grout were found to be non-asbestos containing.

All three (3) of the thermal system insulation samples (pipe elbows and pipe insulation), were determined to contain chrysotile asbestos. The entire thermal piping system on the first floor had green or red stickers on each individual system. It is our understanding the Nanaimo Fire Hall had a previous hazardous material assessment performed by another service provider which may be the reason as to why each piping system was colour coded; however, Total Safety was not given any reports or historical records of prior hazard assessments. If historical records or reports are not available, or are inaccurate, and the colour coding cannot be determined, all thermal system insulation should be considered asbestos containing unless further sampling shows otherwise. We recommend high risk work procedures to remove amounts of pipe larger than a single glove bag. For individual elbows, we would recommend moderate risk work procedures using a glove bag.

One (1) sample of butyl tape was determined to contain asbestos. All windows in the building appeared to have been installed at the same time period; therefore, it is likely any windows in the building with butyl tape contain asbestos. Total Safety concludes that if windows with similar butyl tape are observed they must be considered asbestos containing, unless further testing is completed. We recommend moderate risk work procedures to remove butyl tape with hand tools.

One (1) sample of vinyl floor tile was determined to be asbestos containing. The white 12”x12” vinyl tiles in the second floor janitor’s closet were identified as asbestos containing, it should be noted that the vinyl tiles in the janitor’s closet were contiguous with the tiles in the hallway of the second floor. All 12”x12” tiles of the same colour should be considered asbestos containing. If the tiles are not damaged or removed, there is little to no risk of releasing asbestos fibers into the air. At the time of the survey the floors appeared to be polished, if an electric polisher is to be used a coarse disk must not be used on the floors; however, a soft polishing disk is unlikely to damage the tiles enough to release asbestos fibers. We recommend moderate risk work procedures to remove vinyl floor tiles.

If any of the identified asbestos containing materials are likely to be disturbed they must be removed by a qualified asbestos abatement contractor prior to any renovation or demolition work being performed, using appropriate work procedures as determined by a Risk Assessment performed by a Qualified Person and in accordance with the WorkSafeBC Occupational Health and Safety Regulation (OH&S). In addition to the asbestos containing materials identified in this non-intrusive survey, there may be additional asbestos containing materials in concealed areas such as wall cavities, ceiling spaces and other inaccessible areas. Should materials suspected of being asbestos containing be discovered, all work should cease at that location until the material has been identified.

If any drywall is to be removed, please note that non-asbestos drywall/gypsum is banned from most BC landfills because it forms a hazardous gas when mixed with water; however, it is a recyclable product and should therefore not be mixed with other garbage or left attached to other demolition waste. Non-asbestos drywall must be disposed of separately at a qualified recycling center.

Mercury

Fluorescent light tubes and bulbs contain mercury vapour and should be disposed of in accordance with BC Ministry of Environment Regulations. Systems are in place that can facilitate recycling of the glass and mercury in fluorescent lights while mitigating worker exposure during the disposal process.

Lead

Lead containing paint was identified on various surfaces within the area surveyed. In the event that the surfaces to which lead containing paint has been applied are to be disturbed by cutting, sanding, grinding, burning or otherwise abraded, safe work procedures must be employed in compliance with the requirements of the WorkSafeBC Occupational Health & Safety Regulation Section 6.59-6.69 and their publication *"Lead Containing Paints and Coatings; Preventing Exposure in the Construction Industry"*.

In addition, Total Safety sent several materials with lead containing paint for Toxicity Characteristic Leaching Procedure (TCLP) testing prior to disposal. This testing determines where in the waste stream these materials should be classified (Hazardous Waste or regular demolition debris), and ensure compliance with the BC Ministry of Environment Regulations.

Not all materials which were coated in lead containing paint could be sent for TCLP analysis as to do so would cause significant damage to those materials. This included the lead containing grey paint on concrete floors and the light blue lead containing paint on several doors in the Fire Hall. If either of these materials are destructively disturbed due to demolition or renovation they should be sent for TCLP sampling to determine if they are leachable.

Lead flashings, vents and other lead products can be recycled as metal construction waste.

Ozone Depleting Substances (ODS)

Refrigerator and/or freezer units observed may contain Chlorofluorocarbons (CFCs) and therefore must be disposed of in accordance with the B.C. Ministry of Environment's *"Ozone-Depleting Substances and*

Halocarbons Regulations" (2004). The fridge/freezer must be treated as CFC containing until it has been determined otherwise.

Polychlorinated Biphenyls (PCBs)
Fluorescent light fixtures were observed and may contain PCBs within the light ballasts. Ballasts must be inspected to determine whether or not PCBs are present prior to disposal. Non-PCB containing ballasts must have a label affixed which states they do not contain PCBs. It may also be possible to determine PCB content by using guidelines in Environment Canada's document, *"Identification of Light Ballasts Containing PCBs"* (EPS 2/CC/2, revised August 1991). If no determination can be made the ballasts must be assumed to contain PCBs. If they are determined to or assumed to contain PCBs they must be disposed of at an approved disposal facility.

Radioactive Materials
Smoke detectors were observed within the areas surveyed. These units may be of the ionization type or photoelectric type. Ionization smoke alarms contain a small amount of a material called Americium 241, which emits alpha particles that collide with the oxygen and nitrogen in the air to create ions. Photo-electric smoke detectors use a tiny beam of light to detect smoke particles. Compared with radioactive detectors that rely on ionized air, photoelectric detectors use no radioactive materials. As long as smoke detectors are used as directed and not opened, stored in large numbers, or damaged, they pose no radiation health risk to humans.

Silica
Disturbance of silica containing materials can result in the production of airborne respirable silica. Crystalline silica dust (e.g., quartz dust) is considered a carcinogen and therefore WorkSafeBC requires that exposures be kept As Low As Reasonably Achievable (ALARA). Workers must be protected from silica dust exposure during construction and demolition projects. In order to control worker exposure to silica dust, a risk assessment and work procedures must be developed, which comply with the WorkSafeBC Occupational Health & Safety Regulation.

WorkSafeBC Regulatory Requirements (Asbestos and Lead)

Notification in the form of a Notice of Project for Asbestos (NOPA) and/or Lead (NOPL) must be submitted to WorkSafeBC a minimum of 24 hours prior to commencement of abatement work. In conjunction with the NOPA/NOPL the contractor must submit a site specific risk assessment and safe work procedures.

To comply with Part 6 of the WorkSafeBC OH&S Regulation, specifically Section 6.32 pertaining to documentation, **City of Nanaimo** should acquire copies of the abatement contractor's NOPA/NOPL, abatement procedures, any air monitoring results and all documentation submitted to WorkSafeBC. These documents are required to be maintained for a period of 10 years.

Note that if an abatement contractor is hired to conduct work, they must not list Total Safety as the consultant on their NOPA/NOPL and abatement procedures unless Total Safety is actually engaged as the consultant during the abatement phase. If Total Safety is engaged solely as the air monitoring agency, then this distinction must be clearly indicated.

Limitations

This report is intended for the exclusive use of the City of Nanaimo to determine the likely locations of hazardous materials prior to work commencing at the above referenced site. The use of this document for any other purpose is at the sole risk of the user.

This report is not a Specification or Scope of Work and the use of this document as such will be at the sole risk of the user.

The contents of this report were based on a site visit conducted by Total Safety personnel. Please note that some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey. Products containing hazardous materials are sometimes used behind wall partitions or on mechanical systems located in pipe chases or other concealed areas.

Statement of Qualifications

Total Safety has been providing consulting services in the environmental and industrial hygiene fields since 1990. Our personnel include the following:

- Certified Industrial Hygienists (CIH)
- Canadian Registered Safety Professionals (CRSP)
- Registered Professional Biologist (R.P. Bio)
- Certified Health and Safety Consultant (CHSC)
- PhD (Microbiology)

Total Safety also carries Environmental Errors & Omissions Liability Insurance and Comprehensive General Liability Insurance.

We thank you for the opportunity of performing this work on your behalf. Should you have any questions or require any additional information, please contact the writer.

Best Regards,

Pierce Ficzycz, BSc
IH/OHS Consultant
Field Assessment and Report

Norman Richardson, Mech. Eng. Tech., CRSP, CHSC
Technical Operations Manager
Report Review

Matthew Webb, BAIE
IH/OHS Consultant
Field Assessment and Report Review

Appendix A

Asbestos, Lead, and TCLP Sample Analysis Reports

TSS PACIFIC - RECORD OF ANALYSIS

Report Number:	200790-54972	**Reference:**	
Client:	City of Nanaimo	**Report Date:**	28-Oct-16
Address:	666 Fitzwilliam Street	**Contact:**	
	Nanaimo BC		

Please find enclosed our laboratory's results for the bulk sample(s) submitted to our office for identification.

Sample examination was conducted in accordance with the NIOSH 9002 analytical method using polarized light microscopy and dispersion staining techniques.

A result of 'Asbestos–Not detected' means no asbestos fibres were detected. When asbestos is detected, the minimum quantitation limit is 1%. Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

This test report relates only to the items tested and any extrapolation by the client of the results is the responsibility of the client. For samples not collected by TSS Pacific, the accuracy of locations and material(s) is the responsibility of the client. Samples will be disposed of after one month, unless we are instructed otherwise.

If asbestos products are identified in this report they should be remediated safely in accordance with the requirements of Part 6.0 of the Worksafe B.C. Occupational Health and Safety Regulation. In general this will require the completion of a Risk Assessment (Part 6.6.1) completed by a "Qualified Person" as defined in Part 6.1.

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

TOTAL SAFETY

AIHA Proficiency Analytical Testing Programs, LLC

BAPAT Lab #185672

TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 200790-54972

Address: 666 Fitzwilliam Street, Nanaimo

Sampled By: TSS Pacific

Client Name: City of Nanaimo

Date Sampled: 06-Oct-16

Reference:

Date Analyzed: 12-Oct-16

Amended Report: 28-Oct-16

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200790-54972-001	Pipe Elbow 1st floor / Display room Pipes on east wall	Paint 20% White mesh 10% Yellow fibrous layer 40% White fibrous layer 30%	Not Detected Not Detected Not Detected YES - Chrysotile 40%	Non-Fibrous 100% Cellulose 100% Fibreglass 100% Non-Fibrous 60%
200790-54972-002	Textured Ceiling 1st floor / Main entry West wall	Paint 20% White chalky mix 30% Grey cementitious mix 50%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 92%, Cellulose 8% Non-Fibrous 100%
200790-54972-003	Butyl Tape 1st floor / Main entry Wet side	Paint 20% Grey putty 70% Grey layer 10%	Not Detected Not Detected YES - Chrysotile 1%	Non-Fibrous 100% Non-Fibrous 100% Non-Fibrous 99%
200790-54972-004	Grout 1st floor / Main entry Floor near radiator	Paint 20% Grey cementitious mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
200790-54972-005	Ceiling Tile 1st floor / Entry hallway	Paint 10% Beige fibrous layer 90%	Not Detected Not Detected	Non-Fibrous 100% Cellulose 60%, Non-Fibrous 40%
200790-54972-006	Drywall Joint Compound 1st floor / Entry to office 1	Paint 20% White chalky mix 70% Paper 10%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
200790-54972-007	Ceiling Tile 1st floor / Common room	Paint 10% Brown fibrous layer 90%	Not Detected Not Detected	Non-Fibrous 100% Cellulose 100%
200790-54972-008	Cement 1st floor / Public washroom Floor	Grey cementitious mix 100%	Not Detected	Non-Fibrous 98%, Cellulose 2%

Analyzed in accordance with NIOSH METHOD 9002 – ASBESTOS (BULK) BY PLM AIHA BAPAT Lab #185672

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

TOTAL SAFETY

AIHA Proficiency Analytical Testing Programs, LLC

BAPAT Lab #185672

TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 200790-54972

Address: 666 Fitzwilliam Street, Nanaimo

Sampled By: TSS Pacific

Client Name: City of Nanaimo

Date Sampled: 06-Oct-16

Reference:

Date Analyzed: 12-Oct-16

Amended Report: 28-Oct-16

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200790-54972-009	Drywall Joint Compound 1st floor / Hallway Near stairs to 2nd floor	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
200790-54972-010	Drywall Joint Compound 1st floor / Hallway Near janitor closet	Paint 20% White chalky mix 50% Paper 10% Gypsum 20%	Not Detected Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100% Non-Fibrous 100%
200790-54972-011	Pipe Dope 1st floor / Furnace room On black pipes front of furnace	Beige layer 100%	Not Detected	Non-Fibrous 95%, Synthetic 5%
200790-54972-012	Insulation 1st floor / Furnace body Front of furnace	Black mineral wool 100%	Not Detected	Fibreglass 100%
200790-54972-013	Pipe Insulation 1st floor / Furnace exhaust pipe	Grey sparkling layer 100%	YES - Chrysotile 2%	Non-Fibrous 98%
200790-54972-014	Mastic 1st floor / Furnace room Furnace end caps	Beige mix 100%	Not Detected	Non-Fibrous 95%, Cellulose 5%
200790-54972-015	Pipe Insulation 1st floor / Truck bay East heat radiator	Paint 20% White mesh 20% White fibrous layer 60%	Not Detected Not Detected YES - Chrysotile 30%	Non-Fibrous 100% Cellulose 100% Non-Fibrous 70%
200790-54972-016	Mortar 1st floor / Furnace room West wall	Grey cementitious mix 100%	Not Detected	Non-Fibrous 100%

Analyzed in accordance with NIOSH METHOD 9002 – ASBESTOS (BULK) BY PLM AIHA BAPAT Lab #185672

TOTAL SAFETY

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

AIHA Proficiency Analytical Testing Programs, LLC
BAPAT Lab #185672

TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 200790-54972

Address: 666 Fitzwilliam Street, Nanaimo

Sampled By: TSS Pacific

Client Name: City of Nanaimo

Date Sampled: 06-Oct-16

Reference:

Date Analyzed: 12-Oct-16

Amended Report: 28-Oct-16

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200790-54972-017	Mortar 1st floor / Electrical room North wall	Grey cementitious mix 100%	Not Detected	Non-Fibrous 100%
200790-54972-018	Mortar 1st floor / Tower training room Old chimney room	Grey cementitious mix 100%	Not Detected	Non-Fibrous 100%
200790-54972-019	Drywall Joint Compound 1st floor / Room - fire uniform	Paint 20% White chalky mix 60% Paper 20%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
200790-54972-020	Drywall Joint Compound 1st floor / Paint room Near shelf and top of wood	Paint 20% White chalky mix 50% Paper 20% Gypsum 10%	Not Detected Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100% Non-Fibrous 100%
200790-54972-021	Drywall Joint Compound 1st floor / Doorway to furnace room	Paint 20% White chalky mix 60% Paper 20%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Cellulose 100%
200790-54972-022	Vinyl Floor Tile 2nd floor / Janitor closet	Hard beige vinyl 98% Black mastic 2%	YES - Chrysotile 1% Not Detected	Non-Fibrous 99% Non-Fibrous 95%, Cellulose 5%
200790-54972-023	Parging Compound Exterior / Fire stairs	Paint 20% Grey cementitious mix 78% Yellow layer 2%	Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100% Non-Fibrous 100%
200790-54972-024	Vinyl Floor Tile 2nd floor / Room 206 Entrance	Grey vinyl 60% White fibrous layer 40%	Not Detected Not Detected	Non-Fibrous 100% Cellulose 60%, Non-Fibrous 40%

Analyzed in accordance with NIOSH METHOD 9002 – ASBESTOS (BULK) BY PLM   AIHA BAPAT Lab #185672

TOTAL SAFETY

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

AIHA Proficiency Analytical Testing Programs, LLC

BAPAT Lab #185672

TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 200790-54972

Address: 666 Fitzwilliam Street, Nanaimo

Sampled By: TSS Pacific

Client Name: City of Nanaimo

Date Sampled: 06-Oct-16

Reference:

Date Analyzed: 12-Oct-16

Amended Report: 28-Oct-16

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200790-54972-025	Drywall Joint Compound 2nd floor / Room 206 Entry to gym	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
200790-54972-026	Drywall Joint Compound 2nd floor / Office hall Outside office 5 and office 2	White chalky mix 100%	Not Detected	Non-Fibrous 100%
200790-54972-027	Sheet Vinyl Flooring 2nd floor / Men's washroom Locker - floor	Grey vinyl sheet 100%	Not Detected	Non-Fibrous 100%
200790-54972-028	Drywall Joint Compound 2nd floor / Room 205	Paint 20% White chalky mix 80%	Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 100%
200790-54972-029	Drywall Joint Compound 2nd floor / Office hall Outside office 5/copy	White chalky mix 90% Paper 10%	Not Detected Not Detected	Non-Fibrous 100% Cellulose 100%
200790-54972-030	Grout 2nd floor / Deck	Grey cementitious mix 100%	Not Detected	Non-Fibrous 100%
200790-54972-031	Mastic Roof / Flashing on water tank	Brown mastic 100%	Not Detected	Non-Fibrous 100%
200790-54972-032	Tar Roof / Southeast	Tar 100%	Not Detected	Non-Fibrous 99%, Fibreglass 1%

Analyzed in accordance with NIOSH METHOD 9002 – ASBESTOS (BULK) BY PLM AIHA BAPAT Lab #185672

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

TOTAL SAFETY

AIHA Proficiency Analytical Testing Programs, LLC

BAPAT Lab #185672

TSS PACIFIC - RECORD OF ANALYSIS

Report Number: 200790-54972

Client Name: City of Nanaimo

Reference:

Amended Report: 28-Oct-16

Address: 666 Fitzwilliam Street, Nanaimo

Sampled By: TSS Pacific

Date Sampled: 06-Oct-16

Date Analyzed: 12-Oct-16

Analyst: EC

NO.	SAMPLE INFORMATION	LAYER	ASBESTOS	OTHER MATERIALS
200790-54972-033	Mastic Roof / Southeast corner	Black mastic 100%	Not Detected	Non-Fibrous 100%
200790-54972-034	Roofing Roof / Near center flashing	White pebble layer 20% Black fibrous tar 30% Black fibrous tar-2 40% Yellow foam 10%	Not Detected Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 80%, Cellulose 20% Non-Fibrous 80%, Synthetic 20% Non-Fibrous 100%
200790-54972-035	Roofing Roof / Center Near large antenna/radio tower	White pebble layer 20% Black fibrous tar 30% Black fibrous tar-2 40% Yellow foam 10%	Not Detected Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 80%, Cellulose 20% Non-Fibrous 80%, Fibreglass 20% Non-Fibrous 100%
200790-54972-036	Roofing Roof / Southeast side of water tank	White pebble layer 20% Black fibrous tar 30% Black fibrous tar-2 40% Yellow foam 10%	Not Detected Not Detected Not Detected Not Detected	Non-Fibrous 100% Non-Fibrous 80%, Cellulose 20% Non-Fibrous 80%, Fibreglass 20% Non-Fibrous 100%

Total Number of Samples: 36

Report Reviewed By: Stephen McIntyre Stephen Mc Intyre

- A result of 'Asbestos–Not detected' means no asbestos fibres were detected;
- When asbestos is detected, the minimum quantitation limit is 1%;
- Levels of asbestos present but below 1% based on visual estimation will be described as TRACE.

TOTAL SAFETY

AIHA Proficiency Analytical Testing Programs, LLC

BAPAT Lab #185672

Success Through Science®

Your Project #: 200790-54952
Site Location: 666 FITZWILLIAM ST. NANAIMO BC
Your C.O.C. #: 08428293

Attention:Emily McGloin

TSS Total Safety Services Inc.
Suite 102
4595 Canada Way
Burnaby, BC
CANADA V5G 1J9

Report Date: 2016/10/17
Report #: R2283683
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B689901
Received: 2016/10/12, 09:30

Sample Matrix: PAINT
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Elements by ICP-AES (acid extr. solid)	8	2016/10/17	2016/10/17	BBY7SOP-00018	EPA 6010c R3 m

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Amandeep Nagra, Account Specialist
Email: ANagra@maxxam.ca
Phone# (604)639-2602
==
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B689901
Report Date: 2016/10/17

TSS Total Safety Services Inc.
Client Project #: 200790-54952
Site Location: 666 FITZWILLIAM ST. NANAIMO BC

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		PT1354	PT1355	PT1356	PT1357		
Sampling Date		2016/10/06	2016/10/06	2016/10/06	2016/10/06		
COC Number		08428293	08428293	08428293	08428293		
	UNITS	**200790-54952-PB01**	**200790-54952-PB02**	**200790-54952-PB03**	**200790-54952-PB04**	**RDL**	**QC Batch**
Total Metals by ICP							
Total Lead (Pb)	ug/g	1240	<3.0	<3.0	128	3.0	8435298

RDL = Reportable Detection Limit

Maxxam ID		PT1358	PT1359	PT1360	PT1361		
Sampling Date		2016/10/06	2016/10/06	2016/10/06	2016/10/06		
COC Number		08428293	08428293	08428293	08428293		
	UNITS	**200790-54952-PB05**	**200790-54952-PB06**	**200790-54952-PB07**	**200790-54952-PB08**	**RDL**	**QC Batch**
Total Metals by ICP							
Total Lead (Pb)	ug/g	53.8	615	1800	6.7	3.0	8435298

RDL = Reportable Detection Limit

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B689901
Report Date: 2016/10/17

TSS Total Safety Services Inc.
Client Project #: 200790-54952
Site Location: 666 FITZWILLIAM ST. NANAIMO BC

GENERAL COMMENTS

Change Request (2016/10/13): 200790-54952-Pb08 to be analyzed for lead (GP5).

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B689901
Report Date: 2016/10/17

QUALITY ASSURANCE REPORT

TSS Total Safety Services Inc.
Client Project #: 200790-54952
Site Location: 666 FITZWILLIAM ST. NANAIMO BC

			Method Blank		RPD		QC Standard	
QC Batch	Parameter	Date	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8435298	Total Lead (Pb)	2016/10/17	<3.0	ug/g	NC	35	93	80 - 120

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (one or both samples < 5x RDL).

Maxxam Analytics International Corporation o/a Maxxam Analytics Burnaby: 4606 Canada Way V5G 1K5 Telephone(604) 734-7276 Fax(604) 731-2386

Maxxam Job #: B689901
Report Date: 2016/10/17

TSS Total Safety Services Inc.
Client Project #: 200790-54952
Site Location: 666 FITZWILLIAM ST. NANAIMO BC

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Andy Lu, Ph.D., P.Chem., Scientific Specialist

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

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Unit 120, 8600 Glenlyon Parkway
Burnaby, British Columbia
CANADA V5J 0B6
TEL (778)452-4000
FAX (778)452-4074
http://www.agatlabs.com

CLIENT NAME: **TSS TOTAL SAFETY SERVICES INC. DBA**
102 - 4595 CANADA WAY
BURNABY, BC V5G1J9
(604) 292-4739

ATTENTION TO: **Pierce Ficzycz**

PROJECT: **666 Fitzwilliam**

AGAT WORK ORDER: **16V152521**

SOIL ANALYSIS REVIEWED BY: **Angela Bond, Technical Reviewer**

DATE REPORTED: **Oct 31, 2016**

PAGES (INCLUDING COVER): **6**

VERSION*: **1**

Should you require any information regarding this analysis please contact your client services representative at (778) 452-4000

*NOTES
VERSION 1: Sample receipt temperature 19°C.

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

Certificate of Analysis

AGAT WORK ORDER: 16V152521

PROJECT: 666 Fitzwilliam

Unit 120, 8600 Glenlyon Parkway
Burnaby, British Columbia
CANADA V5J 0B6
TEL (778)452-4000
FAX (778)452-4074
http://www.agatlabs.com

CLIENT NAME: TSS TOTAL SAFETY SERVICES INC. DBA

ATTENTION TO: Pierce Ficzycz

SAMPLING SITE:

SAMPLED BY:

TCLP Lead

DATE RECEIVED: 2016-10-25 **DATE REPORTED: 2016-10-31**

			SAMPLE DESCRIPTION:	TCLP 1	TCLP 2	TCLP 3
			SAMPLE TYPE:	Bulk	Bulk	Bulk
			DATE SAMPLED:	2016-10-06	2016-10-06	2016-10-06
Parameter	**Unit**	**G / S**	**RDL**	**7954665**	**7954666**	**7954667**
Lead - TCLP Leachate	mg/L		0.01	<0.01	0.03	<0.01

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

7954665-7954667 Analysis based on "as received"

Certified By: Angela Bond

Results relate only to the items tested and to all the items tested

AGAT Laboratories

Unit 120, 8600 Glenlyon Parkway
Burnaby, British Columbia
CANADA V5J 0B6
TEL (778)452-4000
FAX (778)452-4074
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: TSS TOTAL SAFETY SERVICES INC. DBA
PROJECT: 666 Fitzwilliam
SAMPLING SITE:

AGAT WORK ORDER: 16V152521
ATTENTION TO: Pierce Ficzycz
SAMPLED BY:

Soil Analysis

RPT Date: Oct 31, 2016			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper	Recovery	Acceptable Limits Lower	Acceptable Limits Upper
TCLP Lead															
Lead - TCLP Leachate	7939253		2.45	2.08	16.1%	< 0.01	115%	50%	150%	101%	90%	110%	109%	70%	130%

Comments: RPDs are calculated using raw analytical data and not the rounded duplicate values reported.

Certified By:

Unit 120, 8600 Glenlyon Parkway
Burnaby, British Columbia
CANADA V5J 0B6
TEL (778)452-4000
FAX (778)452-4074
http://www.agatlabs.com

Method Summary

CLIENT NAME: TSS TOTAL SAFETY SERVICES INC. DBA

AGAT WORK ORDER: 16V152521

PROJECT: 666 Fitzwilliam

ATTENTION TO: Pierce Ficzycz

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Lead - TCLP Leachate	MET-181-6102, LAB-181-4001	EPA 1311 and EPA 6020A	ICP-MS

Results relate only to the items tested and to all the items tested

Appendix B
Photographs

Photo 1	Date: Oct 06, 2016	Location: 1st floor display room
Description: Sample 01 – Pipe elbow		

Photo 2	Date: Oct 6, 2016	Location: Main entry door
Description: Sample 03 - Butyl tape around the edges of the window		

Photo 3	**Date:** Oct 6, 2016	**Location:** East truck bay
Description: Sample 15 – Radiator pipe elbow		

Photo 4	**Date:** Oct 6, 2016	**Location:** Janitor's closet
Description: Sample 22 – 12"x12" vinyl floor tile		

Appendix C
Sampling Locations

First Floor	
<u>Warning:</u> In addition to the materials identified in this drawing some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.	
Legend:	

Green circle	=	Negative Asbestos Sample Location
Red circle	=	Positive Asbestos Sample Location
Blue circle	=	Negative Lead Sample Location
Orange circle	=	Positive Lead Sample Location

Client Name: City of Nanaimo

Site Address: 666 Fitzwilliam St, Nanaimo, BC

Project No: 200777	**Scale:** Not to Scale	**Drawn By:** PF	**Date:** Sept 16, 2016

TOTAL SAFETY
112 – 4595 Canada Way,
Burnaby, BC
V5G 1J9

Phone: 604.292.4700
TotalSafety.com

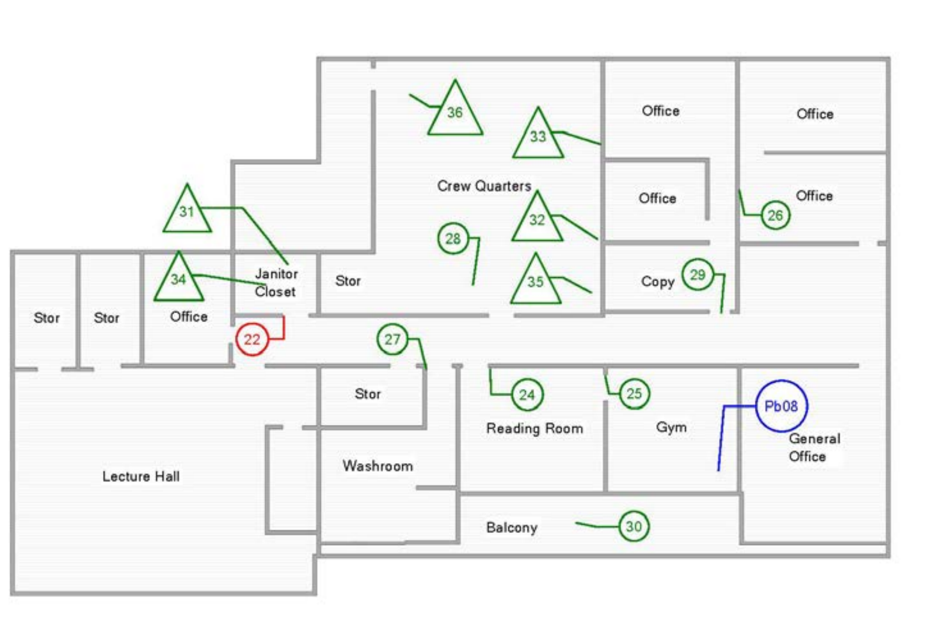
Second Floor

Warning:

In addition to the materials identified in this drawing some hazardous materials may not have been accessible on the day of our survey, and may remain unidentified following our survey.

Legend:

○ (green)	=	Negative Asbestos Sample Location
○ (red)	=	Positive Asbestos Sample Location
○ (blue)	=	Negative Lead Sample Location
△	=	Asbestos roof sample location



Client Name: City of Nanaimo

Site Address: 666 Fitzwilliam St, Nanaimo, BC

Project No: 200777	**Scale:** Not to Scale	**Drawn By:** PF	**Date:** Sept 16, 2016

TOTAL SAFETY

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