CGI Municipal Consulting Services

2009

Fire Protection Service Study

Comox Valley Regional District
Black Creek – Oyster River
Fanny Bay
Denman Island
Hornby Island

NFPA® MEMBER 08-09

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EXECUTIVE SUMMARY

CGI Municipal Consulting Services have been retained to perform a Fire Underwriters Survey of specific communities in the Comox Valley Regional District. Since taking over the IAO in 2002, CGI Group Inc. has operated the Fire Underwriters Survey with the technical staff that were previously employed by the IAO.

Fire Underwriters Survey collects information on behalf of the insurance industry who use the information for rate making purposes. The system used by Fire Underwriters Survey to evaluate fire protection levels is a benchmark system that measures the fire risk level of a community and then measures the community's deficiency in its ability to provide the ideal response. The organization also provides advice and consulting services to government agencies providing fire protection.

This study is intended to provide a measurement of the current fire risk levels in four specified communities in the Comox Valley Regional District and a comparison of the risk level with the available resources for fire protection. The study is also intended to provide direction moving forward with regard to provision of fire protection services for each individual fire department.

In 2008 the Province of British Columbia restructured the Comox-Strathcona Regional District into two individual Regional Districts: the Comox Valley Regional District and the Strathcona Regional District. The Comox Valley Regional District operates five fire departments. Four of the five fire departments were reviewed. The four fire departments and their fire protection areas that were reviewed are the:

- Oyster River Fire/Rescue Department,
- Fanny Bay Volunteer Fire Department,
- Denman Island Volunteer Fire Department, and
- Hornby Island Volunteer Fire Department.

These fire departments are volunteer / paid on call departments and have been developed to serve the local population and commercial need in respect to each of their fire protection areas. The service levels have been developed to varying degrees.

The results of the study indicate that each of the fire departments are pro-actively improving the services they provide to their constituents. The result of the fire insurance grading review resulted in one community improving its Public Fire Protection Classification and the other three communities maintaining the grades they hold.

Table 1.1-1 Fire Protection Service Area Summary

Fire Protection Local Fire Service Area	Population estimate	Approximate Protection Area Size Sq. km	Basic Fire Flow[1] IGPM	Fire Force[2]	Fleet Summary	PFPC 2008	PFPC Previous
Black Creek – Oyster Bay	8,000 + 30% seasonal	66	1,500	36 Volunteer Fire Fighters	Front Line Pumper Second Line Pumper Rescue Apparatus Mobile Water Supply	6	7
Fanny Bay	700	8	1,500	16 Volunteer Fire Fighters	Front Line Pumper Mobile Water Supply	8	8
Denman Island	1,200 + 400 seasonal	52	1,300	18 Paid on Call Fire Fighters	Front Line Pumper Mobile Water Supply Pumper/Mobile Water Supply LAV Officer Vehicle	9	9
Hornby Island	1,044 winter + 5,000 seasonal	29	1,300	22 Volunteer Fire Fighters	Front Line Pumper Mobile Water Supply Rescue Apparatus Officer Vehicle	9	9

Water supplies for fire protection within each of the areas (if available) were reviewed. As a result of the fire insurance grading review two of the water distribution systems did not meet the minimum fire insurance grading requirements to be recognized. The two water systems were the Graham Lake Improvement District water system on Denman Island and the Watutco water system in Black Creek – Oyster Bay.

The study has determined that there are a number of options that would require varying levels of investment in fire protection services and water supplies for fire protection that would have varying effects on the fire insurance grades (and corresponding insurance capacities and rates) throughout each of the Fire Protection Local Service areas.

[1] BFF = Basic Fire Flows are based on Required Fire Flows calculated throughout the community. Typically, the Basic Fire Flow assigned to a community will be the 90th percentile highest required fire flow of all buildings that are protected.
[2] Not including probationary and junior fire fighters

1.0 FIRE INSURANCE GRADING

There are fire insurance grading standards and requirements that need consideration when developing the fire protective service structure and resources. “Recognition” of the fire protection by the fire insurance industry will reduce the cost of property insurance within the region, which will offset some of the capital and ongoing costs to operate the fire service. If no improvements to the current fire protection service level are made, development may be hampered by the cost of fire insurance underwriting and the increased difficulty in acquiring insurance.

To meet fire insurance grading requirements, a fire service needs to be organized and resourced at a level that is consistent with the fire hazard and life safety risk that exist within the service area. An assessment has been undertaken throughout the Comox Valley region (including forecasts of future buildings that are planned/expected to be constructed) to determine required fire flows and this has been used to estimate constructed fire risk and hazard levels that will exist within the foreseeable future (10 to 20 years). This analysis forms the basis of conclusions, recommendations and various options presented within the report.

1.1. Cost Benefits of Providing Fire Protective Services that Qualify for Fire Insurance Grading

Fire insurance grading requirements refer to the evaluation and classification of a community’s programs of fire protection versus the levels of fire risk and hazard that are present. Fire insurance grading classifications are used by fire insurance underwriters to assess the amount of risk they are willing to assume within a given community or class of business. The better the fire insurance grading classification is, the more competitive fire insurance rates tend to be, and the lower insurance premium rates generally are.

There are two fire insurance grading systems used in Canada today.

- The first, **Dwelling Protection Grade (DPG)**, applies to the protection a fire department is able to provide to single family and duplex residential dwellings. This system is used for **Personal Lines**[3] insurance.
- The second grading system, the **Public Fire Protection Classification (PFPC),** applies to all other structures such as commercial, multifamily residential and course of construction developments. The second grading system evaluates a community’s overall program of fire protection against the risk of a

[3] Personal Lines: Insurance covering the liability and property damage exposures of private individuals and their households as opposed to Commercial Lines. Typically includes all detached dwellings that are designated single family residential or duplex.

significant fire or life safety event occurring within a community. This system is used for **Commercial Lines**[4] insurance.

Fire Underwriters Survey[5], which is a division of the Insurers' Advisory Organization (IAO), conducts the fire insurance grading reviews of community fire protection and assigns insurance grading classifications based on the review. Fire Underwriters Survey requirements are being considered in the course of commenting upon the direction a proposed fire service should take. The IAO was recently acquired by CGI Group Inc., however the scope of the services provided by IAO and Fire Underwriters Survey has not been altered.

Currently, several areas under development do not have fire protection which means that construction contractors, residents, property and business owners are likely to pay the highest fire insurance rates for property and contents insurance as well as course of construction insurance. Additionally, it can mean that high-value properties may have to insure through multiple agencies as insurers set low capacities for insurance in communities without recognized fire protection.

One of the goals of this assessment is to assist stakeholders to understand fire insurance grading requirements such that they will be able to improve the fire insurance grading classifications and reduce the risk of fire losses and corresponding fire insurance costs. Investing in fire protection resources that meet fire insurance grading requirements is important to all concerned.

[4] Commercial Lines: A distinction marking property and liability coverage written for business or entrepreneurial interests (includes institutional, industrial, multi-family residential and all buildings other than detached dwellings that are designated single family residential or duplex) as opposed to Personal Lines.

[5] Fire Underwriters Survey is a national organization that represents more than 85 percent of the private sector property and casualty insurers in Canada. The Survey provides data to program subscribers regarding public fire protection for fire insurance statistical and underwriting evaluation. It also advises municipalities of deficiencies in their fire defences and recommends improvements to enable them to better deal with fire protection problems.
Qualified surveyors conduct full field surveys of the fire protection programs maintained in municipalities across Canada. The results of these surveys are used to establish the Public Fire Protection Classification (PFPC) for each community. The PFPC is also used by underwriters to determine the amount of risk they are willing to assume in a given community or section of a community.
The overall intent of the grading systems is to provide a measure of the ability of the protective facilities within a community to prevent and control the major fires that may be expected to occur by evaluating in detail the adequacy, reliability, strength and efficiency of these protective facilities.

Table 1.1-1 FUS Grades correlation to commonly used Insurance terminology and simplified grades

Personal Lines IBC Dwelling Protection Grades Statistical "5 tier" System.	System Used by Many Insurance Companies Underwriting "3 tier" system.	Insurance Companies refer to this grade as:
1 2 3A	Table 1	Protected
3B 4	Table 2	Semi - Protected
5	Table 3	Unprotected
Commercial Lines IBC Public Fire Protection Classification Statistical "10 tier" System.	**System Used by Many Insurance Companies Underwriting "3 tier" system.**	**Insurance Companies refer to this grade as:**
1 2 3 4	Table 1	Protected
5 6 7	Table 2	Semi - Protected
8 9 10	Table 3	Unprotected

Although all insurers utilize their own unique methods for calculating property insurance rates (based on their own profile and loss history), typically, fire protection insurance rating is divided into three major categories, Protected, Semi-Protected and Unprotected (as shown in Table 1.1-1) Each one of these benchmarks has its own class of insurance and communities moving from one rating to another typically experience a significant impact on insurance rates as well as insurance capacities. Notably, all insurers have their own interpretations of the significance of the grades and associated information such as apparatus, manpower, pump capacity, shuttle capacity, etc. it is also important to note that the DPG's shown in the table do not correlate to the PFPC's.

1.2. Response Distance and Coverage Standards

When considering the possible alignments and locations of fire protection assets in relation to the developments, it is important to factor in to the decision making process the effect that the location chosen will have on property insurance.

There are several important factors that are used in determining insurance rates for all types of properties. Although the specific methodologies may differ slightly, there are several key factors that due to their importance are weighted heavily in most systems. The type of department (volunteer, combination or career); the reliability and capacity of apparatus; and the response distance are among the most important factors.

Response distance from fire station to insured property has a large influence on the insurers calculation of rates. Most insurance rating systems utilize response distance categories. It is important to note that response distance (in conjunction with fire department type, volunteer or career) is used as general way of determining approximate response times.

Table 1.2-1 Response distance standards

	Personal Lines - DPG Response distance by road (km)	Commercial Lines - PFPC Response distance by road (km)	Downgrade FUS Classification
Ideal	5	2.5	0
Maximum	8	5	1 class
Rare / Rural	13	8	Unprotected or 2 classes[6]

Commercial lines insurers typically assign deficiencies to properties that are further than ideal. Notably, properties that are between 2.5 km and 5 km by road from the responding fire station may be rated as a FUS Class 1 level inferior to that assigned to the community, and a property located more than 5 km from the responding fire station may be rated as unprotected or in some cases may be rated as a FUS Class 2 levels inferior to that assigned to the community.

Personal Lines insurers typically do not downgrade the Dwelling Protection Grade for properties that are beyond the ideal response distance, however, properties beyond the maximum response distance will normally be treated as unprotected by insurers with the exception of insurers who specialize in rural risks.

[6] Properties beyond the maximum response distance of the responding fire station will typically be treated as unprotected by insurers, however some insurers who specialize in rural risks may downgrade 2 classes or offer a semi-protected rural rate.

1.3. Fire Protection Resource Distribution

Fire protection resource distribution and station location planning is a cornerstone of fire suppression strategy, influencing both the number of fire companies and the assignment of personnel, and thus the bulk of the fire department cost as well as its effectiveness. In developing a response to the community's fire protection needs, relative standards of fire protection should be considered. For new fire departments, the first standards that should be considered are those related to the fire insurance grading system as they will have a strong influence on the cost benefit of providing fire protection.

From the insurance industries perspective, all commercial buildings (all structures that are not insured under Personal Lines) within a community should be located within 2.5 kilometres by road of the fire station. All single family residential buildings should ideally be located no more than 5 kilometres by road of any fire station. The maximum acceptable response distances as set out by the Fire Underwriters Survey are five kilometres for commercial buildings and eight kilometres for single family residential.

2.0 PROJECT SCOPE AND METHODOLOGY

2.1. Project Objectives

The scope of this assignment was to conduct an assessment of four separate fire department's fire protection program, for two purposes being:

- To evaluate the community's fire protection needs, and
- To evaluate whether each of the community's fire insurance grading classifications need updating based on the current level of fire protection available to the community.

A supplementary objective was to provide direction to the Comox Valley Regional District as to where improvements to each of the community's fire protection programs could be made should fire insurance grading classifications remain status quo or be subject to downgrading.

The evaluation is intended to consider both current and future fire protection needs. The tasks and methodology used to conduct the assessment are listed below:

1. Community Risk and Hazard Assessment including:
   - Assessment of community profile
   - Profile and quantify hazard and risk
   - Assess planning methods for future growth

2. Fire Department Assessment including Assessments of:
   - Fire Department Profile
   - Operations and Administration
   - Apparatus and equipment
   - Distribution of resources
   - Pumping capacity
   - Maintenance programs
   - Staffing and personnel
   - Training programs
   - Pre-Incident Planning Program

3. Fire Safety Control Assessment.

4. Emergency Communications Assessment.

5. Water Supplies for Fire Protection Assessment:
   - Evaluate emergency water supplies capacity and storage

- Test water supplies at various representative points throughout system
- Analyze water system for weaknesses and lack of redundancy
- Compare available water supplies to combined domestic demand and calculated fire flow needs

6. Complete a Fire Insurance Grading Review of the each Community.

7. Develop Separate Reports that Include Findings and Recommendations for each Community.

3.0 FIRE PROTECTION ASSESSMENTS

3.1. Black Creek – Oyster Bay

Black Creek – Oyster Bay is located to the south of Campbell River and north of Courtenay on the east coast of Vancouver Island.

Black Creek – Oyster Bay has an approximate population of 8,000 and the population fluctuates with seasonal tourism. Black Creek – Oyster Bay resides in Electoral Area "C" of the Comox Valley Regional District.

3.1.1 Black Creek - Oyster Bay Risk Assessment

The Risk Assessment is an evaluation of the life safety risks, fire loading, and risk of fire that is present in a given area. The assessment is used to determine the "Basic Fire Flow" for the community which is the benchmark that the community's fire protection facilities are measured against.

Adequate response to a fire emergency is generally measured by the speed with which a responding fire fighting crew(s) can arrive at the fire emergency with the correct type and amount of resources to have a reasonable degree of opportunity to control or extinguish a fire. Simply put, the response provided by a fire fighting crew should equal the potential severity of the fire or fire emergency. The required response from a fire

fighting crew is greater if life safety is a factor in a fire event and the expected response time is shorter.

The potential severity of a fire event is generally associated with the fuel load present and exposures to the fire. Factors such as building construction materials; quality of construction; building renovation history; building size, height and age; occupancy and hazards associated with the occupancy, will all contribute to the potential severity of a fire. In addition, other buildings sufficiently exposed to a burning building can contribute to the magnitude of a fire and the resources necessary to be in place to control or extinguish a given fire. Alternatively, building controls and automatic fire protection systems (both active and passive) that limit fire spread will reduce the potential severity of a fire. For building controls to be considered effective, their design, installation, and maintenance must also be reviewed as any weak link may result in the system being ineffectual.

Much of the research into fire protection requirements for individual buildings and communities and the corresponding number of "*pumper companies*" and response times has been conducted by Fire Underwriters Survey and the National Fire Protection Association. Fire Underwriters Survey evaluates adequacy of response by comparing the potential severity of fires that may occur with a rating of the ability of fire crews and their resources responding within a specified time period relative to the fire and life safety risk potential that may be needed.

In a fire and life safety risk analysis, the fire service area is broken up into zones of fire emergency risk and hazard profiles. For this review, the fire protection needs of each community zone were evaluated. A fire and life safety risk analysis provides much of the data that is necessary to comment on the community's fire protection needs including fire apparatus requirements, fire equipment, and other areas of a community's fire protection programs.

Appendix A - Table of Effective Response, illustrates various sectors commonly found in most communities and indicates a range of risk ratings that are commonly applied to these sectors. The Table of Effective Response also indicates a range of fire flows that are normally associated with each community sector profile. Additionally, the Table of Effective Response indicates the number of pumper trucks, ladder trucks and associated companies that are expected to be needed to control and extinguish fires occurring within representative building zones throughout the community.

The number of fire companies that will be needed is correlated to fire loading within the community's building stock and to life safety risks present. Fire flow requirements are determined by construction characteristics, occupancy, size, and exposures to representative buildings throughout the community.

3.1.1.1. Fire Risk in Black Creek - Oyster Bay

Black Creek – Oyster Bay has been reviewed from the perspective of life safety, fire loading, fire risk, and response characteristics.

Each area of the Fire Protection Local Service Area has been reviewed with building risk assessments. Building Risk Assessment was performed at three levels of measure:

Occupancy Risk: Which is defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class. (Occupancy "Required Fire Flow")

Fire Flow Demand Zone: Which is an area used to define or limit the management of a risk situation. A fire flow demand zone can be a single building or a group of buildings. It is usually defined with geographical boundaries and also can be called fire management areas or fire management zones. (FFDZ "Required Fire Flow")

Community: Which is defined as the overall profile of the community based on the unique mixture of individual occupancy risks, fire flow demand zone risk levels and the level of service provided to mitigate those risk levels. ("Basic Fire Flow")

Black Creek - Oyster Bay has mainly single family residential, small mercantile, large farm buildings, and wildland urban interface. Numerous small commercial areas are situated throughout the Fire Protection Local Service Area. They include but are not limited to the:

- Black Creek Building Supplies,
- Black Creek Country Market,
- Black Creek Farm and Feed
- Driftwood Restaurant and Pacific Shore Centre,
- Discovery foods (small shopping centre), and
- Miracle Beach Landing with retail outlet, post office and recreational facilities.

Within the Black Creek – Oyster Bay Fire Protection Local Service Area is a private water purveyor known as Watutco. The water system serves an area that contains single family residential buildings up to 280 m^2 (3,000 ft^2), a marina, camp area with cabins approximately 45 m^2 (500 ft^2), and a motor home camp area. Laneways in the camp area are narrow, creating difficulties for fire fighting access and operations; additionally, it is unknown if these paved roads were designed to withstand the weight of a fully loaded fire apparatus. Roads serving the single family residential buildings were noted to be adequate for fire fighting access and operations.

Required fire flows for single family residential and duplex dwellings had Required Fire Flows in the range of 2,000 to 5,000 LPM (400 to 1,000 Igpm). Required Fire Flows for Commercial Lines insured risks, not one and two family residential dwellings, were in the range of 6,000 to over 9,000 LPM (1,300 to over 2,000 Igpm).

The community was (from the perspective of fire fighting response characteristics) identified as one “fire flow demand zone” organized as shown in Figure 3.1-1 Black Creek - Oyster Bay Fire Flow Demand Zones. To develop the required fire flow in the fire flow demand zone in Black Creek – Oyster Bay, the methodology described in Fire Underwriters Survey 1999 guideline “Water Supply for Public Fire Protection” was used. Refer to Appendix B.

Figure 3.1-1 Black Creek - Oyster Bay Fire Flow Demand Zones

Table 3.1-1 Black Creek - Oyster Bay Fire Flow Demand Zone

Black Creek - Oyster Bay Fire Flow Demand Zones	Fire Zone Risk Rating*	Final RFF LPM (Igpm)
1-2 storey single family residential, small mercantile, and agricultural buildings	3A	6,800 (1,500)

The required fire flows were calculated for a representative sampling of buildings as well as for a representative sampling of “construction parameter zones” based on Zoning Bylaws and local construction practices. The “fire flow demand zone” was assessed for primary zoning (industrial, commercial, residential, etc.) and for typical building construction.

The intent of setting the final required fire flows in this manner is not to provide adequate water supplies for the worst case scenario, but rather to provide adequate water supplies for fire fighting in the majority (90%) of structure fires (not including wild land urban interface fires). The final required fire flows are intended to be adequate for existing construction as well as new construction occurring in already built-up areas of the community.

It should also be noted that the required fire flows set by the Fire Underwriters Survey are intended as a benchmark that the community will be measured against. These fire flows are intended to be adequate to fight fires offensively, and to provide property protection (including exposure protection) in addition to life protection.

Final fire flows (with associated risk categories from FUS Table of Effective Response) for the fire flow demand zone is shown in Table 3.1-1 Black Creek - Oyster Bay Fire Flow Demand Zone Table 3.1-1 Black Creek - Oyster Bay Fire Flow Demand Zone.

The final fire flows are utilized with associated risk categories from Appendix A - Table of Effective Response to determine the appropriate level of response from Fire Departments, including items such as response times and apparatus requirements. These are also used to determine staffing requirements and optimal apparatus and fire station locations based on achieving the level of response indicated in the Table of Effective Response 90% of the time.

The Basic Fire Flow for Black Creek – Oyster Bay has been set at 6,800 LPM (1,500 Igpm) in 2008.

The past Basic Fire Flow for Black Creek – Oyster Bay was set at 6,800 LPM (1,500 Igpm) when fire insurance grades were last updated in 1981.

The benchmark requirements of this Basic Fire Flow from the Table of Effective Response are as shown in Table 3.1-2 Summary of Benchmark Requirements for Basic Fire Flow. The community is measured against these benchmarks to establish the fire insurance grading classification.

Table 3.1-2 Summary of Benchmark Requirements for Basic Fire Flow

Basic Fire Flow	1st Due Pumper	2nd Due Pumper	1st Due Ladder	Total Pumper Companies available	Minutes for all to arrive	Total Ladder Companies available	Minutes for all to arrive
6,800 LPM (1,500 Igpm)	3.5 minutes (2.7 km)	5 minutes (4.1 km)	NA	2 pumper companies	5 minutes (4.1 km)	NA	NA

Notably, the Basic Fire Flow of 6,800 LPM (1,500 Igpm) would not be adequate for the several risks in the Fire Protection Local Service Area. Some risks have required fire flows greater than 9,000 LPM (2,000 Igpm). Some of those risks include the Salmon Point Restaurant, the Black Creek Country Market, and several of the large farms situated in the Fire Protection Local Service Area.

It is important that the fire department and property owner be aware of the apparent risk resulting from the fire department potentially not having sufficient resources to adequately provide fire protection to risks with high required fire flows. To help alleviate

the need for the fire department to have numerous resources and provide adequate protection, mitigative measures should be considered to lower high required fire flows. The installation of active and passive fire protection systems (automatic fire suppression systems) may have a reducing effect on high required fire flows. Refer to Appendix C.

3.1.1.2. Future Fire Risk in Black Creek - Oyster Bay

The Basic Fire Flow of the community has been set at 6,800 LPM (1,500 Igpm). Currently, there are no future commercial developments that would increase the Basic Fire Flow of the community. If the built-up environment of Black Creek – Oyster Bay remains similar (building construction and size of buildings), the Basic Fire Flow is not expected to change. However, if the built-up environment changes with numerous developments larger in relation to what is already built within the Fire Protection Local Service Area (having Required Fire Flows greater than the Basic Fire Flow) then the Basic Fire Flow of Black Creek – Oyster Bay may be adjusted accordingly to reflect change when Black Creek – Oyster Bay's fire insurance grades are updated again.

Significant condo developments have been proposed at Salmon Point and at Saratoga Beach in the Fire Protection Local Service Area. With economic conditions being a concern the developments at Salmon Point and at Saratoga Beach may be delayed. If the economy improves there is anticipation that the developments may move forward. If developments proceed the fire department should consider calculating required fire flows for the risks to determine if the current resources of the fire department will be adequate to provide protection.

3.1.2 Oyster River Fire/Rescue Department Assessment

3.1.2.1. Fire Department Profile

The Oyster River Fire/Rescue Department is a volunteer fire department. There is a Fire Chief, a Deputy Chief, and six officers consisting of two captains, two lieutenants, a training officer, and an assistant training officer. The fire fighting roster consists of 6 officers and 28 firefighters. All members of the fire department live in Black Creek – Oyster Bay and the surrounding areas.

The area covered by the Oyster River Fire/Rescue Department is approximately 66 km^2.

3.1.2.2. Fire Department Operations and Administration

The Oyster River Fire/Rescue Department is operated and funded by property taxes paid through the Comox Valley Regional District. The regional district operates a total of five volunteer fire departments and has working agreements with member municipalities and improvement districts within the regional district to provide fire protection.

The Fire Chief and Deputy Chief receive “part time” remuneration.

Department records are maintained using Fire Pro software. Information pertaining to fire department operations and administration is recorded using the software.

The Oyster River Fire/Rescue Department is managed and organized by knowledgeable and hardworking individuals, including but not limited to:

- Niels Holbek, Chief Fire Official
- Bruce Green, Deputy Chief
- Len Johansen, Captain
- James Doberstien, Captain
- Chris Murray, Lieutenant
- Paul Theirault, Lieutenant
- Jake Nickel, Training Officer
- Lee Ginrich, Assistant Training Officer
- Bill Brundige, Secretary

3.1.2.3. Automatic and Mutual Aid Agreements

The Oyster River Fire/Rescue Department has an agreement with the Courtenay Fire Department. The agreement is as follows; if dispatch does not receive a response from the Oyster River Fire/Rescue Department within four minutes, the Courtenay Fire Department is to respond personnel appropriate to the nature of the call. The

Courtenay Fire Department covers the south section of the community, with the Oyster River being the boundary.

The agreement with the Campbell River Fire Department is to send 4 fully trained, paid on-duty firefighters after 4 minutes if the Oyster River Fire/Rescue Department has not responded. These firefighters respond from Station 1, located at 675 13th Ave, with a 7,500 LPM (1,650 Igpm) pumper, 2,270 litres (500 Imperial Gallon) tank apparatus. The Campbell River Fire Department covers the north section of the community, with the Oyster River being the boundary.

3.1.2.4. Fire Station Suitability

The Oyster River Fire/Rescue Department's fire hall is located at 2241 Catherwood Road and has been in use since January 2007. It is a brand new hall (as shown in Figure 3.1-3 Black Creek – Oyster Bay Fire Protection Local Service Area) that replaced the fire department's original hall that was constructed in 1976.

Figure 3.1-2 Oyster River Fire/Rescue Fire Hall

The fire department operates out of 5 bay doors measuring 4.3m x 4.3m (14' x 14'). The building is of ordinary construction with a metal roof. The construction is of a similar form to heavy timber construction with large wood beams that are resistant to early fire failure. The building is outfitted with a fire alarm system and intrusion protection. The building is constructed to Building Code post disaster specifications.

There is a 110 m^2 (1,200 ft^2) room that is intended for basic fire ground and medical training. Offices are provided for the Fire Chief, the Deputy Chief, and the Training Officer. Overall, this fire station is expected to meet all the requirements and needs of the Oyster River Fire/Rescue Department.

Figure 3.1-3 Black Creek - Oyster Bay Fire Protection Local Service Area

3.1.2.5. Training & Qualifications

Fire fighters go through a six month probation period and must complete module 2 from the Justice Institute of British Columbia. Live Fire training is conducted through the Comox Fire Training Centre. Five members of the department have recently completed Live Fire level 2.

All of the officers must have ICS 100, Emergency Management.

Training is conducted every Wednesday night for two hours. Training is not mandatory for the summer season. As a result, approximately 30 percent of the fire fighters turn out for training during this season. In the winter, approximately 60 percent of the fire fighters turn out for training.

Recommendation 3.1-1 Improve the Formal Training Program for Fire Fighters and Officers

The Oyster River Fire/Rescue Department has a formal training program. It is recommended that each firefighter attend the training sessions on a regular basis, year round to be able to perform all the activities during a fire ground operation. With the training sessions not being mandatory during the summer season, the firefighters that do not attend during the summer months may not be able to perform the fire ground operations as effectively as a firefighter who attends training 100% of the time, year round.

Steps should be taken to ensure that firefighters attend training sessions on a regular basis, year round.

To improve the overall effectiveness of the personnel on the fire department, the training program should be further developed to include setting a curriculum with qualitative and quantitative goals and benchmarks that each fire fighter and officer can work towards.

Two standards that would aid in developing an optimal curriculum would be NFPA 1001 *Standard for Fire Fighter Professional* Qualifications and NFPA 1021 *Standard for Fire Officer Professional Qualifications*. NFPA 1001 identifies the minimum job performance requirements (JPRs) for career and volunteer fire fighters whose duties are primarily structural in nature. NFPA 1021 identifies the performance requirements necessary to perform the duties of a fire officer and specifically identifies four levels of progression.

As well NFPA 1401 *Recommended Practice for Fire Service Training Reports and Records*, 2006 Edition, is recommended to be used by the establishment to upgrade or evaluate training records. Report systems should be developed to document clearly the performance and ability of individual and group activities related to the fire department.

3.1.2.6. Available Fire Force

The Oyster River Fire/Rescue Department is 100% volunteer with a total roster strength of 36, which includes the Fire Chief and the Deputy Chief.

Black Creek - Oyster Bay's Basic Fire Flow benchmark was set at 6,800 LPM (1,500 Igpm).

This benchmark includes two pumper companies being available to respond continuously, year round. An additional pumper company was determined to be required for adequate distribution. Explanation is provided in section 3.1.2.12 Distribution of Resources and Response Times.

For the purposes of fire insurance grading, the benchmark number of career fire fighters per company is six (including officers). Therefore, the benchmark number of career fire fighters that the Oyster River Fire/Rescue Department is measured against is 18 career fire fighters per shift (including officers), available continuously year round (day and night).

Where fire departments are operating with a volunteer roster, such as Oyster River, the Available Fire Forces for fire insurance grading purposes are calculated as follows:

- Each full time career fire fighter is credited as 1 fire fighter.
- Fire chiefs and deputy chiefs are not typically credited as fire fighters unless they normally participate in fire ground duties.

Fire Fighter Equivalent Units (FFEU)[7]

- 1 FFEU is credited for every 3 off-shift career fire fighters who are scheduled to respond
- 1 FFEU is credited for every 4 off-shift career fire fighters who are not scheduled to respond, but are available to respond
- 1 FFEU is credited for every 3 paid-on-call or volunteer fire fighters (based on the average turn-out to fires)
- 1 FFEU is credited for every 6 paid-on-call or volunteer fire fighter (based on a conservative assumption that 50 percent of the fire department roster responds to structural fires (if no statistical data was available)
- Support capacity from mutual and automatic aid companies is credited on a different schedule

Note that probationary fire fighters (incomplete training) and junior fire fighters (under age) are not credited due to lack of active fire ground duties.

[7] The sum of all such equivalent fire fighter units (including those from automatic and mutual aid) shall not exceed 50% of the lesser of

a) the required strength of existing companies (@ 6 fire fighters per company),
or
b) the required strength of required companies (based on the Table of Effective Response @ 6 fire fighters per company).

The Oyster River Fire/Rescue Department roster includes the following:

Table 3.1-3 Oyster River Fire Fighting Manpower Summary

	Fire Stn	Firefighter Equivalent Units (FFEU)
Fire Chief	1	0.3
Deputy Chief	1	0.3
Line Officers	6	2
Fire Fighters	28	9.3
Prob. Fire Fighters / Auxiliary	0	0
	Total:	12

Credit was given for the Chief and Deputy Chief because they participate in fire ground duties.

The average turnout of fire fighters to structural fires for the Oyster River Fire/Rescue Department was not known so a conservative estimate of 50% of the total FFEU is used for determining credit for the number of fire fighters (including officers) responding.

The credited available fire force (FFEU) for the Oyster River Fire/Rescue Department is then:

50% of the Total FFEU = 6 FFEU

Additional support fire fighter equivalent units have been provided for mutual aid that is available to Oyster River Fire/Rescue Department as follows:

- Aid from the Courtenay Fire Department responds with 2 officers and 4 paid on call volunteer fire fighters = 2 FFEU in hydrant protected areas.
- If the fire call is not in the hydrant protected area, a mobile water supply with 2 fire fighters is sent in addition to the 2 officers and 4 paid on call members = 0.66 FFEU

Total aid credited from the Courtenay Fire Department = 2.66 FFEU

- Aid from the Campbell River Fire Department responds with 2 officers and 4 paid on-duty firefighters = 2 FFEU

This aid credit is based on the following assumptions:

a) Aid will come from either station if the Oyster River Fire/Rescue Department has not responded to dispatch within 4 minutes
b) The Oyster River is a physical boundary to distinguish which department will respond in order to provide fire protection.
    - Fire calls north of Oyster River are dispatched to the Campbell River Fire Department
    - Fire calls south of the Oyster River are dispatched to the Courtenay Fire Department

Total aid credited from both fire stations will be the average of both responses = 2.33 FFEU

The total Equivalent Fire Fighter Units in the available Fire Force for Black Creek - Oyster River is:

6 FFEU + 2.3 FFEU = 8.3 FFEU

The benchmark fire force is based on a Basic Fire Flow of 6,800 LPM (1,500 Igpm), which includes 18 career fire fighters on duty 24 hours a day. The Oyster River Fire/Rescue Department received credit for 8.3 career fire fighters that are able to respond continuously year round. Additional credit can be awarded in this area of the fire insurance grading, up to a maximum of 18.

It is important to note that the level of credit received is not uncommon for a volunteer fire department.

Recommendation 3.1-2 Improve available fire force level

The Oyster River Fire/Rescue Department received credit for 8.3 career fire fighters out of the maximum permissible 18 that can be received in this area of the fire insurance grading. It is important to note that the maximum permissible credit of 18 career fire fighters on duty 24 hours per day 365 days of the year is needed for achieving the best possible PFPC grade.

To help improve the relative classification of the fire department within the fire insurance grading, the Oyster River Fire/Rescue Department should increase its available fire force by acquiring additional volunteers to respond to fire calls, or provide career staffing. Note that the available fire forces can be improved through additional volunteers up to 50 percent of the required fire force. For Oyster River, the maximum available fire force that can be provided through volunteers is 9.

Providing career staffing is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.1.2.7. Oyster River Fire Apparatus

Fire departments are evaluated for the number of pumper and ladder companies in service relative to the overall fire potential and the area being protected. Pumper and ladder companies are required to be adequately staffed in order to receive full credit.

The Oyster River Fire/Rescue Department apparatus fleet includes:

Table 3.1-4 Oyster River Fire/Rescue Apparatus Summary

Unit #	Year	Vehicle Type	Pump Capacity IGPM	Tank Capacity Imp. Gal	Manufacturer	ULC Plate #	Age (2008)
41	1994	Pumper	1,050	900	Volvo/Superior	7625C	14
42	1999	Pumper	1,050	1,000	International/Superior	278C	9
43	2003	Rescue	-	-	Ford F550	-	5
44	1995	Mobile Water Supply	-	3,500	Volvo	-	13

3.1.2.8. Ladder Service

Fire fighting and rescue operations involving buildings greater than two storeys in height typically involve ladders, elevated master stream devices, and similar equipment. Industrial occupancies also often require elevated master streams for safe firefighting.

The number of ladder trucks required to be in service (ladder companies) for fire insurance grading is determined mainly by use of the Table of Effective Response.

A ladder company is required when a municipality has five buildings that are three storeys or higher, five buildings which have a required fire flow of 15,000 LPM (3,300 Igpm) or more, or a combination of these.

The number of ladder companies in service and regularly responding to alarms shall be sufficient to properly protect the municipality. The Table of Effective Response with its accompanying notes provides the criteria to be applied.

Each required ladder company shall be provided with a ladder truck, equipped with an aerial ladder, boom with ladder or elevating platform, and elevated master stream capability.

The Basic Fire Flow for Black Creek – Oyster River is set at 6,800 LPM (1,500 Igpm). Black Creek – Oyster River does not have five buildings over three storeys or higher, or five buildings that have a Required Fire Flow of 15,000 LPM (3,300 Igpm) or more, or a combination of both. The Oyster River Fire/Rescue Department is not required to have a ladder apparatus for fire insurance grading.

3.1.2.9. Credit for Fire Apparatus in Service

The benchmark number of pumper and ladder companies needed to be available based on a Basic Fire Flow of 6,800 LPM (1,500 Igpm) is two pumper companies referenced from the Table of Effective Response. Additionally, one reserve pumper company is required for each eight required pumpers in service. A one company fire department requires a reserve pumper for fire insurance grading.

An additional pumper company was determined to be required for adequate response in the Fire Protection Local Service Area. Further explanation is provided in section 3.1.2.12 Distribution of Resources and Response Times.

The maximum acceptable age of apparatus specified in the fire insurance grading index is 20 years. Apparatus is occasionally accepted beyond the age of 20 years for small communities where it may be too financially onerous to acquire newer apparatus. This extension of the usable life of the apparatus is subject to the apparatus and pumps being in good condition (with limited down-time) and being tested regularly. Application for extension of recognized usable life of apparatus for insurance grading purposes should be made in writing to the offices of the Fire Underwriters Survey. Test results should accompany applications for extension.

Apparatus beyond 30 years in age cannot be credited for fire insurance grading purposes due to lack of reliability. Refer to Appendix D.

Table 3.1-5 Credit for Oyster River Fire Apparatus in Service

Unit #	Vehicle Type	Apparatus Credit	Pumper Credit	Ladder Credit	Reserve Credit	Tanker Credit
41	Pumper	100% Pumper	1	0	0	0
42	Pumper	100% Pumper	1	0	0	0
43	Rescue	-	0	0	0	
44	Mobile Water Supply	100% Tanker	0	0	0	1
		Total Pumper Credit	2	-	-	-
		Total Ladder Credit	-	-	-	-
		Total Reserve Credit	-	-	0	-
		Total Tanker Credit	-	-	-	1
Table of Effective Response – BFF 6,800 LPM (1,500 Igpm)			3	-	1	

The Oyster River Fire/Rescue Department received credit for 2 pumper companies out of the max permissible credit of 3 pumper companies within the fire insurance grading.

Support company credit was available to the Oyster River Fire/Rescue Department. Support company credit is limited to a maximum of 33 percent.

Support company credit has been provided for mutual aid that is available to Oyster River Fire Rescue Department is as follows:

- Aid from the Courtenay Fire Department responds to hydrant areas of the Black Creek – Oyster Bay Fire Protection Local Service Area, with two pumper apparatus.
- If the fire call is not in the hydrant protected area of the Black Creek – Oyster Bay Fire Protection Local Service Area, two pumper apparatus and a mobile water supply respond.

- Aid from the Campbell River Fire Department responds with one pumper apparatus.

This aid credit is based on the following assumptions:

a) Aid will come from either station if the Oyster River Fire/Rescue Department has not responded to dispatch within 4 minutes
b) The Oyster River is a physical boundary to distinguish which department will respond in order to provide fire protection. Fire calls north of Oyster River are dispatched to the Campbell River Fire Department
c) Fire calls south of the Oyster River are dispatched to the Courtenay Fire Department

The Oyster River Fire/Rescue Department received credit for the aid coming from Courtenay and Campbell River. Credit for one pumper company was received for the mutual aid. Credit was not combined between the two aid agreements because they only service certain areas of the Fire Protection Local Service Area.

The Oyster River Fire/Rescue Department received an additional 0.33 credit of a pumper company.

The Oyster River Fire/Rescue Department received 78 percent credit for the number of needed pumper companies based on the Basic Fire Flow set out in the Table of Effective Response and an additional pumper company required for adequate distribution. Credit has not been awarded for any reserve apparatus that is available to the Oyster River Fire/Rescue Department.

Adding additional apparatus without the human resources required to operate the apparatus would not be recommended. Consideration should be given to adding pumper companies once the available fire forces have been increased to a level that would support an additional company.

Recommendation 3.1-3 Acquire Additional Apparatus

The Oyster River Fire/Rescue Fire Department received full credit for the two pumper company and an additional 0.33 credit for mutual aid assistance. To receive maximum credit when the Basic Fire Flow for Black Creek – Oyster River has been set at 6,800 LPM (1,500 Igpm), an additional pumper company and reserve pumper is needed. The benchmark requires two pumper companies, as well as an additional pumper for distribution, and one reserve apparatus. In order for the Oyster River Fire/Rescue Department to receive maximum credit in its total pumper companies, it is recommended that an additional pumper company apparatus be acquired.

Acquiring additional apparatus with a credited pump capacity will help the fire department receive additional credit in its pump capacity and it will provide the needed distribution to meet the second due pumper company.

It should be noted that for a pumper company to be recognized within the fire insurance grading it should meet the following requirements:

- ULC listed
- Meet the general requirements of NFPA 1901 *Standard for Automotive Fire Apparatus,* recent edition
- Have a permanently mounted pump with a capacity of at least 3,000 LPM (660 IGPM)
- Have a water tank capacity of at least 1,100 Litres (242 IGAL)
- Have a sufficient amount of hose

In order for the apparatus to be recognized, it must be stored and housed in a facility suitable for the fire departments needs. The storage facility should be of adequate construction, heated, and contain all the necessary tools and equipment required for fire fighting. Additionally, fire fighters should be able to respond to the building within a reasonable time. It is important to note that within the fire insurance grading, each apparatus should be supported by a company (6 fire fighters) that is fully trained and equipped.

Providing additional apparatus is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.1.2.10. Pumping Capacity Credit

The total credited Pump Capacity is calculated for comparison to the Basic Fire Flow for the community. The calculation is conducted as follows:

$$PC_{Total} = PC_{Primary} + PC_{Support}$$

PC_{Total} = Total Credited Pump Capacity
$PC_{Primary}$ = Primary Pump Capacity (local to the specific station)
$PC_{Support}$ = Support Pump Capacity (coming from other areas/stations)

Primary Pump Capacity (Primary PC) is set by taking the sum of the rated capacities of the pumpers in the station and downgrading from 100% of the rated capacities based on reliability factors (including but not limited to age, quality, listing, and pump test results).

Table 3.1-6 Pumping Capacity Credit Summary

Unit #	Vehicle Type	Pump (IGPM)	Tank Imp. Gal	Pump Capacity Credit %	Credited Pump Capacity (IGPM)
41	Pumper	1,050	900	100%	1,050
42	Pumper	1,050	1,000	100%	1,050
43	Rescue	-	-	-	-
44	Mobile Water Supply	-	3,500	-	-
				Total Credited Pump Capacity:	2,100

Support Pump Capacity is available to the Oyster River Fire/Rescue Department. Additional pump capacity can be received from support to a maximum of 33 percent.

Support pumping credit has been provided for mutual aid available to Oyster River Fire/Rescue Department as follows:

- Aid from the Courtenay Fire Department responds to hydrant areas of the Black Creek – Oyster River Fire Protection Local Service Area, two pumper apparatus.
- If fire call is not in the hydrant protected area of the Black Creek – Oyster River Fire Protection Local Service Area, two pumper apparatus and a mobile water supply respond
- Aid from the Campbell River Fire Department responds with one pumper apparatus

The Oyster River Fire/Rescue Department received credit for an additional pumper apparatus with a pumping capacity of 4,773 LPM (1,050 Igpm). The Oyster River Fire Rescue Department received an additional 1577 LPM (347 Igpm) towards pump capacity.

The credited pump capacity of the fire department is 11,124 LPM (2,447 Igpm). The Basic Fire Flow for the community has been set at 6,800 LPM (1,500 Igpm) and therefore the Oyster River Fire Department received maximum credit towards pump capacity in this area of fire insurance grading of the fire department.

3.1.2.11. Apparatus Maintenance Programs

The fire department has a heavy duty mechanic on its roster that is able to conduct minor repairs and maintenance of the apparatus in the fire hall. Pre-inspections of the apparatus are conducted at least every Wednesday night, during training. More thorough inspections are conducted on a monthly basis.

Fire department apparatus receive an annual service and inspection at licensed facilities in either Campbell River or Courtenay. Any major repairs, if required, are done at these facilities.

Pumps are serviced annually by Profire Emergency Services. The results of these tests have been submitted to the Fire Underwriters Survey.

3.1.2.12. Distribution of Resources and Response Times

Resources for fire fighting are centrally located in the Fire Protection Local Service Area. The majority of the risks in the Black Creek – Oyster Bay Fire Protection Local Service Area are single family residential and are generally within 8 km of the fire hall. The few commercial risks in the fire protection area are generally located within the first due Pumper Company and the second due Pumper Company response.

Through analysis a portion of the fire protection area that consists of single family residential dwellings is beyond 8 km in road travel from the Black Creek – Oyster River fire hall. As well, there are several Commercial Lines insured risks[8] that are located beyond both the first due pumper and the second due pumper response distance.

The adequate response distances for the first and second due pumper companies for fire insurance grading purposes are based off the following formula:

$$D(km) = \frac{\left[T(\min) - 0.65(\min)\right]}{1.065(\min/\,km)}$$

Where:
D = total distance in kilometres
T = time in minutes

Black Creek – Oyster Bay has a Basic Fire Flow of 6,800 LPM (1,500 Igpm). Appendix A, "Fire Underwriters Survey – Table of Effective Response" illustrates that the first due Pumper Company should respond within 3.5 minutes and the second due Pumper Company should respond within 5 minutes.

Applying these response times to the equation above will provide a first due pumper response of 2.7 km, and a second due pumper response of 4.1 km.

[8] Commercial risks are buildings that are insured under commercial lines insurance. These include multi-family residential, commercial, industrial, institutional buildings, and construction developments.

Figure 3.1-4 First Due Pumper Response Distance - 2.7 km

Figure 3.1-4 First Due Pumper Response Distance - 2.7 km illustrates the general area in the fire protection area that is covered by the first due pumper company.

Figure 3.1-5 Second Due Pumper Response Distance - 4.1 km

Figure 3.1-5 Second Due Pumper Response Distance - 4.1 km illustrates the general area in the fire protection area that is covered by the second due pumper company.

Figure 3.1-6 8 km Response Distance

Figure 3.1-6 8 km Response Distance illustrates the approximate travel distance from the Black Creek – Oyster River Fire Hall. The 8 km response distance covers approximately 85 percent of the Fire Protection Local Service Area. The areas circled in Figure 3.1-6 represent areas of the fire protection area that are outside of the 8 km response. Single family residential dwellings insured under Personal Lines would be deemed unprotected and receive a Dwelling Protection Grade 5.

It was determined in the fire insurance grading that the Oyster River Fire/Rescue Department would require one additional pumper apparatus to satisfy coverage of 90 to 95 percent of the risks in the fire protection area. A satellite fire hall for the apparatus would be the optimal solution and would greatly improve the fire protection for property owners who are further than 8 km from the Oyster River Fire Hall. Additionally, a mobile water supply apparatus (tanker) would greatly add to the protection in order to meet the requirements for a Dwelling Protection Grade 3B, because the area does not have a water supply for fire protection. Other fire insurance grading requirements may exist, such as available fire forces to respond to the area specifically to receive recognition.

If a satellite fire hall is positioned in the largest circle, road networks may allow faster response to the small circle than response from the Oyster River Fire Hall. The area is single family residential and some properties may not be within 8 km in road travel

distance. If a satellite fire hall and additional apparatus be acquired the Oyster River Fire/Rescue Department would be satisfying coverage in the 95 percent range of the fire protection area.

Recommendation 3.1-4 Provide Additional Apparatus in Order to Ensure Adequate Distribution of Apparatus

The Oyster River Fire/Rescue Department was determined to require an additional pumper apparatus to cover 90 to 95 percent of the risks within the Fire Protection Local Service Area. Highlighted areas in Figure 3.1-6 show where properties insured under Personal Lines are beyond 8 km in road travel distance from the fire hall.

In order for property owners insured under Personal Lines to receive a reasonable level of fire protection from the fire department, it is recommended that an additional apparatus be acquired to satisfy the overall distribution of apparatus. This can be achieved with an additional pumper apparatus and associated pumper company (six fire fighters). It is important to note that each apparatus is required to be supported by a company (6 firefighters) that is fully trained and equipped.

An initial attack apparatus may be substituted for the pumper company when it is supported by a pumper company from the primary hall for hydrant protected areas. A pumper company and a mobile water supply apparatus would be needed for support for non hydrant protected areas. Placement of a satellite fire hall with an initial attack vehicle may receive partial credit within the fire insurance grading for distribution of resources. Assigned duty crews are required for satellite fire hall response.

Providing additional apparatus and resources for adequate distribution is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.1.2.13. Fire Fighting Ancillary Equipment and Hose

The fire department's apparatus and fire station have a combination of miscellaneous tools that meet the needs of the fire apparatus companies. These tools include but are not limited to rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc. The Oyster River Fire/Rescue Department's equipment for pumper apparatus is adequate.

Oyster River Fire/Rescue Department has a reasonable amount of hose for the number of apparatus in the fleet, however some deficiencies were noted.

Table 3.1-7 Fire Fighting Hose

Unit #	Apparatus	Amount of Hose			
		Booster	38 mm	65 mm	100 mm
41	Pumper	-	215 m	150 m	300 m
42	Pumper	-	215 m	150 m	300 m
43	Rescue	-	-	-	-
44	Mobile Water Supply	-	-	-	-
	Total	-	430 m	300 m	600 m
	Recommended Per Pumper Company	60 m	180 m	360 m	300 m
	Spare Hose in Station	0 m	610 m	381 m	0 m
	Recommended Full Compliment	60 m	180 m	360 m	300 m

The Oyster River Fire/Rescue Department has adequate equipment for drying hose. The fire department does not have a hose drying tower, however within the fire hall it has heated hose drying racks. Fire hose is inspected and tested according to NFPA standards by the fire department using testing equipment from the Courtenay Fire Department.

Recommendation 3.1-5 Improve amount of Spare Fire Hose in Hall

To provide a reasonable level of fire protection throughout the community, there should be a full complement of spare hose available to the fire department. In the event that the hose on the apparatus is being tested or serviced, the fire department should have additional spare hose. By having spare hose, the in service apparatus will have adequate tools and equipment available during fire ground operations.

The Oyster River Fire/Rescue Department has received minimal credit for the amount of spare hose that is available. Additional credit can be awarded by providing additional spare hose. To receive full credit for spare hose a full compliment should be kept for each amount of hose stored on apparatus.

If spare hose exists in the fire hall, amounts should be submitted to the Fire Underwriters Survey to make appropriate adjustments to fire insurance grading.

3.1.2.14. Personal Protective Clothing and Equipment

The Fire Department has a total of 38 sets of personal protective clothing (PPC) that is generally replaced every 10 years. Inspections are conducted every Wednesday night. Each member is responsible for the inspection of their personal protective clothing. The clothing is sent to Campbell River for cleaning.

There are a total of 18 sets of Self Contained Breathing Apparatus (SCBA) and a total of 17 spare bottles. The fire department has an air compressor that is serviced by Irwin Air Ltd.

3.1.2.15. Planned Responses

The Oyster River Fire/Rescue department response plan is to respond with all apparatus as manpower permits.

3.1.2.16. Pre-Incident Planning

There are a limited number of risks in the community that require pre-planning. The fire department has 5 buildings that are pre planned and reviewed during training. These plans are available on the duty officer vehicle and the chief's vehicle. The fire department does not have access to NFPA 1620 *Recommended Practice for Pre-Incident Planning*.

Recommendation 3.1-6 Develop and implement Pre-Incident (pre-fire) Planning Program

It is recommended that the fire department set a timeline and develop an action plan for the development and implementation of a comprehensive Pre-Incident (pre-fire) Planning Program. Acquire access to NFPA 1620, *Recommended Practice for Pre-Incident Planning 2003 Edition* and develop pre-plans accordingly.

Developing and implementing a pre-incident planning program has multiple benefits that include but are not limited to:

- Increasing the familiarity fire fighters have with buildings in the community.
- Determining apparatus staging areas allowing quicker set-up times.
- Determining the overall accessibility for fire apparatus to get to risk and set up.
- Identifying hazards in and around the risk that may warrant defensive tactics.
- Identifying available water resources in the vicinity of the risk (example: fire hydrants, ponds, cisterns, dry hydrant, etc).

Credit awarded in the fire insurance grading of the fire department's pre-incident planning program may help to improve the overall fire insurance grade of the community.

3.1.2.17. Fire Department Assessment within the Fire Insurance Grading

The Fire Department Assessment contributes 40% to the total Public Fire Protection Classification grade of the community. This is the most heavily weighted portion of the grading and as such is considered to be the most significant indicator of a community's overall preparedness for dealing with fire emergencies.

The relative classification of the fire department is currently a 6 of out 10. The areas where the least amount of credit was received in the fire insurance grading of the fire department were:

- Fire Department Available Fire Force,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

3.1.3 Black Creek - Oyster Bay Fire Safety Control

Fire Safety Control including Building and Fire Code effectiveness has become an increasingly heavily weighted portion of the fire insurance grading system. This is a result of statistical data showing that communities employing effective programs in these areas have significantly reduced fire related losses.

Black Creek - Oyster Bay has been reviewed in the effectiveness of its practices with regard to Fire Safety Control.

3.1.3.1. Codes and Bylaws: Construction Control, Plan Review, Building Inspection, and Permit Process

The building inspector is an employee of the Comox Valley Regional District. The Comox Valley Regional District provides Building Permits and reviews plans, etc. for new construction. The Comox Valley Regional District also governs re-zoning applications.

Key Codes and Standards:

National: National Building Code
National Fire Code

Provincial: British Columbia Building Code
British Columbia Fire Code

Municipal: Bylaw #2781 – Comox Valley Zoning Blyaw
Bylaw #1404 – Campbell River Area Zoning Bylaw

3.1.3.2. Automatic Sprinkler Protection

No sprinkler by-law is in effect in Black Creek – Oyster River Fire Protection Area. Fire protection sprinklers are included in design only where required by the Building Code or where the designer includes protection voluntarily.

Automatic fire protection sprinklers have been installed in some buildings throughout the community. However, automatic sprinkler protection systems are typically only installed where required by the BC Building Code. The BC Building Code is the minimum standard and does not require sprinkler systems to be installed in many occupancies. Additionally, the BC Building Code does not require pre-existing buildings to be brought up to meet current code requirements. As such, many buildings throughout the community are not sprinkler protected.

Sprinkler protection (when designed and installed in accordance with NFPA 13 and maintained in accordance with NFPA 25) is widely accepted as one of the most effective methods of reducing fire risk in buildings and communities. Properly designed, installed

and maintained sprinkler systems have been shown statistically to reduce fire losses significantly and reduce the number of lives lost to fire.

Recommendation 3.1-7 Implement Sprinkler Bylaw

To reduce fire risk and improve life safety, the community should implement a Sprinkler Bylaw that requires all new buildings (excluding single family residential) to be sprinkler protected, and consider a Sprinkler Retrofit Bylaw that requires all pre-existing "high-risk" buildings/occupancies to be sprinkler protected (where high-risk is defined as buildings/occupancies that are currently required to be designed with sprinkler protection in the BC Building Code).

Additionally, consideration should be given to requiring all fire protection sprinkler systems to be plan checked by the Authority Having Jurisdiction (qualified plan examiner from the Comox Valley Regional District or other qualified third party).

Over the long term, the community should consider implementation of a Sprinkler Bylaw that includes all buildings.

3.1.3.3. Code Enforcement, Inspections and Local Assistants to the Fire Commissioner

Building inspections are conducted by the Comox Valley Regional District. Annual inspections are not conducted on a regular basis; as a result, a significant number of buildings throughout the regional district may have a greater risk of fire. When considering the significance of the wildland urban interface, the potential for a structure fire to spread to the interface increases.

Recommendation 3.1-8 Develop and Implement an Official Fire Prevention Program

To improve the level of fire prevention and reduce the overall fire risk in the community, it is recommended that the Fire Prevention Inspection Program be improved by increasing the minimum number of inspections for all commercially insured buildings.

The number of inspections conducted should be based on the type of occupancy and the risk associated with it. Occupancies at a higher risk of fire should have more frequent inspections compared to occupancies with a low risk of fire.

Increasing the inspection frequencies will help reduce the risks throughout the community, additionally, it will help reduce the development of any hazards/risks that would cause damage to buildings and endanger the lives of the occupants and the firefighters.

In order for the inspections to be considered effective, there should be an Enforcement Program. Once inspections have been completed, an inspector should return to that

building within a reasonable time frame, and confirm whether or not the building owner has addressed the infractions. If the infractions have not been addressed, then steps should be taken to ensure that the building owner does comply with the inspectors concerns. Refer to Appendix E for recommended inspection frequency.

The fire department should request that the Regional District provide fire prevention inspections to commercial occupancies in the Black Creek – Oyster River Fire Protection Local Service Area.

3.1.3.4. Public Education Program

The public education portion of the fire prevention section is an effective method for an all volunteer fire department to help lower the fire insurance grade and to raise awareness in the community about fire safety.

Fire prevention activities that the Oyster River Fire/Rescue Department takes part in include:

- Fire Prevention Week
- Fire Safety House
- Fire Expo
- School events

Recommendation 3.1-9 Develop and Implement Public Education Programs

To improve the level of fire consciousness throughout the community and to reduce the risk of fires, a formal public education program should be developed. A public education program can also be an excellent public relations tool and can be used to improve fire fighter recruitment within the community as well.

The Public Education Program should include promotion and development of various elements such as:

- Smoke Alarm Installation Program
- Hold Regular Fire Department Open Houses
- Host School Classroom Visits in the Fire Department
- Host Regular Community-Wide Fire Drills

The Program should also include promotion of Educational Programs/Materials such as the following (but not limited to):

- Fire Prevention Canada
- Fire Safety Information - (including PSAs)
- Home Fire Escape Plan Worksheet (PDF 207 kB)
- Learn Not to Burn® (LNTB®)
- Older & Wiser
- Kitchen Care Fire Safety Program
- "Use Candles with Care"
- The Arson Prevention Program for Children (TAPP-C)

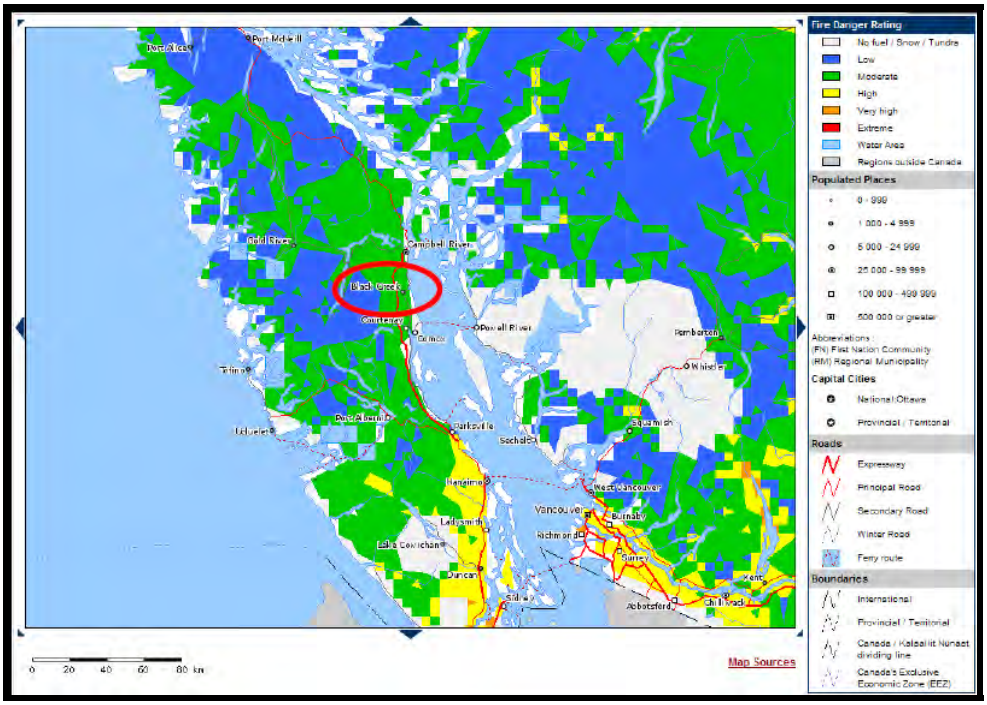
- Risk Watch™
- Fire Safety Teacher Awards
- FNESS

3.1.3.5. Wildland Urban Interface Risk Reduction

Throughout the entire regional district, Wildland Urban Interface is a major concern for all the fire departments. During the survey there was a fire ban in place which was enforced through signs throughout the community.

The Oyster River Fire/Rescue Department is equipped with a Wildfire Trailer. The trailer is equipped with:

- 20 sets of coveralls
- 20 hard hats
- 20 pairs of gloves
- Chain saw
- Shovels
- Pick axes
- Other miscellaneous equipment required for wildland firefighting.



3.1.3.6. Fire Prevention and Fire Safety Control within the Fire Insurance Grading

Fire Prevention and Fire Safety Control Programs contribute 20% to the total Public Fire Protection Classification grade of the community. The relative classification of the fire safety control program is currently 7 out of 10.

3.1.4 Black Creek - Oyster Bay Emergency Communications

3.1.4.1. Emergency Communications System Description

Emergency Communications is provided by North Island 911 Corporation. The initial answering point for public safety calls is the RCMP Operational Communications Centre in Courtenay. Fire calls are relayed to the fire dispatch centre in Campbell River. All police calls are handled by the RCMP OCC in Courtenay. All ambulance calls are relayed to the B.C. Ambulance Service in Victoria.

For full information regarding the emergency communication centres in Courtenay and Campbell River refer to section 4 Emergency Communications.

3.1.4.2. Fire Department Communications

Fire fighting personnel of the Oyster River Fire/Rescue Department are alerted to emergencies via voice pagers and home radio/scanners.

The Oyster River Fire/Rescue Department utilizes permanently mounted and portable radio equipment to receive emergency information and communicate between personnel on the fire ground during an emergency situation. The department possesses approximately 15 portable radios. Portable radios are provided on each of the department's fire apparatus. A base radio station is provided in the Black Creek – Oyster River Fire Hall. Stand-by power is available for the base radio and for charging portable radios. A repeater system is provided to provide continuous use of the emergency communications systems in place. No Dead spots exist within the Fire Protection Local Service Area where communication could become limited.

3.1.4.3. Emergency Communication within the Fire Insurance Grading

Emergency communications contribute 10% of the overall Public Fire Protection Classification grade of the community. The emergency communications program of Black Creek – Oyster Bay has a relative classification of 3 out of 10.

3.1.5 Black Creek - Oyster Bay Water Supplies for Fire Protection

Water supplies for fire fighting are a critical component of the community's fire defence systems. Water supplies for fire fighting were evaluated for adequacy in several areas including but not limited to:

- Fire Flow Delivery – the ability of the water system to deliver the *Required Fire Flows* (from Section 3.1.1.1 Fire Risk in Black Creek - Oyster Bay) to each identified *Fire Flow Demand Zone*
- Storage Adequacy – quantity of stored water reasonable for expected demands and duration of appropriate flows during expected fire events
- Distribution System Adequacy – layout and arrangement of piping and pump capabilities, looping/grid design of pipe networks for maximum versatility and minimum losses
- Hydrant Distribution – appropriate spacing and distribution to minimize hose lays and other delays in setting up an initial attack during structure fires
- System Design and Installation – the overall design of the system with regard to redundancy and capability to continuously provide full service to all areas during all foreseeable events (including catastrophic events and/or perils)
- Maintenance of System and Components – system and component maintenance meets recognized standards and improved reliability of system

This section highlights some of the significant findings of the fire insurance grading emergency water supply review. Areas where improvements can be made have been noted.

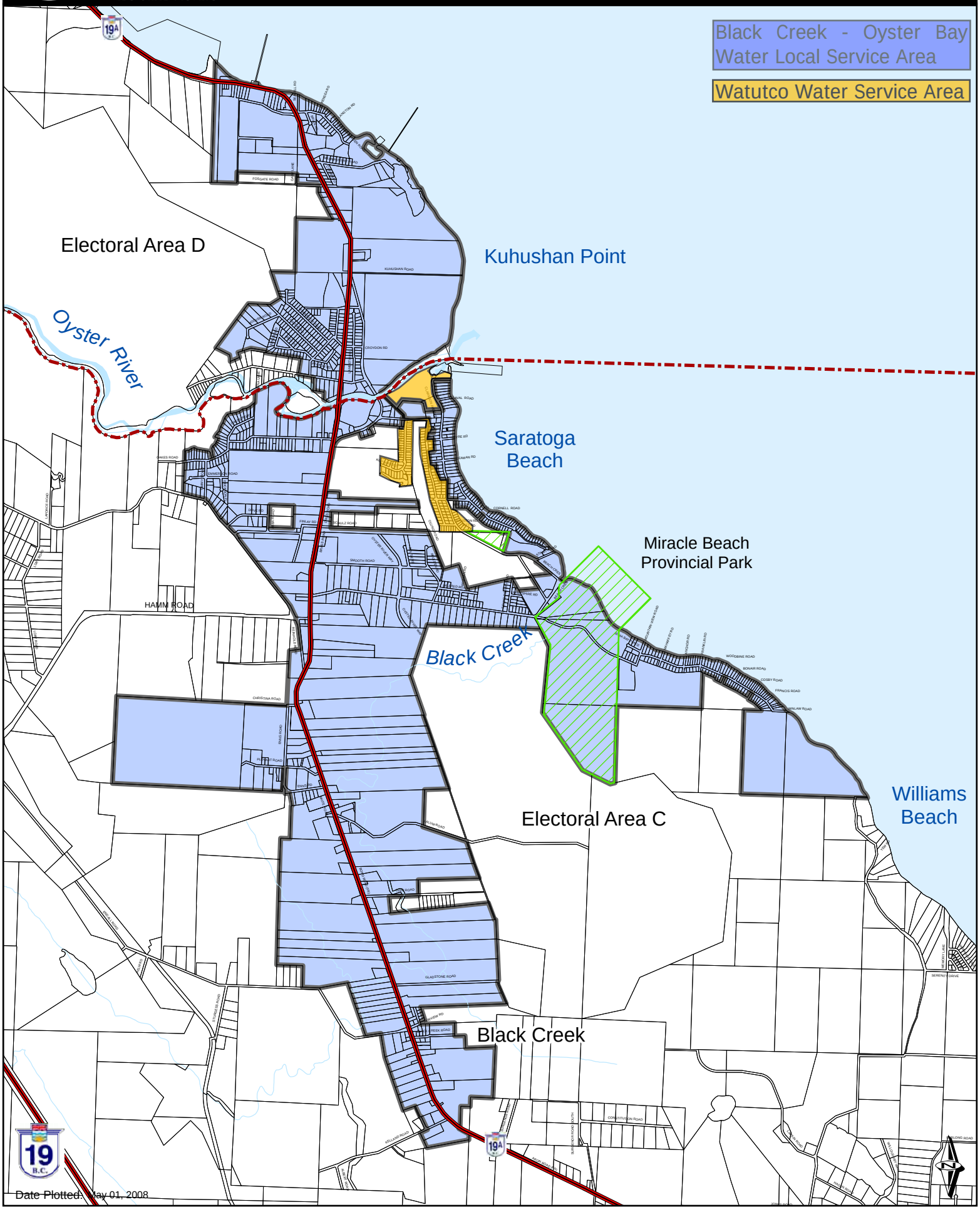
3.1.5.1. Overview of Water Supplies for Black Creek – Oyster River

The Black Creek – Oyster Bay Fire Protection Local Service area has two water systems each operated by separate water purveyors. The two water systems in the fire protection area include:

- Black Creek – Oyster Bay Local Service Area (operated by the Comox Valley Regional District, and
- Watutco.

Comox Valley Regional District

Figure 3.1-7 Black Creek - Oyster Bay Water Supplies for Fire Protection



Date Plotted: May 01, 2008

3.1.5.2. Black Creek – Oyster River Local Water Service Area

The Comox Valley Regional District is responsible for operating and providing water supplies throughout the Black Creek – Oyster River Water Local Service Area. The Water Local service area has approximately 926 connections and serves an approximate population of 2,685.

The water source for the water system is Oyster River. Water is pumped from two wells located near Oyster River. Well No. 1 is referred to as the Drill Well and has a pumping capacity of 1,364 LPM (300 Igpm). A second well has been added in the Well No. 1 site with a capacity of 1,364 LPM (300 Igpm). Together the wells can provide 1,818 LPM (400 Igpm). Well No. 2 is referred to as the Oyster River Well and has a pumping capacity of 2,500 LPM (550 Igpm). All wells have a combined pumping capacity of 4,318LPM (950 Igpm). One booster station exists in the distribution station to pump water to certain portions of the distribution system.

A back-up pump has been provided to the Oyster River Well with a similar pumping capacity for maintenance purposes. The addition of a back-up pump has improved the redundancy of the water systems pumping capacity.

Back-up power has been provided to the two Drill Wells, in the form of a diesel generator. Back-up power has not been provided yet for the Oyster River Well and the booster station. Redundancy has been improved with back-up power. However, if there was a power interruption only specific systems and components would be affected. Other components of the water system that rely on electricity to keep water flowing during an interruption still require back-up power.

On the distribution system there are two reservoirs.

- MaCaulay Reservoir has a storage capacity of 1,055,000 Litres (232,000 Imperial Galllon), and
- Kelland Reservoir has a storage capacity of 273,000 Litres (60,000 Imperial Gallon).

The mains throughout the distribution system are typically 150 mm (6 inch) AC piping. The main to the MaCauley Reservoir was 250 mm (10 inch) and the main to the Kellend Reservoir was 200 mm (8 inch).

There are approximately 111 hydrants within the distribution system. Where installed, hydrants are typically 150 m distant from commercially insured buildings and 300 m distant from single family dwelling buildings. Hydrants are serviced annually and are inspected and tested for leaks. The public works department for the Comox Valley Regional District maintains maintenance records of hydrant inspection and testing.

During the survey, the hydrants were typically found to be in good working condition with exception to the paint. During the winter months, the hydrants may be covered, or partially covered due to snow banks. Steps have been taken to add elevated reflective markers to address the issue of heavy snowfall.

3.1.5.3. Watutco Water System

The Watutco water system is operated by an independent water purveyor within the Fire Protection Local Service Area of Black Creek – Oyster Bay. Water is provided to single family residential dwellings, a small camp area containing cabins approximately 500 ft^2 (45 m^2), and a motor home park.

The source of supply for the Watutco water system is from Oyster River. Water is pumped from a single well to the distribution system. Two pumps exist in the pump house with a combined pumping capacity of 297 Igpm (1,350 LPM). One pump normally operates and the second activates to improve capacity if there is a drop in pressure. Two 3 inch (76 mm) mains connect the well to the pump house. From the pump house to the distribution system is a 6 inch (150 mm) main.

For fire insurance grading the most limiting feature in the analysis of the water system was the two 76 mm (3 inch) mains to the pump house. The maximum rate of flow possible through a 3 inch main at 5 feet/second is 414 LPM (91 Igpm). A maximum rate of flow of 182 Igpm (828 LPM) limits what can be pumped to the distribution system.

The Watutco water distribution system does not have any reservoirs for water storage.

Back-up power is provided for the well pumps. If a power outage were to occur, there would be water available for fire protection.

The Watutco water distribution system has 10 fire hydrants installed. Hydrant maintenance is not conducted annually, information indicated inspections rarely occur. The most recent inspections on the fire hydrant were completed after FUS field representative met with the water purveyor, prior to that inspections were conducted last in1993.

Recommendation 3.1-10 Develop and implement a record keeping system for hydrant maintenance and flushing

To reduce the risk of hydrants failing due to maintenance issues, we recommend that a maintenance schedule be set up and detailed records kept for all hydrant maintenance and flushing. Records should be available for review.

3.1.5.4. Water Supply Analysis

To have an adequate water supply for fire fighting the quantity of stored water available to the fire location must be adequate to sustain the Required Fire Flows for the fire

duration. Fire durations for each design required fire flow are taken from the Fire Underwriters Survey document Water Supply for Public Fire Protection.

The minimum size water supply credited by FUS must be capable of delivering not less than 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to domestic consumption at the maximum daily rate.

The maximum capacities of the reservoirs and their refill rates [for the typical fire event duration] are de-rated with a safety factor for the calculation of the total available water resources for fire fighting. Reservoirs have been de-rated to 80% of the maximum capacities and refill rates have been de-rated by 25% of the theoretical capacity (limiting flow factor).

Table 3.1-8 and Table 3.1-9 summarize the minimum required fire storage volume [BFF for the typical fire event duration] for the water system [column referred to as "Required Fire Storage"]. The table also shows the recommended emergency storage [25% of the sum of "Required Fire Storage" and Domestic Storage].

Water supply systems designed to provide fire protection should meet the following criteria to be considered a "Good Supply" with regard to the adequacy of water storage.

The required total effective storage should be based on the following formula:

Total Storage Required = A + B + C + D

Where:

A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water Supply for Public Fire Protection and Fire Underwriters Survey methodologies

B = equalization storage capacity equal to 25% of projected maximum day demand (MDD)

C = emergency storage capacity [25% of (A + B)]

D = Concurrent domestic demand = Peak hour demand for the event duration

Water supply systems designed to provide fire protection should meet the following to be considered an "Adequate Supply" with regard to the adequacy of storage.

The required minimum storage of the water system to be considered adequate for fire insurance grading is based on the following formula:

Minimum Storage Required = A + E

Where:

A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water Supply for Public Fire Protection and Fire Underwriters Survey methodologies

E = Calculated volume equal to MDD flow rate for the typical fire event duration

The formulas described above may be modified if the level of risk within the community is unusual or if the situation warrants. In some cases alternatives to the formulas may be developed and considered based on specific situations.

Ideally the water supply should be capable of providing fire flows to all built-up areas of the protected community. The water supply system(s) should be designed and constructed such that water supplies are uninterrupted during system maintenance, main breaks, reservoir cleaning, and catastrophic events such as seismic events, wind storms, power failures, etc. This can be achieved through the use of redundant design with multiple sources and storage locations, looped distribution system, back up power, and other safety factors included within the scope of good engineering practices.

Note that this section is directed toward analysis of the volume of water available for fire fighting and not the capacity to deliver the Required Fire Flows to any given area.

Table 3.1-8 Available Water Resources for Fire Fighting

	Serving (pop)	ADD	MDD	PHD	Total Storage	Total Refill Rate	Refill during Event Duration	Total Available Water Resources
Notes --->						derated 25-30%		
Units --->		*MGD*	*MGD*	*Igpm*	*I. gal*	*IGPM*	*I. gal*	*I. gal*
Black Creek – Oyster Bay Water Local Service Area	2,685							
Basic Fire Flow		0.240	0.488	678	292,000	713	85,560	319,160
SFR RFF		0.240	0.488	678	292,000	713	64,170	297,770
Minimum Recognized		0.240	0.488	678	292,000	713	85,560	319,160
Watutco	500							
SFR RFF		0.1056	0.2112	293	0	184	16,560	16,560
Minimum Recognized		0.1056	0.2112	293	0	184	22,080	22,080

Table 3.1-9 Summary of Recommended and Required Water Volumes for Fire Fighting

						Variables -->	A	B	C	D	Eq.I	E	Eq.II		
	BFF	Fire Duration	ADD	MDD	PHD	Total Available Water Resources	Required Fire Storage	Domestic Storage (incl. agr.)	Emergency storage	Concurrent Domestic Demand $_{peak}$	Recommended storage	Concurrent Domestic Demand $_{max}$	Minimum Storage Req'd	Supply Good?	Supply Adequate?
Notes --->						derated 20%	BFFxDuration	.25 MDD	.25 (MDD+Fire)	PHDxDuration		MDDxDuration			
Units --->	*IGPM*	*hrs*	*IMGD*	*IMGD*	*Igpm*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*Eq.I*	*Eq.II*
Basic Fire Flow	1,500	2.0	0.240	0.488	678	319,160	180,000	122,000	75,500	81,333	458,833	40,667	220,667	NO	YES
SFR RFF	900	1.5	0.240	0.488	678	297,770	81,000	122,000	50,750	61,000	314,750	30,500	111,500	NO	YES
Minimum Recognized	200	2.00	0.240	0.488	678	319,160	24,000	122,000	36,500	81,333	263,833	40,667	64,667	YES	YES
SFR RFF	900	1.5	0.1056	0.2112	293	16,560	81,000	52,800	33,450	26,400	193,650	13,200	94,200	NO	NO
Minimum Recognized	200	2.00	0.1056	0.2112	293	22,080	24,000	52,800	19,200	35,200	131,200	17,600	41,600	NO	NO

Figure 3.1-8 Black Creek – Oyster Bay Water Local Service Area – Water Supplies for Fire Fighting

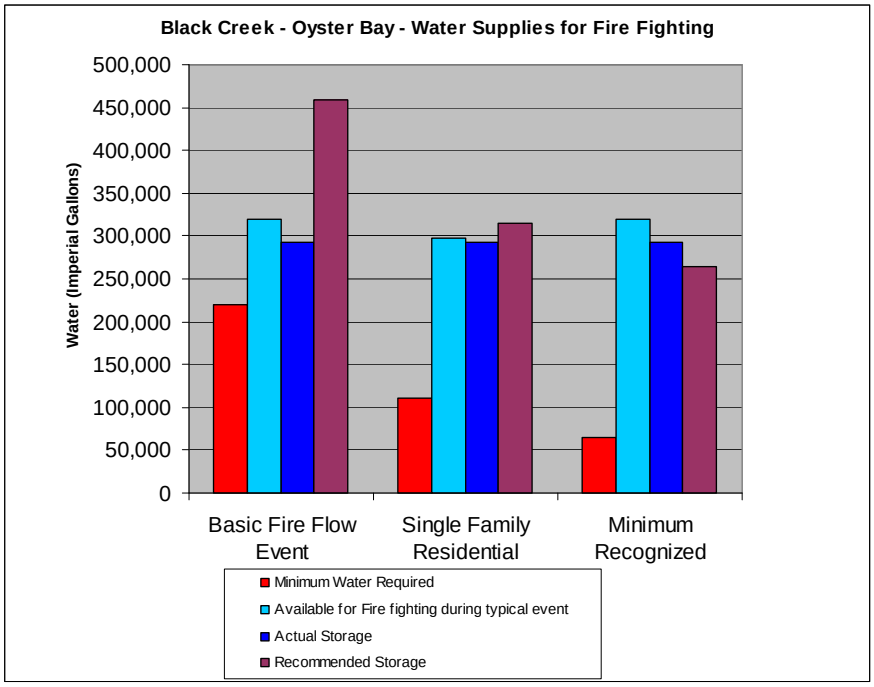
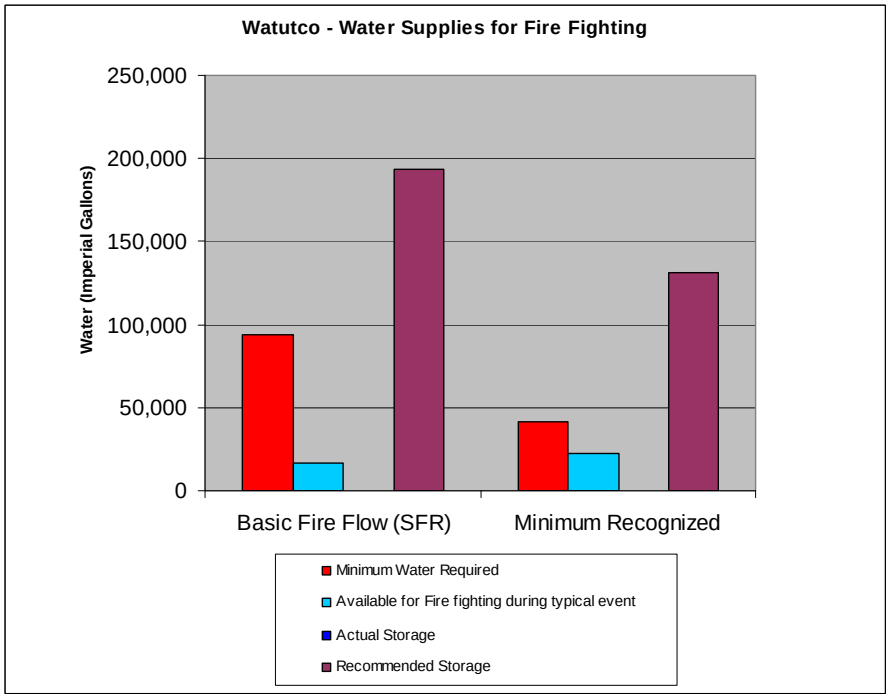


Figure 3.1-9 Watutco Water Distribution System – Water Supplies for Fire Fighting



Analysis of the Black Creek – Oyster Bay water distribution system indicates that the system meets the minimum fire insurance grading requirements needed to be recognized. As noted in Table 3.1-9 Summary of Recommended and Required Water Volumes for Fire Fighting, the Black Creek – Oyster Bay distribution system has adequate storage to meet the criteria for Equation II (minimum storage), but not adequate to meet the criteria to satisfy Equation I (good supply).

It is important to note that the Black Creek – Oyster Bay water distribution system does not have a reasonable level of redundancy built in. In terms of power failure the system would have to rely only on the water left in the reservoirs. As well, if main breaks were to occur along arterial mains to the wells or to the reservoirs, the distribution system would be severely limited in its ability to provide adequate resources' for fire protection.

Recommendation 3.1-11 Improve Redundancies throughout the Water System

To reduce the risk of inadequate water supplies being available for fire fighting during an event, the water supply system should be reviewed and improved with respect to redundancy. Water supply systems should be designed with redundancy at each level so that if any given major component (such as arterial mains, pumps, intakes, power supplies water sources, storage facilities, etc.) is taken out of service for any reason, the water supply system will be unaffected in its ability to deliver the required fire flows throughout the system service area.

Analysis of the Watutco water distribution system indicates that the system does not meet the minimum fire insurance grading requirements to be recognized. As noted in Table 3.1-9 Summary of Recommended and Required Water Volumes for Fire Fighting, the Watutco water distribution system does not have adequate storage to meet the criteria for Equation II (minimum storage) and does not meet the criteria to satisfy Equation I (good supply) when evaluating the water system for the minimum fire insurance grading requirements of 1,000 LPM (200 Igpm) for 2 hours.

With the Watutco water distribution system not meeting the minimum fire insurance grading requirements, the property owners who have insured properties under Personal Lines will be impacted by the result of a downgrade in the Dwelling Protection Grade. The current Dwelling Protection Grade is 3A and downgraded to 3B. If information can be provided to the Fire Underwriters Survey for review to prove the system is capable of meeting the minimum fire insurance requirements, the fire insurance grade will be re-established as a 3A.

The Watutco water distribution system has no additional storage. The mains from the well to the well pump station were the most limiting feature in the analysis of the water system.

Recommendation 3.1-12 Recognition of the Watutco Water Distribution System

Analysis of the Watutco water distribution system indicated that the system is not capable of meeting the minimum requirements to be recognized for fire insurance

grading. The water system does not have adequate storage to meet the criteria for Equation II (minimum storage) and does not meet the criteria to satisfy Equation I (good supply) when evaluating the water system for the minimum fire insurance grading requirements of 1,000 LPM (200 Igpm) for 2 hours, as shown in Table 3.1-9. If the system is capable of meeting the minimum requirements for fire insurance grading, information should be submitted to the Fire Underwriters Survey for review.

To meet the minimum requirements for fire insurance grading two options are available:

Option 1: Install a Reservoir and Improve Main Sizes

To meet the minimum requirements for fire insurance grading a storage reservoir on the distribution system and increasing the main size between the well and the pump station would be needed in order to meet recognition.

The system would require a storage tank with a capacity of 111,379 Litres (24,500 Imperial Gallons) to meet the **minimum** requirements for fire insurance recognition. The capacity indicated includes the current domestic consumption at the maximum daily rate, pumping capacity, and main sizes. If the maximum daily rate, mains sizes, or pumping capacities change, the minimum tank size would have to be adjusted accordingly to determine the appropriate storage tank capacity.

To improve the refill rate of the water system, the two 3 inch (76 mm) mains should be increased to allow an improved rate of flow that will not limit the capacity to the pumps.

Option 2: Provide/Improve Governance

The water system (Watutco) in the fire protection area lacks consistency and does not meet minimum requirements for fire insurance grading. There are numerous issues related to deficient design and lack of adequate management and maintenance. To improve the reliability and consistency of the water system (Watutco) within the fire protection area, consideration should be given to forming a single local government body to manage and administrate the water system. Alternatively, the Regional District could be approached to manage the water system. Additionally, to improve redundancy and meet fire insurance grading requirements the water system should be connected where possible.

Standards for design, installation, and maintenance should be developed and applied to all water systems within the fire protection area.

3.1.5.5. Available Flow Test Results

To determine if the water supply system is adequate or deficient in its ability to deliver a reasonable amount of water for fire fighting purposes, the Required Fire Flows for a number of representative structures have been calculated. The determination method of Required Fire Flows[9] (RFF), fire event duration, and minimum hydrant distribution is detailed in the Fire Underwriters Survey document *Water Supply for Public Fire Protection* (Appendix B).

The Required Fire Flows for the Fire Flow Demand Zone determined during the community risk assessment (see Section 3.1.1) have been utilized as a benchmark for the area. The required fire flows are not the highest RFF's for the Fire Protection Local Service Area, but are intended to be adequate for approximately 90% of the structures in the water distribution system. Notably, the RFF calculations are for fully involved structure fires with an offensive fire fighting attack.

Available Fire Flow tests were conducted in accordance with established protocols specified in NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*. The results of the flow tests are compared to the calculated Required Fire Flows as shown in Table 3.2-10 Available Fire Flows compared to Required Fire Flows. Determining water supply system deficiencies in this way provides a good indicator of the level of adequacy or deficiency of the water supply system with regard to providing adequate water flows for the expected types and sizes of fires (typical for the risks present).

Figure 3.1-10 Available Flow Test – Black Creek – Oyster Bay Water Local Service Area

Test #	Location	RFF	Rated Capacity @ 20 PSI	Deficiency
		IGPM	IGPM	IGPM
1	Miracle Beach & Clarkson Dr	700	2,120	0
2	Hwy 19A – Oyster Bay Resorts	1,100	966	134
3	Hoover Rd & Lewis Rd	900	918	0
4	Glenmore Rd & Lambeth Rd	2,000	1,415	585
5	Catherwood Rd & Oakes Rd	800	1,525	0
6	Hwy 19A – Saratoga Speedway	1,300	2,666	0
7	Ployart Rd & Enns Rd	800	626	174
8	7791 Hwy 19A	900	1,526	0

The available flow tests indicate there is a small deficiency, especially for commercial risks on the Black Creek – Oyster Bay water system when comparing the calculated Required Fire Flows to the Available Fire Flows at 20 psi in the vicinity of the test location. Refer to Appendix F for Available Fire Flow Testing – Black Creek – Oyster River.

[9] A minimum residual water pressure of 20 psi in the street main is required during flow.

Detailed current information on available fire flows for the Watutco Water Distribution System and the Miracle Beach Water Distribution System were not available during this study.

Upon receipt and review of the Miracle Beach water system forms and drawings, arrangements will be made to conduct flow tests. At the same time tests will be conducted on the Watutco water system. Results will be provided upon completion.

3.1.5.6. Alternative Water Supplies

The water systems in the Black Creek – Oyster Bay Fire Protection Local Service Area do not service all of the fire protection area. There are areas outside of the water distribution systems that rely on the fire department to shuttle water using mobile water supply apparatus. For this reason, these areas will be graded as not having fire hydrant protection.

Within the fire protection area dry hydrants have been installed in the Robinson Lake area. Three dry hydrants were installed, tested, and recognized for hydrant protection status in 1998. A Dwelling Protection Grade 3A was recognized for properties within 8 km of the fire hall and within 300 m (1,000 ft) of a dry hydrant. A dry hydrant is installed off of James Crescent. However, no information has been provided about the construction of the dry hydrant and the reliability of the source of supply for fire insurance grading recognition.

Information should be submitted to the Fire Underwriters Survey for review to ensure that the dry hydrants installed in the Robinson Lake area still meet fire insurance grading requirements. Refer to Recommendation 3.1-13.

If dry hydrants do not meet fire insurance grading requirements the Dwelling Protection Grade may have to be downgraded to 3B. A downgrade from hydrant protected to semi-protected status would have an immediate impact on insurance rates for property owners insured under Personal Lines.

Recommendation 3.1-13 Provide information to continue Dry Hydrant Recognition for the Fire Insurance Grading Purpose of Robinson Lake

To maintain hydrant protected status for property owners in the Robinson Lake area of the Black Creek – Oyster River Fire Protection Local Service Area, information pertaining to the items below should be submitted to the Fire Underwriters Survey for fire insurance grading review:

- Maintenance information showing dry hydrants are maintained in accordance with their manufacturer's specifications and all applicable codes and standards including NFPA, NFC, and BCFC.
- On site testing information showing that the dry hydrants are capable of providing flow of not less than 1,000 LPM (200 Igpm), and
- Documentation indicating that the volume of water that is available (considering the depth of intake) for a minimum period of 50 years.

If any new dry hydrants have been installed in the Robinson Lake area or in the Fire Protection Local Service Area, information pertaining to the items listed below should be submitted for review to be recognized for fire insurance grading purposes only if the following criteria are met:

1. All design and installation requirements of NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting* are met.
2. As built drawings and specifications are provided to Fire Underwriters Survey for review and accepted.
3. Dry hydrants are maintained in accordance with their manufacturer's specifications and all applicable codes and standards including NFPA, NFC and BCFC.
4. It can be provided through on-site testing of pump apparatus that the flow capacity is not less than 1,000 LPM (200 Igpm).
5. Volume of available water can be proven to be firmly available (considering the depth of intake) for a minimum period of 50 years.

Recommendation 3.1-14 Develop Formal Water Supply Plan for Non-Hydrant Protected Areas; Consider Dry Hydrants

The Black Creek – Oyster Bay Fire Protection Local Service Area has areas without hydrant water supplies. The Fire Department is equipped to respond utilizing the water shuttle method. The mobile water supply truck will shuttle water from nearby sources to the fire scene where water will be dumped into a portable tank. The engine on scene will pump water through suction from the portable tank. In some cases, the most accessible and reliable water supply will be the nearest recognized fire hydrant; however in some cases, other non-recognized water supply sources may be more accessible. To reduce the risk of time being lost during a fire event due to unreliable water supply sources, formal plans should be developed for water supplies for all non-hydrant protected areas within the Fire Service Area boundaries.

Consideration should be given to installing dry hydrants in strategic locations to minimize travel times during shuttle operations. All dry hydrants should be installed in full compliance with NFPA 1142 *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2007 Edition. Any improvements made to water supplies should be reviewed and approved by Fire Underwriters Survey if they are intended to be credited toward fire insurance grading classifications.

Note: In areas without recognized hydrants it may be possible to achieve significantly improved insurance rates through Superior Tender Shuttle Accreditation administered by Fire Underwriters Survey. Refer to Appendix G.

3.1.5.7. Water Supplies within the Fire Insurance Grading

Water supplies contribute 30% to the total Public Fire Protection Classification grade of the community.

The Black Creek – Oyster Bay Water Local Service Area has a relative classification of 6 out of 10. The Watutco water system was not recognized for fire insurance grading and receives a relative classification of 10.

For areas of the Black Creek – Oyster River Fire Protection Local Service Area that is not serviced by a recognized water supply the relative classification of the water supply is a 10.

3.1.6 Black Creek - Oyster River Fire Insurance Grading

As a result of this assessment, the following information will be published in the fire insurance grading index for the insurance community to set rates on. The information will apply to the Black Creek - Oyster Bay Fire Protection Local Service Area (specified fire service area within the Comox Valley Regional District) and more specifically the following areas within the boundaries of the fire service area.

A downgrade in a fire insurance grade is not immediately published in the fire insurance grading index. A set amount of time will be allowed for the water purveyor to develop a strategy to make improvements and should be submitted Fire Underwriters Survey for review. If accepted by FUS, a set amount of time will be granted to allow improvements to be made. If in that given time improvements have not occurred a downgrade in the fire insurance grade will be made official.

- Watutco water system previous DPG 3A, re-assessment determined a downgrade to DPG 3B.
- Watutco water system previous PFPC 7, re-assessment determined a downgrade to PFPC 8.
- Robinson Lake DPG 3A would be downgraded to DPG 3B if requirements in Recommendation 3.1-13 are not satisfied.

Table 3.1-10 Summary of Black Creek - Oyster Bay Fire Protection Local Service Area Grading Assessment

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Black Creek – Oyster Bay (Black Creek – Oyster River Bay Local Service Area)	3A	**3A**	Hydrant Protected - detached dwellings within 300 m of fire hydrant on the water system operated by the Comox Valley Regional District
Black Creek – Oyster Bay (Watutco)	3A	**3AP**[10]	Fire Station Protected - detached dwellings within 8 km by road on the water system operated by Watutco
Black Creek – Oyster Bay (Robinson Lake)	3A	**3AP**	Hydrant Protected - detached dwellings within 300 m of a dry hydrant and within 8 km of the Oyster River Fire Hall
Black Creek – Oyster Bay F.P.L.S.A.	3B	**3B**	Fire Station Protected - detached dwellings within 8 km by road of the Oyster River Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of the Oyster River Fire Hall

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Black Creek – Oyster Bay (Black Creek – Oyster Bay Water Local Service Area)	7	**6**	Hydrant Protected - commercial properties within 150 m of fire hydrant on the water system operated by the Comox Valley Regional District
Black Creek – Oyster Bay (Watutco)	7	**7P**	Fire Station Protected - commercial properties within 5 km by road of Fire Station on the water system operated by Watutco
Black Creek – Oyster Bay F.P.L.S.A.	9	**8**	Fire Station Protected – commercial properties within 5 km by road of the Oyster River Fire Hall
Rest	10	**10**	Unprotected - commercial properties further than 5 km by road of the Oyster River Fire Hall

Importantly, the re-assessment of the Black Creek – Oyster Bay Fire Protection Local Service Area has identified a number of weaknesses and areas where improvements may result in improved levels of fire protection and improved fire insurance grading classifications.

[10] "P" Stands for Provisional – a provisional grade is given for a municipality or community where deficiencies in the fire insurance grading have warranted a downgrading. A predetermined amount of time (generally 12 months) is provided to a municipality or community to allow them time to correct major deficiencies in order to maintain their fire insurance grade.

3.1.7 Black Creek - Oyster Bay Conclusions

The Oyster River Fire/Rescue Volunteer Fire Department has made great strides in improving its services. The most significant areas of the fire insurance grading where the least amount of credit was received for the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force,
- Pre-incident planning.

The Black Creek – Oyster Bay Water Local Service has made improvements since it was last graded. Overall, the system is adequate to provide available fire flows for risks insured under Personal Lines. Available flows were observed to be slightly lower than required fire flows for risks insured under Commercial Lines. The water system received the least amount of credit in the fire insurance grading as a result of the redundancy in the mains system leading to and from wells and reservoirs. Also the water system would be greatly impacted if a serious power outage were to occur as a result of a lack of back-up power.

The Watutco water system in the Black Creek – Oyster Bay Fire Protection Local Service Area was reviewed and did not meet the minimum requirements for fire insurance grading. As a result property owners insured under Personal Lines with properties on the water system will be impacted by the downgrade in the Dwelling Protection Grade.

A large portion of the Fire Protection Local Service Area is without hydrant water supplies. It is recommended that the fire department continually look at measures to provide adequate fire protection. Providing additional mobile water supply apparatus and developing alternative water supplies in non-hydrant areas is recommended.

Dry hydrants have been installed in a area of the Fire Protection Local Service Area known as Robinson Lake. The dry hydrants were recognized for fire insurance grading in 1998. The Fire Underwriters Survey recommends that current information on the dry hydrants be submitted for review to ensure fire insurance recognition is maintained.

Overall, Black Creek – Oyster Bay has successfully improved its Public Fire Protection Classification (PFPC) to a 6 and maintained its Dwelling Protection (DPG) of 3A. The Oyster River Fire/Rescue Department and operators of the Black Creek – Oyster Bay Water Local Service Area should be congratulated.

Addressing the recommendations in relation to the fire department and water supplies in this report may qualify Black Creek – Oyster Bay Fire Protection Local Service Area for an improved fire insurance grading classification. This would likely have an impact on property insurance rates for property owners who are insured under Commercial and Personal Lines insurance.

3.2. Fanny Bay

Fanny Bay is located on the east coast of Vancouver Island, an hour north of Nanaimo and 30 minutes south of Courtenay. The ocean side community of Fanny Bay is situated on Baynes Sound, the sheltered narrow strait separating Vancouver Island and Denman Island.

Fanny Bay has an approximate population of 700. Fanny Bay resides in Electoral Area "A" of the Comox Valley Regional District.

3.2.1 Fanny Bay Risk Assessment

The Risk Assessment is an evaluation of the life safety risks, fire loading and risk of fire that is present in a given area. The assessment is used to determine the "Basic Fire Flow" for the community which is the benchmark that the community's fire protection facilities are measured against.

Adequate response to a fire emergency is generally measured by the speed with which a responding fire fighting crew(s) can arrive at the fire emergency with the correct type and amount of resources to have a reasonable degree of opportunity to control or extinguish a fire. Simply put, the response provided by a fire fighting crew should equal the potential severity of the fire or fire emergency. The required response from a fire fighting crew is greater if life safety is a factor in a fire event and the expected response time is shorter.

The potential severity of a fire event is generally associated with the fuel load present and exposures to the fire. Factors such as building construction materials; quality of construction; building renovation history; building size, height and age; occupancy; and

hazards associated with the occupancy, will all contribute to the potential severity of a fire. In addition, other buildings sufficiently exposed to a burning building can contribute to the magnitude of a fire, and the resources necessary to be in place to control or extinguish a given fire. Alternatively, building controls and automatic fire protection systems (both active and passive) that limit fire spread will reduce the potential severity of a fire. For building controls to be considered effective, their design, installation, and maintenance must also be reviewed as any weak link may result in the system being ineffectual.

Much of the research into fire protection requirements for individual buildings and communities and the corresponding number of "*pumper companies*" and response times has been conducted by Fire Underwriters Survey and the National Fire Protection Association. Fire Underwriters Survey evaluates adequacy of response by comparing the potential severity of fires that may occur with a rating of the ability of fire crews and their resources responding within a specified time period relative to the fire and life safety risk potential that may be needed.

In a fire and life safety risk analysis, the fire service area is broken up into zones of fire emergency risk and hazard profiles. For this review, the fire protection needs of each community zone were evaluated. A fire and life safety risk analysis provides much of the data that is necessary to comment on the community's fire protection needs including fire apparatus requirements, fire equipment, and other areas of a community's fire protection programs.

Appendix A - Table of Effective Response, illustrates various sectors commonly found in most communities and indicates a range of risk ratings that are commonly applied to these sectors. The Table also indicates a range of fire flows that are normally associated with each community sector profile. Additionally, the Table of Effective Response indicates the number of pumper trucks, ladder trucks and associated companies that are expected to be needed to control and extinguish fires occurring within representative building zones throughout the community.

The number of fire companies that will be needed is correlated to fire loading within the community's building stock and to life safety risks present. Fire flow requirements are determined by construction characteristics, occupancy, size, and exposures to representative buildings throughout the community.

3.2.1.1. Fire Risk in Fanny Bay

The community has been reviewed from the perspective of life safety, fire loading, fire risk, and response characteristics.

Fanny Bay has been reviewed with building risk assessments. Building Risk Assessment was performed at three levels of measure:

Occupancy Risk: Which is defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class. (Occupancy “Required Fire Flow”)

Fire Flow Demand Zone: Which is an area used to define or limit the management of a risk situation. A fire flow demand zone can be a single building or a group of buildings. It is usually defined with geographical boundaries and also can be called fire management areas or fire management zones. (FFDZ “Required Fire Flow”)

Community: Which is defined as the overall profile of the community based on the unique mixture of individual occupancy risks, fire flow demand zone risk levels, and the level of service provided to mitigate those risk levels. (“Basic Fire Flow”)

Fanny Bay is made up primarily of single family dwellings with wild land urban interface exposures. The Fire Protection Local Service Area has a limited amount of Commercial Lines insured risks. A railway system runs through the length of the Fanny Bay community, it is known to occasionally transport dangerous good.

Required fire flows for single family residential and duplex dwellings had Required Fire Flows in the range of 2,000 to 5,000 LPM (400 to 1,000 Igpm). Required Fire Flows for Commercial Lines insured risks, not one and two family residential dwellings, were in the range of 5,900 to over 9,000 LPM (1,300 to over 2,000 Igpm).

The community was (from the perspective of fire fighting response characteristics) identified as one “fire flow demand zone” organized as shown in Figure 3.2-1 Fanny Bay Fire Flow Demand Zone. To develop the required fire flow in the fire flow demand zone in Fanny Bay, the methodology described in Fire Underwriters Survey 1999 guideline “Water Supply for Public Fire Protection” was used. Refer to Appendix B.

Figure 3.2-1 Fanny Bay Fire Flow Demand Zone

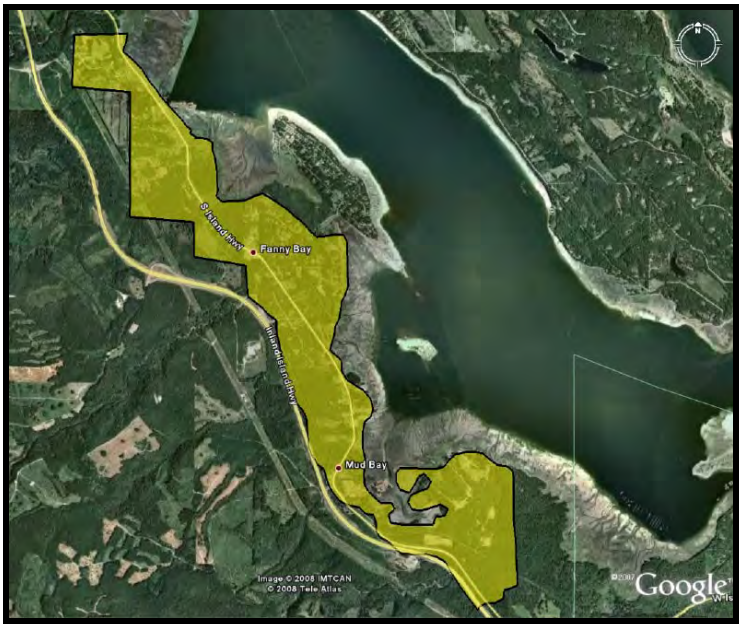


Table 3.2-1 Fanny Bay Fire Flow Demand Zones

Fanny Bay Fire Flow Demand Zone	Fire Zone Risk Rating*	Final RFF LPM (Igpm)
Small mercantile and Industrial	3(a)	6,800 (1,500)

*Corresponding to the Table of Effective Response

The required fire flow was calculated for a representative sampling of buildings as well as for a representative sampling of “construction parameter zones” based on Zoning Bylaws and local construction practices. The “fire flow demand zone” was assessed for primary zoning (industrial, commercial, residential, etc.) and for typical building construction.

The intent of setting the final required fire flow in this manner is not to provide adequate water supplies for the worst case scenario, but rather to provide adequate water supplies for fire fighting in the majority (90%) of structure fires (not including WUI). The final required fire flow is intended to be adequate for existing construction as well as new construction occurring in already built-up areas of the community.

It should also be noted that the required fire flow set by the Fire Underwriters Survey is intended as a benchmark that the community will be measured against. This fire flow is intended to be adequate to fight fires offensively, and to provide property protection (including exposure protection) in addition to life protection.

The final fire flow (with associated risk category from FUS Table of Effective Response) for the fire zone is shown in Figure 3.2-1 Fanny Bay Fire Flow Demand Zone.

The Basic Fire Flow is utilized with associated risk categories from Appendix A, Table of Effective Response, to determine the benchmark level of response from fire departments, including items such as response times and apparatus requirements. These are also used to determine staffing benchmarks and optimal apparatus and fire station locations based on achieving the level of response indicated in the Table of Effective Response 90% of the time.

The Basic Fire Flow for Fanny Bay has been set at 6,800 LPM (1,500 Igpm) in 2008.

The past Basic Fire Flow for Fanny Bay was set at 6,800 LPM (1,500 Igpm) when fire insurance grades were last updated in 2000.

The benchmark requirements of this Basic Fire Flow from the Table of Effective Response are as shown in Table 3.2-2 Fanny Bay Summary of Benchmark Requirements for Basic Fire Flow. Fanny Bay is measured against these benchmarks to establish the fire insurance grading classification.

Table 3.2-2 Fanny Bay Summary of Benchmark Requirements for Basic Fire Flow

Basic Fire Flow	1st Due Pumper	2nd Due Pumper	1st Due Ladder	Total Pumper Companies available	Minutes for all to arrive	Total Ladder Companies available	Minutes for all to arrive
6,800 LPM (1,500 Igpm)	3.5 minutes (2.7 km)	5 minutes (4.1 km)	NA	2 pumper companies	5 minutes (4.1 km)	NA	NA

3.2.1.2. Future Fire Risk in Fanny Bay

The Basic Fire Flow of the community has been set at 6,800 LPM (1,500 Igpm). Currently, there are no future commercial developments that would increase the Basic Fire Flow of the community. If the built-up environment of Fanny Bay remains similar (building construction and size of buildings), the Basic Fire Flow is not expected to change. However, if the built-up environment changes with numerous developments larger in relation to what is already built within the Fire Protection Local Service Area (having Required Fire Flows greater than the Basic Fire Flow) then the Basic Fire Flow of Fanny Bay may be adjusted accordingly to reflect change when Fanny Bay's fire insurance grades are updated again.

At the time of the field survey there were no future fire risks to be addressed that would warrant the possibility of the Basic Fire Flow increasing. Fanny Bay had no developments planned or under construction that would need to be addressed from a fire protection resource planning standpoint.

3.2.2 Fanny Bay Volunteer Fire Department Assessment

3.2.2.1. Fire Department Profile

The Fanny Bay Volunteer Fire Department is a volunteer fire department. There is a Fire Chief, a Deputy Chief, five Officers, nine fire fighters, and one accountant. The chief positions are voted for, by the fire department members. All members of the fire department live and work in Fanny Bay and the surrounding area.

Each member of the fire department carries a pager to be notified about emergency situations that require their response.

3.2.2.2. Fire Department Operations and Administration

The Fanny Bay Volunteer Fire Department is operated and funded by property taxes paid through the Comox Valley Regional District. The regional district operates a total of five volunteer fire departments and has working agreements with member municipalities and improvement districts within the regional district to provide fire protection.

The Fanny Bay Volunteer Fire Department is managed and organized by knowledgeable and hardworking individuals, including but not limited to, the officers listed:

- Chris Cook, Fire Chief
- Peter Golden, Deputy Chief
- Dave Weaving, Assistant Chief

3.2.2.3. Automatic and Mutual Aid Agreements

The Fanny Bay Volunteer Fire Department is a part of one mutual aid agreement administered through the Comox Valley Regional District for wild land urban interface fires.

3.2.2.4. Fire Station Suitability

The Fanny Bay Volunteer Fire Department's fire hall is located at 7512 Cougar Smith Road (Lat. 49 Deg. 30.024 Mins. North, Long. 124 Deg. 49.465 Mins. West) and has been in use since the 1970's. The location of the fire hall is shown in Figure 3.2-2 Fanny Bay Fire Protection Local Service Area.

Figure 3.2-2 Fanny Bay Fire Protection Local Service Area

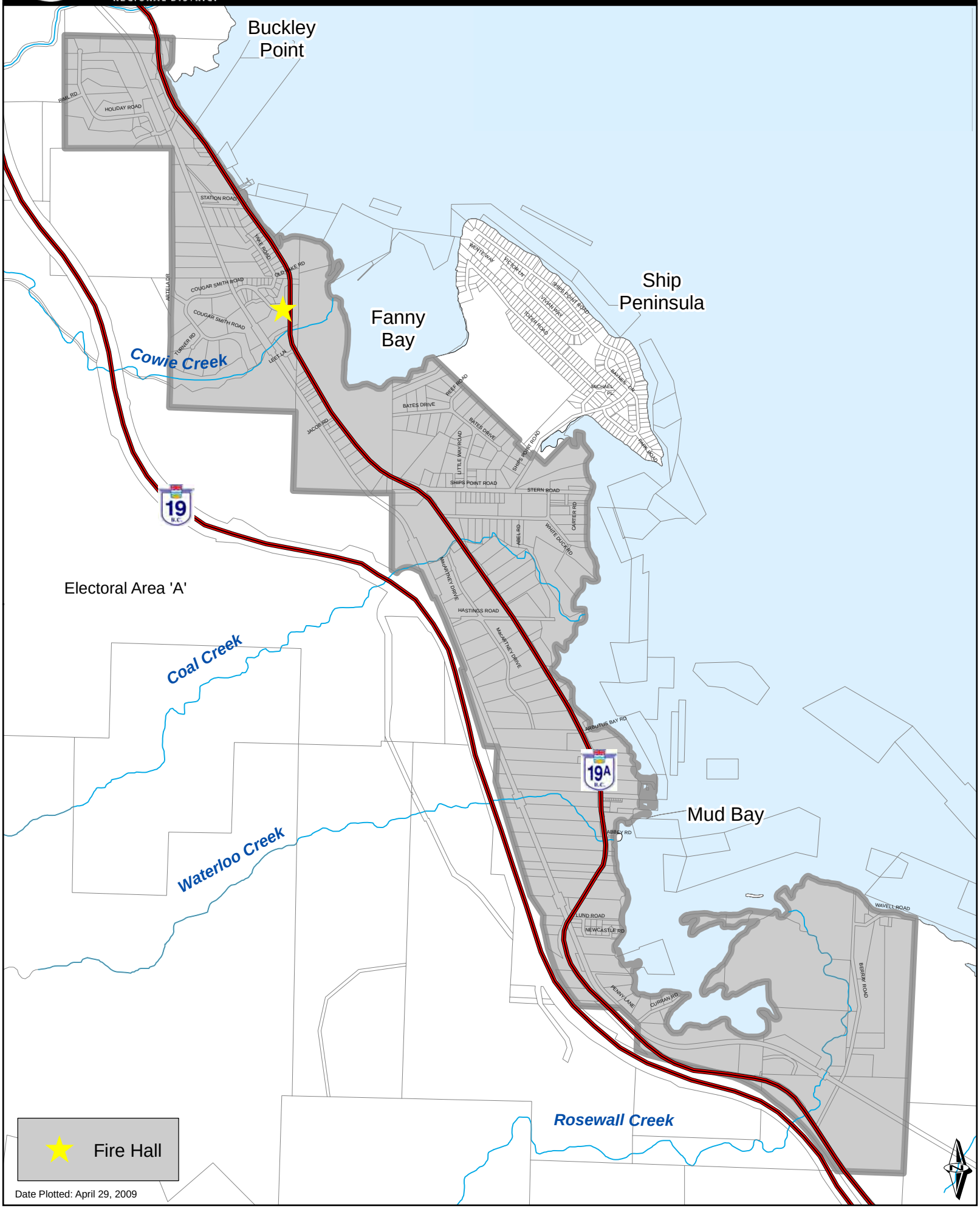


Figure 3.2-3 Fanny Bay Volunteer Fire Department Fire Hall

The fire department operates out of a two bay fire hall. The bay size for pumper (Engine 81) is 3.7 m x 11.6 m (12 ft x 38 ft) and for mobile water supply apparatus (Engine 84) is 3.7 m x 10.4 m (12 ft x 34 ft). The fire hall is of wood frame construction and is one storey in height. The hall has electric heating. An office/meeting area is provided at the rear of the hall. The area provided is small for conducting meetings and training when and if all volunteer members of the department are present.

The area surrounding the fire hall is not adequate for conducting outdoor training sessions. The parking available near the hall is usually used for training and member vehicles have to be moved for training to occur. Locations within the community are utilized that offer additional space and do not disturb the public or traffic, such as the Fanny Bay Community Hall's parking lot and the space near the adjacent playing field.

The fire hall resides in a low lying area that has poor drainage for water. Heavy rainfall, snow melt, and the changing water levels of Cougar (Cowie) Creek contribute to localized flooding. Flooding occurs because of un-maintained drainage in the area, and is fixable. Fire fighting clothing and equipment is stored off floor level in order to prevent water damage. When the bays flood, response times are adversely affected because fire department members have to remove all the water out of the apparatus bays.

Concerns with health and safety with exhaust fumes are an issue. When the apparatus are turned on, exhaust fumes spread from the bay areas to the office area and bathroom because of poor ventilation equipment. An exhaust fan is in the mobile water supply apparatus bay to remove fumes. A second exhaust fan is planned for installation of the pumper bay.

Recommendation 3.2-1 Replace Existing Fire Hall

The current fire station does not meet the needs of the fire department. The hall is not large enough for the number of apparatus that should be in service, the hall is prone to flooding, and noxious fumes produced by the fire apparatus running in the hall are not adequately vented.

Option 1

It is recommended that the Fanny Bay Volunteer Fire Department construct a new fire hall. The fire hall should be of suitable construction, conforming to the BC Building Code, recent edition, have sufficient room for all of the fire departments needs such as, but not limited to:

- Training space
- Fire Chief, Assistant Chief offices
- Bathroom
- Adequate storage space for all fire fighting equipment and personal protective equipment and clothing
- Hose drying tower
- Adequate space for all the apparatus needed
- Adequate parking for all responding fire fighters

Additionally, the location of the fire hall is very important. It should be centrally located within the fire protection local service area to help ensure response times to any area are not excessively long.

Option 2

If a new hall can not be constructed then a building within the local fire service protection area can be retrofitted to meet current building code requirements. All of the needs and requirements listed in option 1 should still be met if the new hall is to be a retrofitted building.

Option 3

If a new hall can not be constructed then refurbishing the existing hall is a cost effective option. Refurbishing the present hall may not meet all the expectations of constructing a new fire hall, but would allow the department to pick and choose areas that need improvement.

Option 4

To maintain the present condition of the fire hall and prevent it from deteriorating due to water damage, measures should be taken to improve the drainage around the hall.

Providing a new fire hall for the fire department is a serious matter. There are many factors to consider and the fire insurance grading is only one such factor.

3.2.2.5. Training & Qualifications

All fire department members take part in training and practice every Tuesday for two and a half hours. Training follows scenario based exercises, fire fighting modules and 1st responder training; however, there is no dedicated training officer. Members of the department have been assigned responsibilities of training based on their capabilities and expertise.

The department has in-house training officers for:

- SCBA use and maintenance,
- driving and vehicle maintenance,
- first aid/first responder,
- communications,
- ladders,
- ropes and knots,
- pumps and pumping operations,
- hoses and nozzles, and
- fire scene safety.

Members of the department are registered with the Justice Institute of British Columbia. Courses are taken at the Comox Fire Training Centre. Courses taken at the training centre include but are not limited to:

- Fire Attack (live fire),
- Survival Training and Rescue Techniques (START),
- First Responder Certification, and
- Air Brake Endorsement.

All Officers on the department receive Emergency Scene Management training.

The fire hall and its immediate surrounding area were noted as being inadequate for the fire department's needs. The fire hall has inadequate space for classroom training and there is limited space outside the hall to conduct drills and other basic fire ground operations. Training is conducted using borrowed buildings and access to specific property mentioned in the Fire Station Suitability section of the report. See Recommendation 3.2-1 Replace Existing Fire Hall.

Recommendation 3.2-2 Improve the Formal Training Program for Fire Fighters and Officers

The Fanny Bay Volunteer Fire Department has a formal training program. To improve the overall effectiveness of the personnel on the fire department, the training program should be further developed to include setting and tracking attainable goals should be developed. The curriculum should include qualitative and quantitative goals and benchmarks that each fire fighter and officer can work towards.

Two standards that would aid in developing an optimal curriculum would be NFPA 1001 *Standard for Fire Fighter Professional* Qualifications and NFPA 1021 *Standard for Fire Officer Professional Qualifications*. NFPA 1001 identifies the minimum job performance requirements (JPRs) for career and volunteer fire fighters whose duties are primarily structural in nature. NFPA 1021 identifies the performance requirements necessary to perform the duties of a fire officer and specifically identifies four levels of progression.

As well NFPA 1401 *Recommended Practice for Fire Service Training Reports and Records*, 2006 Edition, is recommended to be used utilized for the establishment, upgrade, or evaluation of training records and report systems should be developed to document clearly the performance and ability of individual and group activities related to the fire department.

3.2.2.6. Available Fire Force

The fire fighting roster of the Fanny Bay Volunteer Fire Department consists of a Fire Chief, Deputy Chief, five captains/officers, and nine fire fighters. All members of the fire department live and work in Fanny Bay and the surrounding areas

Fanny Bay's Basic Fire Flow benchmark was set at 6,800 LPM (1,500 Igpm).

This benchmark includes two pumper companies being available to respond continuously, year round. For the purposes of fire insurance grading, the benchmark number of career fire fighters per company is six (including officers); therefore the benchmark number of career fire fighters that the Fanny Bay Volunteer Fire Department is measured against is 12 career fire fighters per shift (including officers), available continuously year round (day and night).

Where fire departments are operating with a volunteer roster, such as Fanny Bay, the Available Fire Forces for fire insurance grading purposes are calculated as follows;

- Each full time, on duty career fire fighter is credited as 1 fire fighter.
- Fire chiefs and deputy chiefs are not typically credited as fire fighters unless they normally participate in fire ground duties.

Fire Fighter Equivalent Units (FFEU)[11]

- 1 FFEU is credited for every 3 off-shift career fire fighters who are scheduled to respond
- 1 FFEU is credited for every 4 off-shift career fire fighters who are not scheduled to respond, but are available to respond

[11] The sum of all such equivalent fire fighter units (including those from automatic and mutual aid) shall not exceed 50% of the lesser of

a) the required strength of existing companies (@ 6 fire fighters per company),
or
b) the required strength of required companies (based on the Table of Effective Response @ 6 fire fighters per company).

- 1 FFEU is credited for every 3 paid-on-call or volunteer fire fighters (based on the average turn-out to fires)
- 1 FFEU is credited for every 6 paid-on-call or volunteer fire fighter (based on a conservative assumption that 50 percent of the fire department roster responds to structural fires(if no statistical data was available)
- Support capacity from mutual and automatic aid companies is credited on a different schedule

Note that probationary fire fighters (incomplete training) and junior fire fighters (under age) are not credited due to lack of active fire ground duties.

The Fanny Bay roster includes the following:

Table 3.2-3 Fanny Bay Fire Fighting Available Fire Force Summary

	Fire Stn	Firefighter Equivalent Units (FFEU)
Chief	1	0.33
Deputy Chief	1	0.33
Line Officers	5	1.67
Fire Fighters	9	3
Prob. Fire Fighters	0	0
Total FFEU:		5.3

Credit was given for the Fire Chief and Deputy Chief because they participate with fire ground operations.

The average turnout of fire fighters to structural fires for the Fanny Bay Volunteer Fire Department was not known so a conservative estimate of 50% of the total FFEU is used to determine credit for the number of fire fighters (including officers) responding.

The credited available fire force (FFEU) for the Fanny Bay Volunteer Fire Department is then:

50% of the Total FFEU = 2.7 FFEU

No support fire fighter equivalent units were available to the Fanny Bay Volunteer Fire Department for fire insurance grading.

The Basic Fire Flow benchmark fire force, that the Fanny Bay Volunteer Department is measured against in the fire insurance grading, is 12 career fire fighters on duty 24 hours a day. The Fanny Bay Fire Department received credit for 2.7 career fire fighters that are able to respond continuously year round. Additional credit can be awarded in this area of the fire insurance grading, up to a maximum of 12.

It is important to note that the level of credit received is not uncommon for a volunteer fire department.

Recommendation 3.2-3 Improve Available Fire Force Level

The Fanny Bay Volunteer Fire Department received credit for 2.7 career fire fighters out of the maximum permissible 12 that can be received in this area of the fire insurance grading. It is important to note that the maximum permissible credit of 12 career fire fighters on duty 24 hours per day 365 days of the year is needed for achieving the best possible PFPC grade.

To help improve the relative classification of the fire department within the fire insurance grading, the Fanny Bay Volunteer Fire Department should increase its available fire force by acquiring additional volunteers to respond to fire calls, or provide career staffing. Note that the available fire forces can be improved through additional volunteers up to 50 percent of the required fire force. For Fanny Bay, the maximum available fire force that can be provided through volunteers is 6.

Providing career staffing is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.2.2.7. Fanny Bay Fire Apparatus

Fire departments are evaluated for the number of Pumper companies in service relative to the overall fire potential and the area being protected. Pumper companies are required to be adequately staffed in order to receive full credit.

The Fanny Bay Volunteer Fire Department apparatus fleet includes:

Table 3.2-4 Fanny Bay Fire Apparatus

Unit #	Year	Vehicle Type	Pump Capacity IGPM	Tank Capacity Imp. Gal	Manufacturer	ULC Plate #	Age (2008)
81	1996	Pumper	840	800	HUB/GMC	56C	12
84	1984	Mobile Water Supply	480	1,500	Ford	-	24

3.2.2.8. Ladder Service

Firefighting and rescue operations involving buildings greater than two storeys in height typically involve ladders, elevated master stream devices, and similar equipment. Industrial occupancies also often require elevated master streams for safe firefighting.

The number of ladder trucks required to be in service (ladder companies) for fire insurance grading is determined mainly by use of Table of Effective Response.

A ladder company is required when a municipality has five buildings that are three storeys or higher, five buildings which have a required fire flow of 15,000 LPM (3,300 Igpm) or more, or a combination of these.

The number of ladder companies in service and regularly responding to alarms shall be sufficient to properly protect the municipality. The Table of Effective Response with its accompanying notes provides the criteria to be applied.

Each required ladder company shall be provided with a ladder truck, equipped with an aerial ladder, boom with ladder or elevating platform, and elevated master stream capability.

The Basic Fire Flow for Fanny Bay is set at 6,800 LPM (1,500 Igpm). Fanny Bay does not have five buildings over three storeys or higher, or five buildings that have a Required Fire Flow of 15,000 LPM (3,300 Igpm) or more, or a combination of both. The Fanny Bay Volunteer Fire Department is not required to have a ladder apparatus for fire insurance grading.

3.2.2.9. Credit for Fire Apparatus in Service

The benchmark number of pumper and ladder companies needed to be available based on a Basic Fire Flow of 6,800 LPM (1,500 Igpm) is two pumper companies referenced from the Table of Effective Response. Additionally, one reserve pumper company is required for each eight required pumpers in service. A one company fire department requires a reserve pumper for fire insurance grading.

The maximum acceptable age of apparatus specified in the fire insurance grading index is 20 years. Apparatus is occasionally accepted beyond the age of 20 years for small communities where it may be too financially onerous to acquire newer apparatus. This extension of the usable life of the apparatus is subject to the apparatus and pumps being in good condition (with limited down-time) and being tested regularly. Application for extension of recognized usable life of apparatus for insurance grading purposes should be made in writing to the offices of the Fire Underwriters Survey. Test results should accompany applications for extension.

Apparatus beyond 30 years in age can not be credited for fire insurance grading purposes due to lack of reliability. Refer to Appendix D.

Table 3.2-5 Credit for Fanny Bay Fire Apparatus in Service

Unit #	Vehicle Type	Apparatus Credit	Pumper Credit	Ladder Credit	Reserve Credit	Tanker Credit
81	Pumper	100% Pumper	1	0	0	0
84	Mobile Water Supply	100% Tanker	0	0	0	1
		Total Pumper Credit	1	-	-	-
		Total Ladder Credit	-	-	-	-
		Total Reserve Credit	-	-	-	-
		Total Tanker Credit	-	-	-	1
Table of Effective Response – BFF 6,800 LPM (1,500 Igpm)			2	-	1	

The Fanny Bay Volunteer Fire Department received credit for one pumper company within the fire insurance grading portion of the fire department.

Support apparatus credit was not available to the Fanny Bay Volunteer Fire Department.

For the Fanny Bay Volunteer Fire Department to receive maximum credit within the fire insurance grading portion of the fire department a second pumper company and reserve apparatus would be required.

Adding additional apparatus without the human resources required to operate the apparatus would not be recommended. Consideration should be given to adding pumper companies once the available fire forces have been increased to a level that would support an additional company.

The Fanny Bay Volunteer Fire Department has been developing alternative water supplies throughout Fanny Bay for fire fighting purposes. Additional mobile water supply apparatus with sufficient water carrying capacity would be beneficial if the fire department would like to attain Superior Tanker Shuttle Accreditation.

Recommendation 3.2-4 Acquire Additional Apparatus

The Fanny Bay Volunteer Fire Department received full credit for the one pumper company. To receive maximum credit when the Basic Fire Flow for Fanny Bay has been set at 6,800 LPM (1,500 Igpm), an additional pumper company and reserve pumper is needed. The benchmark requires two pumper companies and one reserve apparatus. In order for the Fanny Bay Volunteer Fire Department to receive maximum credit in its total pumper companies, it is recommended that an additional pumper company apparatus be acquired.

Acquiring additional apparatus with a credited pump capacity will help the fire department receive additional credit in its pump capacity and it will provide the needed distribution to meet the second due pumper company.

It should be noted that for a pumper company to be recognized within the fire insurance grading it should meet the following requirements:

- ULC listed
- Meet the general requirements of NFPA 1901 *Standard for Automotive Fire Apparatus,* recent edition
- Have a permanently mounted pump with a capacity of at least 3,000 LPM (660 Igpm)
- Have a water tank capacity of at least 1100 L (242 IGAL)
- Have a sufficient amount of hose

In order for the apparatus to be recognized, it must be stored and housed in a facility suitable for the fire departments needs. The storage facility should be of adequate construction, heated and contain all the necessary tools and equipment required for fire fighting. Additionally, fire fighters should be able to respond to the building within a

reasonable time. It is important to note that within the fire insurance grading, each apparatus should be supported by a company (6 fire fighters) that is fully trained and equipped.

Providing additional apparatus is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.2.2.10. Apparatus Pumping Capacity Credit

The total credited Pump Capacity is calculated for comparison to the Basic Fire Flow for the community. The calculation is conducted as follows:

$$PC_{Total} = PC_{Primary} + PC_{Support}$$

PC_{Total} = Total Credited Pump Capacity
$PC_{Primary}$ = Primary Pump Capacity (local to the specific station)
$PC_{Support}$ = Support Pump Capacity (coming from other areas/stations)

Primary Pump Capacity (Primary PC) is set by taking the sum of the rated capacities of the pumpers in the station and downgrading from 100% of the rated capacities based on reliability factors (including but not limited to age, quality, listing, and pump test results).

Table 3.2-6 Apparatus Pumping Capacity Credit Summary

Unit #	Vehicle Type	Pump (IGPM)	Tank Imp. Gal	Pump Capacity Credit %	Credited Pump Capacity (IGPM)
81	Pumper	840	800	100%	840
84	Mobile Water Supply	-	1500	-	-
				Total Credited Pump Capacity:	840

The apparatus pump capacity credit refers to the capacity of credited, recognized pumps located on fire apparatus. Recognition and credit for pumps on fire apparatus is typically reduced or withheld based upon the measured reliability of the pumps and the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).

Support Pump Capacity is not available to the Fanny Bay Volunteer Fire Department.

The Fanny Bay Volunteer Fire Department received maximum credit possible for the pump capacity of its pumper. The credited pump capacity of the fire department is 3,818 LPM (840 IGPM). The Basic Fire Flow for the community has been set at 6,800 LPM (1,500 Igpm).

The fire department received 56% credit in the apparatus pump capacity section of the fire insurance grading regarding fire department. To receive maximum credit, additional apparatus would be needed to meet 6,800 LPM (1,500 Igpm).

Recommendation 3.2-5 Improve Apparatus Pumping Capacity

The Fanny Bay Volunteer Fire Department received maximum credit possible for the pump capacity of its pumper when the Basic Fire Flow for the community has been set at 6,800 LPM (1,500 Igpm). To receive maximum credit toward the fire department's pumping capacity additional apparatus would be required. Improving credit in pumping capacity is directly proportional to credit received for pumper companies. Apparatus should be acquired of a reasonable age and pump capacity for fire insurance grading.

Pumper companies are required to be adequately housed and staffed in order to receive full credit.

Acquiring additional pumper apparatus may have a positive beneficial effect in terms of fire insurance grading. Acquiring new pumper apparatus is a serious matter that requires careful consideration. There are many factors to consider and fire insurance grading is only one such factor.

3.2.2.11. Apparatus Maintenance Programs

Profire Emergency Services inspect, service, and test the pumper apparatus on an annual basis.

Apparatus maintenance and repairs are conducted at a local repair facility by a heavy duty mechanic. This facility conducts maintenance and repairs on other fire apparatus throughout the region.

Currently, the fire department does not keep digital records of the maintenance and repairs.

The Fanny Bay Volunteer Fire Department has access to a local repair facility called Shields to have maintenance done on the apparatus. The facility is known to conduct maintenance on other fire department apparatus throughout region. Only paper based records are kept. The fire department has not implemented a way of storing records digitally because they lack the necessary software.

The fire department has their pumper apparatus inspected and pump tested annually by Profire Emergency Services. Records are kept on paper.

3.2.2.12. Distribution of Resources and Response Times

Resources for fire fighting are located on the northern section of the local fire protection service area. The majority of the risks throughout the community are generally within 8

km of the fire hall. The limited number of commercial risks that are in the community are generally located within the second due pumper company; however, the fire department does not have a second pumper apparatus and therefore can not respond to second alarms with sufficient apparatus.

The adequate response distances for the first and second due pumper companies for fire insurance grading purposes is based off the following formula:

$$D(km) = \frac{[T(\min) - 0.65(\min)]}{1.065(\min/\ km)}$$

Where:
D = total distance in kilometres
T = time in minutes

Fanny Bay has a Basic Fire Flow of 6,800 LPM (1,500 Igpm). Appendix A, "Fire Underwriters Survey – Table of Effective Response" illustrates that the first due pumper company should respond within 3.5 minutes and the second due pumper company should respond within 5 minutes.

Applying these response times to the equation above will provide a first due pumper response of 2.7 km and a second due pumper response of 4.1 km.

Figure 3.2-4 - First Due Pumper Response Distance - 2.7 km

Figure 3.2-4 - First Due Pumper Response Distance - 2.7 km illustrates the general area in the fire protection local service area that is covered by the first due pumper company

Figure 3.2-5 - Second Due Pumper Company Response Distance - 4.1 km

Figure 3.2-5 - Second Due Pumper Company Response Distance - 4.1 km illustrates the general area in the fire protection local service area that would be covered by the second due pumper company.

When looking at these areas and applying the correlating fire flow for the demand zone, as seen in Figure 3.2-1 Fanny Bay Fire Flow Demand Zone and Table 3.2-2 Fanny Bay Summary of Benchmark Requirements for Basic Fire Flow, the areas require two pumper companies available to respond within 5 minutes.

In the event that there is a second alarm during a fire event, the fire department would not have sufficient apparatus to cover the alarm.

The Fanny Bay Volunteer Fire Department received 50 percent credit in this portion of the fire insurance grading of the fire department. To achieve maximum credit for distribution of resources an additional pumper company would be needed to fulfill the benchmark requirements set by the Basic Fire Flow of 6,800 LPM (1,500 Igpm).

Recommendation 3.2-6 Provide Additional Pumper Apparatus to Provide a Reasonable Level of Fire Protection

The fire department has a single pumper apparatus and a single mobile water supply apparatus. The Basic Fire Flow indicates that there should be two pumper companies

available to respond. For this reason, the Fanny Bay Volunteer Fire Department does not receive full credit in its distribution of apparatus.

In order for the fire department to be able to provide a second due cover, and provide a reasonable level of fire protection throughout the community, it is recommended that an additional recognized pumper be acquired to satisfy the second due cover. It is important to note that the apparatus must be housed in a suitable facility. Apparatus that is exposed to the weather can not be graded within the fire insurance grading.

Providing additional apparatus is a serious matter that requires careful consideration. There are many such factors to consider and the fire insurance grading is only one such factor.

3.2.2.13. Fire Fighting Ancillary Equipment and Hose

The fire department's apparatus and fire station have a combination of miscellaneous tools that meet the needs of the fire apparatus companies. These tools include but are not limited to rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc. The Fanny Bay Volunteer Fire Department's equipment for pumper apparatus is adequate.

Fire hose used by the fire department should be distributed so that each pumper company carries a minimum of at least 360 m (1,200 ft) of 65 mm (2 ½ in) (or larger), 180 m (600 ft) of 38 mm (1 ½ in), and 60 m (200 ft) of 25 mm (1 in) booster hose (or equivalent hose). A fire department should maintain a complete reload or spare shift of hose at the fire station.

Table 3.2-7 Fanny Bay Volunteer Fire Department Hose Summary

Unit #	Apparatus	Amount of Hose			
		Booster	38 mm	65 mm	100 mm
81	Pumper	-	243 m	304 m	-
84	Mobile Water Supply	-	-	60 m	-
		0 m	243 m	364 m	0 m
	Recommended Per Pumper Company	60 m	180 m	360 m	300 m
	Spare Hose in Station	0 m	0 m	0 m	0 m
	Recommended Full Compliment	60 m	180 m	360 m	300 m

The Fanny Bay Volunteer Fire Department received credit where possible for the amount fire hose carried on pumper apparatus, on other fire apparatus, and spare fire hose in the fire hall. Credit was not provided because of the lack of booster hose, 100 mm hose, and spare fire hose in the hall.

The Fanny Bay Volunteer Fire Department has hose drying facilities built on to the fire hall. It is not known if fire hose is tested annually and maintained according to NFPA standards.

The fire department has a 24' and a 12' extension ladder. The department's ground ladders are tested.

Recommendation 3.2-7 Acquire Additional Hose

It is recommended that the fire department acquire additional hose to meet the totals recommended per pumper company in Table 3.2-7 Fanny Bay Volunteer Fire Department Hose Summary. This will help ensure that the fire department has an adequate amount of hose on the fire ground and will not have to rely on hose that may be drying or undergoing testing and maintenance.

Recommendation 3.2-8 Fire Hose should be Tested to Meet NFPA Standards

Fire fighting hoses should be tested to and meet the respective NFPA standards or equivalent standards (NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose*, most recent edition). Failure of equipment can result in loss of life and/or additional property damage. Testing should be conducted on a regular basis and recorded.

Recommendation 3.2-9 Improve amount of Spare Fire Hose in Hall

To provide a reasonable level of fire protection throughout the community, there should be a full compliment of spare hose available to the fire department. In the event that the hose on the apparatus is being tested or serviced, the fire department should have additional spare hose. By having spare hose, the in service apparatus will have adequate tools and equipment available during fire ground operations.

The Fanny Bay Volunteer Fire Department has received minimal credit for the amount of spare hose that is available. Additional credit can be awarded by providing additional spare hose. To receive full credit for spare hose a full compliment should be kept for each amount of hose stored on apparatus.

If spare hose exists in the fire hall, amounts should be submitted to the Fire Underwriters Survey to make appropriate adjustments to fire insurance grading.

3.2.2.14. Personal Protective Clothing & Equipment

The Fire Department has approximately 12 new sets of personal protective clothing (PPC) in use with four spare sets available. PPC is inspected during every practice by the attending members; however, no standard is followed in the maintenance of PPC.

The PPC is generally replaced when needed and is sent out for dry cleaning.

The Fire Department has six sets of self contained breathing apparatus (SCBA), one spare pack and a total of six spare air tanks.

3.2.2.15. Planned Responses

The Fanny Bay Volunteer Fire Department responds with both of its apparatus for any fire emergency. A minimum of two firefighters is required on each apparatus before it can leave the fire hall.

3.2.2.16. Pre-incident Planning

Currently, the fire department is in the process of completing and updating the pre-plans throughout the community. The plans are stored in a binder and are not available digitally. They are developed following guidelines from an "Emergency Scene Management Course." Nine pre-plans have been developed but it is unknown how often re-inspections are completed to update the plans.

Recommendation 3.2-10 Develop and implement Pre-Incident Planning Program

It is recommended that the fire department set a timeline and develop an action plan for the development and implementation of a comprehensive Pre-Incident (pre-fire) Planning Program. Acquire access to NFPA 1620, *Recommended Practice for Pre-Incident Planning 2003 Edition* and develop pre-plans accordingly.

Developing and implementing a pre-incident planning program has multiple benefits that include but are not limited to:

- Increasing the familiarity fire fighters have with buildings in the community.
- Determining apparatus staging areas allowing quicker set-up times.
- Determining the overall accessibility for fire apparatus to get to risk and set up.
- Identifying hazards in and around the risk that may warrant defensive tactics.
- Identifying available water resources in the vicinity of the risk (example: fire hydrants, ponds, cisterns, dry hydrant, etc).

Credit awarded in the fire insurance grading of the fire department's pre-incident planning program may help to improve the overall fire insurance grade of the community.

3.2.2.17. Fire Department Assessment within the Fire Insurance Grading

The Fire Department Assessment contributes 40% to the total fire insurance grade of the community. This is the most heavily weighted portion of the grading and as such is considered to be the most significant indicator of a community's overall preparedness for dealing with fire emergencies.

The relative classification of the fire department is currently an 8. The areas where the least amount of credit was received in the fire insurance grading of the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

3.2.3 Fanny Bay Fire Prevention and Fire Safety Control

Fire Safety Control including Building and Fire Code effectiveness has become an increasingly heavily weighted portion of the fire insurance grading system. This is a result of statistical data showing that communities employing effective programs in these areas have significantly reduced fire related losses.

Fanny Bay Volunteer Fire Department has been reviewed in the effectiveness of its practices with regard to Fire Prevention and Fire Safety Control.

3.2.3.1. Codes and Bylaws: Construction Control, Plan Review, Building Inspection and Permit Process

The building inspector is an employee of the Comox Valley Regional District. The Comox Valley Regional District provides Building Permits and reviews plans, etc. for new construction. The Comox Valley Regional District also governs re-zoning applications.

Key Codes and Standards:

National: National Building Code
National Fire Code

Provincial: British Columbia Building Code
British Columbia Fire Code

Municipal: Electoral Area 'A' Zoning Bylaw No.

3.2.3.2. Automatic Sprinkler Protection

No sprinkler by-law is in effect in Fanny Bay Fire Protection District. Fire protection sprinklers are included in design only where required by the Building Code or where the designer includes protection voluntarily.

Automatic fire protection sprinklers have been installed in some buildings throughout the community. However automatic sprinkler protection systems are typically only installed where required by the BC Building Code. The BC Building Code is the minimum standard and does not require sprinkler systems to be installed in many occupancies. Additionally, the BC Building Code does not require pre-existing buildings to be brought up to meet current code requirements. As such, many buildings throughout the community are not sprinkler protected.

Sprinkler protection (when designed and installed in accordance with NFPA 13 and maintained in accordance with NFPA 25) is widely accepted as one of the most effective methods of reducing fire risk in buildings and communities. Properly designed, installed,

and maintained sprinkler systems have been shown statistically to reduce fire losses significantly and reduce the number of lives lost to fire.

Recommendation 3.2-11 Implement Sprinkler Bylaw

To reduce fire risk and improve life safety, the community should implement a Sprinkler Bylaw that requires all new buildings (excluding single family residential) to be sprinkler protected, and consider a Sprinkler Retrofit Bylaw that requires all pre-existing "high-risk" buildings/occupancies to be sprinkler protected (where high-risk is defined as buildings/occupancies that are currently required to be designed with sprinkler protection in the BC Building Code).

Additionally, consideration should be given to requiring all fire protection sprinkler systems to be plan checked by the Authority Having Jurisdiction (qualified plan examiner from the Comox Valley Regional District or other qualified third party).

Over the long term, the community should consider implementation of a Sprinkler Bylaw that includes all buildings.

3.2.3.3. Code Enforcement, Inspections and Local Assistants to the Fire Commissioner

The Fanny Bay Volunteer Fire Department does not conduct fire prevention inspections. The fire department currently does not have personnel trained to conduct fire prevention inspections.

Recommendation 3.2-12 Further Development of the Fire Prevention Inspection Program

To improve the level of fire prevention and reduce the overall fire risk in the community, it is recommended that the Fire Prevention Inspection Program be improved by increasing the minimum number of inspections for all commercially insured buildings. The number of inspections conducted should be based on the type of occupancy and the risk associated with it. Occupancies at a higher risk of fire should have more frequent inspections compared to occupancies with a low risk of fire.

Increasing the inspection frequencies will help reduce the risks throughout the community. Additionally, it will help reduce the development of any hazards/risks that would cause damage to buildings and endanger the lives of the occupants and the firefighters.

In order for the inspections to be considered effective, there should be an Enforcement Program. Once inspections have been completed, an inspector should return to that building within a reasonable time frame and confirm whether or not the building owner has addressed the infractions. If the infractions have not been addressed, then steps should be taken to ensure that the building owner does comply with the inspectors concerns. Refer to Appendix E for recommended inspection frequency.

The fire department should request that the Regional District provide fire prevention inspections to commercial occupancies in the Fanny Bay Fire Protection Local Service Area.

3.2.3.4. Public Education Program

The public education portion of the fire prevention section is an effective method for an all volunteer fire department to help improve the fire insurance grade and to raise awareness in the community about fire safety.

Fire prevention activities conducted by the Fanny Bay Volunteer Fire Department is very limited but includes:

- Attending community events
- Smoke Detection Program
- Fire Safety House
- Flyers handed out each month

Recommendation 3.2-13 Develop and Implement Public Education Programs

To improve the level of fire consciousness throughout the community and to reduce the risk of fires, a formal public education program should be developed. A public education program can also be an excellent public relations tool and can be used to improve fire fighter recruitment within the community as well.

The Public Education Program should include promotion and development of various elements such as:

- Smoke Alarm Installation Program
- Hold Regular Fire Department Open Houses
- Host School Classroom Visits in the Fire Department
- Host Regular Community-Wide Fire Drills

The Program should also include promotion of Educational Programs/Materials such as the following (but not limited to):

- Fire Prevention Canada
- Fire Safety Information - (including PSAs)
- Home Fire Escape Plan Worksheet (PDF 207 kB)
- Learn Not to Burn® (LNTB®)
- Older & Wiser
- Kitchen Care Fire Safety Program
- "Use Candles with Care"
- The Arson Prevention Program for Children (TAPP-C)
- Risk Watch™
- Fire Safety Teacher Awards
- FNESS

3.2.3.5. Wildland Urban Interfaces Risk Reduction

Throughout Fanny Bay, Wildland Urban Interface fire risk is a major concern for the fire department. Fire bans are enforced and open burning permits are required in Fanny Bay.

A Wildland Urban Interface Study has not been completed for Fanny Bay. The Fire Department does not provide the Fire Smart manual to local residents.

Recommendation 3.2-14 Have a Wildland Urban Interface Study Conducted

To help reduce the risk of wildland urban interface fires for Fanny Bay a Wildland Urban Interface Study should be completed. Having a study completed will help identify high risk areas on the island.

If a study is to onerous the Fire Department is encouraged to review the BC Fire Smart Manual and distribute to residents of the island to help lower wildland urban fire risk.

3.2.3.6. Fire Prevention and Safety Control within the Fire Insurance Grading

Fire Prevention and Fire Safety Control Programs contribute 20% to the total fire insurance grade of the community. The relative classification of the fire safety control program is currently an 8.

3.2.4 Fanny Bay Emergency Communications

3.2.4.1. Emergency Communications System Description

Emergency Communications is provided by North Island 911 Corporation. The initial answering point for public safety calls is the RCMP Operational Communications Centre in Courtenay. Fire calls are relayed to the fire dispatch centre in Campbell River. All police calls are handled by the RCMP OCC in Courtenay. All ambulance calls are relayed to the B.C. Ambulance Service in Victoria.

For full information regarding the emergency communication centres in Courtenay and Campbell River refer to section 4 Emergency Communications.

3.2.4.2. Fire Department Communications

Fire fighting personnel of the Fanny Bay Volunteer Fire Department are alerted to emergencies via voice pagers and alerting pagers. Each member of the department is given a pager.

The Fanny Bay Volunteer Fire Department utilizes permanently mounted and portable radio equipment to receive emergency information and communicate between personnel on the fire ground during an emergency situation. The department possesses eight portable radios. Three of the eight radios remain at the fire hall for emergency situations. The other five and with charge stations are kept by the Fire Chief, Deputy Chief and Captains. A base radio is provided in the chief's office at the fire.

A repeater system is used by dispatch in Campbell River to provide continuous use of the emergency communications systems in place. Some areas of the fire protection area may have poor radio reception. The department has installed an antenna on the fire hall to boost reception.

3.2.4.3. Emergency Communications within the Fire Insurance Grading

Emergency communications contribute 10% of the overall grade in the calculation of Public fire Protection Classifications. The emergency communications program for Fanny Bay has a relative classification of 3.

3.2.5 Fanny Bay Water Supplies for Fire Protection

Water supplies for fire fighting are a critical component of the community's fire defence systems. Water supplies for fire fighting were evaluated for adequacy in several areas including but not limited to:

- Fire Flow Delivery – the ability of the water system to deliver the *Required Fire Flow* (from Section 3.2.1.1 – Fire Risk in Fanny Bay) to the identified *Fire Flow Demand Zone*.
- Storage Adequacy – quantity of stored water reasonable for expected demands and duration of appropriate flows during expected fire events.
- Distribution System Adequacy – layout and arrangement of piping and pump capabilities, looping/grid design of pipe networks for maximum versatility and minimum losses.
- Hydrant Distribution – appropriate spacing and distribution to minimize hose lays and other delays in setting up an initial attack during structure fires.
- System Design and Installation – the overall design of the system with regard to redundancy, and capability to continuously provide full service to all areas during all foreseeable events (including catastrophic events and/or perils).
- Maintenance of System and Components – system and component maintenance meets recognized standards and improved reliability of system.

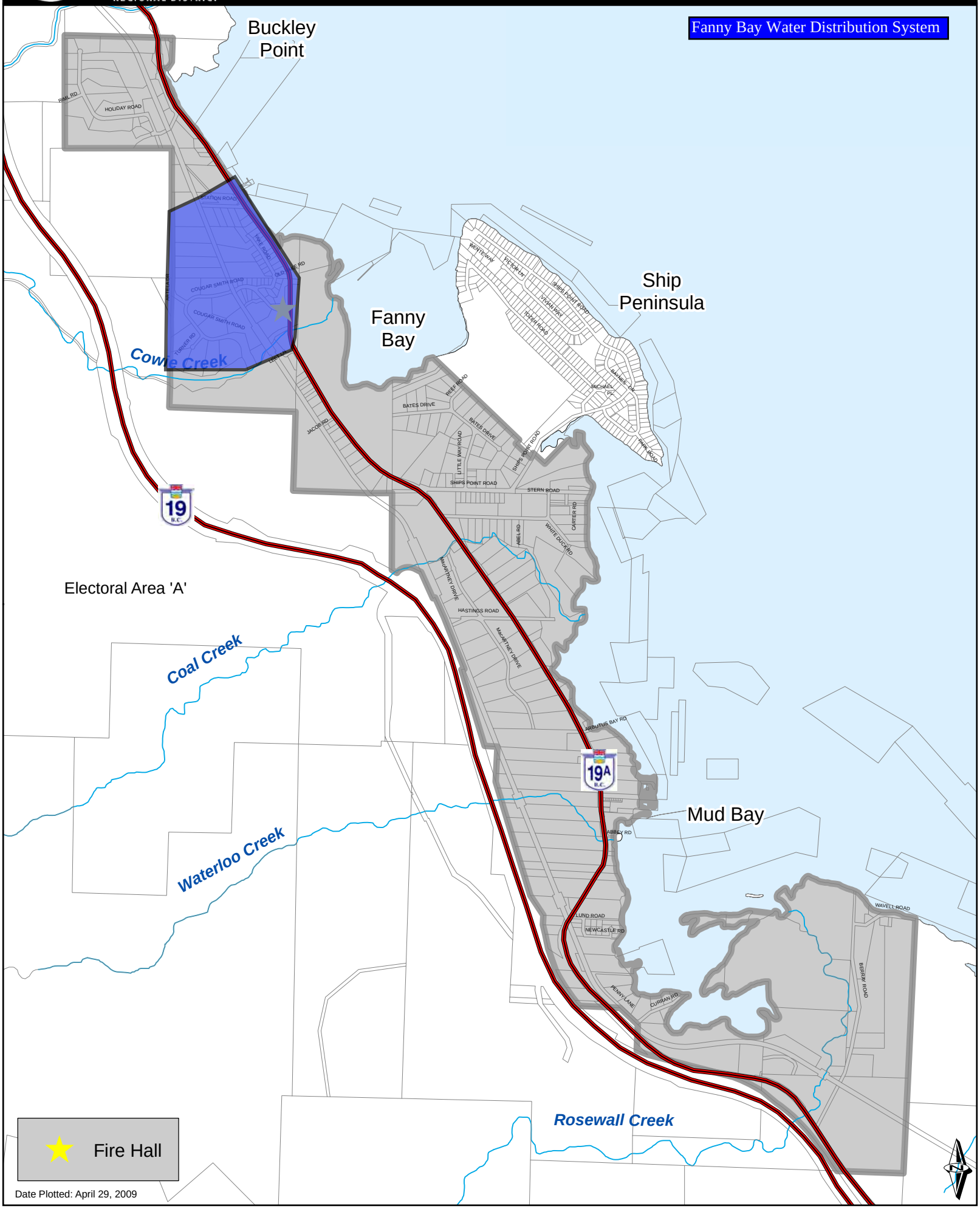
This section highlights some of the significant findings of the fire insurance grading emergency water supply review. Areas where improvements can be made have been noted.

3.2.5.1. Fanny Bay Water Works

The Fanny Bay Water Works serves a population of approximately 250 through 80 connections. The system does not cover all of Fanny Bay as shown in Figure 3.2-6 Fanny Bay Water Distribution System.

Comox Valley Regional District

Figure 3.2-6 Fanny Bay Water Distribution System



Date Plotted: April 29, 2009

The water source comes from two pipe casing wells, each about 9 m (30 feet) deep, located north of Cougar Smith Road close to the west side of the Old Island Highway. The water from the wells is chlorinated.

With both well pumps in operation the wells combined can provide 278 LPM (61.2 Igpm) and a single well pump can provide 209 LPM (45.9 Igpm). The wells pump directly into the distribution system and fill a 500,000 Litre (110,000 Imperial Gallon) reservoir located on Artella Drive.

The wells are run by a PLC. The water system is checked regularly. Pumps are checked every two days. The water system is flushed annually.

The distribution system does not consist of any mains over 150 mm (6 inches). New 150 mm pipes have been installed along the highway up to the reservoir. There are certain sections of the distribution system where 100 mm (4 inches) is still used.

The Water distribution system has a total of 12 hydrants, six standpipes and seven major valves. Hydrants are not routinely serviced. Data collection indicated that hydrants were recently serviced for the first time in six years. Maintenance occurs annually for standpipes and major valves. Hydrant of distribution system mapping is limited. No hydraulic modelling or digital record keeping is done. All records are paper based.

All single family residential structures and duplexes in the water service area are within 300 metres of a fire hydrant. Commercial Lines insured risks within the water system are within 150 metres of a fire hydrant.

The Water Works District does not have back-up power for the well pumps installed in the pump houses. The water works pump house is wired for a generator. An emergency procedure is in place to install a generator when needed. A generator is stored at Water Work's member's storage facility 0.8 km (0.5 mile) from the pump house. One hundred percent of the distribution system would be affected if there was a major power outage.

Recommendation 3.2-15 Improve use of Technology to Manage, Plan, and Optimize the Water System (Fanny Bay Improvement District)

To improve the ability of the purveyor to plan, optimize, manage, and administrate the water system, the following technologies should be implemented and used:

- GIS map system,
- a hydraulic model of the water system,
- a SCADA system, and
- Digital record keeping system.

Recommendation 3.2-16 Improve hydrant maintenance program and records

Detailed records of all maintenance history and programs should be kept by the Works Department. Fire hydrants and valves should be inspected and maintained in accordance with the manufacturers' specifications, and with other applicable standards including but not limited to the BC Fire Code.

As per the BC Fire Code, Section 6.6.4
Clause 6.6.4.2.(1) hydrants shall be inspected at intervals not greater than 6 months and after each use,
Clause 6.6.4.3.(1) records of inspections and tests shall be retained, and
Clause 6.6.4.5.(1) hydrants shall be flushed at intervals not greater than 12 months with the main valve and any outlet valves fully opened until the water runs clear.

3.2.5.2. Water Supply Analysis

To have an adequate water supply for fire fighting the quantity of stored water available to the fire location must be adequate to sustain the Required Fire Flows for the fire duration. Fire durations for each design required fire flow are taken from the Fire Underwriters Survey document Water Supply for Public Fire Protection.

The minimum size water supply credited by FUS must be capable of delivering not less than 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to domestic consumption at the maximum daily rate.

The maximum capacities of the reservoirs and their refill rates [for the typical fire event duration] are de-rated with a safety factor for the calculation of the total available water resources for fire fighting. Reservoirs have been derated to 80% of the maximum capacities and refill rates have been derated by 25% of the theoretical capacity (limiting flow factor).

Table 3.1-8 summarizes the minimum required fire storage volume [BFF for the typical fire event duration] for the water system [column referred to as "Required Fire Storage"]. The table also shows the recommended emergency storage [25% of the sum of "Required Fire Storage" and Domestic Storage].

Water supply systems designed to provide fire protection should meet the following criteria to be considered a "Good Supply" with regard to the adequacy of water storage.

The required total effective storage should be based on the following formula:

Total Storage Required = A + B + C + D

Where:

A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water

Supply for Public Fire Protection and Fire Underwriters Survey methodologies

B = equalization storage capacity equal to 25% of projected maximum day demand (MDD)

C = emergency storage capacity [25% of (A + B)]

D = Concurrent domestic demand = Peak hour demand for the event duration

Water supply systems designed to provide fire protection should meet the following to be considered an “Adequate Supply” with regard to the adequacy of storage.

The required minimum storage of the water system to be considered adequate for fire insurance grading is based on the following formula:

Minimum Storage Required = A + E

Where:

A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water Supply for Public Fire Protection and Fire Underwriters Survey methodologies

E = Calculated volume equal to MDD flow rate for the typical fire event duration

The formulas described above may be modified if the level of risk within the community is unusual or if the situation warrants. In some cases alternatives to the formulas may be developed and considered based on specific situations.

Ideally the water supply should be capable of providing fire flows to all built-up areas of the protected community. The water supply system(s) should be designed and constructed such that water supplies are uninterrupted during system maintenance, main breaks, reservoir cleaning, and catastrophic events such as seismic events, wind storms, power failures, etc. This can be achieved through the use of redundant design with multiple sources and storage locations, looped distribution system, back up power, and other safety factors included within the scope of good engineering practices.

Note that this section is directed toward analysis of the volume of water available for fire fighting and not the capacity to deliver the Required Fire Flows to any given area.

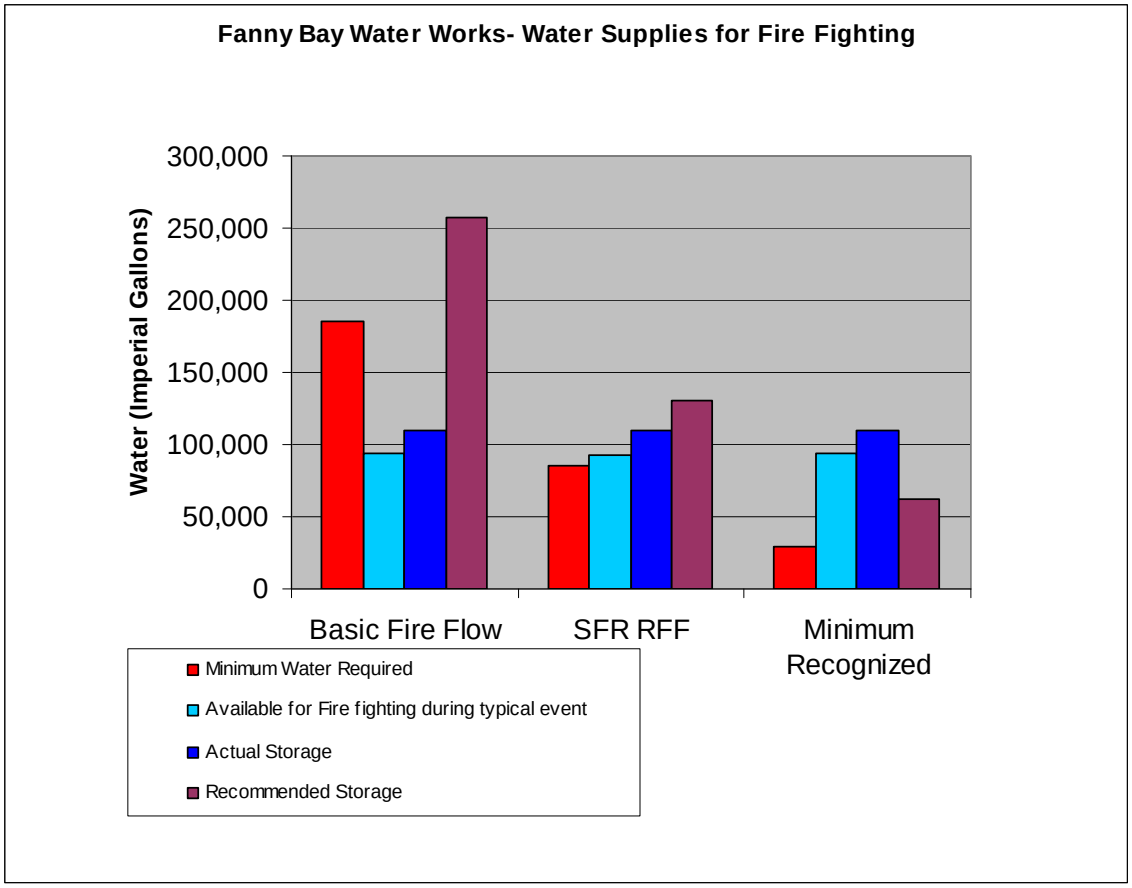
Table 3.2-8 Available Water Resources for Fire Fighting

	Serving (pop)	ADD	MDD	PHD	Total Storage	Total Refill Rate	Refill during Event Duration	Total Available Water Resources
Notes --->						derated 25-30%		
Units --->		*MGD*	*MGD*	*IGPM*	*I. gal*	*IGPM*	*I. gal*	*I. gal*
Fanny Bay Water Works District	250							
Basic Fire Flow		0.035	0.068	95	110,000	45.9	5,508	93,508
SFR RFF		0.035	0.068	95	110,000	45.9	4,131	92,131
Minimum Recognized		0.035	0.068	95	110,000	45.9	5,508	93,508

Table 3.2-9 Summary of Recommended and Required Water Volumes for Fire Fighting

						Variables -->	A	B	C	D	Eq.I	E	Eq.II		
	BFF	Fire Duration	ADD	MDD	PHD	Total Available Water Resources	Required Fire Storage	Domestic Storage (incl. agr.)	Emergency storage	Concurrent Domestic Demand $_{peak}$	Recommended storage	Concurrent Domestic Demand $_{max}$	Minimum Storage Req'd	Supply Good?	Supply Adequate?
Notes --->						derated 20%	BFFxDuration	.25 MDD	.25 (MDD+Fire)	PHDxDuration		MDDxDuration			
Units --->	*IGPM*	*hrs*	*IMGD*	*IMGD*	*IGPM*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*Eq.I*	*Eq.II*
Basic Fire Flow	1,500	2	0.035	0.068	95	93,508	180,000	17,048	49,262	11,365	257,675	5,683	185,683	NO	NO
SFR RFF	900	1.5	0.035	0.068	95	92,131	81,000	17,048	24,512	8,524	131,083	4,262	85,262	NO	YES
Minimum Recognized	200	2	0.035	0.068	95	93,508	24,000	17,048	10,262	11,365	62,675	5,683	29,683	YES	YES

Figure 3.2-7 Fanny Bay Water Works – Water Supplies for Fire Fighting



The analysis of the Fanny Bay Water Works shows that the water system is adequate at meeting the minimum requirements needed to be recognized for fire insurance grading. The water supply however, is not consider good when comparing the total available water to the recommended amount of storage and the water supply is not considered adequate when comparing the total available water to the minimum storage required with the Basic Fire Flow set at 6,800 LPM (1,500 Igpm). As shown in Figure 3.2-7 Fanny Bay Water Works – Water Supplies for Fire Fighting.

When measuring the water supply for single family residential dwellings located on the water system with average required fire flow of 4,090 LPM (900 Igpm), the supply was not considered good (comparing the total available water to the recommended amount of storage); but the supply was considered adequate when comparing the total available water to the minimum storage required. As shown in Figure 3.2-1 Fanny Bay Fire Flow Demand Zone.

If a main break were to occur along the main that leaves the pump houses or along the main to the reservoir, water available for fire fighting purposes would be drastically reduced. If a break were to occur along the main to the reservoir the wells would not

have enough capacity to provide a reasonable amount of water for fire protection. Improving main redundancy in key sections of the distribution system is recommended.

The wells supplying water to the distribution system are not provided with a means of back-up power. If power outage or damage were to occur to the above ground power lines that feed the two pump houses, the flow of water would be cut-off. Improving back-up power redundancy is recommended.

Recommendation 3.2-17 Improve Redundancies throughout the Water System

To reduce the risk of inadequate water supplies being available for fire fighting during an event, the water supply system should be reviewed and improved with respect to redundancy. Water supply systems should be designed with redundancy at each level so that if any given major component (such as arterial mains, pumps, intakes, power supplies water sources, storage facilities, etc.) is taken out of service for any reason, the water supply system will be unaffected in its ability to deliver the required fire flows throughout the system service area.

3.2.5.3. Available Fire Flows

To determine if the water supply system is adequate or deficient in its ability to deliver a reasonable amount of water for fire fighting purposes, the Required Fire Flows for a number of representative structures have been calculated. The determination method of Required Fire Flows[12] (RFF), fire event duration, and minimum hydrant distribution is detailed in the Fire Underwriters Survey document *Water Supply for Public Fire Protection* (Appendix B).

The Required Fire Flows for the Fire Flow Demand Zone determined during the community risk assessment (see Section 3.2.1) have been utilized as a benchmark for each respective area. The required fire flows are not the highest RFF's for the zone, but are intended to be adequate for approximately 90% of the structures in the water distribution system. Notably, the RFF calculations are for fully involved structure fires with an offensive fire fighting attack.

Available Fire Flow tests were conducted in accordance with established protocols specified in NFPA 291,*Recommended Practice for Fire Flow Testing and Marking of Hydrants*. The results of the flow tests are compared to the calculated Required Fire Flows as shown in Table 3.2-10 Available Fire Flows compared to Required Fire Flows. Determining water supply system deficiencies in this way provides a good indicator of the level of adequacy or deficiency of the water supply system with regard to providing adequate water flows for the expected types and sizes of fires (typical for the risks present).

[12] A minimum residual water pressure of 20 psi in the street main is required during flow.

Two available fire flow tests were conducted on the water system. It should be noted that Test 1 was conducted near the end of the system and Test 2 was conducted in an area of single family residential dwellings.

Table 3.2-10 Available Fire Flows compared to Required Fire Flows

Test #	Location	RFF	Rated Capacity @ 20 PSI	Deficiency
		IGPM	IGPM	IGPM
Test 1	Residual: Holiday Rd. Flow: Hwy 19A across from Mac Oysters	1,500	442*	1,058
Test 2	Residual: Hydrant before Flow Hydrant on Old Yakes Rd. Flow: Last hydrant on Old Yakes Rd	900	1,152	0

* Flow Test 1 residual reading of 10 psi. A minimum residual pressure of 20 psi should be maintained at hydrants when delivering the fire flow. NFPA 291 – 4.1.3

The available fire flow tests that were conducted on the Fanny Bay Water Works system validate that the water system is capable of providing flows greater than 200 Igpm. Available fire flow tests indicate that flows are reasonably adequate for Personal Lines insured risks (single family residential dwellings and duplexes) on the distribution system. However, for Commercial Lines insured risks available flows may not be adequate for all risks, depending on location. Refer to Appendix F for the Available Fire Flow Testing – Fanny Bay.

It is recommended that available fire flow tests be conducted near Commercial Lines insured risks to ensure available fire flows are adequate for risks in the vicinity of recognized fire hydrants. If flows are not adequate additional measures may be required to adequately protect the risk (example: additional mobile water supply apparatus).

Recommendation 3.2-18 Improve Water System Available Fire Flows to Meet Calculated Fire Flows

Available fire flows were noted to be deficient when comparing calculated required fire flows of Commercial Lines insured risks to available fire flow tests. To reduce the risk of property losses and to reduce the risk to the life safety of fire fighters responding to fires in the commercial areas, the available water supplies to these areas should be improved. Steps should be taken to improve the flow capabilities of the system. Additionally, steps should be taken to periodically review the flow capacities through areas of increased value and risk (multi-family, commercial, and industrial zones) by flow testing to ensure that adequate water supplies are consistently available for the type of risks in these areas.

Flow testing and hydrant marking should be done in accordance with NFPA 291 *Recommended Practice for Flow Testing and Marking of Hydrants*, 2007 Edition.

3.2.5.4. Alternative Water Supplies

The Fanny Bay Volunteer Fire Department maintains three emergency water storage tanks within the Fanny Bay Fire Protection Local Service Area. The storage tanks are old propane tanks with an approximate capacity of 800 Imperial Gallons each. They are located in areas of the of the fire protection local service area that are not protected by recognized fire hydrants. Individual storage tanks are located at these places:

- At the top end of Holiday Road,
- McArtney Drive, and
- The extreme end of Bates Drive.

Recommendation 3.2-19 Develop Formal Water Supply Plan for Non-Hydrant Protected Areas; Consider Dry Hydrants

The Fanny Bay Fire Protection Local Service Area has areas without hydrant water supplies. The Fire Department is equipped to respond utilizing the water shuttle method. The mobile water supply truck will shuttle water from nearby sources to the fire scene where water will be dumped into a portable tank. The engine on scene will pump water through suction from the portable tank. In some cases, the most accessible and reliable water supply will be the nearest recognized fire hydrant, however in some cases, other non-recognized water supply sources may be more accessible. To reduce the risk of time being lost during a fire event due to unreliable water supply sources, formal plans should be developed for water supplies for all non-hydrant protected areas within the Fire Service Area boundaries.

Consideration should be given to installing dry hydrants in strategic locations to minimize travel times during shuttle operations. All dry hydrants should be installed in full compliance with NFPA 1142 *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2007 Edition. Any improvements made to water supplies should be reviewed/approved by Fire Underwriters Survey if they are intended to be credited toward fire insurance grading classifications.

Note: In areas without recognized hydrants it may be possible to achieve significantly improved insurance rates through Superior Tender Shuttle Accreditation administered by Fire Underwriters Survey. Refer to Appendix G.

3.2.5.5. Water Supplies within the Fire Insurance Grading

Water supplies contribute 30% to the total fire insurance grade of the community. The relative classification of the water supply for Fanny Bay is currently 8. The previous relative classification was 8.

For areas of the Fanny Bay Fire Protection Local Service Area that are not serviced by a recognized water supply the relative classification of the water supply is a 10.

3.2.6 Fanny Bay Fire Insurance Grading

As a result of this assessment, the following information will be published in the fire insurance grading index for the insurance community to set rates on. The information will apply to the Fanny Bay Fire Protection Local Service Area (Specified Fire Service Area within the Comox Valley Regional District) and more specifically the following areas within the boundaries of the Fire Service Area.

Table 3.2-11 Summary of Fanny Bay Fire Protection Local Service Area Grading Assessment

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Fanny Bay Waterworks District	3A	**3A**	Hydrant Protected - detached dwellings within 300 m of fire hydrant on the Fanny Bay's water system
Fanny Bay Fire Hall	3B	**3B**	Fire Station Protected - detached dwellings within 8 km by road of Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of Fire Hall

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Fanny Bay Waterworks District	8	**8**	Hydrant Protected - Commercial Lines insured properties within 150 m of fire hydrant on the Fanny Bay water system
Rest	9	**9**	Fire Station Protected - Commercial Lines insured properties within 5 km by road of responding Fanny Bay Fire Hall
Rest	10	**10**	Unprotected - commercial properties further than 5 km by road of the Fanny Bay Fire Hall

Importantly, the re-assessment of the community has identified a number of weaknesses and areas where improvements may result in improved levels of fire protection and improved fire insurance grading classifications.

3.2.7 Fanny Bay Conclusions

The Fanny Bay Volunteer Fire Department has made great strides in improving its services. The most significant areas of the fire insurance grading where the least amount of credit was received for the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

The Fanny Bay Water Works remained the same since grading information about it was last updated. The water distribution system is adequate when providing available fire flows for Personal Lines insured risks. However, the distribution system may not be capable of providing adequate flows for Commercial Lines insured risks. It is recommended that additional flow testing be conducted to ensure and understand the capability of the water system for fire protection.

A large portion of the Fire Protection Local Service Area is without hydrant water supplies. It is recommended that the fire department continually look at measures to provide adequate fire protection. Providing additional mobile water supply apparatus and developing alternative water supplies in non-hydrant areas is recommended.

Overall, Fanny Bay has successfully maintained its Public Fire Protection Classification (PFPC) of an 8 and maintained its Dwelling Protection (DPG) of 3A.

Addressing the recommendations in relation to the fire department and water supplies in this report may qualify Fanny Bay for an improved fire insurance grading classification. This would likely have an impact on property insurance rates for property owners who are insured under Commercial and Personal Lines insurance.

3.3. Denman Island

Denman Island is located in the northwest corner of the Georgia Strait, approximately 1 hour north of Nanaimo and 20 minutes south of City of Courtenay. The Island is connected to Vancouver Island by the BC Ferry service.

Denman Island has an approximate population of 1,200. The size of Denman Island is approximately 5,108 hectares (12,622 acres). Denman Island resides in Electoral Area "A" of the Comox Valley Regional District.

3.3.1 Denman Island Risk Assessment

The Risk Assessment is an evaluation of the life safety risks, fire loading and risk of fire that is present in a given area. The assessment is used to determine the "Basic Fire Flow" for the community which is the benchmark that the community's fire protection facilities are measured against.

Adequate response to a fire emergency is generally measured by the speed of which a responding fire fighting crew(s) can arrive at the fire emergency with the correct type and amount of resources, to have a reasonable degree of opportunity to control or extinguish a fire. Simply put, the response provided by a fire fighting crew should equal the potential severity of the fire or fire emergency. The required response from a fire fighting crew is greater if life safety is a factor in a fire event and the expected response time is shorter.

The potential severity of a fire event is generally associated with the fuel load present and exposures to the fire. Factors such as building construction materials; quality of construction; building renovation history; building size, height and age; occupancy and hazards associated with the occupancy, will all contribute to the potential severity of a fire. In addition, other buildings sufficiently exposed to a burning building can contribute

to the magnitude of a fire and, the resources necessary to be in place to control or extinguish a given fire. Alternatively, building controls and automatic fire protection systems (both active and passive) that limit fire spread will reduce the potential severity of a fire. For building controls to be considered effective, their design, installation and maintenance must also be reviewed as any weak link may result in the system being ineffectual.

Much of the research into fire protection requirements for individual buildings and communities and the corresponding number of "*pumper companies*" and response times has been conducted by Fire Underwriters Survey and the National Fire Protection Association. Fire Underwriters Survey evaluates adequacy of response by comparing the potential severity of fires that may occur with a rating of the ability of fire crews and their resources responding within a specified time period relative to the fire and life safety risk potential that may be needed.

In a fire and life safety risk analysis, the fire service area is broken up into zones of fire emergency risk and hazard profiles. For this review, the fire protection needs of each community zone were evaluated. A fire and life safety risk analysis provides much of the data that is necessary to comment on the community's fire protection needs including fire apparatus requirements, fire equipment and other areas of a community's fire protection programs.

Appendix A - Table of Effective Response, illustrates various sectors commonly found in most communities, and indicates a range of risk ratings that are commonly applied to these sectors. The Table also indicates a range of fire flows that are normally associated with each community sector profile. Additionally, the Table of Effective Response indicates the number of pumper trucks, ladder trucks and associated companies that are expected to be needed to control and extinguish fires occurring within representative building zones throughout the community.

The number of fire companies that will be needed is correlated to fire loading within the community's building stock and to life safety risks present. Fire flow requirements are determined by construction characteristics, occupancy, size and exposures to representative buildings throughout the community.

3.3.1.1. Fire Risk in Denman Island

The community has been reviewed from the perspective of life safety, fire loading, fire risk and response characteristics.

Each area of the community has been reviewed with building risk assessments. Building Risk Assessment was performed at three levels of measure:

Occupancy Risk: Which is defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class. (Occupancy "Required Fire Flow")

Fire Flow Demand Zone: Which is an area used to define or limit the management of a risk situation. A fire flow demand zone can be a single building or a group of buildings. It is usually defined with geographical boundaries and also can be called fire management areas or fire management zones. (FFDZ "Required Fire Flow")

Community: Which is defined as the overall profile of the community based on the unique mixture of individual occupancy risks, fire flow demand zone risk levels and the level of service provided to mitigate those risk levels. ("Basic Fire Flow")

Denman Island is made up primarily of widely and moderately spaced single family dwellings with wild land urban interface exposures. Exception to this are several commercial occupancies located in one central area of the island, include the Denman Seniors and Museum Centre, the Denman Island Community Hall, the Denman Island Community School, and the Denman Island General Store & Café.

Two small ferry terminals are located on the island and are operated by the BC Ferries Corp. The Fire Department is not equipped to fight fires from the water but does provide on-shore services. The Fire Department has draft equipment, but no other equipment (such as boats, etc.) for dealing with fire incidents in the marina areas.

The community was identified as one "fire flow demand zone" as shown in Figure 3.3-1 Denman Island Fire Flow Demand Zone.

To develop the required fire flow in the fire flow demand zone for Denman Island, the methodology described in Fire Underwriters Survey 1999 guideline "Water Supply for Public Fire Protection" was used. Refer to Appendix B.

Figure 3.3-1 Denman Island Fire Flow Demand Zone

Table 3.3-1 Denman Island Fire Flow Demand Zone

Denman Island Fire Flow Demand Zones	Fire Zone Risk Rating*	BFF LPM (Igpm)
Single Family Residential & Small mercantile	3(a)	5,900 (1,300)

* Corresponding to the Table of Effective Response

The required fire flows were calculated for a representative sampling of buildings as well as for a representative sampling of "construction parameter zones" based on local construction practices. The "fire flow demand zone" was assessed for primary zoning (industrial, commercial, residential, etc.) and for typical building construction.

The intent of setting the final required fire flow in this manner is not to provide adequate water supplies for the worst case scenario, but rather to provide adequate water supplies for fire fighting in the majority (90%) of structure fires (not including WUI). The final required fire flow is intended to be adequate for existing construction as well as new construction occurring in already built-up areas of the community.

It should also be noted that the required fire flows set by the Fire Underwriters Survey are intended as a benchmark that the community will be measured against. This fire flow is intended to be adequate to fight fires offensively, and to provide property protection (including exposure protection) in addition to life protection.

The final fire flow (with associated risk categories from FUS Table of Effective Response) for the fire flow demand zone is shown in Table 3.3-1 Denman Island Fire Flow Demand Zone.

The final fire flow is utilized with associated risk categories from Appendix A, Table of Effective Response, to determine the benchmark level of response from fire department, including items such as response times and apparatus requirements. These are also used to determine staffing benchmarks and optimal apparatus and fire station locations based on achieving the level of response indicated in the Table of Effective Response 90% of the time.

The Basic Fire Flow for Denman Island has been set at 5,900 LPM (1,300 Igpm) in 2008.

The past Basic Fire Flow for Denman Island was set at 4,500 LPM (1,000 Igpm) when fire insurance grades were last updated in 1982.

The benchmark requirements of this Basic Fire Flow from the Table of Effective Response are as shown in Table 3.3-2 Denman Island Summary of Benchmark Requirements for Basic Fire Flow. Denman Island is measured against these benchmarks to establish the fire insurance grading classification.

Table 3.3-2 Denman Island Summary of Benchmark Requirements for Basic Fire Flow

Basic Fire Flow	1st Due Pumper	2nd Due Pumper	1st Due Ladder	Total Pumper Companies available	Minutes for all to arrive	Total Ladder Companies available	Minutes for all to arrive
5,900 LPM (1,300 Igpm)	3.5 minutes (2.7 km)	5 minutes (4.1 km)	NA	2 pumper companies	5 minutes (4.1 km)	NA	NA

3.3.1.2. Future Fire Risk in Denman Island

The Basic Fire Flow of Denman Island is not expected to increase significantly in the future. Growth in residential sub-divisions will not have a have a dramatic effect on the Basic Fire Flow unless new sub-divisions are built that are very large. For the Basic Fire Flow of Denman Island to increase significantly construction of large commercial, large multi-family residential or industrial buildings would have to occur in the area. At this moment there are no future fire risks to be addressed that may warrant the Basic Fire Flow to increase. The community has no developments being built that would need to be addressed from a fire protection resource planning standpoint.

The community is not experiencing significant growth in population and industry.

3.3.2 Denman Island Fire Department Assessment

3.3.2.1. Fire Department Profile

The Denman Island Volunteer Fire Department is a volunteer fire department. The Fire Chief is a paid on-call member. In addition to the Fire Chief and Deputy Chief there are five officers consisting of four captains and a Safety/Administration Officer. The fire department has a training officer and maintenance officer, both are captains.

The fire fighting roster consists of the Fire Chief, one deputy chief, five line officers and 16 fire fighters and two radio operators. Members are supplied with a pager which will notify them of emergency calls.

The fire department has seven auxiliary members. The auxiliary members train once a month and fill support roles other than front-line emergency response. At a large incident, the auxiliaries can operate fire apparatus such as the mobile water supply apparatus, operate pumps, move equipment and perform other such support tasks, allowing trained firefighters to attack the fire.

3.3.2.2. Fire Department Operations and Administration

The Denman Island Fire Department is operated by the Comox Valley Regional District and funded by the Denman Island Island tax base. The regional district operates a total of five volunteer fire departments and has working agreements with member municipalities and improvement districts within the regional district to provide fire protection.

The Fire Department's annual budget is reviewed and endorsed by a general meeting of the Denman Island Residents' Association (DIRA) before being presented to the Comox Valley Regional District for final decision.

Additional funds are raised through special events or donations and are directed towards non-budget items.

A portion of the annual budget is deposited into a capital reserve fund, which is used for major equipment purchases.

Officers:

- Don Luckett, Fire Chief/Fire Warden
- Rob Manering, Deputy Chief
- Jamie Prowse, Captain
- Bob Simons, Captain

- Peter Marshall, Captain/Auxiliary Training
- Keith Walker, Captain
- John Ralston, Administration/Safety Officer

Records are kept on paper and date back seven years. These records are available upon request.

3.3.2.3. Automatic and Mutual Aid Agreements

The Denman Island Volunteer Fire Department is part of the Comox Valley mutual aid agreement that is administered through the Fire Chiefs Association and the Comox Valley Regional District for wild land urban interface fires. It is a legal agreement with all fire departments within the Comox Valley.

3.3.2.4. Fire Station Suitability

The Denman Island Volunteer Fire Department's fire hall is located at 5555 Denman Road as shown in Figure 3.3-2 Denman Island Volunteer Fire Department Fire Hall and has been in use since the 1970's. The fire hall has been renovated multiple times over the years, with the last renovations occurring within the last 10 years. The fire hall was brought up to Earthquake standards in 1999. The fire hall is located in the centre of Denman Island.

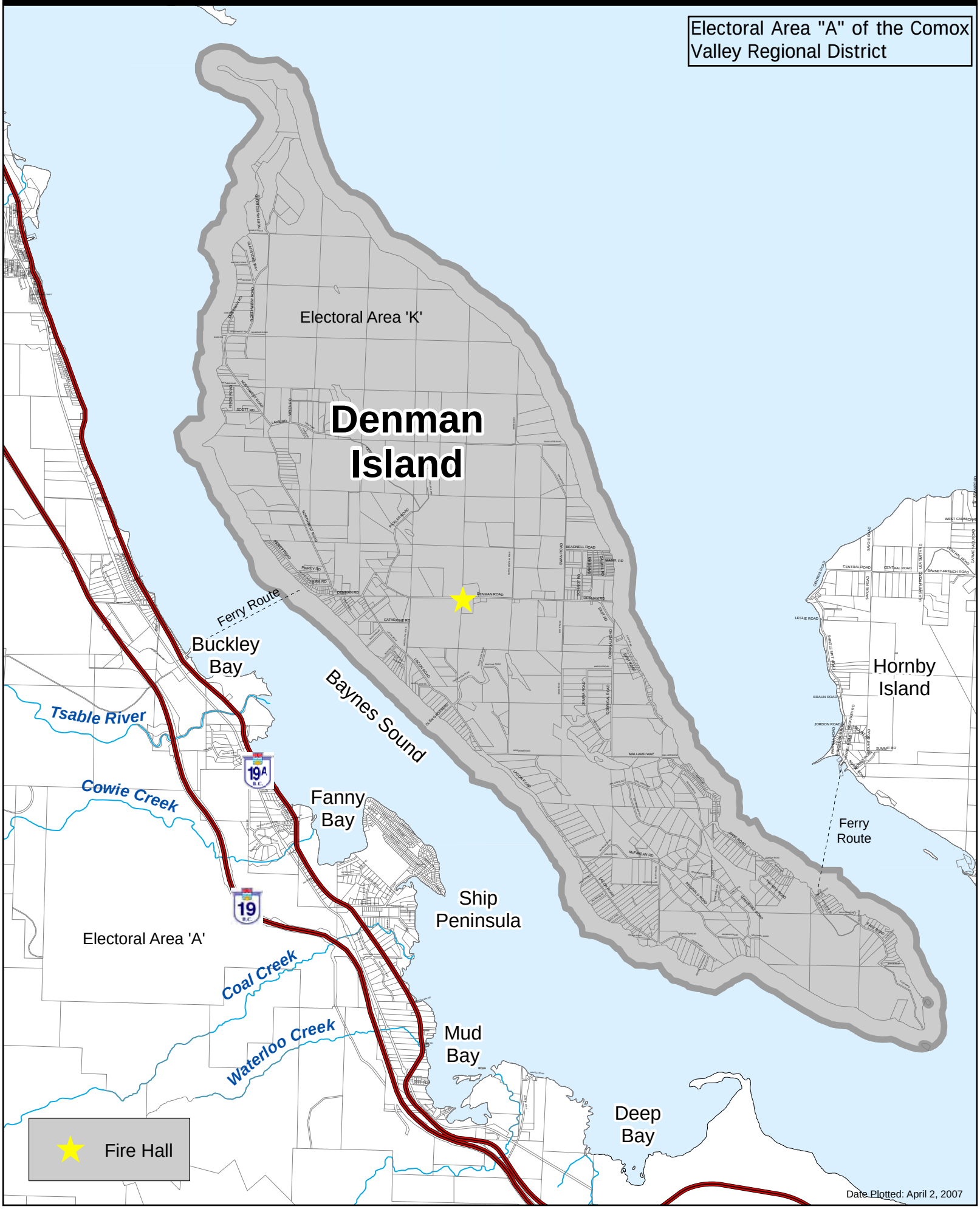
Figure 3.3-2 Denman Island Volunteer Fire Department Fire Hall

The fire department operates out of four bay measuring 3.7 m x 3.7 m (12 ft x 12 ft) for three of the bays and 4.3 m x 3.7 m (14 ft x 12 ft) for the largest bay. The fire hall is of wood frame construction and is one storey in height. The furthest bay in Figure 3.3-2 is leased space to BC Ambulance. The fire hall has one officer offices/radio room and a training/meeting area.

The largest bay houses one apparatus, while the next two bays beside it house two apparatus each. From a visual walk through of the fire hall the roof height near the back of two of the bays gets quite low for larger apparatus.

Comox Strathcona Regional District

Figure 3.3-3 Denman Island Fire Protection Local Service Area



3.3.2.5. Training & Qualifications

The Denman Island Volunteer Fire Department practices every Thursday night from 7 pm to 9 pm. Some weekends are used to supplement evening training sessions. Fire Department members are required to attend a minimum of 75% of the weekly practices. The fire department has a six month probationary period for new members.

The Fire Department allows anyone to apply for membership to the department if they are over 18 years or older. Candidates for membership must undertake a medical check, driving record check, police check and must be will to agree to commit to an appropriate training program.

Individuals between the ages of 16-18 can join the department as a junior member; however, junior members are not permitted to engage in front line fire fighting and drive fire apparatus.

All members of the Fire Department are registered with the Justice Institute of British Columbia. Courses are taken at the Comox Fire Training Centre. Courses taken at the training centre include but not limited to:

- Fire Attack (live fire),
- Survival Training and Rescue Techniques (START),
- First Responder Certification, and
- Air Brake Endorsement.

All members of the department are at varying stages of attaining Fire Fighter Level 1 and 2 through the Justice Institute of British Columbia. The fire department tries to send every member for Fire Fighter Level 1 and 2, to obtain a minimum accreditation approved by the Justice Institute of British Columbia.

Members are required to have a clean driving record in order to operate the fire department apparatus. Courses taken for operating apparatus is the air brake endorsement course.

All members of the fire department have recently completed the pump operator course offered at the Comox Fire Training Centre.

Radio operators receive specialized training for communications to support front-line incident operations from the fire hall radio room. They provide a communications base for the Incident Commander, and coordinate contact with external agencies such as Fire Dispatch, RCMP, Forestry, Highways, Air Ambulance, etc.

The Fire Department has a portion of the fire hall designed for conducting meetings and training. A computer and projector system is available to use during training sessions. Behind the fire hall, the department has constructed a burn house that is built out of large shipping containers placed on a concrete slab.

Recommendation 3.3-1 Improve the Formal Training Program for Fire Fighters and Officers

The Denman Island Volunteer Fire Department has a formal training program. To improve the overall effectiveness of the personnel on the fire department, the training program should be further developed to include setting and tracking attainable goals should be developed. The curriculum should include qualitative and quantitative goals and benchmarks that each fire fighter and officer can work towards.

Two standards that would aid in developing an optimal curriculum would be NFPA 1001 *Standard for Fire Fighter Professional* Qualifications and NFPA 1021 *Standard for Fire Officer Professional Qualifications*. NFPA 1001 identifies the minimum job performance requirements (JPRs) for career and volunteer fire fighters whose duties are primarily structural in nature. NFPA 1021 identifies the performance requirements necessary to perform the duties of a fire officer and specifically identifies four levels of progression.

As well NFPA 1401 *Recommended Practice for Fire Service Training Reports and Records*, 2006 Edition, is recommended to be used by the establishment to upgrade or evaluate training records. Report systems should be developed to document clearly the performance and ability of individual and group activities related to the fire department.

Update 2009. Since the initial field survey in 2008 the fire department has been making improvements and has defined training goals. By the end of 2009 the fire department administration plans to have all fire fighters complete the Basic Fire Fighter program with formal practises and written exams.

3.3.2.6. Available Fire Force

The Denman Island Volunteer Fire Department is a paid on call/volunteer fire department.

Denman Island's Basic Fire Flow benchmark was set at of 5,900 LPM (1,300 Igpm).

This benchmark includes two pumper companies being available to respond continuously, year round. For the purposes of fire insurance grading, the benchmark number of career fire fighters per company is six (including officers). Therefore, the benchmark number of career fire fighters that Denman Island is measured against is 12 career fire fighters per shift (including officers), available continuously year round (day and night).

Where Fire Departments are operating with a volunteer roster, such as Denman Island, the Available Fire Forces for fire insurance grading purposes are calculated as follows;

- Each full time, on duty career fire fighter is credited as 1 fire fighter.
- Fire chiefs and deputy chiefs are not typically credited as fire fighters unless they normally participate in fire ground duties.

Fire Fighter Equivalent Units (FFEU)[13]

- 1 FFEU is credited for every 3 off-shift career fire fighters who are scheduled to respond
- 1 FFEU is credited for every 4 off-shift career fire fighters who are not scheduled to respond, but are available to respond
- 1 FFEU is credited for every 3 paid-on-call or volunteer fire fighters (based on the average turn-out to fires)
- 1 FFEU is credited for every 6 paid-on-call or volunteer fire fighter (based on a conservative assumption that 50 percent of the fire department roster responds to structural fires(if no statistical data was available)
- Support capacity from mutual and automatic aid companies is credited on a different schedule

Note that probationary fire fighters (incomplete training) and junior fire fighters (under age) are not credited due to lack of active fire ground duties.

Statistical data was available to indicate the average number of volunteers that turn-out to structural fires for Denman Island. The average fire fighter turn-out for Denman Island Volunteer Fire Department is 18.4 (80% of the 23 fire fighters on the department's roster). Therefore, to calculate the total available fire force for the fire department, the total FFEU that the fire department received credit for is:

1/3 of the average turn-out = 6.13

The Denman Island Volunteer Fire Department can only receive a maximum credit for six career fire fighters towards its available fire force. Fifty percent of the required fire force is the maximum allowed for volunteer credit based on the maximum number of career fire fighters on duty 24 hours a day.

No support fire fighter equivalent units were available to the Denman Island Volunteer Fire Department for fire insurance grading.

The benchmark fire force is based on a Basic Fire Flow of 5,900 LPM (1,300 Igpm), which includes 12 career fire fighters on duty 24 hours a day. The Denman Island Volunteer Fire Department has received the maximum credit of six career fire fighters that are able to respond continuously year round. Additional credit can be awarded in this area of the fire insurance grading, up to a maximum of 12 with career fire fighters on duty 24 hours a day.

It is important to note that the level of credit received is not uncommon for a volunteer fire department.

[13] The sum of all such equivalent fire fighter units (including those from automatic and mutual aid) shall not exceed 50% of the lesser of

a) the required strength of existing companies (@ 6 fire fighters per company),
or
b) The required strength of required companies (based on the Table of Effective Response @ 6 fire fighters per company).

Recommendation 3.3-2 Improve Available Fire Force Level

The Denman Island Fire Department received maximum credit for six career fire fighters based on the average turnout of volunteers out of the maximum permissible 12 that can be received in this area of the fire insurance grading. It is important to note that the maximum permissible credit of 12 career fire fighters on duty 24 hours per day 365 days of the year is needed for achieving the best possible PFPC grade.

To help improve the relative classification of the fire department within the fire insurance grading, the Denman Island Fire Department should increase its available fire force by acquiring additional volunteers to respond to fire calls, or provide career staffing. Note that the available fire forces can be improved through additional volunteers up to 50 percent of the required fire force. For Denman Island, the maximum available fire force that can be provided through volunteers is six.

Providing career staffing is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.3.2.7. Denman Island Fire Apparatus

Fire departments are evaluated for the number of pumper companies and ladder companies in service relative to the overall fire potential and the area being protected. Pumper companies and ladder companies are required to be adequately staffed in order to receive full credit.

The Denman Island Volunteer Fire Department apparatus fleet includes:

Table 3.3-3 Denman Island Fire Apparatus Summary

Unit #	Year	Vehicle Type	Pump Capacity IGPM	Tank Capacity Imp. Gal	Manufacturer	ULC Plate #	Age (2008)
55	2000	Pumper	850	750	Superior	97C	7
53	1992	Rapid Attack/Rescue	-	250	Dodge Custom	-	15
51	1978	Tanker/Pumper	650	1200	Superior	-	29
54	2008	Mobile Water Supply	420	1700	Rosenbaur/ Freightliner	-	0
50	2004	Duty Vehicle/Incident Command	-	-	Tracker	-	3

3.3.2.8. Ladder Service

Firefighting and rescue operations involving buildings greater than two storeys in height typically involve ladders, elevated master stream devices, and similar equipment. Industrial occupancies also often require elevated master streams for safe firefighting.

The number of ladder trucks required to be in service (ladder companies) for fire insurance grading is determined mainly by use of Table of Effective Response.

A ladder company is required when a municipality has six buildings that are three storeys or higher, five buildings which have a required fire flow of 15,000 LPM (3,300 Igpm) or more, or a combination of these.

The number of ladder companies in service and regularly responding to alarms shall be sufficient to properly protect the municipality. The Table of Effective Response with its accompanying notes provides the criteria to be applied.

Each required ladder company shall be provided with a ladder truck, equipped with an aerial ladder, boom with ladder or elevating platform, and elevated master stream capability.

The Basic Fire Flow for Deman Island was set at 5,900 LPM (1,300 Igpm). Denman Island does not have five buildings over three storeys or higher, or five buildings that have a Required Fire Flow of 15,000 LPM (3,300 Igpm) or more, or a combination of both. The Denman Island Fire Department is not required to have a ladder apparatus for fire insurance grading.

3.3.2.9. Credit for Fire Apparatus in Service

The benchmark number of pumper and ladder companies needed to be available based on a Basic Fire Flow of 5,900 LPM (1,300 Igpm) is two pumper companies referenced from the Table of Effective Response. Additionally, one reserve pumper company is required for each eight required pumpers in service. A one company fire department requires a reserve pumper for fire insurance grading.

The maximum acceptable age of apparatus specified in the fire insurance grading index is 20 years. Apparatus is occasionally accepted beyond the age of 20 years for small communities where it may be too financially onerous to acquire newer apparatus. This extension of the usable life of the apparatus is subject to the apparatus and pumps being in good condition (with limited down-time) and being tested regularly. Application for extension of recognized usable life of apparatus for insurance grading purposes should be made in writing to the offices of the Fire Underwriters Survey. Test results should accompany applications for extension.

Apparatus beyond 30 years in age can not be credited for fire insurance grading purposes due to lack of reliability. Refer to Appendix D.

Table 3.3-4 Credit for Denman Island Fire Apparatus in Service

Unit #	Vehicle Type	Apparatus Credit	Pumper Credit	Ladder Credit	Reserve Credit	Tanker Credit
55	Pumper	100% Pumper	1	0	0	0
53	Rapid Attack/Rescue	-	0	0	0	0
51	Pumper Mobile Water Supply	10% Pumper	0.1	0	0	0
54	Mobile Water Supply	100% Tanker	0	0	0	1
50	Duty Vehicle/Incident Command	-	0	0	0	0
		Total Pumper Credit	1.1	-	-	-
		Total Ladder Credit	-	-	-	-
		Total Reserve Credit	-	-	-	-
		Total Tanker Credit	-	-	-	1
Table of Effective Response – BFF 1,300 Igpm			2	-	1	

The Denman Island Volunteer Fire Department has received credit for 1.1 pumper company out of the max permissible credit of 2 pumper companies within the fire insurance grading.

Support company credit was not available to the Denman Island Fire Department.

The Denman Island Volunteer Fire Department received 55 percent credit for the number of needed pumper companies based on the Basic Fire Flow set out by the Table of Effective Response. Credit has not been awarded for any reserve apparatus that is available to the Denman Island Volunteer Fire Department.

Adding additional apparatus without the human resources required to operate the apparatus would not be recommended. Consideration should be given to adding pumper companies once the available fire forces have been increased to a level that would support an additional company.

Recommendation 3.3-3 Acquire Additional Apparatus

The Denman Island Volunteer Fire Department received full credit for the 1.1 pumper companies available to the fire department. To receive maximum credit when the Basic Fire Flow for Denman Island has been set at 5,900 LPM (1,300 Igpm), an additional pumper company and reserve pumper is needed. The benchmark requires two pumper companies and one reserve apparatus. In order for the Denman Island Volunteer Fire Department to receive maximum credit in its total pumper companies, it is recommended that an additional pumper company apparatus be acquired.

Acquiring additional apparatus with a credited pump capacity will help the fire department receive additional credit in its pump capacity and it will provide the needed distribution to meet the second due pumper company.

It should be noted that for a pumper company to be recognized within the fire insurance grading it should meet the following requirements:

- ULC listed
- Meet the general requirements of NFPA 1901 *Standard for Automotive Fire Apparatus,* recent edition
- Have a permanently mounted pump with a capacity of at least 3,000 LPM (660 Igpm)
- Have a water tank capacity of at least 1,100 Litres (242 IGAL)
- Have a sufficient amount of hose

In order for the apparatus to be recognized, it must be stored and housed in a facility suitable for the fire departments needs. The storage facility should be of adequate construction, heated and contain all the necessary tools and equipment required for fire fighting. Additionally, fire fighters should be able to respond to the building within a reasonable time. It is important to note that within the fire insurance grading, each apparatus should be supported by a company (6 fire fighters) that is fully trained and equipped.

Providing additional apparatus is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

Recommendation 3.3-4 Decommission or Refurbish Apparatus Older than 20 years

To reduce the risk to the life safety of firefighters utilizing the apparatus, the 1978 mobile water supply should be refurbished or decommissioned/replaced.

Until such time as the apparatus is replaced, it is recommended that the apparatus undergo annual service testing and ongoing preventative maintenance. Partial credit for apparatus older than 20 years may be received contingent up reliability indicators such as service test results. Further details of validating apparatus 20 years and older can be found in Appendix D. Apparatus exceeding 20 years in age should be tested annually in accordance with the Fire Underwriters Survey service and road tests. Test results should be submitted to the Fire Underwriters Survey.

The Denman Island Volunteer Fire Department has one apparatus that has surpassed 20 years in age. Some credit has been given for the apparatus; however, apparatus exceeding 20 years in age do not generally receive recognition. If it can be shown through maintenance and test results that the apparatus remains reliable, the accepted age may be extended to 30 years. Apparatus are not recognized beyond 30 years of age due to unreliability factors. To ensure that the Denman Island fire insurance grades are not adversely affected, an apparatus replacement schedule should be developed, to address the aging apparatus. Refer to Appendix D - Insurance Grading Recognition of Used of Rebuilt Fire Apparatus.

3.3.2.10. Apparatus Pumping Capacity Credit

The total credited Pump Capacity is calculated for comparison to the Basic Fire Flow for the community. The calculation is conducted as follows:

$$PC_{Total} = PC_{Primary} + PC_{Support}$$

PC_{Total} = Total Credited Pump Capacity
$PC_{Primary}$ = Primary Pump Capacity (local to the specific station)
$PC_{Support}$ = Support Pump Capacity (coming from other areas/stations)

Primary Pump Capacity (Primary PC) is set by taking the sum of the rated capacities of the pumpers in the station and downgrading from 100% of the rated capacities based on reliability factors (including but not limited to age, quality, listing and pump test results).

Table 3.3-5 Pumping Capacity Credit Summary

Unit #	Vehicle Type	Pump (IGPM)	Tank Imp. Gal	Pump Capacity Credit %	Credited Pump Capacity (IGPM)
55	Pumper	850	750	100%	850
53	Rapid Attack/Rescue	-	250	-	-
51	Tanker/Pumper	650	1200	10%	65
54	Mobile Water Supply	420	1700	-	-
50	Duty Vehicle/Incident Command	-	-	-	-
				Total Credited Pump Capacity:	915

The Apparatus Pump Capacity credit refers to the capacity of credited, recognized pumps located on fire apparatus. Recognition and credit for pumps on fire apparatus is typically reduced or withheld based upon the measured reliability of the pumps and the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).

Support Pump Capacity is not available to Denman Island Volunteer Fire Department.

The credited pump capacity of the fire department is 4,160 LPM (915 Igpm). The Basic Fire Flow for the community has been set at 5,900 (1,300 Igpm) and therefore the Denman Island Fire Department is deficient in this area of fire insurance grading of the fire department.

The Denman Island Volunteer Fire Department received maximum credit possible for the pump capacity of Unit #51 and some credit was given for Unit #51. The credited pump capacity of the fire department is 4,160 LPM (915 Igpm).

The Basic Fire Flow for Denman Island has been set at 5,900 (1,300 Igpm). The fire department received 70 percent credit in the apparatus pump capacity section of the fire insurance grading regarding fire department. To receive maximum credit additional apparatus would be needed to meet 5,900 (1,300 Igpm).

Recommendation 3.3-5 Improve Apparatus Pumping Capacity

The Denman Island Volunteer Fire Department received maximum credit possible for the pump capacity of its pumper and pumper/tanker apparatus when the Basic Fire Flow for the community has been set at 5,900 (1,300 Igpm). To receive maximum credit toward the fire department's pumping capacity additional apparatus would be required. Improving credit in pumping capacity is directly proportional to credit received for pumper companies. Apparatus should be acquired of a reasonable age and pump capacity for fire insurance grading.

Pumper companies are required to be adequately housed and staffed in order to receive full credit.

Acquiring additional pumper apparatus may have positive benefit effect in terms of fire insurance grading. Acquiring new pumper apparatus is a serious matter that requires careful consideration. There are many factors to consider and fire insurance grading is only one such factor.

3.3.2.11. Apparatus Maintenance Programs

Denman Island does not have an adequate repair facility needed for the maintenance of fire department apparatus. Minor maintenance and repairs can be conducted on island. If major maintenance is required apparatus have to be sent off island.

The fire department has their pumper apparatus inspected and pump tested annually by Profire Emergency Services. Records are kept on paper.

A vehicle check is conducted by the individual who takes the apparatus out of the fire hall. Pre and post trip inspections are completed every time an apparatus is taken out from the fire hall. Weekly checks are completed on each apparatus. Logs are kept for each apparatus.

3.3.2.12. Distribution of Resources and Response Times

Resources for fire fighting are centrally located on the island. The majority of the risks on the island are single family residential and are generally within 8 km of the fire hall. The few commercial risks that are on the island are generally located within the first due Pumper Company and the second due Pumper Company.

The adequate response distance for the first and second due pumper companies for fire insurance grading purposes is based off the following formula:

$$D(km) = \frac{[T(\min) - 0.65(\min)]}{1.065(\min/km)}$$

Where:
D = total distance in kilometres
T = time in minutes

Denman Island has a Basic Fire Flow of 5,900 (1,300 Igpm). Appendix A, "Fire Underwriters Survey – Table of Effective Response" illustrates that the first due Pumper Company should respond within 3.5 minutes and the second due Pumper Company should respond within 5 minutes.

Applying these response times to the equation above will provide a first due pumper response of 2.7 km, and a second due pumper response of 4.1 km.

Figure 3.3-4 - First Due Pumper Company Response Distance - 2.7 km

Figure 3.3-4 - First Due Pumper Company Response Distance - 2.7 km illustrates the areas in the fire protection local service area that is covered by the first due Pumper Company.

Figure 3.3-5 - Second Due Pumper Company Response Distance - 4.1 km

Figure 3.3-5 - Second Due Pumper Company Response Distance - 4.1 km illustrates the areas in the first protection local service area that is covered by the second due Pumper Company

Figure 3.3-6 - Response Distance for Single Family Residential Buildings

Figure 3.3-6 - Response Distance for Single Family Residential Buildings illustrate the single family dwelling areas in the fire protection local service area that is covered by the fire department.

3.3.2.13. Fire Fighting Ancillary Equipment and Fire Hose

The fire department's apparatus and fire station have a combination of miscellaneous tools that meet the needs of the fire apparatus companies. These tools include but are not limited to rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc. The Denman Island Volunteer Fire Department's equipment for pumper apparatus is adequate.

Fire hose used by the fire department should be distributed so that each pumper company carries a minimum of at least 360 m (1200 ft) of 65 mm (2 ½ in) (or larger), 180 m (600 ft) of 38 mm (1 ½ in), and 60 m (200 ft) of 25 mm (1 in) booster hose (or equivalent hose). A fire department should maintain a complete reload or spare shift of hose at the fire station.

Denman Island Volunteer Fire Department has a reasonable amount of hose for the number of apparatus in the fleet.

Table 3.3-6 Denman Island Volunteer Fire Department Fire Hose Summary

Unit #	Apparatus	Amount of Hose			
		Booster	38 mm	65 mm	100 mm
55	Pumper	-	207 m	488 m	-
54	Rapid Attack/Rescue	-	107 m	76 m	-
53	Tanker/Pumper	-	213 m	-	-
51	Mobile Water Supply	30 m (forestry)	107 m	76 m	-
	Total	30 m	634 m	640 m	0 m
	Recommended Per Pumper Company	60 m	180 m	360 m	300 m
	Spare Hose in Station	76 m	91 m	107 m	0 m
	Recommended Full Compliment	60 m	180 m	360 m	300 m

The Denman Island Volunteer Fire Department received credit were possible for the amount fire hose carried on pumper apparatus, on other fire apparatus, and spare fire hose in the fire hall. Credit has not been awarded for 100 mm (4 inch) hose.

Fire hose is maintained by the fire department's maintenance officer. Fluorescent tape is attached to indicate when it was tested. Hose that is deemed as unsafe is taken out of service. There is no hose tower for drying of hose. Records are kept of the maintenance.

The fire department has three 4.3 m (14 ft) ladders, one 3.7 m (12 ft) ladder, one 9.1 m (30 ft) ladder, and one 24' ladder. Ground Ladders are inspected in house by the fire department's maintenance officer.

Recommendation 3.3-6 Hose Testing

To provide a reasonable level of fire protection, the firefighting hoses should be tested and meet the respective NFPA standards or equivalent standards. NFPA 1962, *Standard for the Inspection, Care, and Use of Fire Hose Couplings, and Nozzles AND THE Service Testing of Fire Hose,* most recent edition. Failure of equipment can result in loss of life and or additional property damage. Testing should be conducted on a regular basis and recorded.

Recommendation 3.3-7 Ground Ladder Testing

To provide a reasonable level of fire protection, the firefighting ground ladders should be tested and meet the respective NFPA standards or equivalent standards. NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders,* most recent edition. Failure of equipment can result in loss of life and or additional property damage. Testing should be conducted on a regular basis and recorded.

Recommendation 3.3-8 Improve amount of 100 mm Hose and Spare Hose in Hall

To provide a reasonable level of fire protection throughout the community, there should be a full compliment of spare hose available to the fire department. In the event that the hose on the apparatus is being tested or serviced, the fire department should have additional spare hose. By having spare hose, the in service apparatus will have adequate tools and equipment available during fire ground operations.

To receive maximum credit towards fire hose within the fire insurance grading, the fire department should acquire recommends amounts per pumper company and spare in station as indicated in Table 3.3-6.

If spare hose exists in the fire hall, amounts should be submitted to the Fire Underwriters Survey to make appropriate adjustments to fire insurance grading.

Recommendation 3.3-9 Develop Proper Hose Drying Facilities

In conjunction with a proper inspection and testing of fire hose, adequate cleaning and drying equipment is recommended to have, to ensure fire hose is properly maintained. Failure of equipment, especially fire hose during an emergency situation can result in increased loss of life and or property damage.

3.3.2.14. Personal Protective Clothing & Equipment

The Fire Department has a total of 30 sets of personal protective clothing (PPC) in use. PPC is inspected during training and after each use. The fire department follows a replacement schedule to replace PPC when damaged or after 10 years. The fire department has set funds aside to budget four sets of new PPC. A washer and dryer are provided at the fire hall for cleaning the PPC.

The Fire Department has 10 sets of Self Contained Breathing Apparatus (SCBA) and a total of 10 spare bottles. The department has a fill station in the fire hall that is serviced by Irwin Air Ltd. A program is in place for 2009 to update and replace SCBA equipment.

3.3.2.15. Planned Responses

The Denman Island Volunteer Fire Department's response plan for commercial and residential structure fires is as follows:

- In the event of a fire, all the fire department's apparatus and available firefighters respond.
- First on the fire scene will be Truck 50, the department's incident command vehicle. The incident commander will evaluate the situation and plan the response, including where to locate each fire truck for the optimum response.
- Second on scene will be Truck 53, the departments rapid attack vehicle which carries up three fire fighters. The crew will begin initial firefighting operations within minutes of arriving, without waiting for additional vehicles

- Third on scene will be Truck 55, the department's pumper which carries up to three firefighters. It will begin operations using water from its 750-gallon on-board tank until the tanker trucks arrive and begin delivering their water loads.
- The remaining department vehicles, Trucks 54 and 51 will arrive on the scene after Truck 55. Each carries a crew of up to three firefighters. They will set up a portable water tank near the pumper and will deliver their loads (1700 and 1000 gallons respectively) into it.
- For the duration of the fire fighting operation, Trucks 54 and 51 will shuttle back and forth between the nearest water source (typically a marsh or pond) and the fire scene to maintain a steady supply of water.

3.3.2.16. Pre-incident Planning

Denman Island has a limited number of risks in the community that require pre-incident planning. The Fire Department has three structures pre-planned. The structures are inspected yearly and the plans are reviewed. The pre-plans are hand drawn and are located in the fire hall. The pre-plans are used during training sessions. It is not known if pre-plans are developed following NFPA 1620 *Recommended Practice for Pre-Incident Planning*.

3.3.2.17. Fire Department Assessment within the Fire Insurance Grading

The Fire Department Assessment contributes 40% to the total Public Fire Protection Classification grade of the community. This is the most heavily weighted portion of the grading and as such is considered to be the most significant indicator of a community's overall preparedness for dealing with fire emergencies.

The relative classification of the fire department is currently a 9. The areas where the least amount of credit was received in the fire insurance grading of the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force, and
- Fire Department Training of Fire Fighters and Officers.

3.3.3 Denman Island Fire Prevention and Fire Safety Control

Fire Safety Control including Building and Fire Code effectiveness has become an increasingly heavily weighted portion of the fire insurance grading system. This is a result of statistical data showing that communities employing effective programs in these areas have significantly reduced fire related losses.

Denman Island has been reviewed in the effectiveness of its practices with regard to Fire Prevention and Fire Safety Control.

3.3.3.1. Codes and Bylaws: Construction Control, Plan Review, Building Inspection and Permit Process

The Islands Trust is the governing body that plans land use and regulates development in the trust area of Denman Island. The Islands Trust does not have the responsibility of building inspection.

The provincial building code and fire code is not enforced by the Islands Trust or the Comox Valley Regional District on Denman Island. With no Building Code enforced, it is difficult to assess to what degree the buildings on Denman Island are constructed to a reasonable construction standard. The electrical code is enforced on the island by the BC Safety Authority.

The Islands Trust provides a Bylaw Officer to handle complaints and enforcement of the local land use bylaw for the trust area.

Recommendation 3.3-10 Develop and Implement Controls for Construction and Building Code Compliance

To ensure that buildings are built to a reasonable construction standard and for code compliance for safety of residents, Denman Island should consider incorporation to be able to implement a planning department that will handle the review and inspection of new buildings to ensure occupant and building safety. Alternatively, request the Regional District to provide building code services in the form of plan review and inspections during the course of construction that follow the British Columbia Building Code.

3.3.3.2. Automatic Sprinkler Protection

No sprinkler by-law is in effect in the Denman Island Fire Protection Local Service Area. This is due, in part, to the fact that there is no municipal water supply. The residents of the island are serviced primarily by well water with some small community/co-op water supplies.

3.3.3.3. Code Enforcement, Inspections and Local Assistants to the Fire Commissioner

The Denman Island Volunteer Fire Department's Fire Chief acts as a Local Assistant to the Fire Commissioner. The Deputy Fire Chief is an alternative Local Assistant to the Fire Commissioner.

Fire Prevention Inspections are currently not conducted on Denman Island by the Fire Department. No inspection program exists.

Recommendation 3.3-11 Develop and Implement an Official Fire Prevention Program

To improve the level of fire prevention and reduce the overall fire risk in the community, it is recommended that the Fire Prevention Inspection Program be improved by increasing the minimum number of inspections for all commercially insured buildings.

The number of inspections conducted should be based on the type of occupancy and the risk associated to it. Occupancies at a higher risk of fire should have more frequent inspections compared to occupancies with a low risk of fire.

Increasing the inspection frequencies will help reduce the risks throughout the community, additionally, it will help reduce the development of any hazards/risks that would cause damage to buildings and endanger the lives of the occupants and the firefighters.

In order for the inspections to be considered effective, there should be an Enforcement Program. Once inspections have been completed, an inspector should return to that building within a reasonable time frame, and confirm whether or not the building owner has addressed the infractions. If the infraction shave not been addressed, then steps should be taken to ensure that the building owner does comply with the inspectors concerns. Refer to Appendix E for recommended inspection frequency.

The fire department should request that the Regional District provide fire prevention inspections to commercial occupancies in the Denman Island Fire Protection Local Service Area.

3.3.3.4. Public Education Program

The public education portion of the fire prevention section is an effective method for an all volunteer fire department to help lower the fire insurance grade and to raise awareness in the community, about fire safety.

Fire prevention activities that the Denman Island Volunteer Fire Department is very limited but includes:

- Fire Prevention Week

- Smoke Detection Program (had out smoke alarms and batteries)
- Fire Safety House
- Annual Pancake Fundraiser and Information Session
- Established and published presence on the World Wide Web
- Fire Safety information is posted on a billboard on the island
- Fire safety information is routinely provided in local newspaper for residents
- Burn permit program (allows Fire Department to speak with every applicant and educate)
- Education program for school children

3.3.3.5. Wildland Urban Interface Risk Reduction

Throughout Denman Island, Wildland Urban Interface fire risk is a major concern for the fire department. Fire bans are enforced on Denman Island during times of hot dry weather. Information and signs are posted throughout the Island indicating when a fire ban is in effect.

A Wildland Urban Interface Study has been completed for Denman Island. The Fire Department provides the Fire Smart manual to residents of the island. As well, the real estate agency on the island hands out the Fire Smart manual. Manuals are also handed out with all burn permits.

3.3.3.6. Fire Prevention and Safety Control within the Fire Insurance Grading

Fire Prevention and Fire Safety Control Programs contribute 20% to the total Public Fire Protection Classification grade of the community. The relative classification of the fire safety control program is currently 8.

3.3.4 Denman Island Emergency Communications

3.3.4.1. Emergency Communications System Description

Emergency Communications is provided by North Island 911 Corporation. The initial answering point for public safety calls is the RCMP Operational Communications Centre in Courtenay. Fire calls are relayed to the fire dispatch centre in Campbell River. All police calls are handled by the RCMP OCC in Courtenay. All ambulance calls are relayed to the B.C. Ambulance Service in Victoria.

For full information regarding the emergency communication centres in Courtenay and Campbell River refer to section 4 Emergency Communications.

3.3.4.2. Fire Department Communications

Fire fighting personnel are notified via pagers of an emergency situation on Denman Island. Each member of the fire department is provided with a pager. Radios are provided on fire department apparatus.

The Denman Island Volunteer Fire Department utilizes permanently mounted and portable radio equipment to receive emergency information and communicate between personnel on the fire ground during an emergency situation. The department possesses portable radios, an exact number was not known. Portable radios are provided on each of the department's fire apparatus. A base radio station is provided in the Denman Island Fire Hall. Back-up power is available for the fire hall base station and radios. A repeater system is provided to provide continuous use of the emergency communications systems in place. No radio dead spots were identified within the Denman Island Fire protection Local Service Area.

3.3.4.3. Emergency Communication within the Fire Insurance Grading

Emergency communications contribute 10% of the Public Fire Protection Classification grade of the community. The emergency communications program for Denman Island has a relative classification of 3.

3.3.5 Denman Island Water Supplies for Fire Protection

Water supplies for fire fighting are a critical component of the community's fire defence systems. Water supplies for fire fighting were evaluated for adequacy in several areas including but not limited to:

- Fire Flow Delivery – the ability of the water system to deliver the *Required Fire Flows* (from Section 3.3.1.1 - Fire Risk in Denman Island) to the identified *Fire Flow Demand Zone*.
- Storage Adequacy – quantity of stored water reasonable for expected demands and duration of appropriate flows during expected fire events.
- Distribution System Adequacy – layout and arrangement of piping and pump capabilities, looping/grid design of pipe networks for maximum versatility and minimum losses.
- Hydrant Distribution – appropriate spacing and distribution to minimize hose lays and other delays in setting up an initial attack during structure fires.
- System Design and Installation – the overall design of the system with regard to redundancy, and capability to continuously provide full service to all areas during all foreseeable events (including catastrophic events and/or perils).
- Maintenance of System and Components – system and component maintenance meets recognized standards and improved reliability of system.

This section highlights some of the significant findings of the fire insurance grading emergency water supply review. Areas where improvements can be made have been noted.

3.3.5.1. Overview of Water Supplies for Denman Island

Denman Island residents draw their domestic water supplies from private wells, surface water courses and other facilities (ex. Cisterns).

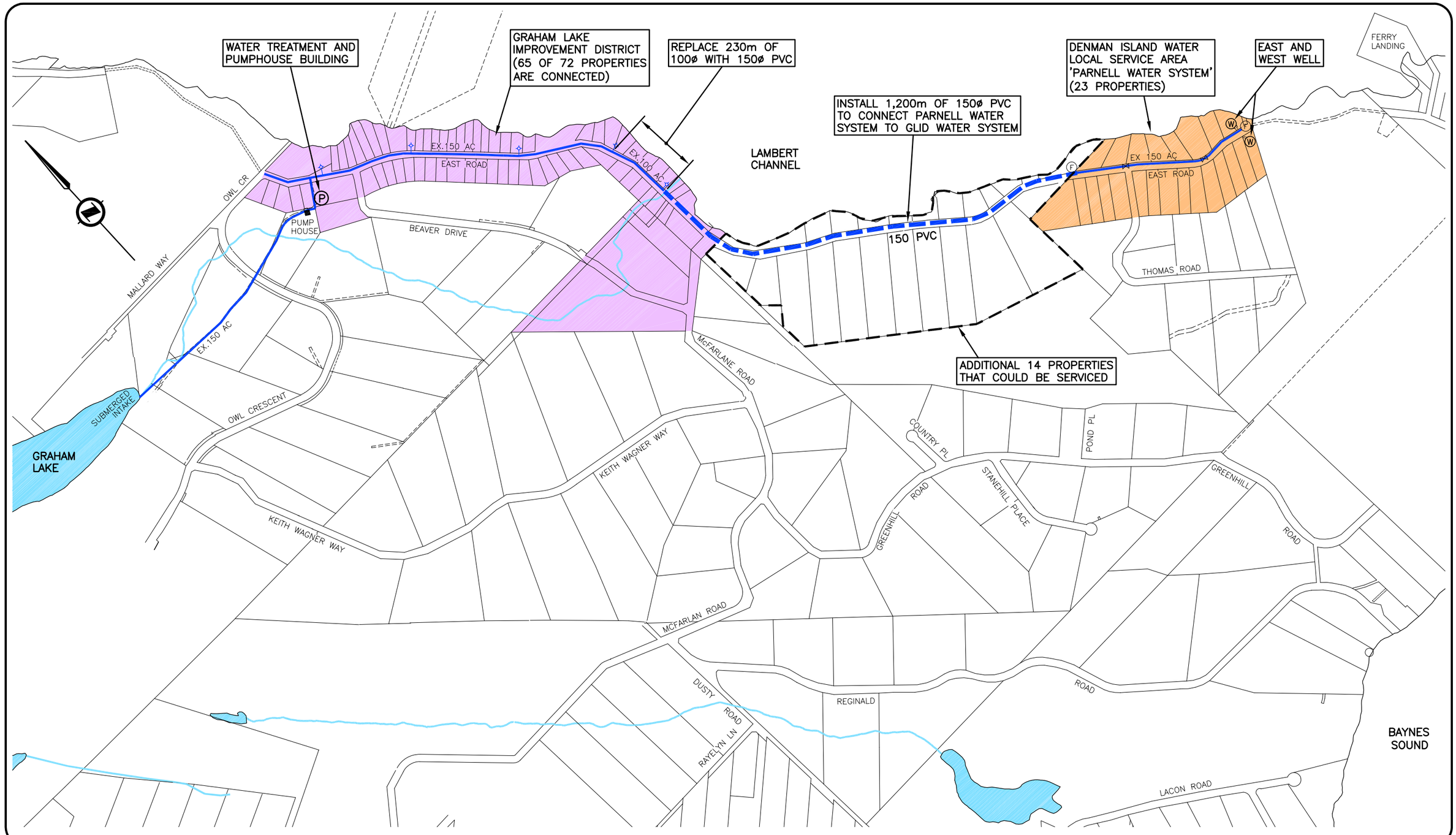
There are two small communal water systems that serve a limited number of users. Hydrants associated with these communal systems are available for drafting (siphoning) purposes. The two water systems are:

- Graham Lake Improvement District
- Denman Island Water Local Service Area (Parnell Water System)
- Kirnel water system (services Kirk Road and Nelson Road residents)

Locations of the water systems on Denman Island is shown in Figure 3.3-7 provided from a Koers & Associates Engineer Limited report entitled *Denman Island Local Water Service Area – Graham Lake Source Study*, 2009.

The Denman Island Volunteer Fire Department relies heavily on alternative water supplies located throughout the island.

Figure 3.3-7 Location of Graham Lake and the Denman Island Water Local Service Area



KOERS & ASSOCIATES ENGINEERING LTD. *Consulting Engineers*	CLIENT: COMOX VALLEY REGIONAL DISTRICT	TITLE: CONNECTION TO GRAHAM LAKE IMPROVEMENT DISTRICT
	PROJECT: DENMAN ISLAND WATER LOCAL SERVICE AREA GRAHAM LAKE SOURCE STUDY	APPROVED; DATE: NOVEMBER 2008; JOB No.: 0833; SCALE: 1:10,000; DWG No.: FIGURE 1

3.3.5.2. Graham Lake Improvement District

The Graham Lake Improvement District is small water distribution system that has approximately 65 connections. The Graham Lake Improvement District was incorporated in 1986.

Water is supplied from Graham Lake by gravity through a 150 mm (6 inch) main to a pump house where the water from the lake is treated in a 21,800 Litre (4,800 Imperial Gallon) cistern and then pumped to the distribution system through a 150 mm (6 inch) main. The pump house has with four pumps, two 3 horse power pumps and two 2 horse power pumps. The two 2 HP pumps are considered for back-up.

One of the 3 horse power pumps operates and if the pressure drops the second 3 HP pump automatically starts to pump. A combined pumping capacity of 532 LPM (117 Igpm) can reportedly be provided.

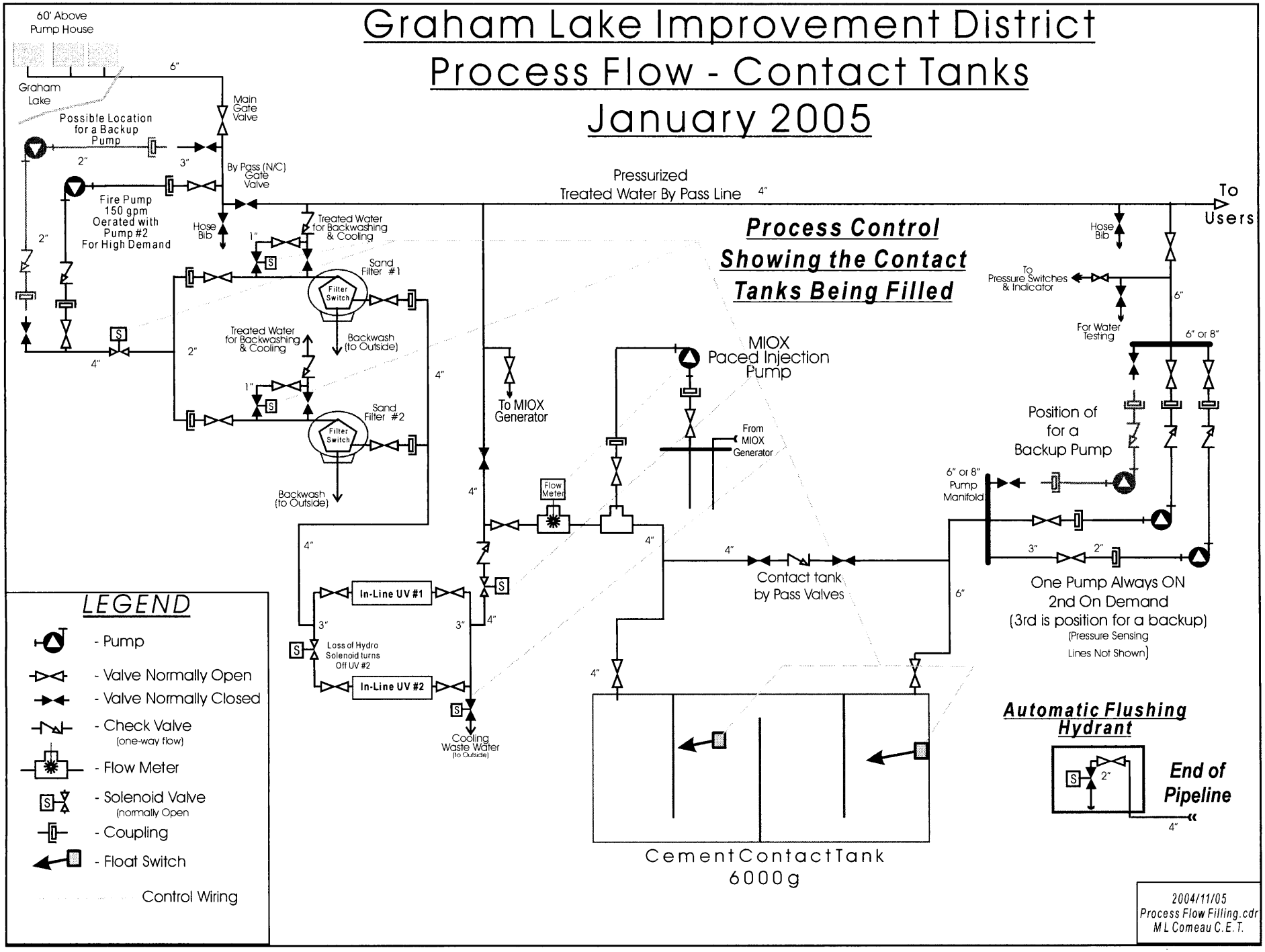
Five fire hydrants are installed in the distribution system. All of the fire hydrants are provided with 64 mm (2.5 inch) pumper outlets. The hydrants undergo maintenance yearly but the adequacy of the maintenance is not fully known. There are two major valves one before the pump house and another after the pump house. A back-up propane generator is provided and has a 7 day supply.

Water from the supply source can by-pass the pump house and the supply will be gravity fed through the 100 mm (4 inch) main. It is not automatic and the water is treated. A water system schematic of the Graham Lake Improvement District is provided in Figure 3.3-8 Graham Lake Water Schematic.

3.3.5.3. Denman Island Water Local Service Area (Parnell Water System) & Kirnel Water System

Limited information was available to assess the adequacy of the water systems for fire protection purposes and for fire insurance recognition.

Figure 3.3-8 Graham Lake Water Schematic



3.3.5.4. Water Supply Analysis

To have an adequate water supply for fire fighting the quantity of stored water available to the fire location must be adequate to sustain the Required Fire Flows for the fire duration. Fire duration for each design required fire flow are taken from the Fire Underwriters Survey document Water Supply for Public Fire Protection. Refer to Appendix B.

The minimum size water supply credited by FUS must be capable of delivering not less than 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to domestic consumption at the maximum daily rate.

The maximum capacities of the reservoirs and their refill rates [for the typical fire event duration] are de-rated with a safety factor for the calculation of the total available water resources for fire fighting. Reservoirs have been de-rated to 80% of the maximum capacities and refill rates have been de-rated by 25% of the theoretical capacity (limiting flow factor).

Table 3.3-7 and Table 3.3-8 summarize the minimum required fire storage volume [BFF for the typical fire event duration] for the water system [column referred to as “Required Fire Storage”]. The table also shows the recommended emergency storage [25% of sum of “Required Fire Storage” and Domestic Storage].

Water supply systems designed to provide fire protection should meet the following criteria to be considered a “Good Supply” with regard to the adequacy of water storage.

The required total effective storage should be based on the following formula:

Total Storage Required = A + B + C + D

Where:

- A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water Supply for Public Fire Protection and Fire Underwriters Survey methodologies
- B = equalization storage capacity equal to 25% of projected maximum day demand (MDD)
- C = emergency storage capacity [25% of (A + B)]
- D = Concurrent domestic demand = Peak hour demand for the event duration

Water supply systems designed to provide fire protection should meet the following to be considered an “Adequate Supply” with regard to the adequacy of storage.

The required minimum storage of the water system to be considered adequate for fire insurance grading is based on the following formula:

Minimum Storage Required = A + E

Where:

A = fire protection storage capacity as calculated based upon Basic and Required Fire Flows determined utilizing the accepted Standard Water Supply for Public Fire Protection and Fire Underwriters Survey methodologies

E = Calculated volume equal to MDD flow rate for the typical fire event duration

The formulas described above may be modified if the level of risk within the community is unusual or if the situation warrants. In some cases alternatives to the formulas may be developed and considered based on specific situations.

Ideally the water supply should be capable of providing fire flows to all built-up areas of the protected community. The water supply system(s) should be designed and constructed such that water supplies are uninterrupted during system maintenance, main breaks, reservoir cleaning, and catastrophic events such as seismic events, wind storms, power failures, etc. This can be achieved through the use of redundant design with multiple sources and storage locations, looped distribution system, back up power, and other safety factors included within the scope of good engineering practices.

Note that this section is directed toward analysis of the volume of water available for fire fighting and not the capacity to deliver the Required Fire Flows to any given area.

Each of the water systems on Denman Island were evaluated (if information was available) on the ability of the water systems to provide the Basic Fire Flow and if the water systems were capable of providing the minimum size water supply that is credited by FUS to be credited in fire insurance grading.

Table 3.3-7 Available Water Resources for Fire Fighting

	Serving (pop)	ADD	MDD	PHD	Total Storage	Total Refill Rate	Refill during Event Duration	Total Available Water Resources
Notes --->						de-rated 25-30%		
Units --->		*MGD*	*MGD*	*Igpm*	*I. gal*	*Igpm*	*I. gal*	*I. gal*
Graham Lake I.D.	65*							
Basic Fire Flow		0.000984[14]	0.00447[15]	6	4,600	40[16]	4,800	8,480
SFR RFF		0.000984	0.00447	6	4,600	40	3,000	6,680
Minimum Recognized		0.000984	0.00447	6	4,600	40	4,800	8,480

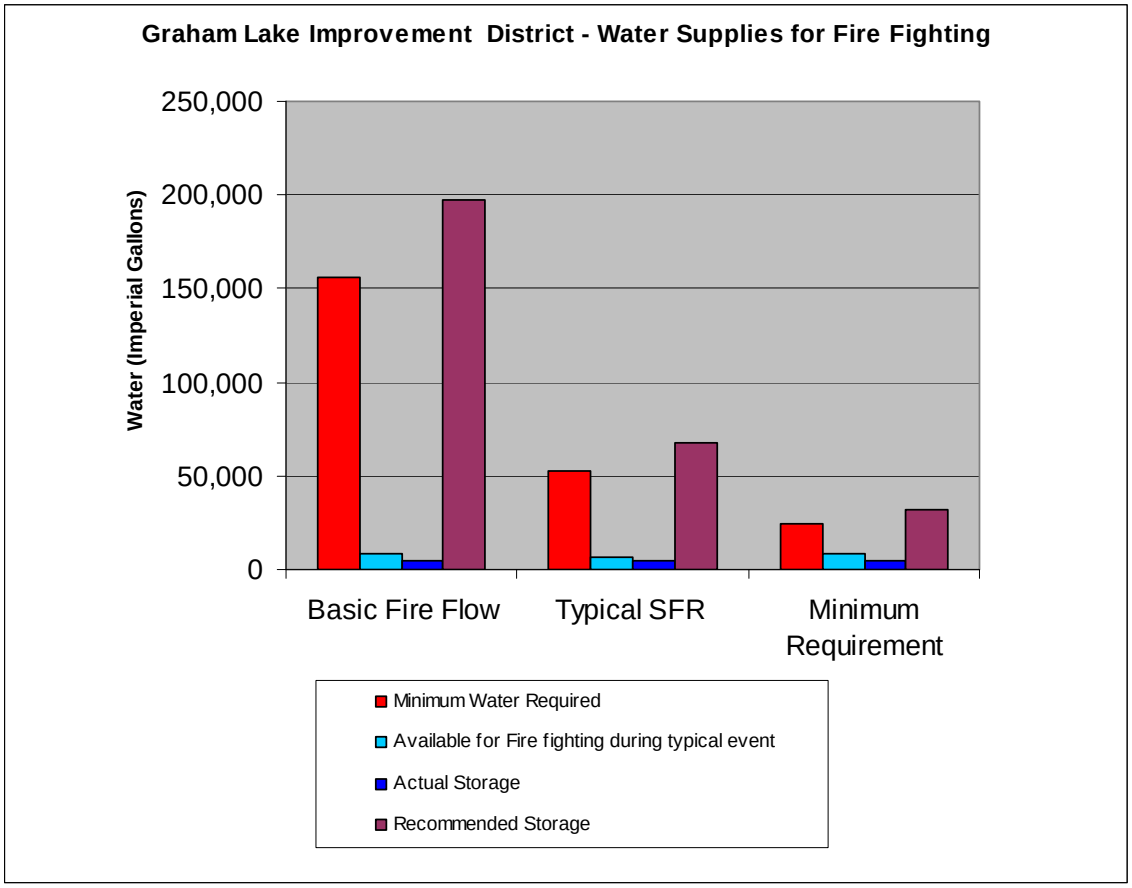
* Number of Connections. Population served not known.

Table 3.3-8 Summary of Recommended and Required Water Volumes for Fire Fighting

						Variables->	A	B	C	D	Eq.I	E	Eq.II		
	BFF	Fire Duration	ADD	MDD	PHD	Total Available Water Resources	Required Fire Storage	Domestic Storage (incl. agr.)	Emergency storage	Concurrent Domestic Demand $_{peak}$	Recommended storage	Concurrent Domestic Demand $_{max}$	Minimum Storage Req'd	Supply Good?	Supply Adequate?
Notes --->						de-rated 20-50%	BFFxDuration	.25 MDD	.25 (MDD+Fire)	PHDxDuration		MDDxDuration			
Units --->	*Igpm*	*hrs*	*IMGD*	*IMGD*	*Igpm*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*I. gal*	*Eq.I*	*Eq.II*
Graham Lake I.D.															
Basic Fire Flow	1,300	2	0.000984	0.00447	6	8,480	156,000	1,118	39,279	745	197,142	373	156,373	NO	NO
SFR RFF	700	1.3	0.000984	0.00447	6	6,680	52,500	1,118	13,404	466	67,488	233	52,733	NO	NO
Minimum Rec.	200	2	0.000984	0.00447	6	8,480	24,000	1,118	6,279	745	32,142	373	24,373	NO	NO

[14] The average day demand used for analysis provided from the Koers & Associates Engineering Limited report.
[15] The maximum day demand used for analysis was 5 times the average day demand provided from the Koers & Associates Engineering Limited report.
[16] The refill rate of the water system was limited by 2 inch pipes before filtration. 2 inch diameter, flowing at 5 feet/second, correlates to a flow of 40 Igpm.

Figure 3.3-9 Graham Lake Improvement District – Water Supplies for Fire Fighting



The Graham Lake Improvement District's water system was 'recognized' in 1988 based on the system capability and system design at that time. Many changes have occurred on the water system since it was last evaluated for fire insurance grading purposes.

Analysis of the Graham Lake water system shows that the water system was deemed as being not capable of meeting the requirements for fire insurance recognition. As shown in Figure 3.3-9. The most limiting factor in the analysis of the water system was the 2 inch pipe before sand filtration that limited the system's refill rate. The water systems 'by-pass' was not recognized because of the lack of information regarding its use during a fire situation.

From analysis of the water system, fire insurance grading recognition will have to be removed until such time as it can be made certain that the system is capable of meeting the minimum fire insurance grading requirements. The water system should be able to flow at a minimum 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to domestic consumption at the maximum daily rate. This will likely have an impact on insurance rates for properties owners on the Graham Lake water system.

Sufficient information including available fire flow testing would be required to make certain the water system is capable of meeting the minimum fire insurance grading requirements. If information can be provided regarding the water systems 'by-pass,' some recognition may be granted. The 'by-pass' if operated correctly may help improve the water system being recognized.

Recommendation 3.3-12 Recognizing the Water Systems 'By-Pass'

The Graham Lake water system 'by-pass' may be recognized if documentation can be provided to indicate it can meet the minimum requirements for fire insurance grading, which are it must be capable of delivering not less than 1,000 LPM (200 Igpm) for two hours or 2,000 LPM (400 Igpm) for one hour in addition to domestic consumption at the maximum daily rate.

To receive recognition, the 'by-pass' would be required to either be fully automated for a fire situation or have protocols an individual follows to use the 'by-pass' during a fire situation. If one or both scenarios exist, documentation of automation and/or procedure an operator follows should be submitted to the Fire Underwriters Survey for review.

To improve the recognition of the 'by-pass' main the pipe diameter should be increased from 100 mm (4 inch) to 150 mm (6 inch) to allow greater that may allow the water system to meet the minimum fire insurance grading requirements.

Recommendation 3.3-13 Provide Additional Water Storage Capacity (Graham Lake Improvement District)

The Graham Lake Improvement District's water supply system is significantly deficient in water storage capacity. The quantity of stored water should be improved for the water system. Providing only the minimum amount of water to qualify for fire insurance grading is adequate for typical fire events with no adverse circumstances, however many factors can contribute to fire losses. One significant factor is inadequate water supplies at the fire scene.

Providing water storage in accordance with the recommended practice of the Fire Underwriters Survey would significantly reduce the risk of failure to control fires resulting from inadequate water supplies.

To reduce the risk of water supplies running short during a fire event, water storage capacity should be increased to minimums noted in Table 3.3-8 Summary of Recommended and Required Water Volumes for Fire Fighting.

Recommendation 3.3-14 Improve use of Technology to Manage, Plan and Optimize Water System (Graham Lake Improvement District)

To improve the ability of the purveyor to plan, optimize, manage and administrate the water system, the following technologies should implemented and used:

- GIS map system,

- a hydraulic model of the water system,
- a SCADA system, and
- Digital record keeping system.

3.3.5.5. Available Fire Flows

To determine if the water supply system is adequate or deficient in its ability to deliver a reasonable amount of water for fire fighting purposes, the Required Fire Flows for a number of representative structures have been calculated. The determination method of Required Fire Flows[17] (RFF), fire event duration, and minimum hydrant distribution is detailed in the Fire Underwriters Survey document *Water Supply for Public Fire Protection*. See Appendix B.

The Required Fire Flow for the Fire Flow Demand Zone determined during the community risk assessment (see Section 3.3.1.1) has been utilized as a benchmark. The required fire flows are not the highest RFF's for the zone, but are intended to be adequate for approximately 90% of the structures in the water distribution system. Notably, the RFF's calculations are for fully involved structure fires with an offensive fire fighting attack.

Detailed current information on available fire flows for the Graham Lake Improvement District and the Denman Island Water Local Service Area (Parnell Water System) were not available during this study.

Upon receipt and review of the Graham Lake Improvement District and the Denman Island Water Local Service Area (Parnell Water System) drawings, arrangements will be made to conduct flow tests of both the Graham Lake and Denman Island Water Local Service Area (Parnell Water System). Results will be provided upon completion.

If available flow testing is to be conducted by a third party and results to be submitted to the Fire Underwriters Survey for review, available flow testing should be conducted in accordance with NFPA 291, *Recommended Practice for Fire Flow Testing and Marking of Hydrants*, 2007 edition.

3.3.5.6. Alternative Water Supplies

The Denman Island Volunteer Fire Department uses a number of ponds, marshes and water storage tanks located throughout the island for fire protection. Ocean water is also used for fire suppression. The Denman Island Volunteer Fire Department is actively pursuing means of improving available water sources throughout the island. This includes placing storage reservoirs at appropriate locations and installing dry hydrants.

[17] A minimum residual water pressure of 20 psi in the street main is required during flow.

Recommendation 3.3-15 Develop Formal Water Supply Plan for Non-Hydrant Protected Areas; Consider Dry Hydrants

The Denman Island Fire Protection Local Service Area has areas without hydranted water supplies. The Fire Department is equipped to respond utilizing the water shuttle method. The mobile water supply trucks will shuttle water from nearby sources to the fire scene where water will be transferred into a portable tank. The pumper apparatus on scene will pump water through suction from the portable tank. In some cases, the most accessible and reliable water supply will be the nearest recognized fire hydrant, however in some cases, other non-recognized water supply sources may be more accessible. To reduce the risk of time being lost during a fire event due to unreliable water supply sources, formal plans should be developed for water supplies for all non-hydrant protected areas within the Fire Service Area boundaries.

Consideration should be given to installing dry hydrants in strategic locations to minimize travel times during shuttle operations. All dry hydrants should be installed in full compliance with NFPA 1142 *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2007 Edition. Any improvements made to water supplies should be reviewed/approved by Fire Underwriters Survey if they are intended to be credited toward fire insurance grading classifications.

Note: In areas without recognized hydrants it may be possible to achieve significantly improved insurance rates through Superior Tender Shuttle Accreditation administered by Fire Underwriters Survey. Refer to Appendix G.

3.3.5.7. Water Supplies within the Fire Insurance Grading

Water supplies contribute 30% to the total Public Fire Protection Classification grade of the community. The relative classification of the water supply for Denman Island is currently 10.

The Graham Lake Improvement District's water system through analysis has shown that the system is not capable of meeting the minimum fire insurance grading requirements.

3.3.6 Denman Island Fire Insurance Grading

As a result of this assessment, the following information will be published in the fire insurance grading index for the insurance community to set rates on. The information will apply to the Denman Island Fire Protection Local Service Area (Specified Fire Service Area within the Comox Valley Regional District) and more specifically the following areas within the boundaries of the Fire Service Area.

A downgrade in a fire insurance grade is not immediately published in the fire insurance grading index. A set amount of time will be allowed for the water purveyor to develop a strategy to make improvements and should be submitted Fire Underwriters Survey for review. If accepted by FUS, a set amount of time will be granted to allow improvements to be made, if in that given time improvements have not occurred a downgrade in the fire insurance grade will be made official.

- Graham Lake Improvement District previous DPG 3A, re-assessment determined a downgrade to DPG 3B.

Table 3.3-9 Denman Island Summary of Grading Assessment

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Denman Island – Graham Lake Improvement District	3A	**3AP**[18]	Fire Station Protected - detached dwellings within 8 km by road of Fire Hall
Denman Island – Denman Island Local Water Service Area (Parnell Water System)	-	**3B**	Fire Station Protected - detached dwellings within 8 km by road of Fire Hall
Rest	3B	**3B**	Fire Station Protected - detached dwellings within 8 km by road of Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of fire station

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Denman Island – Graham Lake Improvement District	8	**8P**	Fire Station Protected - Commercial Lines insured properties within 5 km by road of responding Denman Island Fire Station
Denman Island – Denman Island Local Water Service Area (Parnell Water System)	-	**9**	Fire Station Protected - Commercial Lines insured properties within 5 km by road of responding Denman Island Fire Hall
Rest	9	**9**	Fire Station Protected - Commercial Lines insured properties within 5 km by road of responding Denman Island Fire Station
Rest	10	**10**	over 5 km by road of responding Denman Island Fire Hall

Importantly, the re-assessment of the community has identified a number of weaknesses and areas where improvements may result in improved levels of fire protection and improved fire insurance grading classifications.

[18] "P" Stands for Provisional – a provisional grade is given for a municipality or community where deficiencies in the fire insurance grading have warranted a downgrading. A predetermined amount of time (generally 12 months) is provided to a municipality or community to enable them time to correct major deficiencies to maintain their fire insurance grade.

3.3.7 Denman Island Conclusions

The Denman Island Volunteer Fire Department has made great strides in improving its services. The most significant areas of the fire insurance grading where the least amount of credit was received for the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force, and
- Fire Department Training of Fire Fighters and Officers.

The Graham Lake Improvement District's water system has changed significantly since it was last evaluated in 1988. The water system was recognized based on its capability at that time. However, since changes have occurred, the water system was viewed as being inadequate to meet the minimum requirements for fire insurance grading. The loss of recognition will have the greatest impact on insurance rates for property owners on the Graham Lake water system, changing from "protected" status to "semi-protected" status.

Denman Island's Public Fire Protection Classification (PFPC) has stayed at a 9 and its Dwelling Protection (DPG) remained at 3B. However, as a result of the survey fire insurance grades for the Graham Lake Improvement District will be downgraded, the PFPC to a 9 and its DPG to 3B. A set amount of time will be allowed for information to be provided to validate if the water system is capable of meeting the minimum fire insurance requirements before a downgrade is published in the fire insurance grading index.

Addressing the recommendations in relation to the fire department and especially the water supplies in this report may qualify Denman Island for an improved fire insurance grading classification. Improvements in the water supply recognition would likely have the greatest impact on property insurance rates for property owners on the Graham Lake Improvement District water system who are insured under Personal Lines insurance.

3.4. Hornby Island

Hornby Island is situated in the Georgia Strait, between Vancouver Island and the rest of British Columbia. The Island is accessible by BC Ferry services from Denman Island and by floatplane.

Hornby Island has an approximate population of 1,044 during the winter and upwards of 5,000 with seasonal fluctuations. Hornby Island resides in Electoral Area "A" of the Comox Valley Regional District.

3.4.1 Hornby Island Risk Assessment

The "Risk and Hazard Assessment" is an evaluation of the life safety risks, fire loading and risk of fire that is present in a given area. Historical call volumes are also utilized in the evaluation process.

Adequate response to a fire emergency is generally measured by the speed with which a responding fire fighting crew(s) can arrive at the fire emergency with the correct type and amount of resources to have a reasonable degree of opportunity to control or extinguish a fire. Simply put, the response provided by a fire fighting crew should equal the potential severity of the fire or fire emergency. The required response from a fire fighting crew is greater if life safety is a factor in a fire event and the expected response time is shorter.

The potential severity of a fire event is generally associated with the fuel load present and exposures to the fire. Factors such as building construction materials; quality of construction; building renovation history; building size, height and age; occupancy and hazards associated with the occupancy; will all contribute to the potential severity of a fire. In addition, other buildings sufficiently exposed to a burning building can contribute to the magnitude of a fire, and the resources necessary to be in place to control or extinguish a given fire. Alternatively, building controls and automatic fire protection systems (both active and passive) that limit fire spread will reduce the potential severity of a fire. For building controls to be considered effective, their design,

installation, and maintenance must also be reviewed as any weak link may result in the system being ineffectual.

Much of the research into fire protection requirements for individual buildings and communities and the corresponding number of "*pumper companies*" and response times has been conducted by Fire Underwriters Survey and the National Fire Protection Association. Fire Underwriters Survey evaluates adequacy of response by comparing the potential severity of fires that may occur with a rating of the ability of fire crews and their resources responding within a specified time period relative to the fire and life safety risk potential that may be needed.

In a fire and life safety risk analysis, the Fire Service Area is broken up into zones of fire emergency risk and hazard profiles. For this review, the fire protection needs of each community zone were evaluated. A fire and life safety risk analysis provides much of the data that is necessary to comment on the community's fire protection needs including fire apparatus requirements, fire equipment, and other areas of a community's fire protection programs.

Appendix A - Table of Effective Response, illustrates various sectors commonly found in most communities and indicates a range of risk ratings that are commonly applied to these sectors. The Table also indicates a range of fire flows that are normally associated with each community sector profile. Additionally, the Table of Effective Response indicates the number of Pumper trucks, ladder trucks, and associated companies that are expected to be needed to control and suppress fires occurring within representative building zones throughout the community.

The number of fire companies that will be needed is correlated to fire loading within the community's building stock and to life safety risks present. Fire flow requirements are determined by construction characteristics, occupancy, size, and exposures to representative buildings throughout the community.

3.4.1.1. Fire Risk in Hornby Island

Hornby Island has been reviewed from the perspective of life safety, fire loading, fire risk, and response characteristics.

Each area of the community has been reviewed with building risk assessments. Building Risk Assessment was performed at three levels of measure:

Occupancy Risk: Which is defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class. (Occupancy "Required Fire Flow")

Fire Flow Demand Zone: Which is an area used to define or limit the management of a risk situation. A fire flow demand zone can be a single building or a group of buildings. It is usually defined with geographical boundaries and also can be called fire management areas or fire management zones. (FFDZ "Required Fire Flow")

Community: Which is defined as the overall profile of the community based on the unique mixture of individual occupancy risks, fire flow demand zone risk levels, and the level of service provided to mitigate those risk levels. ("Basic Fire Flow")

Hornby Island has primarily residential fire risks. Single Family Residential occupancies do not have automatic sprinkler protection installed. These occupancies are spaced apart but are surrounded by forest, which introduces Wildland Urban Interface risks. There are only a few Commercial Lines insured risks on the island.

The community is considered to be (from the perspective of fire fighting response characteristics) a single "fire flow demand zone" as shown in Figure 3.4-1 Hornby Island Fire Flow Demand Zone.

To develop the required fire flow for the fire flow demand zone for Hornby Island, the methodology described in Fire Underwriters Survey 1999 guideline "Water Supply for Public Fire Protection" was used. Refer to Appendix B.

Figure 3.4-1 Hornby Island Fire Flow Demand Zone

Table 3.4-1 Hornby Island Required Fire Flow

Hornby Island Fire Flow Demand Zone	Fire Zone Risk Rating*	Final RFF LPM (Igpm)
Single Family Residential & Small mercantile	3A	5,900 (1,300)

* Corresponding to the Table of Effective Response

Required fire flows were calculated for a representative sampling of buildings as well as for a representative sampling of "construction parameter zones" based on Zoning Bylaws

and local construction practices. The “fire flow demand zone” was assessed for primary zoning (industrial, commercial, residential, etc.) and for typical building construction.

The intent of setting the final required fire flow in this manner is not to provide adequate water supplies for the worst case scenario, but rather to provide adequate water supplies for fire fighting in the majority (90 percent) of structure fires (not including Wildland Urban Interface Risks). The final required fire flow is intended to be adequate for existing construction as well as new construction occurring in already built-up areas of the community.

It should also be noted that the Basic Fire Flow set by the Fire Underwriters Survey is intended as a benchmark that the community and fire department will be measured against. The fire flow is intended to be adequate to fight fires offensively, and to provide property protection (including exposure protection) in addition to life protection.

The Basic Fire Flow is utilized with associated risk categories from Appendix A - Table of Effective Response, to determine the appropriate level of response from Fire Departments, including items such as response times and apparatus requirements. It is also used to determine staffing requirements and optimal apparatus and fire station locations based on achieving the level of response indicated in the Table of Effective Response 90 percent of the time.

The Basic Fire Flow for Hornby Island has been set at 5,900 LPM (1,300 Igpm) in 2008.

The past Basic Fire Flow for Hornby Island was set at 5,682 LPM (1,250 Igpm) when fire insurance grades were last updated in 1988.

The Basic Fire Flow benchmark requirements of 5,900 LPM (1,300 Igpm) from the Table of Effective Response are as shown in Table 3.4-2 Summary of Benchmark Requirements for Basic Fire Flow. Hornby Island is measured against these benchmarks within the fire insurance grading.

Table 3.4-2 Summary of Benchmark Requirements for Basic Fire Flow

Basic Fire Flow	1st Due Pumper	2nd Due Pumper	1st Due Ladder	Total Pumper Companies available	Minutes for all to arrive	Total Ladder Companies available	Minutes for all to arrive
5,900 LPM (1,300 Igpm)	3.5 minutes (2.7 km)	5 minutes (4.1 km)	NA	2 pumper companies	5 minutes (4.1 km)	NA	NA

3.4.1.2. Future Fire Risk on Hornby Island

The Basic Fire Flow of the community has been set at 5,900 LPM (1,300 Igpm). Currently, there are no future commercial developments that would increase the Basic Fire Flow of Hornby Island. If the built-up environment of Hornby Island remains similar (building construction and size of buildings) the Basic Fire Flow of the island is not

expected to change. However, if the built-up environment changes with numerous developments larger in relation to what is already built on the island (having Required Fire Flows greater than the Basic Fire Flow) then the Basic Fire Flow of the island may be adjusted accordingly to reflect change.

At the time of the field survey there were no future fire risks to be addressed that would warrant the possibility of the Basic Fire Flow increasing. Hornby Island had no developments planned or under construction that would need to be addressed from a fire protection resource planning standpoint.

3.4.2 Hornby Island Fire Department Assessment

3.4.2.1. Fire Department Profile

The Hornby Island Fire Department is a volunteer fire department. There is a Chief, a Deputy Chief, four officers, and 16 volunteer fire fighters. All members of the department live and work on the island; however, there is the possibility of one member who works off the island.

The area covered by the Hornby Island Fire Department is approximately 32 km^2.

3.4.2.2. Fire Department Operations and Administration

The Hornby Island Fire Department is operated by the Comox Valley Regional District and funded by the Hornby Island tax base. The regional district operates a total of five volunteer fire departments and has working agreements with member municipalities and improvement districts within the regional district to provide fire protection.

The Hornby Island Fire Department is managed and organized by knowledgeable and hardworking individuals. The Hornby Island Fire Department produces an annual report that includes information on call-outs, training, fire prevention, finance, and strategic planning.

Fire Department Officers:

- Giff LaRose, Chief Fire Official
- Robbie Zielinski, Deputy Chief
- Al Cannon, Captain
- Gregg Kendrick, Fire Prevention Officer/Fire Patrol
- Albini Lapierre, Safety Officer
- Duncan MacCaskill, Training Officer

3.4.2.3. Automatic and Mutual Aid Agreements

There are no aid agreements for the Hornby Island Fire Department. Due to the geographic nature of the island, there are no road ways connecting Hornby Island to Denman Island or to Vancouver Island.

Aid coming from off island would have to use the BC Ferry service. This results in a very unreliable response time with many potential delays.

3.4.2.4. Fire Hall Suitability

The Hornby Island Fire Department is located at 3850 Central Rd, as seen in Figure 3.4-3 Hornby Island Fire Protection Local Service Area. The station is located in the geographic centre of the island to help provide the most adequate response possible.

Figure 3.4-2 Hornby Island Fire Department

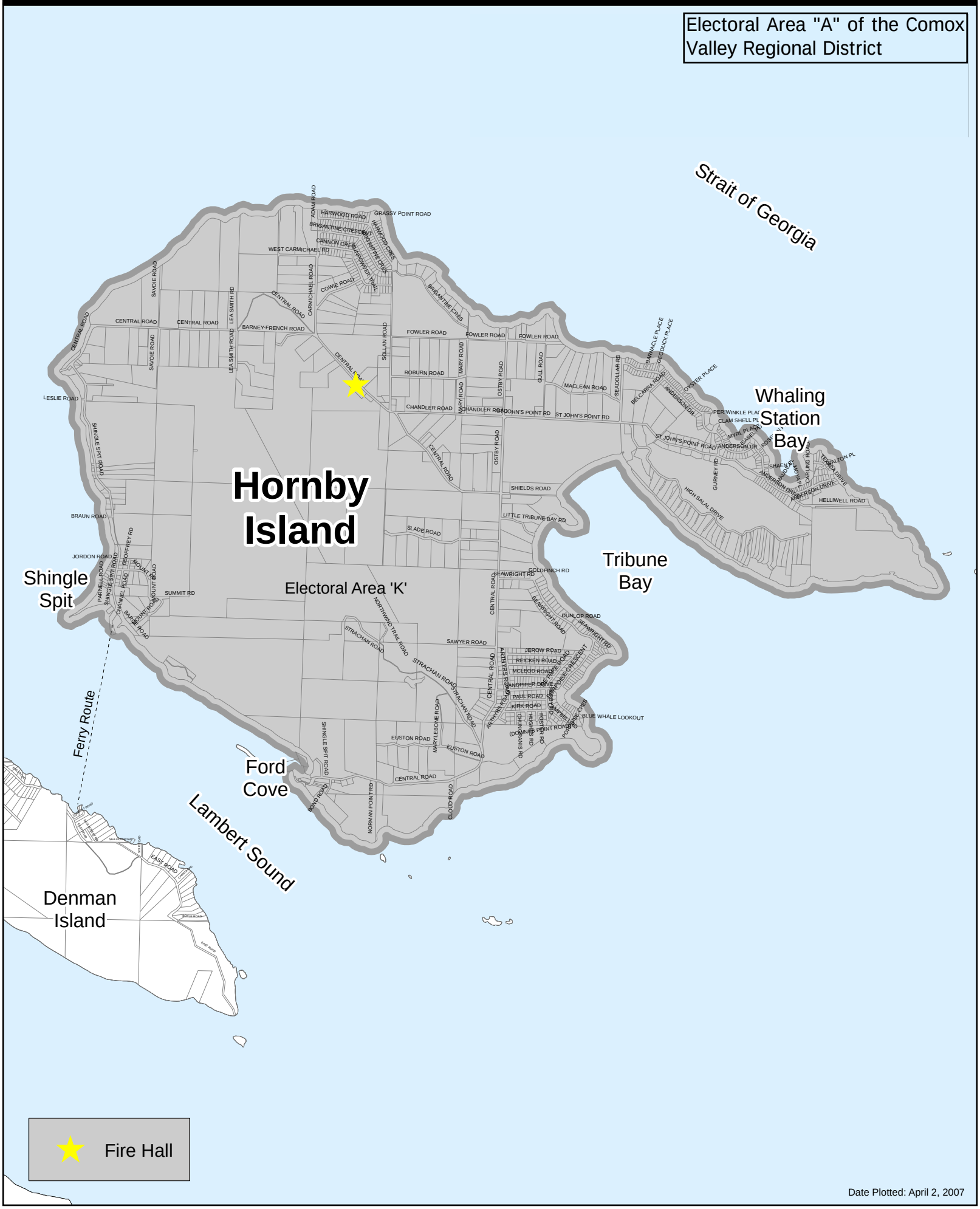
The fire department operates out of four bay doors measuring 3.7 m x 3.7 m (12' x 12'). The building is of concrete block construction for the bays and ground floor, with wood frame construction for the second storey. The radio/base station is located on the ground floor. The upper floor contains a general lounge area and kitchen in addition to the fire department's library of materials including the Operational Guidelines. This floor is where classroom training is conducted. There is ample room for seating for all the fire department members.

Construction of a new fire hall is under review as the current hall is structurally unsound and does not meet the BC Building Code for post disaster requirements. The current fire hall property does not have its own water source. An informal agreement is in place between a neighbouring property and the fire department. A garden hose supplies water to the fire hall's cistern for running water and washroom facilities. The current property is not outfitted for water or sewer. A major upgrade for water and sewer would be required to supply the current property with its own source of water.

Comox Strathcona
REGIONAL DISTRICT

Figure 3.4-3 Hornby Island Fire Protection Local Service Area

Electoral Area "A" of the Comox Valley Regional District



Date Plotted: April 2, 2007

3.4.2.5. Training & Qualifications

The fire department has three members certified to Fire Instructor Level 1, and two fire fighters NFPA 1001 certified. The department's training program uses in house trainers to teach new skills to the other members as well as sending members off island for advanced training, instructor training, and live fire certification and recertification.

Training is conducted every Thursday night for approximately three hours. New recruits are accepted in October, and are trained until March. These members are not sent to the Justice Institute of British Columbia, but are enrolled in the Fire Fighter Level 1 program and trained to Basic level using department administered exams and evaluations with two certified JI Evaluators.

The fire department has limited training facilities provided on island. All that is available are the grounds around the fire hall and the space in the fire hall.

Recommendation 3.4-1 Develop a Formal Training Program for Fire Fighters and Officers

The Hornby Island Volunteer Fire Department has a formal training program. To improve the overall effectiveness of the personnel on the fire department, the training program should be further developed to include setting and tracking attainable goals. The curriculum should include qualitative and quantitative goals and benchmarks that each fire fighter and officer can work towards.

Two standards that would aid in developing an optimal curriculum would be NFPA 1001 *Standard for Fire Fighter Professional* Qualifications and NFPA 1021 *Standard for Fire Officer Professional Qualifications*. NFPA 1001 identifies the minimum job performance requirements (JPRs) for career and volunteer fire fighters whose duties are primarily structural in nature. NFPA 1021 identifies the performance requirements necessary to perform the duties of a fire officer and specifically identifies four levels of progression.

As well NFPA 1401 *Recommended Practice for Fire Service Training Reports and Records*, 2006 Edition, is recommended to be used by the establishment to upgrade or evaluate training records. Report systems should be developed to document clearly the performance and ability of individual and group activities related to the fire department.

3.4.2.6. Available Fire Force

The Hornby Island Fire Department is a volunteer fire department, consisting of 22 members. There is a Chief, a Deputy Chief, four officers, and 16 volunteer fire fighters. For the purpose of determining the available fire force, the number of fire fighters that are considered is 22.

Hornby Island's Basic Fire Flow benchmark was set at 5,900 LPM (1,300 Igpm).

This benchmark includes two pumper companies being available to respond continuously, year round. For the purposes of fire insurance grading, the benchmark

number of career fire fighters per company is six (including officers); therefore the benchmark number of career fire fighters that Hornby Island Fire Department is measured against is 12 career fire fighters per shift (including officers), available continuously year round (day and night).

Where Fire Departments are operating with a volunteer roster, such as Hornby Island, the Available Fire Forces for fire insurance grading purposes are calculated as follows;

- Each full time career fire fighter is credited as 1 fire fighter.
- Fire chiefs and deputy chiefs are not typically credited as fire fighters unless they normally participate in fire ground duties.

Fire Fighter Equivalent Units (FFEU)[19]

- 1 FFEU is credited for every 3 off-shift career fire fighters who are scheduled to respond
- 1 FFEU is credited for every 4 off-shift career fire fighters who are not scheduled to respond, but are available to respond
- 1 FFEU is credited for every 3 paid-on-call or volunteer fire fighters (based on the average turn-out to structural fires (if statistical data was available e.g. turn-out records)
- 1 FFEU is credited for every 6 paid-on-call or volunteer fire fighter (based on a conservative assumption that 50 percent of the fire department roster responds to structural fires(if no statistical data was available)
- Support fire fighter equivalent units from mutual and automatic aid companies is credited on a different schedule

Note that probationary fire fighters (incomplete training) and junior fire fighters (under age) are not credited due to lack of active fire ground duties.

Statistical data was available to indicate the average number of volunteers that turn-out to structural fires for the Hornby Island. The average fire fighter turn out for the Hornby Island Fire Department is 11; therefore, to calculate the total available fire force of the fire department, the total FFEU that the fire department received credit for is:

1/3 of the average turn-out = 3.7 FFEU

No support fire fighter equivalent units were available to the Hornby Island Fire Department for fire insurance grading.

The Basic Fire Flow benchmark fire force is 12 career fire fighters on duty 24 hours a day. The Hornby Island Fire Department received credit for 3.7 career fire fighters that are able to respond continuously year round. Additional credit can be awarded in this area of the fire insurance grading, up to a maximum of 12.

[19] The sum of all such equivalent fire fighter units (including those from automatic and mutual aid) shall not exceed 50percent of the lesser of

a) the required strength of existing companies (@ 6 fire fighters per company),
or
b) The required strength of required companies (based on the Table of Effective Response @ 6 fire fighters per company).

It is important to note that the level of credit received is not uncommon for a volunteer fire department.

Recommendation 3.4-2 Improve Available Fire Force Level

The Hornby Island Fire Department received credit for 3.7 career fire fighters out of the maximum permissible 12 that can be received in this area of the fire insurance grading. It is important to note that the maximum permissible credit of 12 career fire fighters on duty 24 hours per day 365 days of the year is needed for achieving the best possible PFPC grade.

To help improve the relative classification of the fire department within the fire insurance grading, the Hornby Island Fire Department should increase its available fire force by acquiring additional volunteers to respond to fire calls, or provide career staffing. Note that the available fire forces can be improved through additional volunteers up to 50 percent of the required fire force. For Hornby Island, the maximum available fire force that can be provided through volunteers is 6.

Providing career staffing is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

3.4.2.7. Fire Department Apparatus

Fire departments are evaluated for the number of pumper companies and ladder companies in service relative to the overall fire potential and the area being protected. Pumper companies and ladder companies are required to be adequately staffed in order to receive full credit.

The Hornby Island Fire Department apparatus fleet includes:

Table 3.4-3 Hornby Island Fire Apparatus Summary

Unit #	Year	Vehicle Type	Pump Capacity IGPM	Tank Capacity Imp. Gal	Manufacturer	ULC Plate #	Age (2008)
61	2003	Pumper	1050	1000	American LaFrance	9001C	5
62	1996	Tanker	400	1600	Ford Superior	N/A	12
64	1981	Rescue	-	-	Ford International	-	27
63	1991	Ambulance	-	-	Dodge	-	17
	1997	Officer Vehicle	-	-	Chevrolet	-	11

3.4.2.8. Ladder Service

Firefighting and rescue operations involving buildings greater than two storeys in height typically involve ladders, elevated master stream devices, and similar equipment. Industrial occupancies also often require elevated master streams for safe firefighting.

The number of ladder trucks required to be in service (ladder companies) for fire insurance grading is determined mainly by use of Table of Effective Response.

A ladder company is required when a municipality has five buildings that are three storeys or higher, five buildings which have a required fire flow of 15,000 LPM (3,300 Igpm) or more, or a combination of these.

The number of ladder companies in service and regularly responding to alarms shall be sufficient to properly protect the municipality. The Table of Effective Response with its accompanying notes provides the criteria to be applied.

Each required ladder company shall be provided with a ladder truck, equipped with an aerial ladder, boom with ladder or elevating platform, and elevated master stream capability.

The Basic Fire Flow for Hornby Island is set at 5,900 (1,300 Igpm). Hornby Island does not have five buildings over three storeys or higher, or five buildings that have a Required Fire Flow of 15,000 LPM (3,300 Igpm) or more, or a combination of both. The Hornby Island Fire Department is not required to have a ladder apparatus for fire insurance grading.

3.4.2.9. Credit for Fire Companies in Service

The benchmark number of pumper and ladder companies needed to be available, based on a Basic Fire Flow of 5,900 (1,300 Igpm), is two pumper companies referenced from the Table of Effective Response. Additionally, one reserve pumper company is required for each eight required pumpers in service. A one company fire department requires a reserve pumper for fire insurance grading.

The maximum acceptable age of apparatus specified in the fire insurance grading index is 20 years. Apparatus is occasionally accepted beyond the age of 20 years for small communities where it may be too financially onerous to acquire newer apparatus. This extension of the usable life of the apparatus is subject to the apparatus and pumps being in good condition (with limited down-time) and being tested regularly. Application for extension of recognized usable life of apparatus for insurance grading purposes should be made in writing to the offices of the Fire Underwriters Survey. Test results should accompany applications for extension.

Apparatus beyond 30 years in age can not be credited for fire insurance grading purposes due to lack of reliability. Refer to Appendix D.

Table 3.4-4 Credit for Fire Companies in Service

Unit #	Vehicle Type	Company Credit	Pumper Credit	Ladder Credit	Reserve Credit	Tanker Credit
61	Pumper	100% Pumper	1	0	0	0
62	Tanker	100% Tanker	0	0	0	1
64	Rescue	-	0	0	0	0
63	Ambulance	-	0	0	0	0
-	Officer Vehicle	-	0	0	0	0
		Total Pumper Credit	1	-	-	-
		Total Ladder Credit	-	-	-	-
		Total Reserve Credit	-	-	-	-
		Total Tanker Credit	-	-	-	1
Table of Effective Response – BFF 1,300 Igpm			2	-	1	

The Hornby Island Fire Department received credit for one pumper company out of the max permissible credit of two within the fire insurance grading.

Support company credit was not available to the Hornby Island Fire Department.

The Hornby Island Fire Department received 50 percent credit for the number of needed pumper companies based on the Basic Fire Flow set out by the Table of Effective Response. Credit has not been awarded for any reserve apparatus that is available to the Hornby Island Volunteer Fire Department.

The Hornby Island Fire Department has been developing alternative water supplies throughout the Island for fire fighting purposes. Additional mobile water supply apparatus with sufficient water carrying capacity would be beneficial for the fire department to attain Superior Shuttle Tanker Accreditation.

Adding additional apparatus without the human resources required to operate the apparatus would not be recommended. Consideration should be given to adding pumper companies once the available fire forces have been increased to a level that would support an additional company.

Recommendation 3.4-3 Acquire Additional Apparatus

The Hornby Island Volunteer Fire Department received full credit for the one pumper company. To receive maximum credit when the Basic Fire Flow for Hornby Island has been set at 1,300 Igpm, an additional pumper company and reserve pumper is needed. The benchmark requires two pumper companies and one reserve apparatus. In order for the Hornby Island Volunteer Fire Department to receive maximum credit in its total pumper companies, it is recommended that an additional pumper company apparatus be acquired.

Acquiring additional apparatus with a credited pump capacity will help the fire department receive additional credit in its pump capacity and it will provide the needed distribution to meet the second due pumper company.

It should be noted that for a pumper company to be recognized within the fire insurance grading it should meet the following requirements:

- ULC listed
- Meet the general requirements of NFPA 1901 *Standard for Automotive Fire Apparatus,* recent edition
- Have a permanently mounted pump with a capacity of at least 420 Igpm
- Have a water tank capacity of at least 250 IGAL
- Have a sufficient amount of hose

In order for the apparatus to be recognized, it must be stored and housed in a facility suitable for the fire departments needs. The storage facility should be of adequate construction, heated and contain all the necessary tools and equipment required for fire fighting. Additionally, fire fighters should be able to respond to the building within a reasonable time. It is important to note that within the fire insurance grading, each apparatus should be supported by a company (6 fire fighters) that is fully trained and equipped.

Providing additional apparatus is a serious matter that requires careful consideration. There are many factors to consider and the fire insurance grading is only one such factor.

Recommendation 3.4-4 Consider Acquiring Additional Mobile Water Apparatus

To improve the reliability of the Hornby Island Volunteer Fire Department to shuttle water for fire protection, consideration of acquiring an additional mobile water supply apparatus. Additional mobile water supply apparatus may help meet criteria needed for the fire department to attain Superior Tanker Shuttle Accreditation. Refer to Appendix G.

3.4.2.10. Pumping Capacity Credit

The apparatus pump capacity credit refers to the capacity of credited recognized pumps located on fire apparatus. Recognition and credit for pumps on fire apparatus is typically reduced or withheld based upon the measured reliability of the pumps and the apparatus upon which they are installed (ex. factors such as age, listing, testing, etc.).

The total credited pump capacity is calculated in comparison to the Basic Fire Flow for the community. The calculation is conducted as follows:

$$PC_{Total} = PC_{Primary} + PC_{Support}$$

PC_{Total} = Total Credited Pump Capacity
$PC_{Primary}$ = Primary Pump Capacity (local to the specific station)
$PC_{Support}$ = Support Pump Capacity (coming from other areas/stations)

Primary Pump Capacity ($PC_{Primary}$) is set by taking the sum of the rated capacities of the pumpers in the station and downgrading from 100 percent of the rated capacities based on reliability factors (including but not limited to age, quality, listing, and pump test results).

Support Pump Capacity ($PC_{Support}$) is set by taking the sum of the rated capacities of the support apparatus and giving a specified percentage of the rated capacity based on the aid being automatic or mutual. If aid is automatic a maximum of 75 percent of the pump capacity may be granted. If aid is mutual a maximum of 33 percent of the pump capacity is granted.

Table 3.4-5 Pumping Capacity Credit Summary

Unit #	Vehicle Type	Pump (Igpm)	Tank Imp. Gal	Pump Capacity Credit %	Credited Pump Capacity (Igpm)
61	Pumper	1,050	1,000	100%	1,050
62	Tanker	400	1,600	0%	0
64	Rescue	-	-	-	-
63	Ambulance	-	-	-	-
-	Officer Vehicle	-	-	-	-
				Total Credited Pump Capacity:	1,050

Support pump capacity was not available to the Hornby Island Fire Department for fire insurance grading.

The credited pump capacity of the fire department is 4,773 LPM (1,050 Igpm). The Basic Fire Flow for the community has been set at 5,900 LPM (1,300 Igpm) and therefore the Hornby Island Fire Department received 81 percent credit in its credited pump capacity within the fire insurance grading portion of the fire department.

Recommendation 3.4-5 Improve Apparatus Pumping Capacity

The Hornby Island Fire Department received 81 percent for its credited pump capacity towards the relative classification of the fire department within the fire insurance grading when the Basic Fire Flow benchmark is 1,300 Igpm.

To receive maximum credit (up to 1,300 Igpm) toward the fire department's pumping capacity, additional fire apparatus would be required. Improving credit in pumping capacity is directly proportional to credit received for pumper and ladder apparatus. Apparatus of a reasonable age and pump capacity should be acquired for fire insurance grading.

Pumper and ladder companies are required to be adequately housed and staffed in order to receive full credit.

Acquiring additional pumper and ladder apparatus may have a positive beneficial effect in terms of fire insurance grading. Acquiring new fire apparatus is a serious matter that requires careful consideration and fire insurance grading is only one such factor to consider.

3.4.2.11. Apparatus Maintenance Programs

There are no repair facilities located on Hornby Island. Fire apparatus are sent off the island for major repairs; however, there is a heavy duty mechanic on the island that is capable and able to perform minor repairs and maintenance on the fire apparatus.

The fire department contracts Profire Emergency Services to conduct annual pump maintenance and service tests.

Recommendation 3.4-6 Acquire Additional Apparatus for Reserve Purposes

In the event that the front line pumper is out of service, the Hornby Island Fire Department would be expected to not have enough resources to adequately fight fires. Due to the geographic nature of the community a neighbouring community could not provide cover in status. It is for this reason that an additional pumper should be acquired for reserve purposes. During major repairs the reserve apparatus could be moved to front line status and maintain the current level of fire protection throughout the community.

Additionally, this apparatus could be used to eliminate the second due pumper company deficiency. For this pumper to be considered as a second due pumper/reserve apparatus, it should meet all the fire departments needs and meet the requirements for fire insurance grading. It is important to note that the apparatus must be housed in a suitable facility. Apparatus that are continually exposed to the elements (weather) can not be graded within the fire insurance grading.

Providing additional apparatus is a serious matter that requires careful consideration and the fire insurance grading is only one such factor to consider.

3.4.2.12. Distribution of Resources and Response Times

Resources for fire fighting are centrally located on the island. The majority of risks on the island are single family residential and are generally within 8 km of the fire hall. The few commercial risks that are on the island are generally located within the first due pumper company response; however, the fire department does not have a second pumper company that can be recognized within the fire insurance grading and therefore can not respond to second alarms with sufficient apparatus.

The adequate response distance for the first and second due pumper companies for fire insurance grading purposes is based off the following formula:

$$D(km) = \frac{[T(\min) - 0.65(\min)]}{1.065(\min/km)}$$

Where:
D = total distance in kilometres
T = time in minutes

Hornby Island has a Basic Fire Flow of 5,900 Igpm (1,300 Igpm). Fire Underwriters Survey – Table of Effective Response illustrates that the first due Pumper Company should respond within 3.5 minutes and the second due Pumper Company should respond within 5 minutes.

Applying these response times to the equation above will provide a first due pumper response of 2.7 km, and a second due pumper response of 4.1 km.

Figure 3.4-4 First Due Pumper Response Distance - 2.7 km

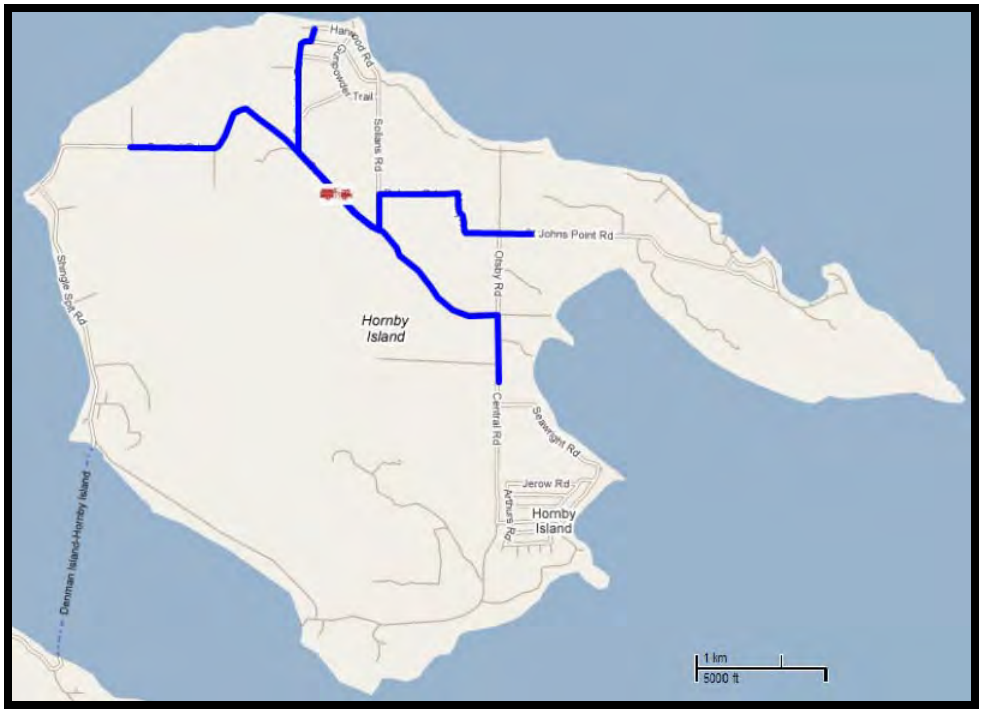


Figure 3.4-4 First Due Pumper Response Distance - 2.7 km illustrates the general area in the fire protection local service area that is covered by the first due Pumper Company.

Figure 3.4-5 Second Due Pumper Response Distance - 4.1 km

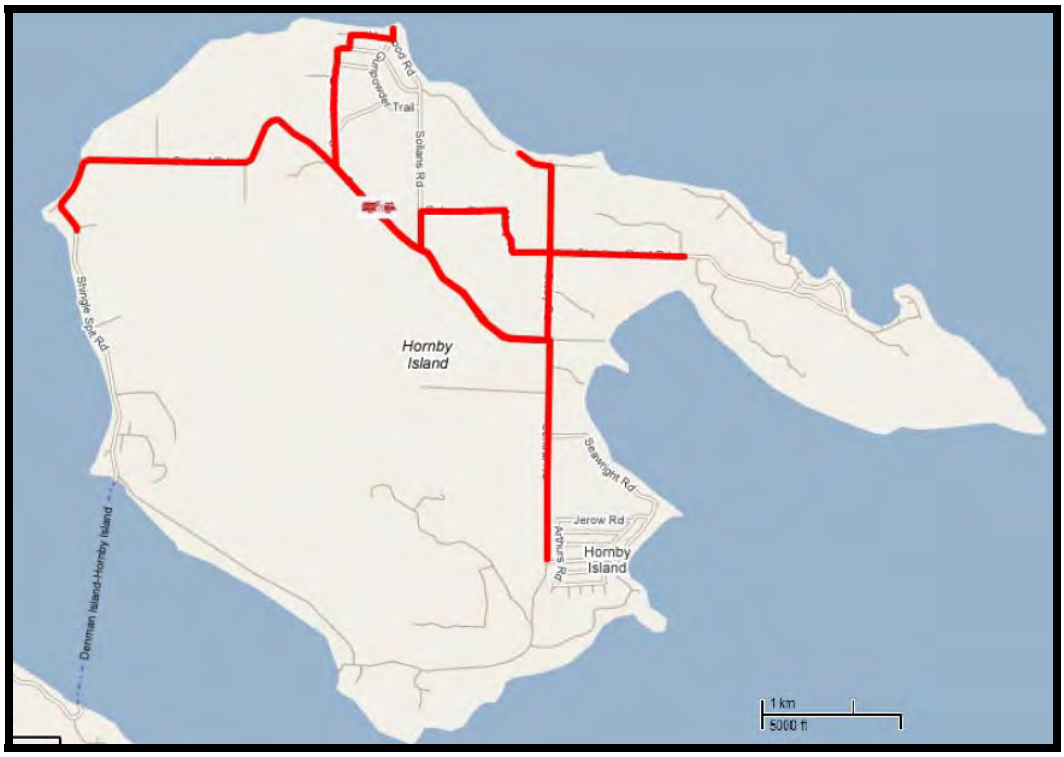


Figure 3.4-5 Second Due Pumper Response Distance - 4.1 km illustrates the general area in the fire protection local service area that would be covered by the second due Pumper Company.

When considering that most of the buildings on the island are single family residential, the response distance considered is 8 km.

Figure 3.4-6 Response Distance for Single Family Residential Buildings

Figure 3.4-6 Response Distance for Single Family Residential Buildings illustrates the single family dwelling areas in the fire protection local service area that are covered by the fire department.

When looking at these areas and applying the correlating fire flow for the demand zone, as seen in Table 3.4-1 Hornby Island Required Fire Flow and Table 3.4-2 Summary of Benchmark Requirements for Basic Fire Flow, the areas require two pumper companies available to respond within 5 minutes.

In the event that there is a second alarm during a fire event, the fire department would not have sufficient apparatus to cover the alarm.

Recommendation 3.4-7 Provide Additional Pumper Apparatus to Provide a Reasonable Level of Fire Protection

The fire department has a single pumper apparatus and a single mobile water supply apparatus. The Basic Fire Flow indicates that there should be two pumper companies available to respond. For this reason, the Hornby Island Fire Department does not receive full credit in its distribution of apparatus.

In order for the fire department to be able to provide a second due cover, and provide a reasonable level of fire protection throughout the community, it is recommended that an additional recognized pumper be acquired to satisfy the second due cover. It is important to note that the apparatus must be housed in a suitable facility. Apparatus that is exposed to the weather can not be graded within the fire insurance grading.

Providing additional apparatus is a serious matter that requires careful consideration. There are many such factors to consider and the fire insurance grading is only one such factor.

3.4.2.13. Fire Fighting Ancillary Equipment and Hose

The fire department's apparatus and fire station have a combination of miscellaneous tools that meet the needs of the fire apparatus companies. These tools include but are not limited to rope, cutters, fire extinguishers, nozzles, first aid equipment, wrenches, generators, salvage tarps, etc.

Fire hose used by the fire department should be distributed so that each pumper company carries a minimum of at least 360 m (1,200 ft) of 65 mm (2 ½ in) (or larger), 180 m (600 ft) of 38 mm (1 ½ in), and 60 m (200 ft) of 25 mm (1 in) booster hose (or equivalent hose). A fire department should maintain a complete reload or spare shift of hose at the fire station.

The Hornby Island Fire Department has adequate amounts of hose lengths for the number of apparatus in its fleet.

Table 3.4-6 Hornby Island Fire Department Hose Summary

Unit #	Apparatus	Amount of Hose		
		Booster	38 mm	65 mm or larger
Total and Spare Hose in Station		0 m	760 m	1,520 m
Recommended Per Pumper Company		60 m	180 m	360 m
Recommended Full Compliment		60 m	180 m	360 m

Recommendation 3.4-8 Improve amount of Spare Fire Hose in Hall

To provide a reasonable level of fire protection throughout the community, there should be a full compliment of spare hose available to the fire department. In the event that the hose on the apparatus is being tested or serviced, the fire department should have additional spare hose. By having spare hose, the in service apparatus will have adequate tools and equipment available during fire ground operations.

The Hornby Island Volunteer Fire Department has received minimal credit for the amount of spare hose that is available. Additional credit can be awarded by providing additional spare hose. To receive full credit for spare hose a full compliment should be kept for each amount of hose stored on apparatus.

If spare hose exists in the fire hall, amounts should be submitted to the Fire Underwriters Survey to make appropriate adjustments to fire insurance grading.

3.4.2.14. Personal Protective Clothing & Equipment

The fire department has a total of 22 sets of personal protective clothing (PPC) that are generally replaced every eight years. Inspections are conducted after each use and during training sessions.

The fire department has total of 10 sets of Self Contained Breathing Apparatus, and a total of 30 spare bottles. The fire department does not own a SCBA refill station, but has access a refill station at a scuba diving business on the island that the fire department has access to. The owner of this establishment is a member of the fire department.

3.4.2.15. Planned Responses

The Hornby Island Fire Department's response plan is to respond with all fire apparatus and as many members as available. The fire department's Operational Guidelines state each apparatus is required to have a minimum of two fire fighters before it leaves the fire hall.

Not all members of the fire department respond to the fire hall to pick up apparatus and drive the apparatus to the fire ground. Members of the department listen to their pagers for updates on when fire apparatus have left the hall and will respond with their personal vehicle to the fire ground with their personal protective clothing.

3.4.2.16. Pre-incident Planning

Pre-incident planning is one of the most effective tools a fire department has in effectively controlling or reducing the damage caused by fire. Planning for fires in industrial and commercial occupancies increases the confidence and ability of the fire department in handling the fires and reduces the risk to the life safety of the fire fighters involved.

The Hornby Island Fire Department has no pre-incident planning program that follows NFPA standards. For this reason credit was not received in this area of the fire insurance grading. Fire scenarios are discussed, but are not recorded on paper.

Recommendation 3.4-9 Develop and Implement Pre-Incident Planning Program

It is recommended that the fire department set a timeline and develop an action plan for the development and implementation of a comprehensive Pre-Incident (pre-fire) Planning Program. Acquire access to NFPA 1620, *Recommended Practice for Pre-Incident Planning,* 2003 Edition and develop pre-plans accordingly.

Developing and implementing a pre-incident planning program has multiple benefits that include but are not limited to:

- Increasing the familiarity fire fighters have with buildings in the community.
- Determining apparatus staging areas allowing quicker set-up times.
- Determining the overall accessibility for fire apparatus to get to risk and set up.

- Identifying hazards in and around the risk that may warrant defensive tactics.
- Identifying available water resources in the vicinity of the risk (example: fire hydrants, ponds, cisterns, dry hydrant, etc).

Credit awarded in the fire insurance grading of the fire department's pre-incident planning program may help to improve the overall fire insurance grade of the community.

3.4.2.17. Fire Department Assessment within the Fire Insurance Grading

The Fire Department Assessment contributes 40 percent of the Public Fire Protection Classification grade for the community. This is the most heavily weighted portion of the grading and as such is considered to be the most significant indicator of a community's overall preparedness for dealing with fire emergencies.

The relative classification of the fire department is currently a 9. The areas where the least amount of credit was received in the fire insurance grading of the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

3.4.3 Hornby Island Fire Prevention and Fire Safety Control

Fire Safety Control including Building and Fire Code effectiveness has become an increasingly heavily weighted portion of the fire insurance grading system. This is a result of statistical data showing that communities employing effective programs in these areas have significantly reduced fire related losses.

The Hornby Island Fire Department has been reviewed in the effectiveness of its practices with regard to Fire Safety Control.

3.4.3.1. Codes and Bylaws: Construction Control, Plan Review, Building Inspection and Permit Process

There is a building inspector who is part of the Comox Valley Regional District. The Comox Valley Regional District provides Building Permits and reviews plans, re-zoning applications, etc. for new construction to the respective areas. However, there is no building inspection on Hornby Island.

Key Codes and Standards:

National: National Building Code
National Fire Code

Provincial: British Columbia Building Code
British Columbia Fire Code

Local: Hornby Island Local Trust – Land use Bylaw No. 86

3.4.3.2. Automatic Sprinkler Protection

No sprinkler by-law is in effect in Hornby Island Fire Protection Local Service Area. This is due, in part, to the fact that there is no municipal water supply. The residents of the island are serviced by well water only.

3.4.3.3. Code Enforcement, Inspections and Local Assistants to the Fire Commissioner

There are approximately 25 buildings on Hornby Island that require building inspections. The community hall and public buildings receive inspections every 6 months. All other buildings are inspected on an annual basis.

The Fire Department has been trying to establish a complete program which covers BC Fire Code inspections, public education and awareness. This is an on-going effort which relies heavily on the time of the volunteers.

Records of these inspections were not available; however, the fire department has purchased Fire Pro. It is expected that current and historical data will be digitally stored and will be available upon request once archived using the software is completed.

The Islands Trust is the governing body that plans land use and regulates development in the trust area of Hornby Island. The Islands Trust does not have the responsibility of building inspection.

The provincial building code and fire code is not enforced by the Islands Trust or the Comox Valley Regional District on Hornby Island. With no building code being enforced it is difficult to assess to what degree the buildings on Hornby Island are constructed to a reasonable construction standard. Electrical code inspections are conducted and enforced on Hornby Island.

The Islands Trust provides a Bylaw Officer to handle complaints and enforcement of the local land use bylaw for the trust area.

Recommendation 3.4-10 Develop and Implement Controls for Construction and Building Code Compliance

To ensure that buildings are built to a reasonable construction standard and for code compliance for safety of residents, Hornby Island should consider incorporation to be able to implement a planning department that will handle the review and inspection of new buildings to ensure occupant and building safety. Alternatively, request the Regional District to provide building code services in the form of plan review and inspections during the course of construction that follow the British Columbia Building Code.

Recommendation 3.4-11 Further Development of the Fire Prevention Inspection Program

To improve the level of fire prevention and reduce the overall fire risk in the community, it is recommended that the Fire Prevention Inspection Program be improved by increasing the minimum number of inspections for all commercially insured buildings. The number of inspections conducted should be based on the type of occupancy and the risk associated with it. Occupancies at a higher risk of fire should have more frequent inspections compared to occupancies with a low risk of fire.

Increasing the inspection frequencies will help reduce the risks throughout the community. Additionally, it will help reduce the development of any hazards/risks that would cause damage to buildings and endanger the lives of the occupants and the firefighters.

In order for the inspections to be considered effective, there should be an Enforcement Program. Once inspections have been completed, an inspector should return to that building within a reasonable time frame and confirm whether or not the building owner has addressed the infractions. If the infractions have not been addressed, then steps should be taken to ensure that the building owner does comply with the inspectors concerns. Refer to Appendix E for recommended inspection frequency.

The fire department should request that the Regional District provide fire prevention inspections to commercial occupancies in the Hornby Island Fire Protection Local Service Area.

3.4.3.4. Public Education Program

For a community having rural fire protection and not being able to rely on aid from other communities, public education is an important element for raising awareness in the community and to help reduce the number of fires that occur.

The fire department helps promote fire safety by actively taking part in:

- Fire Prevention Week
- Handing out flyers during community meetings and other events
- A monthly paper is distributed to the residents of the island
- Cadet Camp
- Free smoke alarms
- Fire Chief for the day

There have been successful initiatives such as the smoke alarm program, school visits, and public information flyers.

The topic of Fire Prevention includes not only issues surrounding house fires but wildfires and campfires. The Summer Fire Patrol has been the most successful program, raising public awareness of burning and outdoor fire issues. This program benefits greatly by being tax funded and has grown over the years into an essential part of the community program.

Recommendation 3.4-12 Develop and Implement Public Education Programs

To improve the level of fire consciousness throughout the community and to reduce the risk of fires, a formal public education program should be developed. A public education program can also be an excellent public relations tool and can be used to improve fire fighter recruitment within the community as well.

The Public Education Program should include promotion and development of various elements such as:

- Smoke Alarm Installation Program
- Hold Regular Fire Department Open Houses
- Host School Classroom Visits in the Fire Department
- Host Regular Community-Wide Fire Drills

The Program should also include promotion of Educational Programs/Materials such as the following (but not limited to):

- Fire Prevention Canada
- Fire Safety Information - (including PSAs)
- Home Fire Escape Plan Worksheet (PDF 207 kB)

- Learn Not to Burn® (LNTB®)
- Older & Wiser
- Kitchen Care Fire Safety Program
- "Use Candles with Care"
- The Arson Prevention Program for Children (TAPP-C)
- Risk Watch™
- Fire Safety Teacher Awards
- FNESS

3.4.3.5. Wildland Urban Interface Risk Reduction

A Community Wildfire Protection Plan has been completed for Hornby Island. Implementation of the plan was noted to be difficult.

3.4.3.6. Fire Prevention and Safety Control within the Fire Insurance Grading

Fire Prevention and Fire Safety Control Programs contributes 20 percent to the Public Fire Protection Classification grade for the community. The relative classification of the fire safety control program is currently 7.

3.4.4 Hornby Island Emergency Communications

3.4.4.1. Emergency Communications System Description

Emergency Communications are provided by North Island 911 Corporation. The initial answering point for public safety calls is the RCMP Operational Communications Centre in Courtenay. Fire calls are relayed to the fire dispatch centre in Campbell River. All police calls are handled by the RCMP OCC in Courtenay. All ambulance calls are relayed to the B.C. Ambulance Service in Victoria.

For full information regarding the emergency communication centres in Courtenay and Campbell River refer to section 4 Emergency Communications.

3.4.4.2. Fire Department Communications

Fire fighting personnel of the Hornby Island Volunteer Fire Department are alerted to emergencies via voice pagers.

The Hornby Island Fire Department utilizes permanently mounted and portable radio equipment to receive emergency information and communicate between personnel on the fire ground during an emergency situation. The department possesses nine portable radios. Portable radios are provided on each of the department's fire apparatus. A base radio station is provided in the Hornby Island Fire Hall, with paging capability to alert fire fighters. Back-up power is available for the hall's base radio and radios. A repeater system is provided on the Island to provide continuous use of the emergency communications systems in place. No dead spots exist on the island where communications could become limited.

3.4.4.3. Emergency Communications within the Fire Insurance Grading

Emergency communications contributes 10 percent of the Public Fire Protection Classification grade of the community. The emergency communication services (9-1-1) available in the Hornby Island Local Fire Protection Area were reviewed. The emergency communications for fire insurance grading for Hornby Island has a relative classification of 3 out of 10.

3.4.5 Hornby Island Water Supplies for Fire Protection

Water supplies for fire fighting are a critical component of the community's fire defence systems. Water supplies for fire fighting were evaluated for adequacy in several areas including but not limited to:

- Fire Flow Delivery – the ability of the water system to deliver the *Required Fire Flows* (from Section 3.4.1.1) to the identified *Fire Flow Demand Zone*
- Storage Adequacy – quantity of stored water reasonable for expected demands and duration of appropriate flows during expected fire events
- Distribution System Adequacy – layout and arrangement of piping and pump capabilities, looping/grid design of pipe networks for maximum versatility and minimum losses
- Hydrant Distribution – appropriate spacing and distribution to minimize hose lays and other delays in setting up an initial attack during structure fires
- System Design and Installation – the overall design of the system with regard to redundancy and capability to continuously provide full service to all areas during all foreseeable events (including catastrophic events and/or perils)
- Maintenance of System and Components – system and component maintenance meets recognized standards and improved reliability of system

This section highlights some of the significant findings of the fire insurance grading emergency water supply review. Areas where improvements can be made have been noted.

3.4.5.1. Water Supplies within the Fire Protection Local Service Area

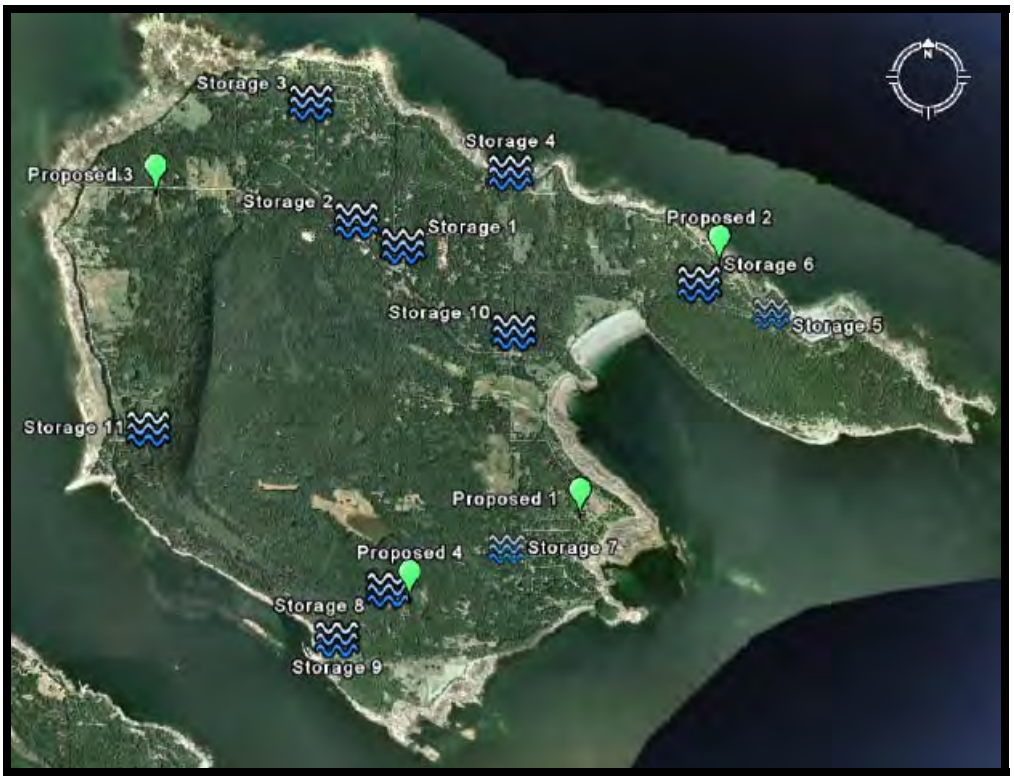
Hornby Island has no municipal or private water purveyors that have developed water supplies with recognized fire hydrant that could be available for public fire protection use.

The fire department has been proactively developing and placing storage reservoirs throughout Hornby Island to be used as alternate water supplies for fire situations. Seven reservoirs have been strategically placed across the island in addition to using two ponds. These sources of water are used to deliver the necessary amounts of water for fire events.

Table 3.4-7 Volume of Stored Water

Available Alternative Water Supplies		Proposed Alternative Water Supplies	
Water Storage No.	Volume of Water (IGAL)	Proposed Storage No.	Volume of Water (IGAL)
1	9,000	1	15,000
2	9,000	2	15,000
3	15,000	3	15,000
4	Pond	4	24,000
5	15,000		
6	Pond		
7	15,000		
8	4,500		
9	24,000		
10	26,000		
11	26,000		

Figure 3.4-7 Hornby Island Storage Reservoir Locations



In 2003, the storage reservoir located at Storage 9 in Figure 3.4-7 Hornby Island Storage Reservoir Locations was recognized as a fire hydrant. All single family residential dwellings within 300 metres of the storage reservoir's dry hydrant assembly would be recognized as being protected by a fire hydrant.

The fire department should continue to develop alternate water supply sources throughout Hornby Island. Consideration should be given to acquiring additional mobile

water supply apparatus (tankers) to shuttle water effectively to and from available water supplies.

Strategic locations of alternate water supplies and mobile water supply apparatus may help enable the fire department to achieve Superior Tanker Shuttle Accreditation.

Plans are in place to further develop water storage throughout Hornby Island and acquire a second mobile water supply apparatus to work toward attaining Superior Tanker Shuttle Accreditation.

Recommendation 3.4-13 Develop Formal Water Supply Plan for Non-Hydrant Protected Areas

Hornby Island is entirely without hydrant water supplies. A significant demand for adequate water resources increases and the lack of them can greatly increase property and life safety. Alternative water supplies for the use of fire fighting should be readily available and easily accessible for emergency apparatus. Alternative water supplies should be designed according to NFPA 1142 Standard on Water Supplies Suburban and Rural Fire Fighting, 2007 edition. Chapters 7 and 8 address water supplies and dry hydrants. Properly locating, planning, and determining adequate alternate water supplies in rural areas will help to improve and reduce problems occurring.

Consideration should be given to purchasing an additional mobile water supply apparatus that would be able to effectively shuttle water from nearby sources to the fire scene where water will be dumped into a portable tank. The engine on scene will pump water through suction from the onboard capacity or portable tank.

The fire department should continue to proactively develop alternate water supplies throughout Hornby Island. Consideration should be also given to installing dry hydrants in strategic locations to minimize travel times during shuttle operations. All dry hydrants should be installed in accordance with NFPA 1142, *Standard on Water Supplies for Suburban and Rural Fire Fighting*, 2007 Edition. In order for them to be credited toward fire insurance grading classifications, any improvements made to water supplies should be reviewed by Fire Underwriters Survey.

Note: It may be possible to achieve significantly improved insurance rates through Superior Tender Shuttle Accreditation administered by Fire Underwriters Survey. See Appendix G.

3.4.5.2. Water Supplies within the Fire Insurance Grading

Water supplies contributes 30 percent of the Public Fire Protection Classification grade of the community. No water systems are installed on Hornby Island with fire hydrants for fire protection. The relative classification of the water supply for Hornby Island is currently 10. The previous relative classification was 10.

3.4.6 Hornby Island Fire Insurance Grading

As a result of this assessment, the following information will be published in the fire insurance grading index for the insurance community to set rates on. The information will apply to the Hornby Island Fire Protection Local Service Area (Specified Fire Service Area within the Comox Valley Regional District).

Table 3.4-8 Hornby Island Summary of Grading Assessment

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Hornby Island Hydrant Protected	3B	**3A**	Hydrant Protected – detached dwellings within 300 metres of the Ford Cove Dry Hydrant Assembly (intersection of Central Rd. and Bond Rd.) and within 8 km by road of the Hornby Island Fire Hall
Hornby Island	3B	**3B**	Fire Hall Protected – detached dwellings within 8 km by road of the Hornby Island Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of the Hornby Island Fire Hall

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Hornby Island	9	**9**	Fire Hall Protected – commercial properties within 5 km of the Hornby Island Fire Hall
Rest	10	**10**	Unprotected – commercial properties further than 5 km by road of the Hornby Island Fire Hall

The re-assessment of Hornby Island has identified a number of weaknesses and areas where improvements may result in improved levels of fire protection and improved fire insurance grading classifications.

3.4.7 Hornby Island Conclusions

The Hornby Island Fire Department has made great strides in improving its services. The most significant areas of the fire insurance grading where the least amount of credit was received for the fire department were:

- Required Fire Apparatus,
- Fire Department Available Fire Force,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

Hornby Island has no water systems to provide fire protection. However, the fire department actively pursues alternative water supply methods to provide service to property owners of Hornby Island.

Overall, Hornby Island has maintained its Public Fire Protection Classification (PFPC) of a 9 and maintained its Dwelling Protection (DPG) of 3B. The fire department should continue to development alternate water supplies on Hornby Island and train to achieve Superior Tanker Shuttle Accreditation.

Hornby Island should put forward a plan to address (to some extent) other recommendations throughout the report and, as a result, it may be possible to improve the community's overall PFPC which would have a significant impact on fire insurance rates for properties insured under Commercial lines insurance.

Addressing the recommendations in relation to mobile water supply apparatus and water supplies in this report may help Hornby Island with meeting the requirements to pass the Superior Tanker Shuttle Accreditation test for an improved fire insurance grading classification (DBG 3B – Superior Shuttle Tanker Accreditation). This would likely have an impact on property insurance rates for property owners who are insured under Personal Lines insurance (Single Family Residential and duplexes).

4.0 EMERGENCY COMMUNICATIONS

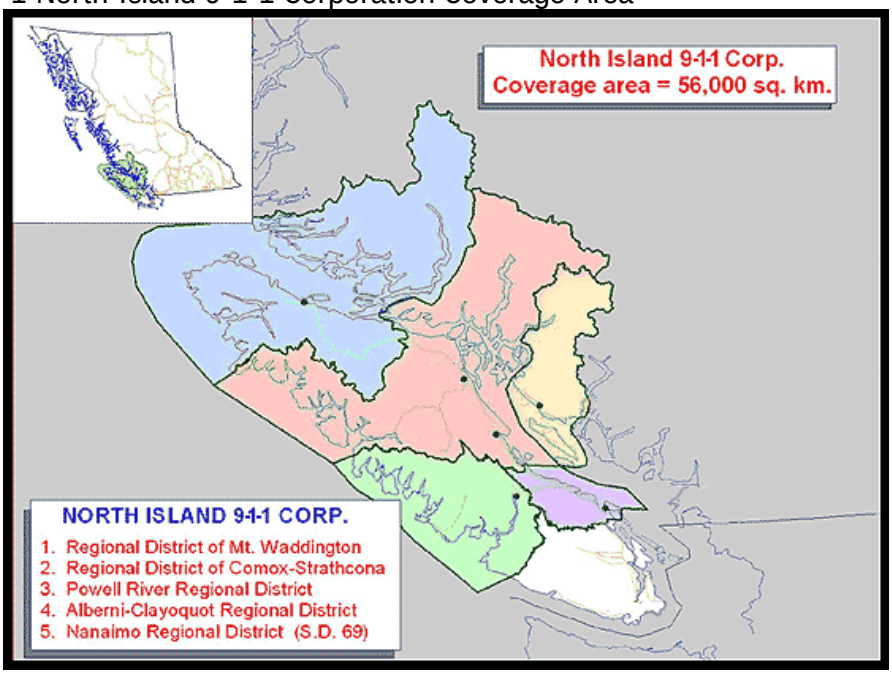
4.1. North Island 9-1-1

Emergency Communications is provided by North Island 9-1-1 Corporation. North Island 9-1-1 provides and manages emergency 911 services to the

- Comox Valley Regional District,
- Strathcona Regional District,
- Regional District of Mt. Waddington,
- Regional District of Alberni-Clayoquot,
- Powell River Regional District (excluding Lasqueti Island), and
- a portion (School District No. 69) of the Nanaimo Regional District.

The North Island 9-1-1 Corporation coverage is shown in Figure 4.1-1 North Island 9-1-1 Corporation Coverage Area. In 2008 the Province of British Columbia restructured the Comox-Strathcona Regional District into two separate regional districts: the Comox Valley Regional District and the Strathcona Regional District.

Figure 4.1-1 North Island 9-1-1 Corporation Coverage Area



The initial answering point for public safety calls is the RCMP Operational Communications Centre in Courtenay. The North Island 9-1-1 Corporation contracts the RCMP OCC to perform this function. Fire calls are relayed to the fire dispatch centre in Campbell River. All ambulance calls are relayed to the B.C. Ambulance Service in Victoria.

Figure 4.1-2 Emergency Communication Organizational Chart

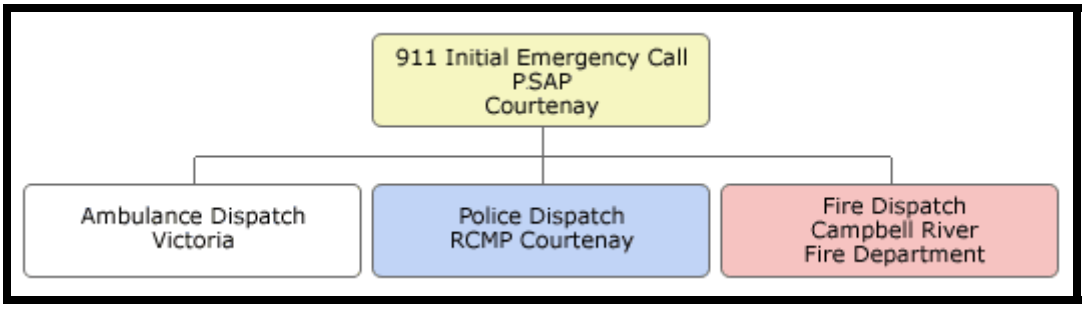
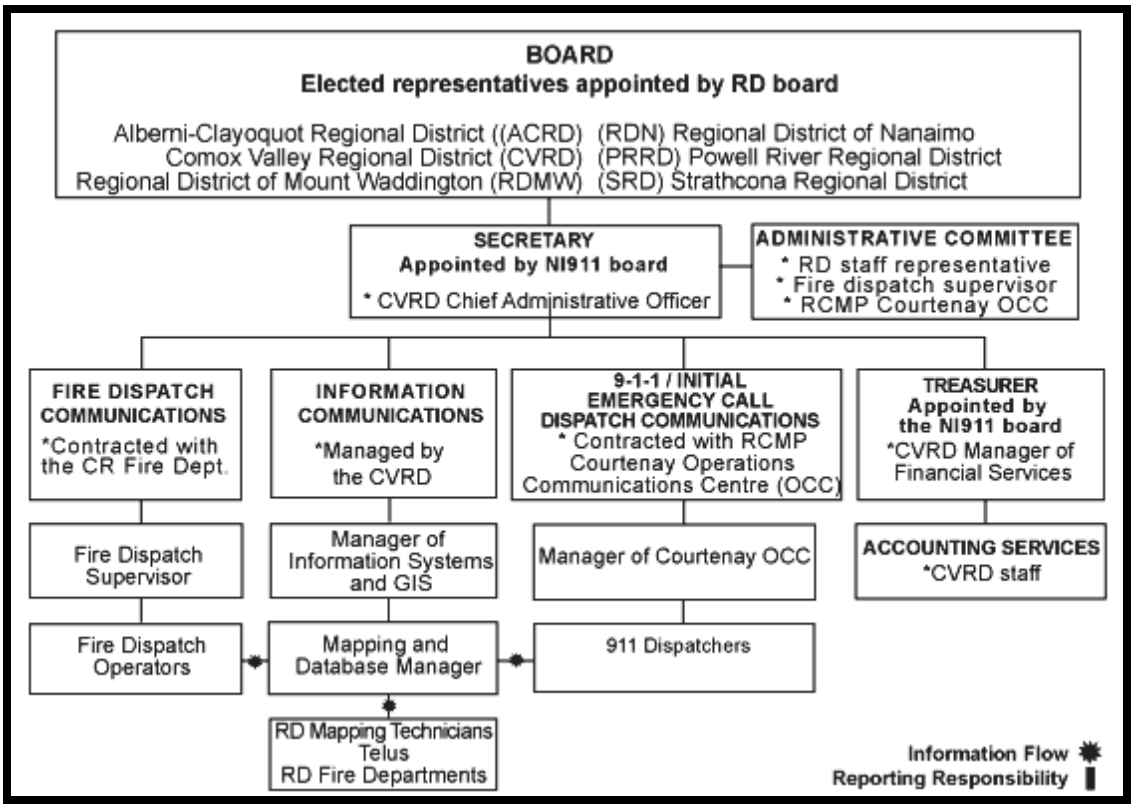


Figure 4.1-3 Organizational Chart (North Island 9-1-1)



4.1.1 Courtenay PSAP/Police Dispatch Centre

The Courtenay Operations Communications Centre is a state-of-the-art facility that is responsible for supporting the largest geographical 9-1-1 area in Canada. All employees in this centre are both 9-1-1 and police dispatch trained. Approximately 30 full-time and nine casual employees comprise the Courtenay OCC Staff.

4.1.1.1. Communication Centre

The Courtenay OCC has six incoming 9-1-1 lines that are all transferable to fire. The centre also has one dedicated back-up line to provide single button push contact with the Campbell River Fire Dispatch Centre.

Alarms are monitored by companies come in on a dedicated phone line to the Courtenay OCC. A redundant 9-1-1 back-up is provided to the OCC in Nanaimo.

4.1.1.2. Receiving and Handling of Emergency Calls

When a 911 call is received it is distinguishable by a unique emergency call sound and is answered by the first available operator. The dispatch operator will ask the caller whether they would like police, fire or ambulance. A computer screen appears displaying the callers address, name, and telephone number, as well as a business name in the event that they are calling from a business, and effectively pinpoints the caller's location.

It is the Courtenay OCC's policy that the 9-1-1 telecommunicator will stay on the line when done streaming/transferring calls. This ensures effective communication has been established between the caller and the agency desired.

Emergency calls are recorded utilizing a digital recording system made by Eventide. A main recorder keeps all incoming phone lines and radio transmissions made from within the OCC.

A radio dispatching system is provided at the OCC. The radio dispatching system utilized by the OCC is called the Windows InterTalk Console and has been modified to meet the needs of the RCMP.

A computer aided dispatch system is also utilized by the OCC. It is an overall system used by all police agencies in British Columbia called Police Records Information and Management Environment (PRIME).

The dispatch operator will then relay the call to the appropriate unit. Calls regarding fire emergency are instantly directed to North Island 9-1-1's fire dispatch centre in Campbell River. Ambulance emergency calls are relayed immediately to Victoria, while calls for police are dispatched by the Courtenay OCC Dispatch Operators. Radio support is also provided for the 17 detachments and two highway patrols within the jurisdiction.
All 9-1-1 emergency call histories are automatically recorded.

4.1.1.3. Personnel and Training

The Courtenay OCC has between six and eight telecommunicators on duty depending on the time of day and day of the week. The centre has one shift supervisor assigned per team. This supervisor is available to the team 20 to 24 hours per day. If the shift

supervisor is off-shift or taking time off, there is always an acting shift supervisor in their place. Shift supervisors report to the OCC manager. The OCC does not have facilties for telecommunicators to sleep on shift.

The OCC currently has seven telcommunicator/dispatcher work stations and two additional work stations are available if required.

The Courtenay OCC has its own training centre. It has two telecommunicator work stations that are used as training stations. The two stations are convertible to fully functioning operational work stations if needed.

The British Columbia RCMP OCC staff are trained under the "Telecom Operator Apprenticeship Program." It is an intensive eight week program that is administered at the RCMP's Pacific Region Training Centre, followed by on the job training with a field coach until the program is complete. Completion of this program requires participants to complete a Demonstrated Proficiency Test and a final exam that must be signed off by a senior staff member.

4.1.2 Campbell River Fire Dispatch

The Campbell River Fire Dispatch Centre is partnered with approximately 53 fire departments. The dispatch area covered by the communications centre and member fire departments extends approximately 56,000 square kilometres over the northern portion of Vancouver Island and the mainland around Powell River.

4.1.2.1. Communication Centre

The Campbell River Fire Dispatch Centre has three dedicated fires lines and five business lines. Fires lines are not progressive to business lines. Primary and secondary dispatch circuits are provided for transmitting alarms. If failure were to occur of the primary circuit, it would not affect the operation of the secondary circuit.

Radio dispatching is provided by Orbacom TDM 150. Communication with fire departments is achieved with an application called "The Resource," which is visible at the dispatch console.

4.1.2.2. Receiving and Handling of Emergency Calls

The communications system utilizes many different systems and mediums for establishing and maintaining contact with the Fire Departments, including regular telephone lines, mountaintop towers with VHF radio repeaters as well as satellite phone systems. The system is designed to be fault tolerant, with backup for paging and emergency power into remote areas particularly for the event of the most severe weather situations.

Emergency calls are recorded utilizing Comlog Digital Voice Recorder. An instant recorder is provided for each telecommunicator.

Incoming 9-1-1 calls are routed through Avel-CAD, a computer aided dispatch and mapping system. The Avel-CAD mapping software utilizes GIS mapping and automatically centre a map over the civic address locating the 9-1-1 caller when using a standard home phone within any of the five regional districts. The Avel-CAD system provides resource information and sector data for all 49 locations that the dispatch centre services. It provides tracking services to capture critical times or benchmarks throughout the duration of incidents.

The use of a cell phone however, requires the caller to provide an address, landmark, or other location descriptor to the dispatcher, who will enter the information manually, enabling the mapping software to then pinpoint the location and indicate the proper fire department to be dispatched.

Radio and telephone communications are recorded on an Atis recorder for archiving and dispatchers are equipped with a Spilsbury instant play-back recorder to verify addresses at any time during an incident.

4.1.2.3. Personnel and Training

The Campbell River Fire Dispatch Centre has two telecommunicators are on duty twenty-four hours a day. The centre has four workstations for telecommunicators. Sleeping accommodations are not provided for staff at the dispatch centre.

The dispatch centre does not have its own training centre. Training is conducted in-house with the goal to be as close to *NFPA 1061: Standard for Professional Qualifications for Public Safety Telecommunicator*, as possible. Records of training are kept.

5.0 CONCLUSION

The current situation in the Comox Valley Regional District has five separate fire protection service providers. Four of the five fire protection service providers were reviewed. Each fire protection service provider operates independently. Resources are available through a mutual aid agreement. However, resources are not shared for fire incidents because the geographic nature does not permit. Fire insurance grades have improved for one community and remained the same for the other three communities considered in this study.

The study indicates that several of the fire departments received relatively the same amount of credit within the fire insurance grading of the fire department relating to but not limited to:

- Required Fire Apparatus,
- Fire Department Training of Fire Fighters and Officers, and
- Pre-incident planning.

Recommendations have been provided throughout the report where more credit could be received, which may result in improving fire insurance grades.

The study also indicates that two water distribution systems in the Comox Valley Regional District did not meet the minimum fire insurance grading requirements to be recognized. Recommendations have been developed and are strongly encouraged to maintain or improve fire insurance recognition.

All of the fire protection service providers involved recognize the limitations of the current resources and have a strong desire to develop a solution that will allow current fire protection service levels to be maintained or improved.

5.1. Options for Fire Protection Services

The current model of separate agencies providing fire protection offers the benefit of autonomy and helps to ensure that each individual area is able to choose and pay for the desired level of fire protection.

The possible options for merging the fire protection service providers through a regional fire service model would allow the service providers to share resources and would provide greater ability to provide consistent levels of response throughout the protected areas. Particularly over the long term, the perceived benefits of merging fire protection service providers (and/or governments) into a single entity is considerably greater than maintaining separate entities. Notably, the perceived benefits are from the perspective of providing the highest quality of fire protective services to the greatest number of benefactors for the best cost to benefit ratio (including cost benefits of fire insurance grading recognition).

There are advantages and benefits as well as disadvantages and obstacles to each of the possible solutions. It will be important for all stakeholders and constituents to carefully consider the desired outcome before deciding how best to move forward.

Looking at the Comox Valley area and fire protection service areas from the broadest perspective, the areas appear to be forming very similar levels of service.

Regionalization of government and/or services such as fire protection and water supplies would greatly benefit all of the communities through implementation of standards and addition of administrative functions that are generally beyond the reasonable scope of volunteer fire departments to provide. However, there are controversial issues surrounding regionalization and in some cases, small area service providers are reluctant to give up control over the areas they serve, even if superior levels of service would be available through alternatives.

Looking at the entire study area from the perspective of providing the optimal level of fire protection in the most cost effective manner, all of the communities would benefit from merging into a regional fire service, or at least a regionally administered service.

Moving to a regional model would offer the benefit of allowing the fire departments to share key resources and assets freely. The majority of fire departments that are primarily volunteer have deficiencies in the areas of:

- Administration,
- Training,
- Training program development,
- Public education,
- Fire prevention inspections,
- Fire investigations, and
- Technical resources (such as code experts, etc.)

These deficiencies are very common and are not a result of lack of effort on behalf of the volunteers. Volunteers on fire departments should be commended for their efforts, however the volunteers' efforts are generally best suited for the operations aspect of fire fighting. It is not reasonable to ask volunteer fire fighters to provide administrative services or the other types of work noted above. This is not because volunteers are less capable rather it is too much to ask.

In many cases volunteer fire fighters and officers do this type of work, however this can put an undue strain on volunteers and lead to reduced capacity to retain volunteers. For these reasons, it is a better approach to have these responsibilities handled by career staff who are qualified and compensated for the duties they are responsible for.

Providing career staff to handle administration, training, public education, fire prevention inspections, etc., is generally not an option for volunteer fire departments due to the costs associated with providing career staff, however in a regional model, economic

resources can be pooled and the responsibilities that are more tedious can be handled centrally in a standardized manner.

Implementing this type of regional model could improve service levels significantly, and allow fire fighters to focus on their passion, protecting their communities and loved ones from fires.

APPENDIX A Table of Effective Response

Excerpt from:
Fire Underwriters Survey: A Guide to Public Fire Protection

Basis of Table of Effective Response

Fire Underwriters Survey considers it appropriate from available data that speed of response can be transposed to plans for the general assessment of travel times, as a rule of thumb, using the formula: travel distance (in kilometres) is equal to travel time (in minutes) minus one; that is if the maximum travel time allowed is four minutes, then travel time minus one equal three kilometres. This formula reflects data showing that average speeds of response increase with the length of the run, and is reasonably close to the result of several major studies (RAND, ISO).

Variable conditions of severe weather and traffic congestion (impedance) may be expected to affect this by as much as 20% or more. Municipalities should always run comparisons with actual conditions by calculating their own times, but should be wary of extending allowable runs much beyond those indicated in the Table of Effective Response, as the Table of Effective Response is an insurance industry standard that all fire protective services are measured against.

A number of modifications to the indicated requirements of the table may be necessary in the case of such factors such as severe life hazard conditions, exceptional street and traffic problems, high frequency fire incidence and the availability of automatic aid fire company response available from adjoining communities. Qualified judgments will be a necessary part of any application of the system.

For severe life hazard, first alarm availability times generally should be reduced by one time- group in the table. While times shown may, for a fairly broad range of travel conditions, be transposed to kilometres for application to plans simply by subtracting one, this should be modified downward in circumstances for such factors as steep grades, narrow or traffic congested streets, or conversely, upward for fire department control of traffic lights of exceptionally fast arterial routes.

FIRE UNDERWRITERS SURVEY

TABLE OF EFFECTIVE RESPONSE [1]

The following Table aids in the determination of Pumper and Ladder Company distribution and total members needed. It is based on availability within specified response travel times in accordance with the fire potential as determined by calculation of required fire flows, but requiring increases in availability for severe life hazard.

RISK RATING [2]	BUILDING DISTRICT EXAMPLES	FIRE FLOW		INITIAL RESPONSE TO ALARMS		1ST DUE	2ND DUE	1ST DUE	TOTAL AVAILABILITY NEEDED			
		L/min X1000	Approx. Igpm Range	Pumper Companies	Ladder Companies	Pumper Company, Minutes	Pumper Company, Minutes	Ladder Company, Minutes	Pumper Co's.		Ladder Co's.	
									No.	Min.	No.	Min.
1 (a)	Very small buildings, widely detached. Scattered	2	400	1	0	7.5	-	9 [3]	1	7.5	1 [3]	9
(b)	development (except where wood roof coverings).	3	600	1	0	6	-	7.5 [3]	1	6	1 [3]	7.5
2	Typical modern, 1 - 2 storey residential subdivision 3 - 6 m 10 - 20 ft. detached).	4-5	800-1000	2	0	4	6	6 [3]	2	6	1 [3]	6
3 (a)	Close 3 - 4 storey residential and row housing, small mercantile and industrial.	6-9 10-13	1200-2000 2200-2800	2 2	1 [5] 1 [5]	3.5 3.5	5 5	4 [3] 4 [3]	2 3	5 6	1 [3] 1 [3]	4 4
3 (b)	Seriously exposed tenements. Institutional. Shopping Centres Fairly large areas and fire loads, exposures.	14-16 17-19	3000-3600 3800-4200	2 2	1 1	3.5 3.5	5 5	4 4	4 5	7 7	1 1 [4]	4 4
4 (a)	Large combustible institutions, commercial buildings, multi-storey and with exposures.	20-23 24-27	4400-5000 5200-6000	2	1	2.5 2.5	4 4	3.5 3.5	6 7	7.5 7.5	2 2	5 5
4 (b)	High fire load warehouses and buildings like 4(a).	28-31 32-35	6200-6800 7000-7600	3	1	2.5 2.5	3.5 3.5	3.5 3.5	8 9	8 8	3 3	7 7
5	Severe hazards in large area buildings usually with major exposures. Large congested frame districts.	36-38 39-42 43-46	7800-8400 8600-9200 9400-10000	3	3	2.0 2.0 2.0	3.5 3.5 3.5	2.5 2.5 2.5	10 12 14	8 9 9	4 5 6	7.5 8 9

[1] Source: Fire Underwriters Survey manual: A Guide to Public Fire Protection

[2] These groupings do not refer to Dwelling Protection grade classification (also a 1-5 scale).

[3] A ladder company is required here only when exceptional conditions apply, such as 3 storey heights, significant life hazards.

[4] For numerous or large single buildings over three stories use two ladder companies in 5 minutes.

[5] If required by hazards (ex. 5 or more buildings of 3 storeys or greater)

Notes to Table of Effective Response

(a) When unsprinklered buildings over six stories have fire flow requirements less than Group 4, the number of Pumper and Ladder Companies under "Total Availability Needed" should be increased at least to the next group to provide the additional manpower required except where this additional manpower regularly responds in the time allotted, as occurs in some volunteer or composite fire departments.

(b) The table gives travel times for apparatus AFTER dispatch and turn-out. Under very exceptional conditions affecting total response time, these nominal figures should be modified.

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APPENDIX B Water Supply for Public Fire Protection, 1999

WATER SUPPLY
FOR
PUBLIC FIRE PROTECTION

1999

FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

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WATER SUPPLY FOR PUBLIC FIRE PROTECTION

PREFACE

This guide summarizes the more significant recommendations of Fire Underwriters Survey with respect to fire protection requirements in municipal water works system design. It reflects the manner in which FUS assesses the water supply aspect of a municipality's fire risk potential during surveys on behalf of the Canadian property insurance industry and represents the accumulated experience of many years of study of actual fires. Water supply is one of a number of components evaluated by FUS in the municipal fire protection system. Recommendations applying to the fire departments and code enforcement are covered in other publications of Fire Underwriters Survey. FUS local offices are prepared to assist municipal officials or their consultants with advice on special problems, as time limits permit, in accordance with the intent of this guide. The minimum size water supply credited by FUS must be capable of delivering not less than 1000 L/min for two hours or 2000 L/min for one hour in addition to any domestic consumption at the maximum daily rate. Static suction supplies to fire department pumpers are recognized as a supplement to the piped system.

In the FUS assessment of a water supply system, the major emphasis is placed upon its ability to deliver **adequate** water to control major fires throughout the municipality on a **reliable** basis via sufficient and suitable **hydrants**. What is ultimately available to the fire department is the critical test in this fire protection evaluation.

Rates of flow for firefighting purposes are expressed in litres per minute as this is the adopted unit for the firefighting field.

In this edition all quantities are specified in S.I. units.

PART I

GENERAL

ADEQUACY AND RELIABILITY. An adequate and reliable water supply for firefighting is an essential part of the fire protection system of a municipality. This is normally a piped system in common with domestic potable water service for the community.

A water supply system is considered to be fully adequate if it can deliver the necessary fire flow at any point in the distribution gridiron for the applicable time period specified in the table “Required Duration of Fire Flow” with the consumption at the maximum daily rate (average rate on maximum say of a normal year). When this delivery is also possible under certain emergency or unusual conditions as herein specified, the system is considered to be reliable. In cities of population in excess of 250,000 (or smaller places with high fire incident and severe hazard conditions) it is usually necessary to consider the possibility of two simultaneous major fires in the area served by the system.

Fire flows are amounts of water necessary to control fires. These are determined as shown in Part II. System design should contemplate meeting the required fire flows existing or probable with the possible exception of gross anomalies where there is no fire threat to the remainder of the community. In these cases, the properties should preferably be modified in hazard to reduce the required flow as part of a coordinated community fire protection system.

The protection of buildings by automatic sprinkler systems is a significant contribution to the fire protection of the community and should be encouraged, not penalized by onerous service charges or metering requirements.

In order to provide reliability, duplication of some or all parts of the system will be necessary, the need for duplication being dependent upon the extent to which the various parts may reasonably be expected to be out of service as a result of maintenance and repair work, an emergency or some unusual condition. The introduction of storage, either as part if the supply works or on the distribution system, may partially or completely offset the need for duplicating various parts of the system, the value of the storage depending upon its amount, location and availability.

STORAGE. In general, storage reduces the requirements of those parts of the system through which supply has already passed. Since storage usually fluctuates, the normal daily minimum maintained is the amount that should be considered as available for fires. Because of the decrease in pressure when water is drawn down in standpipes, only the portion of this normal daily minimum storage that can be delivered at a residual pressure of 150kPa at the point of use is considered as available. As well as the quantity available, the rate of delivery of water to the system from storage for the fire flow period is critical to this consideration.

PRESSURE. The principal requirement to be considered is the ability to deliver water in sufficient quantity to permit fire department pumpers to obtain an adequate supply from hydrants. To overcome friction loss in the hydrant branch, hydrant and suction hose, a minimum residual water pressure of 150 kPa in the street main is required during flow. Under conditions of exceptionally low suction losses, a lower residual may be possible. This includes the use of 100 mm and larger outlets for fire department pumper use and hydrants with large waterways.

Higher sustained pressure is of importance in permitting direct continuous supply to automatic sprinkler systems, to building standpipe and hose systems, and in maintaining a water plan so that no portion of the protection area is without water, such as during a fire at another location. Residual pressures that exceed 500 kPa during large flows are of value as they permit short hose-lines to be operated directly from hydrants without supplementary pumping.

SUPPLY WORKS

NORMAL ADEQUACY OF SUPPLY WORKS. The source of supply, including impounding reservoirs, and each part of the supply works should normally be able to maintain the maximum daily consumption rate plus the maximum required fire flow. Each distribution service within the system should similarly support its own requirements. In large cities where fire frequency may result in simultaneous fires, additional flow must be considered in accordance with the potential. Filters may be considered as capable of operating at a reasonable overload capacity based upon records and experience. In general, overload capacity will not exceed 25 percent, but may be higher in well designed plans operating under favourable conditions.

The absolute minimum supply available under extreme dry weather conditions should not be taken as the measure of the normal ability of the source of supply such as supply from wells. The normal or average capacity of wells during the most favourable nine month period should be considered, or the normal sustained flow of surface supplies to the source.

RELIABILITY OF SOURCE OF SUPPLY. The effect on adequacy must be considered for such factors as frequency, severity and duration of droughts, physical condition of dams and intakes; danger from earthquakes, floods, forest fires, and ice dams or other ice formations; silting-up or shifting of channels; possibility of accidental contamination of watershed or source; absence of watchmen or electronic supervision where needed; and injury by physical means. Where there is a risk of disruption, special precautions or alternate supplies should be arranged.

Where the supply is from wells, some consideration should be given to the absolute minimum capacity of the wells under the most unfavourable conditions; also to the length of time that the supply from the wells would be below the maximum daily consumption rate, and the likelihood of this condition recurring every year or only at infrequent intervals. It should be recognized that some water is generally available from wells and that the most extreme conditions are not as serious as a total interruption of the supply, as would be the case in the breaking of a dam or shifting of a channel. The possibility of clogging, salinity, and the need for periodic cleaning and overhauling must be considered. Dependence upon a single well, even where records are favourable, may be considered a feature of unreliability.

Frequent cleaning of reservoirs and storage tanks may be considered as affecting reliability.

Continuity of, and delay in implementing water supplies obtained from systems or sources not under the control of the municipality or utility should be considered also from these aspects.

GRAVITY SYSTEMS. A gravity system delivering supply from the source to distribution directly without the use of pumps is advantageous from a fire protection point of view because of its inherent reliability, but a pumping system can also be developed to a high degree of reliability.

PUMPING

RELIABILITY OF PUMPING CAPACITY. Pumping capacity, where the system or service is supplied by pumps, should be sufficient, in conjunction with storage when the two most important pumps are out of service, to maintain the maximum daily consumption rate plus the maximum required fire flow at required pressure for the required duration. For smaller municipalities (usually up to about 25,000 population) the relative infrequency of fires is assumed as largely offsetting the probability of a serious fire occurring at times when two pumps are out of service. (The most important pump is normally, but not always, the one of largest capacity, depending upon how vital is its contribution to maintaining flow to the distribution system.)

To be adequate, remaining pumps in conjunction with storage, should be able to provide required fire flows for the specified durations at any time during a period of five days with consumption at the maximum daily rate. Effect of normal minimum capacity of elevated storage located on the distribution system and storage of treated water above low lift pumps should be considered. The rate of flow from such storage must be considered in terms of any limitation of water main capacity. The availability of spare pumps or prime movers that can quickly be installed may be credited, as may pumps of compatible characteristics which may be valved from another service.

POWER SUPPLY FOR PUMPS. Electric power supply to pumps should be so arranged that a failure in any power line or the repair or replacement of a transformer, switch, control unit or other device will not prevent the delivery, in conjunction with elevated storage, of required fire flows for the required durations at any time during a period of two days with consumption at the maximum daily rate.

Power lines should be underground from the station or substation of the power utility to water plants and pumping stations and have no other consumers enroute. The use of the same transmission lines by other consumers introduces unreliability because of the possibility of interruption of power or deterioration of power characteristics.

Overhead power lines are more susceptible to damage and interruption than underground lines and introduce a degree of un-reliability that depends upon their location and construction. In connections with overhead lines, consideration should be given to the number and duration of lightning, wind, sleet, and snow storms in the area; the type of poles or towers and wires; the nature of the country traversed; the effect of earthquakes, forest fires, and floods; the lightning and surge protection provided; the extent to which the system is dependent upon overhead lines; and the ease of, and facilities for, repairs.

The possibility of power systems or network failures affecting large areas should be considered. In-plant auxiliary power or internal combustion driver standby pumping are appropriate solutions to these problems in many cases, particularly in small plants where high pumping capacity is required for fire protection service. When using automatic starting, prime 'movers' for auxiliary power supply and pumping should have controllers listed by Underwriters' Laboratories of Canada to establish their reliability.

FUEL SUPPLY. At least a five day supply of fuel for internal combustion engines or boilers used for regular domestic supply should be provided. Where long hauls, condition of roads, climatic conditions, or other circumstances could cause interruptions of delivery longer than five days, a greater storage should be provided. Gas supply should be from two independent sources or from duplicate gas-producer plants with gas storage sufficient for 24 hours. Unreliability of regular fuel supply may be offset in whole or in part by suitable provisions for the use of an alternate fuel or power supply.

BUILDINGS AND PLANT

BUILDINGS AND STRUCTURES. Pumping stations, treatment plants, control centres and other important structures should be located, constructed, arranged, and protected so that damage by fire, flooding, or other causes will be held to a minimum. They should contain no combustible material in their construction, and, if hazards are created by equipment or materials located within the same structure, the hazardous section should be suitably separated by fire-resistive partitions or fire walls.

Buildings and structures should have no fire exposures. If exposures exist, suitable protection should be provided, Electrical wiring and equipment should be installed in accordance with the Canadian Electrical Code. All internal hazards should be properly safeguarded in accordance with good practice. Private in-plant fire protection should be provided as needed.

MISCELLANEOUS SYSTEM COMPONENTS, PIPING AND EQUIPMENT. Steam piping, boiler-feed lines, fuel-piping (gas or oil lines to boilers as well as gas, oil or gasoline lines to internal-combustion engines), and air lines to wells or control systems should be so arranged that a failure in any line or the repair or replacement of a valve, fuel pump, boiler-feed pump, injector, or other necessary device, will not prevent the delivery, in conjunction with storage, of the required fire flows for the specified duration at any time during a period of two days with consumption at the maximum daily rate.

Plants should be well arranged to provide for effective operation. Among the features to be considered are: ease of making repairs and facilities for this work, danger of flooding because of broken piping; susceptibility to damage by spray; reliability of priming and chlorination equipment; lack of semi-annual inspection of boilers or other pressure vessels; dependence upon common non-sectionalized electric bus bars; poor arrangement of piping; poor condition or lack of regular inspections of important valves; and factors affecting the operation of valves or other devices necessary for fire service such as design, operation, and maintenance of pressure regulating valves, altitude valves, air valves, and other special valves or control devices, provision of power drives, location of controls, and susceptibility to damage.

Reliability of treatment works is likely to be influenced by the removal from service of at least one filter or other treatment unit; the reduction of filter capacity by turbidity, freezing or other conditions of the water; the need for cleaning basins; and the dependability of power for operating valves, wash-water pumps, mixers and other appurtenances.

OPERATIONS. Reliability in operation of the supply system and adequate response to emergency or fire demands are essential. Instrumentation, controls and automatic features should be arranged with this in mind. Failure of an automatic system to maintain normal conditions or to meet unusual demands should result in the sounding of an alarm where remedial action will be taken.

The operating force should be competent, adequate, and continuously available as may be required to maintain both the domestic and fire services.

EMERGENCY SERVICES. Emergency crews, provided with suitable transportation, tools and equipment, should be continuously on duty in the larger systems and be readily available upon call in small systems. Spare pipe and fittings, and construction equipment should be readily available. Alarms for fires in buildings should be received by the utility at a suitable location where someone is always on duty who can take appropriate action as required, such as placing additional equipment in operation, operating emergency or special valves, or adjusting pressures. Receipt of alarms may be by fire alarm circuit, radio, outside alerting device, or telephone, but where special operations are required, the alarm service should be equivalent to that needed for a fire station.

Response of an emergency crew should be made to major fires to assist the fire department in making the most efficient use of the water system and to ensure the best possible service in the event of a water main break or other emergency. The increase of pressures by more than 25 percent for fires is considered to increase the possibility of breaks.

PIPING

RELIABILITY OF SUPPLY MAINS. Supply mains cut off for repair should not drastically reduce the flow available to any district. This includes all pipe lines or conduits on which supply to the distribution system is dependent, including intakes, suction or gravity lines to pumping stations, flow lines from reservoirs, treatment plant piping, force mains, supply and arterial mains, etc. Consideration should be given to the greatest effect that a break, joint separation or other failure could have on the delivery of the maximum daily consumption rate plus required fire flow at required pressure over a three day period. Aqueducts, tunnels or conduits of substantial construction may be considered as less susceptible to failure and equivalent to good mains with a long history of reliability.

INSTALLATION OF PIPE. Mains should be in good condition and properly installed. Pipe should be suitable for the service intended. Asbestos-cement, poly-vinyl chloride (PVC), cast and ductile iron, reinforced concrete and steel pipe manufactured in accordance with appropriate Canadian Standards Association or ANSI/AWWA standards, or any pipes listed by Underwriters' Laboratories of Canada for fire service are considered satisfactory. Normally, pipe rated for a maximum working pressure of 1000 kPa is required, Service records, including the frequency and nature of leaks, breaks, joint separations, other failures and repairs, and general conditions should be considered as indicators of reliability. When mains are cleaned they should be lined.

Mains should be so laid as not to endanger one another, and special construction should be provided to prevent their failure at stream crossings, railroad crossings, bridges, and other points where required by physical conditions; supply mains should be valved at one and one half kilometre intervals and should be equipped with air valves at high points and blow offs at low points. Mains should not be buried extremely deep or be unusually difficult to repair, though depths to ten feet may be required because of frost conditions.

The general arrangement of important valves, of standard or special fittings, and of connections at cross-overs, intersections, and reservoirs, as well as at discharge and suction headers, should be considered with respect to the time required to isolate breaks. The need for check valves on supply or force mains and for other arrangements to prevent flooding of stations or emptying of reservoirs at the time of a break in a main should also be considered, as well as the need for relief valves or surge chambers. Accessibility of suitable material and equipment and ease of making repairs should be considered.

Arterial feeder mains should provide looping throughout the system for mutual support and reliability, preferably not more than 1000 metres between mains. Dependence of a large area on a single main is a weakness. In general the gridiron of minor distributors supplying residential districts should consist of mains at least 150mm in size and arranged so that the lengths on the long sides of blocks between intersecting mains do not exceed 200 metres. Where longer lengths of 150mm pipe are necessary 200mm or larger intersecting mains should be used. Where initial pressures are unusually high, a satisfactory gridiron may be obtained with longer lengths of 150mm pipe between intersecting mains.

Where deadends and a poor gridiron are likely to exist for a considerable period or where the layout of the streets and the topography are not well adapted to the above arrangement, 200mm pipe should be used. Both the ability to meet the required fire flows and reliability of a reasonable supply by alternate routing must be taken into account in this consideration.

VALVES. A sufficient number of valves should be installed so that a break or other failure will not affect more than 400 metres of arterial mains, 150 metres of mains in commercial districts, or 250 metres of mains in residential districts. Valves should be maintained in good operating condition. The recommended inspection frequency is once a year, and more frequently for larger valves and valves for critical applications.

A valve repair that would result in reduction of supply is a liability, but because of the probable infrequency of occurrence, it might be considered as introducing only a moderate degree of unreliability even if it resulted in total interruption. The repair of a valve normally should be accomplished in two days. Valves opening opposite to the majority are undesirable and when they do occur they should be clearly identified.

HYDRANTS

SIZE, TYPE AND INSTALLATION. Hydrants should conform to American Water Works Standard for Dry Barrel Fire Hydrants or Underwriters' Laboratories of Canada listing. Hydrants should have at least two 65mm outlets. Where required fire flows exceed 5000 l/min or pressures are low there should also be a large pumper outlet. The lateral street connection should not be less than 150mm in diameter. Hose threads, operating and cap nuts on outlets should conform to Provincial Standard dimensions. A valve should be provided on lateral connections between hydrants and street mains.

Hydrants that open in a direction opposite to that of the majority are considered unsatisfactory. Flush hydrants are considered undesirable because of delay in getting into operation; this delay is more serious in areas subject to heavy snow storms. Cisterns are considered unsatisfactory as an alternative to pressure hydrants. The number and spacing of hydrants should be as indicated in the table titled "Standard Hydrant Distribution".

INSPECTION AND CONDITION. Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Where freezing temperatures occur, the semi-annual inspections should be made in the spring and fall of each year. Because of the possibility of freezing they should be checked frequently during extended periods of severe cold. Hydrants should be kept in good condition and suitable records of inspections and repairs be maintained. Hydrants should be painted in highly visible colours so that they are conspicuous and be situated with outlets at least twelve inches above the grade. There should be no obstruction that could interfere with their operation. Snow should be cleared promptly after storms and ice and snow accumulations removed as necessary.

HYDRANT DISTRIBUTION. Hydrant locations and spacing should be convenient for fire department use. Hydrants should be located at intersections, in the middle of long blocks and at the end of long dead-end streets. To allow for convenient utilization of water supplies, distribution density of hydrants should be in accordance with the required fire flows indicated in the table titled "Standard Hydrant Distribution" (page 16). The maximum recommended spacing of hydrants in commercial, industrial, institutional and multi-family residential areas is 90 metres; in single family residential areas 180 metres is recommended. In areas where fire apparatus have access (e.g. large properties, private developments, etc.), hydrants should be required by bylaw. The planning of hydrant locations should be a cooperative effort between the water utility and fire department.

RECORDS

PLANS AND RECORDS. Complete, up-to-date plans and records essential for the proper operation and maintenance of the system should be available in a convenient form, suitably indexed and safely filed. These should include plans of the source as well as records of its yield and a reliable estimate of the safe yield; plans of the supply works including dams, intakes, wells, pipelines, treatment plants, pumping stations, storage reservoirs and tanks; and a map of the distribution system showing mains, valves, and hydrants. Plans and maps should be in duplicate and stored at different locations.

Detailed distribution system plans, in a form suitable for field use, should be available for maintenance crews. Records of consumption, pressures, storage levels, pipes, valves, hydrants, and of the operations of the supply works and distribution system, including valve and hydrant inspections and repairs should be maintained.

TABLES

STANDARD HYDRANT DISTRIBUTION	
Fire Flow Required (litres per minute)	Average Area per Hydrant (m^2)
2,000	16,000
4,000	15,000
6,000	14,000
8,000	13,000
10,000	12,000
12,000	11,000
14,000	10,000
16,000	9,500
18,000	9,000
20,000	8,500
22,000	8,000
24,000	7,500
26,000	7,000
28,000	6,500
30,000	6,000
32,000	5,500
34,000	5,250
36,000	5,000
38,000	4,750
40,000	4,500
42,000	4,250
44,000	4,000
46,000	3,750
48,000	3,500

REQUIRED DURATION OF FIRE FLOW	
Fire Flow Required (litres per minute)	Duration (hours)
2,000 or less	1.0
3,000	1.25
4, 000	1.5
5,000	1.75
6,000	2.0
8000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

Interpolate for intermediate figures

Area refers to surface area of blocks and bounding streets. For a street without adjacent streets, a depth of one-half block is used.

A water supply system is considered to be adequate for fire protection when it can supply water as indicated above with consumption at the maximum daily rate. Certain types of emergency supplies may be included where reasonable conditions for their immediate use exist. Storage on the system is credited on the basis of the normal daily minimum maintained insofar as pressure permits its delivery at the rate considered.

PART II

GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOW
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N.B. It should be recognized that this is a "guide" in the true sense of the word, and requires a certain amount of knowledge and experience in fire protection engineering for its effective application. Its primary purpose is for the use of surveyors experienced in this field, but it is made available to municipal officials, consulting engineers and others interested as an aid in estimating fire flow requirements for municipal fire protection.

Required Fire Flow may be described as the amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

1. An estimate of the fire flow required for a given area may be determined by the formula:

$$F = 220C\sqrt{A}$$

where

F = the required fire flow in litres per minute.

C = coefficient related to the type of construction.

= 1.5 for wood frame construction (structure essentially all combustible).

= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior).

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls).

= 0.6 for fire-resistive construction (fully protected frame, floors, roof).

Note: For types of construction that do not fall within the categories given, coefficients shall not be greater than 1.5 nor less than 0.6 and may be determined by interpolation between consecutive construction types as listed above. Construction types are defined in the Appendix.

A = The total floor area in square metres (including all storeys, but excluding basements at least 50 percent below grade) in the building being considered.

For fire-resistive buildings, consider the two largest adjoining floors plus 50 percent of each of any floors immediately above them up to eight, when the vertical openings are inadequately protected. If the vertical openings and exterior vertical communications are properly protected (one hour rating), consider only the area of the largest floor plus 25 percent of each of the two immediately adjoining floors.

For one family and two family dwellings not exceeding two storeys in height, see **Note J.**

2. The value obtained in No. 1 may be reduced by as much as 25% for occupancies having a low contents fire hazard or may be increased by up to 25% surcharge for occupancies having a high fire hazard. Those may be classified as to contents as follows:

Non-Combustible	-25%	Free Burning	+15%
Limited Combustible	-15%	Rapid Burning	+25%
Combustible	No Charge		

As guide for determining low or high fire hazard occupancies, see the list in the Appendix. The fire flow determined shall not be less than 2,000 L/min,

3. The value obtained in No.2 above may be reduced by up to 50% for complete automatic sprinkler protection depending upon adequacy of the system. The credit for the system will be a maximum of 30% for an adequately designed system conforming to NFPA 13 and other NFPA sprinkler standards. Additional credit of up to 10% may be granted if the water supply is standard for both the system and fire department hose lines required. The percentage reduction made for an automatic sprinkler system will depend upon the extent to which the system is judged to reduce the possibility of fires spreading within and beyond the fire area. Normally this reduction will not be the maximum allowed without proper system supervision including water flow and control valve alarm service. Additional credit may be given of up to 10% for a fully supervised system.

4. To the value obtained in No. 2 above a percentage should be added for structures exposed within 45 metres by the fire area under consideration. This percentage shall depend upon the height, area, and construction of the building(s) being exposed, the separation, openings in the exposed building(s), the length and height of exposure, the provision of automatic sprinklers and/or outside sprinklers in the building(s) exposed, the occupancy of the exposed building(s), and the effect of hillside locations on the possible spread of fire.

   The charge for any one side generally should not exceed the following limits for the separation:

Separation	Charge	Separation	Charge
0 to 3m	25%	20.1 to 30 m	10%
3.1 to 10m	20%	30.1 to 45m	5%
10.1 to 20m	15%		

   The total percentage shall be the sum of the percentage for all sides, but shall not exceed 75%.

   The fire flow shall not exceed 45,000 L/min nor be less than 2,000 L/min.

Notes to Calculation

Note A: The guide is not expected to necessarily provide an adequate value for lumber yards, petroleum storage, refineries, grain elevators, and large chemical plants, but may indicate a minimum value for these hazards.

Note B: Judgment must be used for business, industrial, and other occupancies not specifically mentioned.

Note C: Consideration should be given to the configuration of the building(s) being considered and accessibility by the fire department.

Note D: Wood frame structures separated by less than 3 metres shall be considered as one fire area.

Note E: Fire Walls: - In determining floor areas, a fire wall that meets or exceeds the requirements of the current edition of the National Building Code of Canada (provided this necessitates a fire resistance rating of 2 or more hours) may be deemed to subdivide the building into more than one area or may, as a party wall, separate the building from an adjoining building.

Normally any unpierced party wall considered to form a boundary when determining floor areas may warrant up to a 10% exposure charge.

Note F: High one storey buildings: When a building is stated as 1=2, or more storeys, the number of storeys to be used in the formula depends upon the use being made of the building. For example, consider a 1=3 storey building. If the building is being used for high piled stock, or for rack storage, the building would probably be considered as 3 storeys and, in addition, an occupancy percentage increase may be warranted.

However, if the building is being used for steel fabrication and the extra height is provided only to facilitate movement of objects by a crane, the building would probably be considered as a one storey building and an occupancy credit percentage may be warranted.

Note G: If a building is exposed within 45 metres, normally some surcharge for exposure will be made.

Note H: Where wood shingle or shake roofs could contribute to spreading fires, add 2,000 L/min to 4,000 L/min in accordance with extent and condition.

Note I: Any non-combustible building is considered to warrant a 0.8 coefficient.

Note J: Dwellings: For groupings of detached one family and small two family dwellings not exceeding 2 stories in height, the following short method may be used. (For other residential buildings, the regular method should be used.)

Exposure distances	Suggested required fire flow	
	Wood Frame	Masonry or Brick
Less than 3m	See Note "D"	6,000 L/min
3 to 10m	4,000 L/min	4,000 L/min
10.1 to 30m	3,000 L/min	3,000 L/min
Over 30m	2,000 L/min	2,000 L/min

If the buildings are contiguous, use a minimum of 8,000 L/min. Also consider Note H.

OUTLINE OF PROCEDURE

A. Determine the type of construction.

B. Determine the ground floor area.

C. Determine the height in storeys.

D. Using the fire flow formula, determine the required fire flow to the nearest 1,000 L/min.

E. Determine the increase or decrease for occupancy and apply to the value obtained in D above. Do not round off the answer.

F. Determine the decrease, if any, for automatic sprinkler protection. Do not round off the value.

G. Determine the total increase for exposures, Do not round off the value.

H. To the answer obtained in E, subtract the value obtained in F and add the value obtained in G.

The final figure is customarily rounded off to the nearest 1,000 L/min.

APPENDIX

TYPES OF CONSTRUCTION

For the specific purpose of using the Guide, the following definitions may be used:

Fire-Resistive Construction - Any structure that is considered fully protected, having at least 3-hour rated structural members and floors. For example, reinforced concrete or protected steel.

Non-combustible Construction - Any structures having all structural members including walls, columns, piers, beams, girders, trusses, floors, and roofs of non-combustible material and not qualifying as fire-resistive construction. For example, unprotected metal buildings.

Ordinary Construction - Any structure having exterior walls of masonry or such non-combustible material, in which the other structural members, including but not limited to columns, floors, roofs, beams, girders, and joists, are wholly or partly of wood or other combustible material.

Wood Frame Construction - Any structure in which the structural members are wholly or partly of wood or other combustible material and the construction does not qualify as ordinary construction.

OCCUPANCIES

Examples of Low Hazard Occupancies:

Apartments
Asylums
Churches
Clubs
Colleges & Universities
Dormitories
Dwellings
Hospitals
Hotels
Institutions
Libraries, except Large Stack Room Areas
Museums
Nursing, Convalescent and Care Homes
Office Buildings
Prisons
Public Buildings
Rooming Houses
Schools
Tenements

Generally, occupancies falling in National Building Code Groups A, B, C and D are of this class.

Examples of High Hazard Occupancies:

- Aircraft Hangars
- Cereal, Feed, Flour and Grist Mills
- Chemical Works - High Hazard
- Cotton Picker and Opening Operations
- Explosives & Pyrotechnics Manufacturing
- Shade Cloth Manufacturing
- Foamed Plastics, Storage or use in Manufacturing
- High Piled Combustibles Storage in excess of 6.5 metres high
- Linseed Oil Mills
- Match Manufacturing
- Oil Refineries
- Paint Shops
- Pyroxylin Plastic Manufacturing & Processing
- Solvent Extracting
- Varnish and Paint Works
- Woodworking with Flammable Finishing
- Linoleum and Oilcloth Manufacturing

Other occupancies involving processing, mixing storage and dispensing flammable and/or combustible liquids. Generally, occupancies falling in National Building Code Group F, Divisions 1 and 2 would be in this class.

For other occupancies, good judgment should be used, and the percentage increase will not necessarily be the same for all buildings that are in the same general category - for example "Colleges and Universities": this could range from a 25% decrease for buildings used only as dormitories to an increase for a chemical laboratory. Even when considering high schools, the decrease should be less if they have extensive shops.

It is expected that in commercial buildings no percentage increase or decrease for occupancy will be applied in most of the fire flow determinations. In general, percentage increase or decrease will not be at the limits of plus or minus 25%.

EXPOSURES

When determining exposures it is necessary to understand that the exposure percentage increase for a fire in a building (x) exposing another building (y) does not necessarily equal the percentage increase when the fire is in building (y) exposing building (x). The Guide gives the maximum possible percentage for exposure at specified distances. However, these maximum possible percentages should not be used for all exposures at those distances. In each case the percentage applied should reflect the actual conditions but should not exceed the percentage listed.

The maximum percentage for the separations listed generally should be used if the exposed building meets all of the following conditions:

a. Same type or a poorer type of construction than the fire building.
b. Same or greater height than the fire building.
c. Contains unprotected exposed openings.
d. Unsprinklered.

CONVERSION FACTORS

Multiply	By	To Obtain
Centimetre	0.3937	Inches
Cubic Foot	0.0283	Cubic Metres
Cubic Metre	35.3145	Cubic Feet
Cubic Metre	219.97	Imperial Gallons
Cubic Metre	1.000	Litres
Foot	0.3048	Metres
Horsepower	0.7457	Kilowatt
Imperial Gallon	4.546	Litres
Inch	2.54	Centimetres
Kilogram	2.2046	Pounds
Kilogram of Water	1	Litres
Kilopascal	0.1450	Pounds per sq. inch
Kilowatt	1.341	Horsepower
Litre	0.21997	Imperial Gallons
Litre of Water	1	Kilograms
Metre	3.281	Feet
Metre of Water	10	Kilopascals
Pound	0.4536	Kilograms
Pound per sq. inch	6.89476	Kilopascals
U.S. Gallons	0.8327	Imperial Gallons
Imperial Gallons	1.201	U.S.Gallons

APPENDIX C Assumptions of the British Columbia Building Code

A-3 Application of Part 3.

A-3 Application of Part 3. In applying the requirements of this Part, it is intended that they be applied with discretion to buildings of unusual configuration that do not clearly conform to the specific requirements, or to buildings in which processes are carried out which make compliance with particular requirements in this Part impracticable. The definition of “building” as it applies to this Code is general and encompasses most structures, including those which would not normally be considered as buildings in the layman's sense. This occurs more often in industrial uses, particularly those involving manufacturing facilities and equipment that require specialized design that may make it impracticable to follow the specific requirements of this Part. Steel mills, aluminum plants, refining, power generation and liquid storage facilities are examples. A water tank or an oil refinery, for example, has no floor area, so it is obvious that requirements for exits from floor areas would not apply. Requirements for structural fire protection in large steel mills and pulp and paper mills, particularly in certain portions, may not be practicable to achieve in terms of the construction normally used and the operations for which the space is to be used. In other portions of the same building, however, it may be quite reasonable to require that the provisions of this Part be applied (e.g., the office portions). Similarly, areas of industrial occupancy which may be occupied only periodically by service staff, such as equipment penthouses, normally would not need to have the same type of exit facility as floor areas occupied on a continuing basis. It is expected that judgment will be exercised in evaluating the application of a requirement in those cases when extenuating circumstances require special consideration, provided the occupants' safety is not endangered.

The provisions in this Part for fire protection features installed in buildings are intended to provide a minimum acceptable level of public safety. It is intended that all fire protection features of a building, whether required or not, will be designed in conformance with good fire protection engineering practice and will meet the appropriate installation requirements in relevant standards. Good design is necessary to ensure that the level of public safety established by the Code requirements will not be reduced by a voluntary installation.

Firefighting Assumptions

The requirements of this Part are based on the assumption that firefighting capabilities are available in the event of a fire emergency. These firefighting capabilities may take the form of a paid or volunteer public fire department or in some cases a private fire brigade. If these firefighting capabilities are not available, additional fire safety measures may be required.

Firefighting capability can vary from municipality to municipality. Generally, larger municipalities have greater firefighting capability than smaller ones. Similarly, older, well established municipalities may have better firefighting facilities than newly formed or rapidly growing ones. The level of municipal fire protection considered to be adequate will normally depend on both the size of the municipality (i.e., the number of buildings to be protected) and the size of buildings within that municipality. Since larger buildings tend to be located in larger municipalities, they are generally, but not always, favoured with a higher level of municipal protection.

Although it is reasonable to consider that some level of municipal firefighting capability was assumed in developing the fire safety provisions in Part 3, this was not done on a consistent or defined basis. The requirements in the Code, while developed in the light of commonly prevailing municipal fire protection

levels, do not attempt to relate the size of building to the level of municipal protection. **The responsibility for controlling the maximum size of building to be permitted in a municipality in relation to local firefighting capability rests with the municipality. If a proposed building is too large, either in terms of floor area or building height, to receive reasonable protection from the municipal fire department, fire protection requirements in addition to those prescribed in this Code, may be necessary to compensate for this deficiency.** Automatic sprinkler protection may be one option to be considered.

Alternatively, the municipality may, in light of its firefighting capability, elect to introduce zoning restrictions to ensure that the maximum building size is related to available municipal fire protection facilities. This is, by necessity, a somewhat arbitrary decision and should be made in consultation with the local firefighting service, who should have an appreciation of their capability to fight fires.

The requirements of Subsection 3.2.3. are intended to prevent fire spread from thermal radiation assuming there is adequate firefighting available. It has been found that periods of from 10 to 30 minutes usually elapse between the outbreak of fire in a building that is not protected with an automatic sprinkler system and the attainment of high radiation levels. During this period, the specified spatial separations should prove adequate to inhibit ignition of an exposed building face or the interior of an adjacent building by radiation. Subsequently, however, reduction of the fire intensity by firefighting and the protective wetting of the exposed building face will often be necessary as supplementary measures to inhibit fire spread.

In the case of a building that is sprinklered throughout, the automatic sprinkler system should control the fire to an extent that radiation to neighbouring buildings should be minimal. Although there will be some radiation effect on a sprinklered building from a fire in a neighbouring building, the internal sprinkler system should control any fires that might be ignited in the building and thereby minimize the possibility of the fire spreading into the exposed building. NFPA 80A, “Protection of Buildings from Exterior Fire Exposures,” provides additional information on the possibility of fire spread at building exteriors.

The water supply requirements for fire protection installations depend on the requirements of any automatic sprinkler installations and also on the number of fire streams that may be needed at any fire, having regard to the length of time the streams will have to be used. Both these factors are largely influenced by the conditions at the building to be equipped, and the quantity and pressure of water needed for the protection of both the interior and exterior of the building must be ascertained before the water supply is decided upon. Acceptable water supplies may be a public waterworks system that has adequate pressure and discharge capacity, automatic fire pumps, pressure tanks, manually controlled fire pumps in combination with pressure tanks, gravity tanks, and manually controlled fire pumps operated by remote control devices at each hose station.

APPENDIX D Insurance Grading Recognition of Used or Rebuilt Fire Apparatus

Insurance Grading Recognition of Used or Rebuilt Fire Apparatus

The performance ability and overall acceptability of older apparatus has been debated between municipal administrations, the public fire service and many others for years. Fire Underwriters Survey (F.U.S.) has reviewed experiences across Canada and in other countries and has developed a standard for acceptance of apparatus as the apparatus becomes less reliable with age and use.

The public fire service is unique compared to other emergency services in that fire apparatus vehicles are not continuously in use. However, when in use, the apparatus is subject to considerable mechanical stress due to the nature of its function. This stress does not normally manifest itself on the exterior of the equipment. It is effectively masked in most departments by a higher standard of aesthetic care and maintenance. Lack of replacement parts further complicates long term use of apparatus. Truck and pump manufacturers maintain a parts inventory for each model year for a finite time. After that period, obtaining necessary parts may be difficult. This parts shortage is particularly acute with fire apparatus due to the narrow market for these devices.

F.U.S.'s lengthy experience in evaluating fire apparatus indicates that apparatus should be designed to an acceptable standard. The standard that is accepted throughout Canada by Fire Underwriters Survey is the Underwriters' Laboratories of Canada (ULC) Standard S515-04 titled, "Automobile Fire Fighting Apparatus," which was adopted as a National Standard of Canada in September 2004. Fire apparatus should be built by recognized manufacturers.

Fire apparatus should respond to first alarms for the first fifteen years of service. During this period it has reasonably been shown that apparatus effectively responds and performs as designed without failure at least 95% of the time. For the next five years, it should be held in reserve status for use at major fires or used as a temporary replacement for out-of-service first line apparatus. Apparatus should be retired from service at twenty years of age. Present practice indicates the recommended service periods and protocols are usually followed by the first purchaser. However, at the end of that period, the apparatus is either traded in on new apparatus or sold to another fire department. At this juncture, the unit may have one or more faults which preclude effective use for emergency service. These deficiencies include:

a. Inadequate braking system
b. Slow pick-up and acceleration
c. Structurally weakened chassis due to constant load bearing and/or overloading
d. Pump wear

F.U.S. has modified its application of the age requirement for used or rebuilt apparatus. Due to municipal budget constraints within small communities we have continued to recognize apparatus over twenty years of age, provided the truck successfully meets the recommended annual tests and has been deemed to be in excellent condition. The specified service tests are outlined below under the heading "Recommended Service Tests for Used or Modified Fire Apparatus". Testing and apparatus maintenance should only be completed by a technician who is certified to an appropriate level in accordance with NFPA 1071, *Standard for Emergency Vehicle Technician Professional Qualifications*.

Insurance grading recognition may be extended for a limited period of time if we receive documentation verifying that the apparatus has successfully passed the specified tests. If the apparatus does not pass the required tests or experiences long periods of "downtime" we may request the municipal authority to replace the equipment with new or newer apparatus. If replacement does not occur, fire insurance grading recognition may be revoked for the specific apparatus which may adversely affect the Fire Underwriters Survey grades of the community. This can also affect the rates of insurance for property owners throughout the community.

Table 1 Service Schedule for Listed Fire Apparatus

For

Fire Insurance Grading Purposes

Apparatus Age	**Major Cities**	**Medium Sized Cities or Communities Where Risk is Significant**	**Small Communities and Rural Centres**
0 – 15 Years	First Line	First Line	First Line
16 – 20 Years	Reserve	2nd Line	First Line
20 – 25 Years [1]	No Credit in Grading	No Credit in Grading *Reserve [2]*	No Credit in Grading *2nd Line [2]*
26 – 29 Years [1]	No Credit in Grading	No Credit in Grading *Reserve [2]*	No Credit in Grading *Reserve [2]*
30 Years and Older	No Credit in Grading	No Credit in Grading	No Credit in Grading

[1] *All listed fire apparatus 20 years of age and older are required to be service tested by recognized testing agency on an annual basis to be eligible for grading recognition. (NFPA 1071)*

[2] *Exceptions to age status may be considered in a small to medium sized communities and rural centres conditionally, when apparatus condition is acceptable and apparatus successfully passes required testing.*

Table 2 Frequency of Listed Fire Apparatus Acceptance and Service Tests

For

Fire Insurance Grading Purposes

	Frequency of Test					
	@ Time of Purchase New or Used	**Annual Basis**	**@ 15 Years**	**@ 20 Years** ***See Note 4***	**20 to 25 Years (annually)**	**After Extensive Repairs**
Recommended For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	Service Test	Acceptance Test	Yes	Yes	Acceptance or Service Test depending on extent of repair
Required For Fire Insurance Purposes	Acceptance Test if new; Service Test if used & < 20 Years	No	No	Acceptance Test	Acceptance Test	Acceptance or Service Test depending on extent of repair
Factor in FUS Grading	Yes	Service Test	Yes	Yes	Yes	Yes
Required By Listing Agency	Acceptance Test	No	No	No	N/A	Acceptance Test
Required By NFPA	Acceptance Test	Service Test	No	N/A	N/A	Acceptance Test

Note 1: See: 'Service Tests for Used or Rebuilt Fire Apparatus' for description of applicable tests
Note 2: Acceptance Tests consist of 60 minute capacity and 30 minute pressure tests
Note 3: Service Tests consist of 20 minute capacity test and 10 minute pressure test in addition to other listed tests

Note 4: Apparatus exceeding 20 years of age may not be considered to be eligible for insurance grading purposes regardless of testing. Application must be made in writing to Fire Underwriters Survey for an extension of the grade-able life of the apparatus.

SERVICE TESTS FOR USED OR MODIFIED FIRE APPARATUS

The intent of this document is to ensure that all used or modified fire apparatus, equipped with a pump or used for tanker service, essentially meet the requirements of Underwriters' Laboratories of Canada (ULC) "Standard for Automobile Fire Fighting Apparatus" S515-04 or subsequent (current) editions of the Standard. Full adherence with the following specified tests is recommended when purchasing used apparatus.

1) **Weight Tests**

1.1) Load Balance Test: When fully laden (including a 460kg (1000 lbs) personnel weight, full fuel and water tanks, specified load of hose and miscellaneous equipment), the vehicle shall have a load balance of 22% to 50% of total vehicle mass on the front axle and 50% to 78% of this mass on the rear axle.

Distribution of mass of 33% and 67% respectively on the front and rear axles is preferable for a vehicle having dual rear tires or tandem rear axels.

For a vehicle having tandem rear axels and dual tires on each axle, a loading of between 18% and 25% on the front axle with the balance of mass on the rear axles is permissible.

2) **Road Tests**

2.1) Acceleration Tests:

2.1.1) From a standing start, the apparatus shall attain a true speed of 55 km/h (35 mph) within 25 seconds for Pumpers carrying up to 3,150 litres (700 gallons) of water.

For apparatus carrying in excess of 3,150 litres (700 gallons) or apparatus equipped with aerial ladders or elevating platforms, a true speed of 55 km/h (35 mph) in 30 seconds should be attained.

2.1.2) The vehicle should attain a top speed of at least 80 km/h (50mph).

2.2) Braking Test: The service brakes shall be capable of bringing the fully laden apparatus to a complete stop from an initial speed of 30 km/h (20 mph) in a distance not exceeding 9 metres (30 feet) by actual measurement. The test should be conducted on a dry, hard surfaced road that is free of loose material, oil and grease.

3) Pump Performance Tests

3.1) Hydrostatic Test – Recent evidence of hydrostatic testing of the pump for 10 minutes at a minimum pressure of 3,400 kPa (500 psi). APPLICABLE TO NEW OR REBUILT PUMPS ONLY (see 3.3).

3.2) Priming and Suction Capability Tests

3.2.1) Vacuum Test: The pump priming device, with a capped suction at least 6 metres (20 feet) long, shall develop –75 kPa (22 inches of mercury) at altitudes up to 300 metres (1000 feet) and hold the vacuum with a drop of not in excess of 34 kPa (10 inches of mercury) in 10 minutes.

For every 300 metres (1000 feet) of elevation, the required vacuum shall be reduced 3.4 kPa (1 inch mercury).

The primer shall not be used after the 10-minute test period has been started. The test shall be made with discharge outlets uncapped.

3.2.2) Suction Capability Test: The pump (in parallel or series) when dry, shall be capable of taking suction and discharging water with a lift of not more than 3 metres (10 feet) through 6 metres (20 feet) of suction hose of appropriate size, in not more than 30 seconds and not over 45 seconds for 6000 L/min (1320 Igpm) or larger capacity pumps. Where front or rear suction is provided on midship pumps, an additional 10 seconds priming time will be allowed. The test shall be conducted with all discharge caps removed.

3.3 Pump Performance

3.3.1) Capacity Test: Consists of drafting water (preferably with a 10 feet lift) and pumping the rated capacity at 1000 kPa (150 psi) net pump pressure for a continuous period of at least 1 hour.

3.3.2) Pressure Test: Under the same conditions as in 3.3.1 above pumping 50% of the rated capacity at 1700 kPa (250 psi) net pump pressure for at least ½ hour/

For additional information on the above noted tests and test procedures, the following documents provide useful data:

(1) Underwriters Laboratories of Canada (ULC) Standard S515-04 "Standard for Automobile Fire Fighting Apparatus, latest edition.

(2) Fire Underwriters Survey (FUS) publication titled "Fire Stream Tables and Testing Data" latest edition.

(3) International Fire Service Training Association (IFSTA) publication title "Fire Department Pumping Apparatus", latest edition.

(4) National Fire Protection Association (NFPA) 1901 Standard title "Pumper Fire Apparatus", latest edition.

(5) National Fire Protection Association (NFPA 1911 Standard titled "Service Tests of Pumps on Fire Department Apparatus" latest edition.

For further information regarding the acceptability of fire apparatus for insurance grading purposes, please contact:

Michael Currie, AScT.
Public Fire Protection Specialist

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CGI Information Systems and Management Consultants
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APPENDIX E Recommended Frequency of Fire Prevention Inspections

Fire Underwriters Survey Recommended Frequency of Fire Prevention Inspections

The frequency of fire prevention inspections for all occupancies should be specifically appropriate for the level of fire risk within the occupancy. The frequency of inspections will vary from one occupancy to another depending on;

1. Type of occupancy.
2. Occupant load.
3. Function.
4. Grade of hazard.

As the fire risk increases, the frequency of inspections should also be increased.

The following table is a minimum frequency guideline for occupancies as identified within the National Building Code of Canada.

Minimum Frequency
Group - Division (National Building Code)

Occupancy	Inspection Frequency
A-1	6 months
A-2	6 months
A-3	6 months
A-4	6 months
B-1	6 months
B-2	6 months
C	6 months
D	12 months
E	12 months
F-1	3 months
F-2	6 months
F-3	6 months

Sample Customized Frequency Schedule

Group - Division National Building Code

Occupancy	Inspection Frequency
A-1	
Movie Theaters	6 months
Theaters	6 months
A-2	
Bowling Alleys	6 months
Churches	6 months
Non-Residential Clubs	6 months
Community Halls	6 months
Dance Halls	6 months
Exhibition Halls	6 months
Gymnasiums	6 months
Libraries	6 months
Licenced Beverage Premises (Unsprinklered)	2 months
Licenced Beverage Premises (Sprinklered)	4 months
Museums	6 months
Restaurants	6 months
Schools	4 months
Daycares	6 months
Undertaker Premises	6 months
A-3	
Arenas	6 months
Rinks	6 months
Indoor Pools	6 months
A-4	
Stadiums	6 months
B-1	
Jails	6 months
Police Stations	6 months
B-2	
Children's Custodial Homes	2 months
Hospitals	2 months
Nursing Homes	4 months
C	
Apartments	6 months

Boarding Houses	6 months
Hotels (Unsprinklered)	2 months
Hotels (Sprinklered)	4 months
Lodging Houses	6 months
Motels	6 months
Residential Schools	6 months

D

Banks	12 months
Barbers/Hairdressers	12 months
Beauty Parlours	12 months
Dental Offices	12 months
Self-Services Laundries	12 months
Medical Offices	12 months
Offices	12 months
Radio Stations	12 months
Appliance Service/Rentals	12 months

E

Department Stores	12 months
Shops	12 months
Stores	12 months
Supermarkets	12 months

F-1

Feed Mills	3 months
Spray Paint Booths	3 months

F-2

Warehouses, Service Stations	12 months

F-3

Storage Garages, Medical Labs	12 months

Fire Underwriters Survey

APPENDIX F Available Fire Flow Testing Results

Available Fire Flow Testing – Black Creek – Oyster Bay

WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES

Available Fire Flow Calculator

Name of Risk:	SFR	Test No.	Flowtest(1)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 8" PVC Dead End: Two Ways: Loop: Y

Source Reliable: Yes If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Miracle Beach One hydrant up from Flow Across from 1967 on Clarkson Drive

Flow: Clarkson Drive Miracle Beach Drive Before T in road

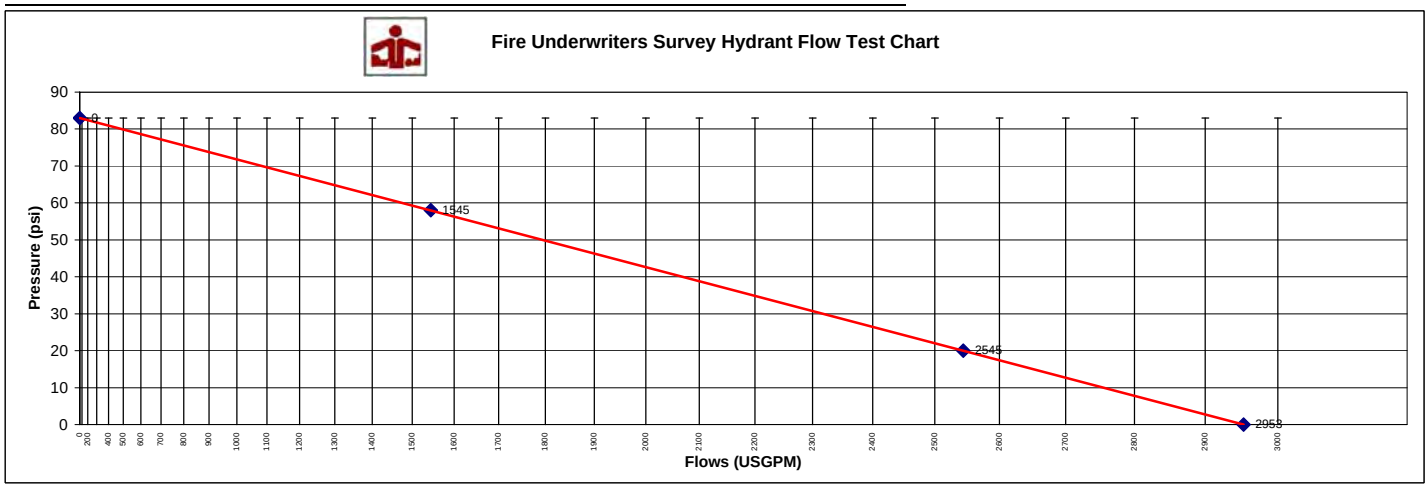
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	70		
USGPM:	1545	0	0

TOTAL FLOW DURING TEST: 1545 USGPM / 1287 IGPM

STATIC READING: 83 PSI RESIDUAL: 58 PSI

RATED CAPACITY: 2545 USGPM AT 0 PSI 2953 USGPM / 2120 IGPM 2460 IGPM

REMARKS:



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Available Fire Flow Calculator

Name of Risk:	Oyster Bay Resort	Test No.	Flowtest(2)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 8" AC Dead End: Two Ways: Loop: Y

Source Reliable: Yes If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Hwy 19A Island Hwy Near 4437 across from big resort

Flow: Hwy 19A Hwy in front of multiple resorts

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.15		
COEFFICIENT:	0.99		
PITOT READING:	35		
USGPM:	808	0	0

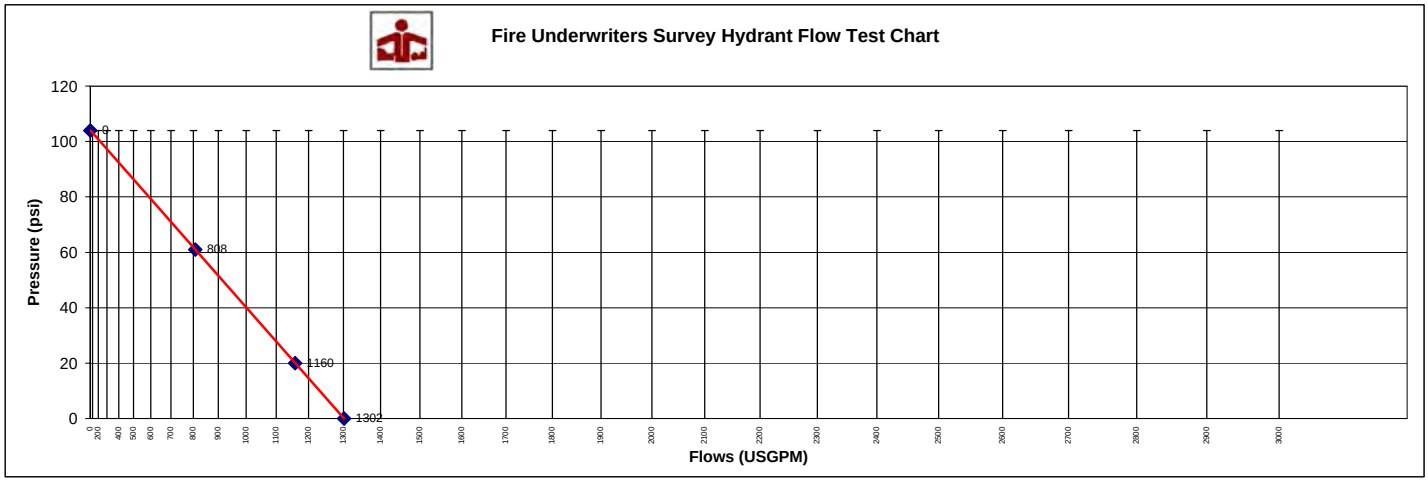
TOTAL FLOW DURING TEST: 808 USGPM

STATIC READING: 104 PSI 673 IGPM RESIDUAL: 61 PSI

RATED CAPACITY: 1160 USGPM AT 0 PSI 1302 USGPM

966 IGPM 1084 IGPM

REMARKS:



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Available Fire Flow Calculator

Name of Risk:	SFR	Test No.	Flowtest(3)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 6" AC Dead End: Yes Two Ways: Loop:

Source Reliable: Yes If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Hoover Rd & Lewis Road

Flow: Hoover road End near 2395

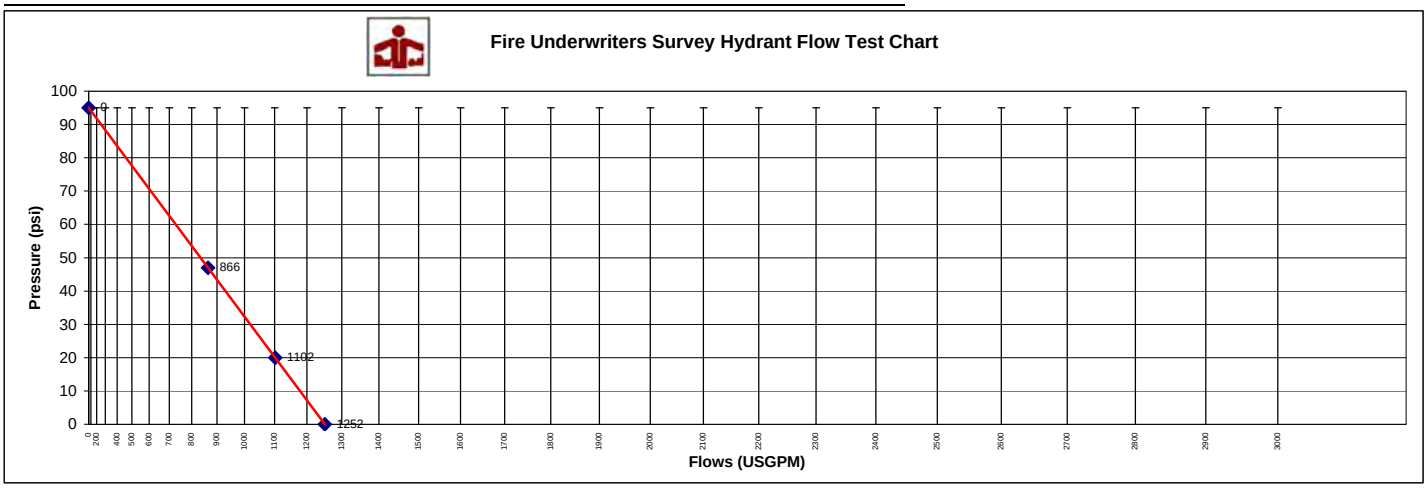
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	22		
USGPM:	866	0	0

TOTAL FLOW DURING TEST: 866 USGPM / 721 IGPM

STATIC READING: 95 PSI RESIDUAL: 47 PSI

RATED CAPACITY:		AT 0 PSI	
	1102 USGPM		1252 USGPM
	918 IGPM		1043 IGPM

REMARKS:



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Available Fire Flow Calculator

Name of Risk:	Commercial	Test No.	Flowtest(4)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: AC 8-10" Dead End: Two Ways: Loop:

Source Reliable: Yes If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Glenmore & Lambeth near end of Lambeth 4781

Flow: Ternnance and Regent

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.15		
COEFFICIENT:	0.99		
PITOT READING:	66		
USGPM:	1109	0	0

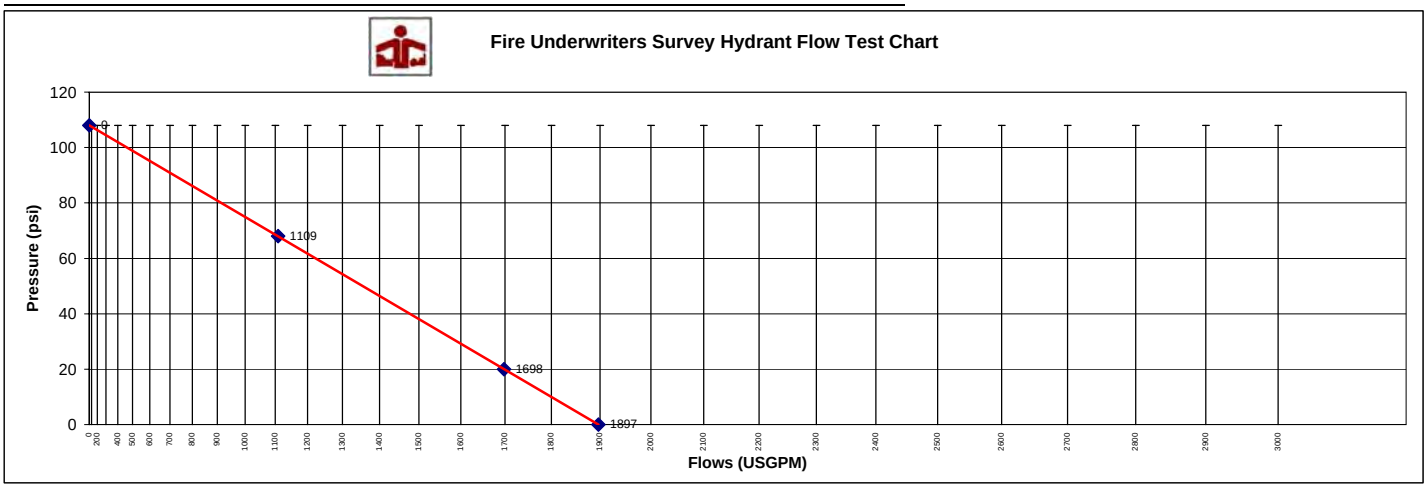
TOTAL FLOW DURING TEST: 1109 USGPM

924 IGPM

STATIC READING: 108 PSI RESIDUAL: 68 PSI

RATED CAPACITY:	1698 USGPM	AT 0 PSI	1897	USGPM
	1415 IGPM		1580	IGPM

REMARKS:



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	SFR	Test No.	Flowtest(5)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 8" AC Dead End: Two Ways: Loop: Y

Source Reliable: Yes If not explain:

Comments: Gravity near reservoir

TEST DATA:

Location of test hydrants; Residual: Catherwood & Oakes 8949

Flow: 8993 Oakes Rd

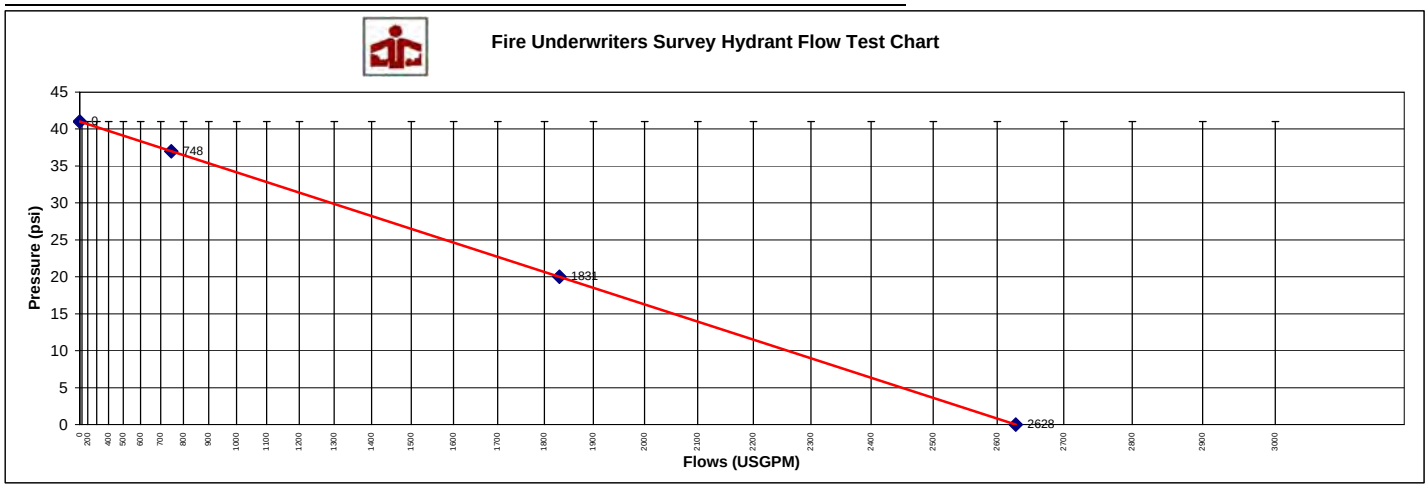
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.15		
COEFFICIENT:	0.99		
PITOT READING:	30		
USGPM:	748	0	0

TOTAL FLOW DURING TEST: 748 USGPM / 623 IGPM

STATIC READING: 41 PSI RESIDUAL: 37 PSI

RATED CAPACITY: 1831 USGPM AT 0 PSI 2628 USGPM / 1525 IGPM 2189 IGPM

REMARKS:



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Available Fire Flow Calculator

Name of Risk:	Saratoga Speedway	Test No.	Flowtest(6)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 10" PVC Dead End: Two Ways: Loop: Yes

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Outisde of entrance of the Saratoga Speedway, Mcauley road

Flow: Down from entrance from Saratoga Speedway

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	25		
USGPM:	923	0	0

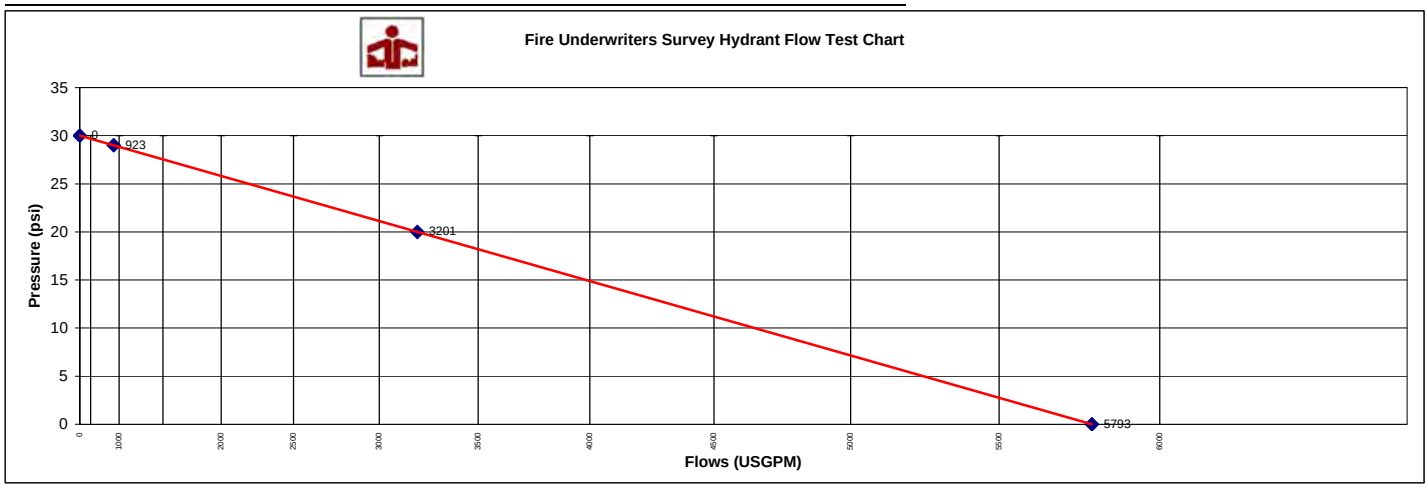
TOTAL FLOW DURING TEST: 923 USGPM / 769 IGPM

STATIC READING: 30 PSI RESIDUAL: 29 PSI

RATED CAPACITY:			AT 0 PSI	
	3201	USGPM		5793 USGPM
	2666	IGPM		4826 IGPM

REMARKS:

Warning: Hydrants having a static pressure of less than 40 psi (2.8 bar) should be rated at one-half of the static pressure. NFPA 291 - 4.1.2



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	School (was) Black Creek School	Test No.	Flowtest(7)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 6" AC Dead End: Yes Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Corner of Ployart Rd & Enns Rd

Flow: 2368 Ployart Rd

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	11		
USGPM:	612	0	0

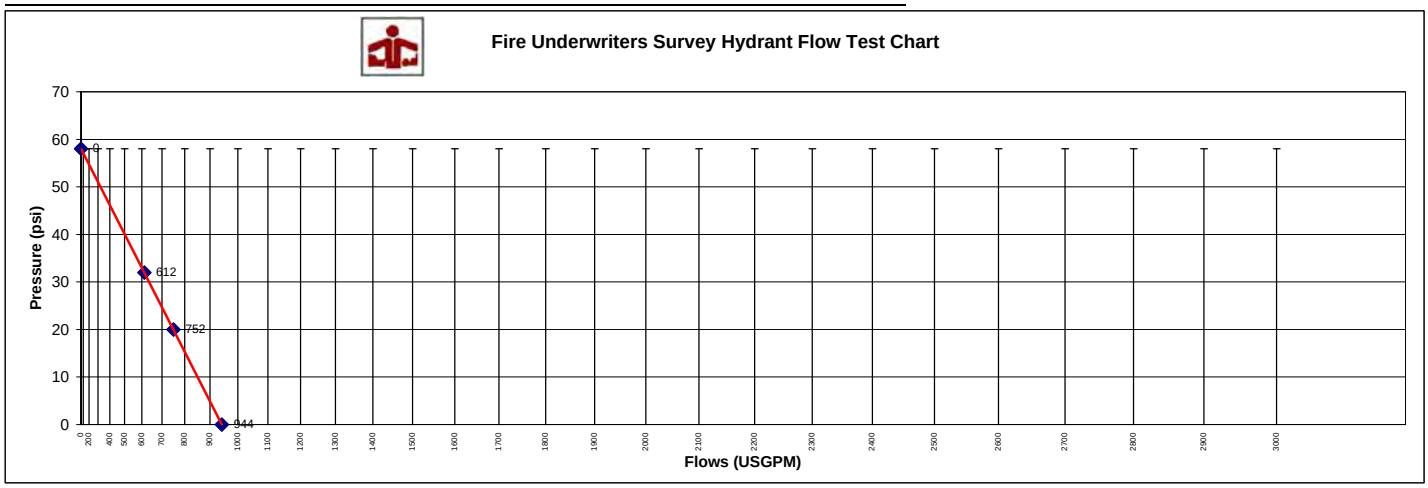
TOTAL FLOW DURING TEST: 612 USGPM / 510 IGPM

STATIC READING: 58 PSI RESIDUAL: 32 PSI

RATED CAPACITY: 752 USGPM AT 0 PSI 944 USGPM

626 IGPM 787 IGPM

REMARKS:



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WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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Available Fire Flow Calculator

Name of Risk:	SFR	Test No.	Flowtest(8)
Municipality:	Black Creek / Oyster River CVRD Water System	Test By:	SS & MK
Purpose of Test:	Fire Inurance Grading	Date:	07-Aug-08

Size of Main: 8" AC Dead End: Two Ways: Loop: Yes

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: 1st hydrant north of reservoir Hwy 19A

Flow: Hwy 19A 7791

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	33		
USGPM:	1061	0	0

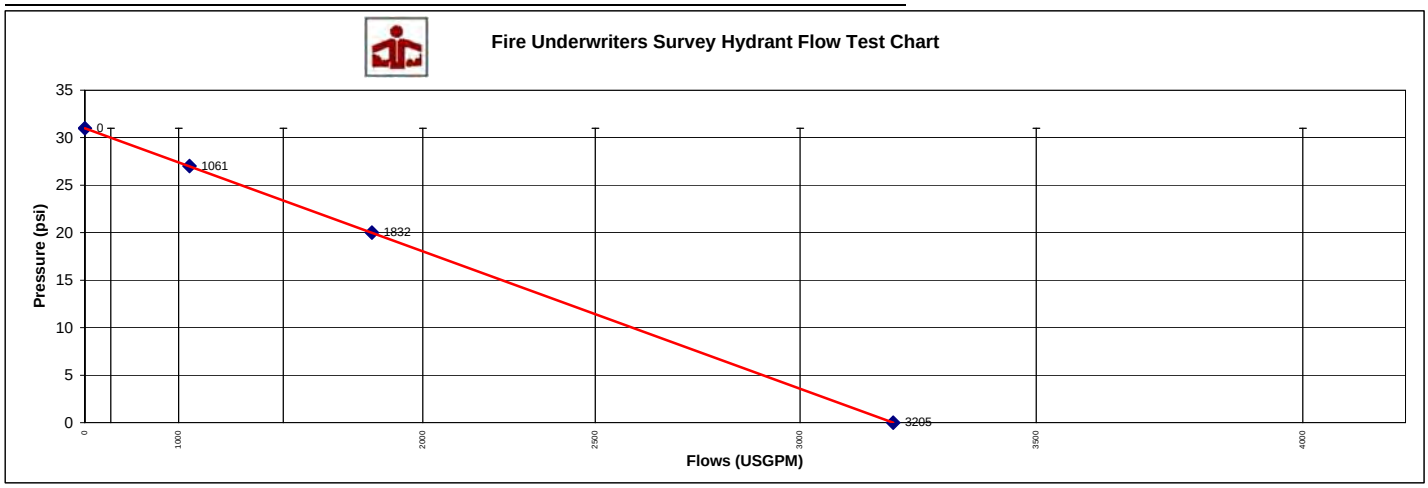
TOTAL FLOW DURING TEST: 1061 USGPM / 884 IGPM

STATIC READING: 31 PSI RESIDUAL: 27 PSI

RATED CAPACITY:	1832 USGPM	AT 0 PSI	3205	USGPM
	1526 IGPM		2670	IGPM

REMARKS:

Warning: Hydrants having a static pressure of less than 40 psi (2.8 bar) should be rated at one-half of the static pressure. NFPA 291 - 4.1.2



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Available Fire Flow Testing – Fanny Bay

WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES

Available Fire Flow Calculator

Name of Risk:	Macs Oysters	Test No.	Flowtest(1)
Municipality:	Fanny Bay Fire Protection Local Service Area	Test By:	MK & SS
Purpose of Test:	Fire Inurance Grading	Date:	08-Aug-08

Size of Main: 6" Dead End: Yes Two Ways: Loop:

Source Reliable: Yes If not explain:

Comments: Right at the very end of the system

TEST DATA:

Location of test hydrants; Residual: Holiday Road

Flow: Hwy 19A across from Mac Oysters

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	10		
GPM:	584	0	0

TOTAL FLOW DURING TEST: 584 USGPM

486 IGPM

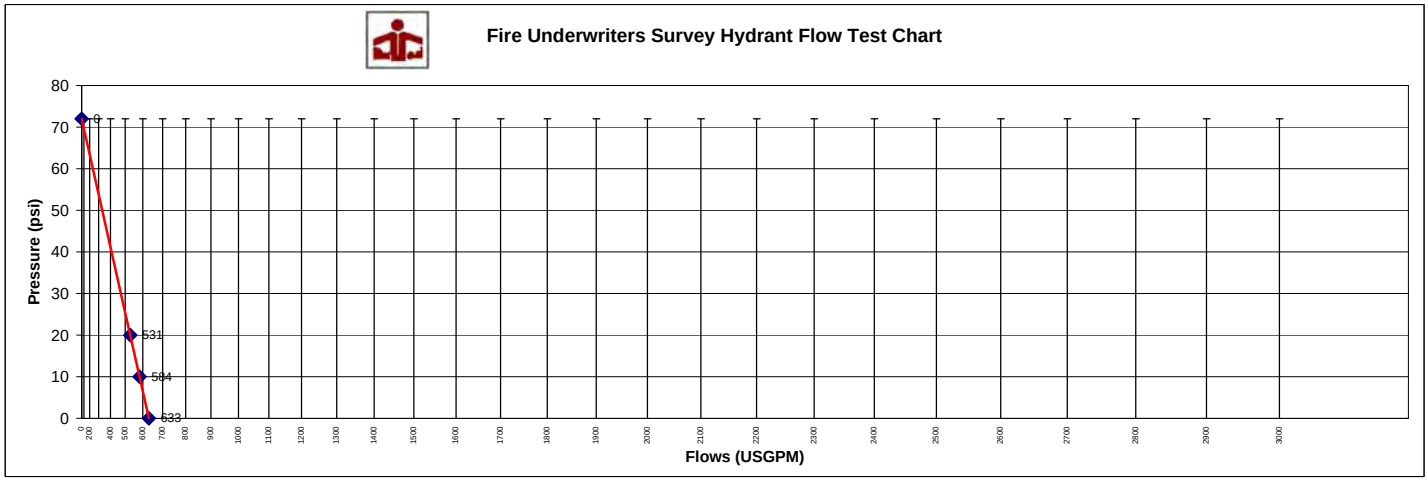
STATIC READING: 72 PSI RESIDUAL: 10 PSI

RATED CAPACITY: 531 USGPM AT 0 PSI 633 GPM

442 IGPM 527 IGPM

REMARKS: It was noted that Mac Oysters has a 2.5 inch line connects to the water system at the end and is in continual use during the day time operations so test could be affected by it constantly drawing water

Warning: A minimum residual pressure of 20 psi should be maintained at hydrants when delivering the fire flow. NFPA 291 - 4.1.3



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	SFR	Test No.	Flowtest(2)
Municipality:	Fanny Bay Fire Protection Local Service Area	Test By:	MK &SS
Purpose of Test:	Fire Inurance Grading	Date:	08-Aug-08

Size of Main: 6" Dead End: Yes Two Ways: Loop:

Source Reliable: If not explain:

Comments: 15 feet above pump

TEST DATA:

Location of test hydrants; Residual: Before Flow on Old Yakes Rd

Flow: End of Old Yakes Rd. 7415

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	30		
USGPM:	1011	0	0

TOTAL FLOW DURING TEST: 1011 USGPM

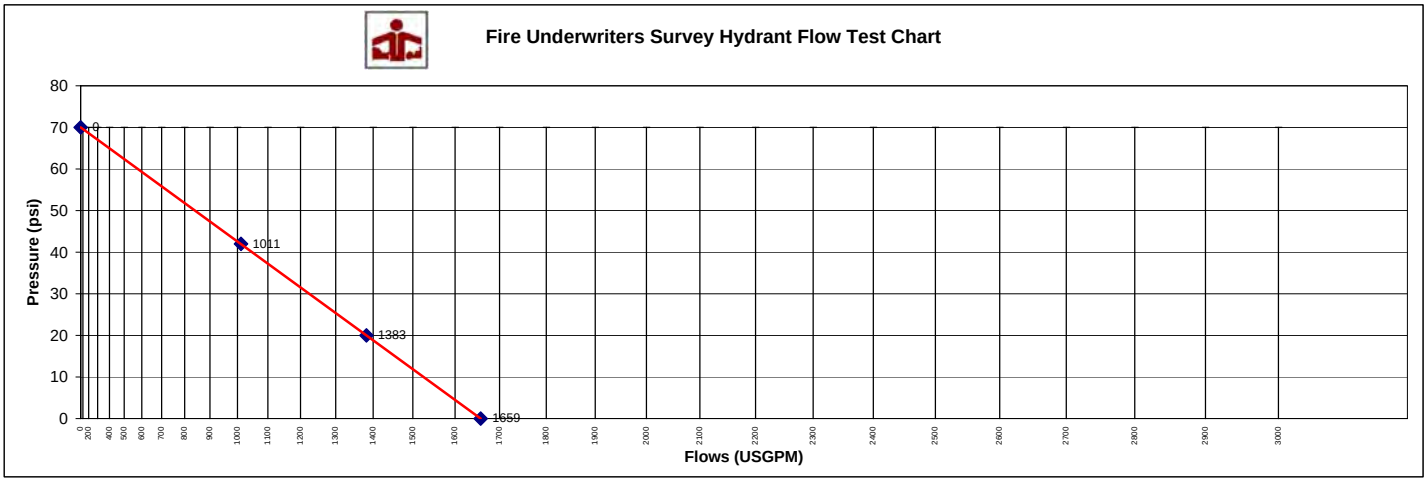
842 IGPM

STATIC READING: 70 PSI RESIDUAL: 42 PSI

RATED CAPACITY: 1383 USGPM AT 0 PSI 1659 USGPM

1152 IGPM 1382 IGPM

REMARKS:



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APPENDIX G Superior Tanker Shuttle Accreditation

Volume

2

FIRE UNDERWRITERS SURVEY

A Service to Insurers and Municipalities

Alternative Water Supplies for Public Fire Protection

AN INFORMATIVE REFERENCE GUIDE FOR USE IN

Fire Insurance Grading

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REVISED
10:54 am, May 11, 2009

Table of Contents

Chapter 1

1.0 General

1.1. Introduction

Fire Underwriters Survey evaluates fire protection service levels and fire risk levels in communities across Canada and publishes the Fire Insurance Grading Index for Personal Lines and Commercial Lines insurers. To provide fire protection, the majority of communities across Canada utilize water as the primary extinguishing agent. In areas without pressurized, municipal-type water supply systems, alternative water supplies are used in fire fighting operations. When developed and executed with a high level of proficiency, systems of shuttling water to and from alternative water supply sources can be as effective as municipal type water supplies, although typically more labour intensive.

1.2. Purpose And Scope

This document is intended to define the terms for fire departments to deliver water supply shuttle services that will be recognized for fire insurance grading purposes.

1.3. How To Use This Document

Chapter 2 provides a summary of the theory and objectives of alternative water supplies, shuttle operations and common problems with service delivery. Chapter 3 summarizes the accreditation protocol. Chapter 4 presents the procedure and the associated form is included in Appendix A. References are provided throughout this document for additional information on specific issues.

1.4. Equivalency

Nothing in this document is intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, and safety in place of those described in this document, provided technical documentation is submitted to the Fire Underwriters Survey to demonstrate equivalency and the system, method, or device is approved for the intended purpose.

1.5. Glossary

Accreditation body: for Superior Tanker Shuttle Service refers to Fire Underwriters Survey™.

Approved: acceptable to the authority having jurisdiction.

Auditor: a Certified Applied Science or Engineering Technologist, Professional Technologist or Professional Engineer carrying appropriate Errors and Omissions insurance who is versed in the provision of water supplies for public fire protection utilizing Alternative Water Supplies and Shuttle methods and who is accepted by the accreditation body as being qualified to conduct Superior Tanker Shuttle Service Tests.

Authority Having Jurisdiction: an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

Certificate of Accreditation: a document issued in accordance with this protocol that is sealed by Fire Underwriters Survey™.

Storey: means that portion of a building situated between the top of any floor and the top of the floor next above it, and if there is no floor above it, that portion between the top of such floor and the ceiling above it.

Alternative Water Supply: water supplies provided where no municipal-type water system exists or to supplement an inadequate municipal-type water supply.

Automatic Aid: a plan developed between two or more fire departments for immediate joint response on first alarms.

Building: any structure used or intended for supporting any occupancy.

Commercial Lines Insurance: a distinction marking property and liability coverage written for business or entrepreneurial interests (includes institutional, industrial, multi-family residential and all buildings other than detached dwellings that are designated single family residential or duplex) as opposed to Personal Lines.

Dry Hydrant: an arrangement of pipe(s) permanently connected to a water source other than a piped, pressurized water supply system that provides a ready means of water supply for fire-fighting purposes and that utilizes the drafting (suction) capability of a fire department pump. To be recognized for fire insurance grading purposes, a dry hydrant must be designed and maintained in accordance with NFPA 1142, Chapter 8.

Dwelling: any building that contains not more than one or two dwelling units intended to be used, rented, leased, let, or hired out to be occupied or that are occupied for habitation purposes.

Dwelling Unit: one or more rooms arranged for the use of one or more individuals living together, providing complete, independent living facilities, including permanent provisions for living, sleeping, eating, cooking, and sanitation.

Dwelling Protection Grade (DPG): the fire insurance grade or grades utilized by Personal Lines Insurers in Canada. The DPG is a number between 1 and 5 that is calculated by comparing the fire risk in terms of require fire flows to available resources. Unlike the PFPC system, within the DPG system, the benchmark required fire flow is a constant, and is typical for a Detached Dwelling. The DPG for communities across Canada is determined from a basic survey of the available resources related to fire risk reduction and fire protection capacity.

Exposure Hazard: a structure within 15.24 m (50 ft) of another building and 9.3 m^2 (100 ft^2) or larger in area.

Fire Department (Public): a legally formed organization providing rescue, fire suppression, emergency medical services, and related activities to the public.

Large Diameter Hose: a hose of 90 mm (3 in.) size or larger.

Lift: the vertical height that water must be raised during a drafting operation, measured from the surface of a static source of water to the centerline of the pump intake.

Minimum Water Supply: the quantity of water required for fire control and extinguishment.

Mobile Water Supply Apparatus (Tanker, Tender): a vehicle designed primarily for the safe and effective pickup, transport, and delivery of water to fire emergency scenes where other apparatus or pumping equipment provide tactical fire stream application.

Municipal-Type Water System: a system having water pipes serving hydrants and designed to furnish, over and above domestic consumption (maximum day consumption), a minimum flow of 1200 L/min (265 Igpm or 320 USgpm) at 139 kPa (20 psi) residual pressure for a 1.5-hour duration.

Mutual Aid Agreement: a pre-arranged agreement developed between two or more entities to render assistance to the parties of the agreement.

Personal Lines Insurance: insurance covering the liability and property damage exposures of private individuals and their households as opposed to Commercial Lines. Typically includes all detached dwellings that are designated single family residential or duplex.

Public Fire Protection Classification (PFPC): the fire insurance grade or grades utilized by Commercial Lines Insurers in Canada. The PFPC is a number between 1 and 10 that is calculated by comparing the fire risk in terms of require fire flows to available resources. The PFPC for communities across Canada is determined from an extensive survey and analysis of the fire risk in the built environment and the available resources related to fire risk reduction and fire protection capacity.

Required Fire Flow. The rate of water flow, at a residual pressure of 20 psi (138 kPa) and for a specified duration, that is necessary to confine and control a major fire in a specific building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure. This may include as much as a city block.

Rural: those areas that are not unsettled wilderness or uninhabitable territory but are sparsely populated with densities below 200 persons per square km.

Structure: that which is built or constructed; an edifice or building of any kind.

Suburb or Suburban: those moderately inhabited areas with population densities of at least 200 persons per square kilometre but less than 400 persons per square kilometre.

Water Delivery Rate: the minimum amount of water per minute (in L/min, Igpm or USgpm), required by this standard or the AHJ, to be delivered to the fire scene via mobile water supply apparatus, hose lines, or a combination of both.

Water Supply Officer (WSO): The fire department officer or designee responsible for providing water for fire-fighting purposes.

Chapter 2

2.0 Background on Alternative Water Supplies

Water supplies are known to be an effective extinguishing agent, but what can be done if there is no hydrant system?

Alternative water supplies include water supplies other than those that are defined as pressurized, municipal-type water supply systems. Generally speaking fire fighting operations are dependent on water and/or other extinguishing agents to succeed. In developed areas, water supplies (if designed for fire protection) are provided through a network of distribution pipes, storage and pumping facilities. The entire arrangement should be designed to provide adequate water supplies for domestic demand (at the Maximum Daily Rate) simultaneously with Fire Flow Demand.

In areas without municipal-type water supplies, fire fighting presents a significantly greater challenge. Historically various methods have been utilized including the bucket line to deliver water from some source location to the fireground. Generally speaking these types of water supplies were not effective with respect to reducing property damage.

Since the advent of automotive fire apparatus, the capacity to move water from a source location to the fire ground has improved dramatically. The fundamental steps in a shuttle operation are as follows:

- set up pumper apparatus at fire event and deliver water from temporary water storage location (pool) through fire pump to fire;
- draft water (from a location where water supplies are known to be reliable and accessible) into a mobile water supply apparatus

- move water from source location to fire event using mobile water supply apparatus

- dump water into temporary storage facility (ex. portable tank) at fire event location.

Levels of Service

An infinite number of levels of service are available and the level of service provided to the community should be one that the fire department is equipped, trained and prepared to provide.

It is important that property owners and insurers realize that providing water supplies for fire protection utilizing shuttle operations requires specialized equipment training and practice to shuttle water safely and reliably.

From the perspective of the insurance industry, there are three important levels of shuttle service

2.1. Unrecognized Shuttle Service

If the level of shuttle service provided by a community does not meet the minimum benchmarks set out in NFPA 1142, then the level of service will not be recognized for fire insurance grading purposes.

2.2. Standard Tanker Shuttle Service (non-accredited)

To be recognized, for Standard Tanker Shuttle Service, the fire department must have adequate equipment, training and continuous access to approved alternative water supplies to deliver standard tanker shuttle service in accordance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. A formal plan for use of alternative water supplies must be in place and available for review detailing the alternative water supply sources and characteristics. To be credited, fire department access to alternative water supplies must be 24 hours per day and 365 days per year. Refill capacity from alternative water supplies using drafting techniques requires a pump that has a minimum capacity of 450 LPM (100 Igpm) at 275-415 kPa (40-60 psi).

2.3. Accredited Superior Tanker Shuttle Service

To be recognized for Accredited Superior Tanker Shuttle Service, the system of delivery of water supplies must be well-designed and well-documented. The system of delivery must meet all of the requirements specified for Standard Tanker Shuttle Service and must exceed the requirements in several key areas:

2.3.1 The fire department must be able to prove through testing that the specified requirements of Superior Tanker Shuttle Service can be met.

2.3.2 The fire department must be able to deliver a flow rate of not less than 1200 LPM (265 IGPM) within 2 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).

2.3.3 The fire department must be able to deliver the flow rate which will be accredited within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).

2.3.4 The volume of water available for fire fighting must be adequate to sustain the accredited flow rate for a duration in accordance with the Fire Underwriters Survey Water Supplies for Public Fire Protection.

2.4. Further Notes

2.4.1 To be recognized for fire insurance grading purposes, the water-delivery system must be available AND accessible 24 hours per day and 365 days per year;

2.4.2 To be recognized for fire insurance grading purposes, the water capacity of alternative water supply sources must be documented for a 50-year drought cycle and documentation must be available for review

2.4.3 Fire Underwriters Survey treats dry hydrants with suction points in the same way as it treats standard (pressurized) fire hydrants. Any property within 300 metres of a dry hydrant may be eligible for a Dwelling Protection Grade better than 3B, provided the building is within eight kilometres by road of a responding fire station, the fire department is recognized as meeting the criteria for a Dwelling Protection Grade of 3A or better and the fire department has adequate apparatus to effectively utilize the dry hydrant through suction.

2.4.4 Fire Underwriters Survey may extend credit beyond 300 metres of a fire hydrant when the company uses large-diameter hose, if the fire department can demonstrate a standard procedure for deployment of hose and also establish a relay operation.

Common Problems

Like all emergency services, many factors contribute to fire protection service levels being inconsistent regardless of the checks and balances that are in place. Such factors include (but are not limited to):

- response distances and associated times

- response delays (road conditions, traffic, weather)
- turn out times of responders (particularly those that are not on-duty)

Introducing mobile water supply apparatus to the fire protection equation increases the probability of issues resulting from mechanical problems and apparatus travel problems due to the increased amount of apparatus travel associated with shuttle service. Any significant mechanical issue or road delay may result in interruption in water supplies to a fire event.

2.5. Underlying Fire Protection Science

The underlying basis of the model for Superior Tanker Shuttle Service Accreditation is scientifically based on peer-reviewed research, literature, international standards and fire loss experience.

The basic theory is that as time progresses, the losses resulting from a structure fire become worse and worse. It is common for the fire protection engineering community to utilize fire propagation curves to demonstrate how losses increase in relation to time. Typically, at some point between 4 minutes and 10 minutes on a fire propagation curve, flashover occurs. The property losses associated with a fire increase at a more rapid rate after flash over occurs and as such, it is desirable to intervene prior to flash over.

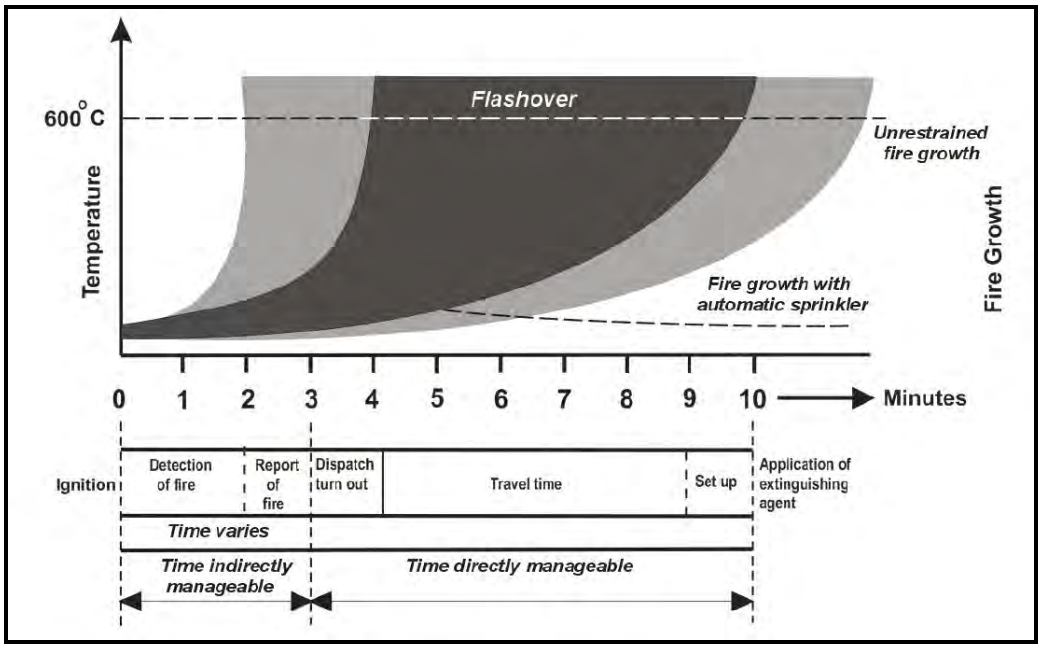

Figure 2.5-1 Example Fire Propagation Curve

The length of time a fire takes to reach the flash over state varies depending on many factors including the combustibility of the building, its contents and the ventilation of the area. As such, there is no single model of fire protection that is appropriate for all situations, however it is reasonable to state that a primary goal of public fire protection is to intervene prior to flash over.

The earlier that intervention occurs, the less resources are typically required to provide a reasonable level of response.

The underlying theory of the Accredited Superior Tanker Shuttle Service is based on the following conditions/assumptions:

- Response is timely
    - *Emergency communications system in place and effective(dispatch time efficient)*
    - *Turn out time reasonable (auxiliary and on-duty) fire fighters respond from reasonable distance*
    - *Response is from within a reasonable travel distance (less than 8 km by road)*
- Fire force is adequate

If these underlying conditions/assumptions are true and response is timely and the fire force is adequate, then it can be reasonably demonstrated that equivalent resources are available for fire fighting to fire departments with access to pressurized, municipal-type water supply systems.

It is important to state that there are many variables in structural fires and regardless of methods utilized, fire fighting operations are not always successful. The success or failure of fire fighting operations is influenced by many factors related to experience, operation, deployment, equipment and other such factors.

Conclusion

While it is up to individual insurers to determine their own level of comfort with recognizing or not recognizing the Fire Underwriters Survey Accredited Superior Tanker Shuttle Service, FUS recommends that accredited services be recognized as providing a reasonable equivalency to hydrant protection. Due to the need for specialized equipment, training and practice to deliver the service, it is imperative that Superior Tanker Shuttle Service be accredited according to a recognizable standard and that re-accreditations occur at a reasonable frequency.

Chapter 3

3.0 Accreditation Protocol

The system for accrediting alternative water supplies for public fire protection

Preamble

This protocol details the establishment and administration of an accreditation program for agencies that deliver fire protection services in areas where municipal-type pressurized water supply systems do not exist.

Accreditation will be granted by Fire Underwriters Survey™ to a public Fire Department that has documented and implemented a water shuttle system that meets the applicable requirements of the Superior Tanker Shuttle Service Standard for Fire Insurance Grading. Conformity with the requirements specified in this document will be assessed on an ongoing basis using Certified Engineering Technologists, Certified Applied Science Technologists, Professional Technologists or Professional Engineers.

Accreditation Process

3.1. Application for Accreditation Services

3.1.1 The accreditation body will prepare an accreditation program handbook that details the accreditation program including rules of accreditation and appeal procedures. The handbook will include the forms necessary for an applicant to apply for accreditation. A copy of the handbook is to be provided to a potential applicant upon written request.

3.1.2 The accreditation body will not process an application for accreditation unless the application includes, as appropriate, completed application forms, Fire Department endorsed operational plans for the water supply shuttle system for which accreditation is sought, and all required fees.

3.1.3 The accreditation body will inform an applicant in writing of any deficiencies in an accreditation application.

3.2. Accreditation Process – General

3.2.1 The accreditation body will use the following process to consider an application for the accreditation of a Fire Department.

3.2.2 Each application for accreditation will be assigned to an auditor who will review the application in accordance with the applicable accreditation processes set out in this protocol.

3.2.3 When assigning auditors, the accreditation body will assign auditors who are not in a conflict of interest, who have experience with applications of similar complexity, and with a view towards minimizing travel costs.

3.2.4 Application for accreditations will be considered for accreditation from external auditors who are not representatives of Fire Underwriters Survey conditionally when:

(a) auditors have appropriate credentials (AScT, P.Tech or P.Eng) and carry Errors and Omission insurance;

(b) auditors can demonstrate comprehensive knowledge of the process of delivery of water supplies for fire protection through shuttle methods;

(c) all appropriate documentation of process and testing as detailed in this protocol is provided to the accreditation body for review; AND

(d) documentation of test results bearing the professional seal of the approved auditor and all relevant details of test are provided to the accrediting body for review.

3.3. Accreditation Process – Standard

3.3.1 The accreditation body will use the following process to consider a standard application for a Superior Tanker Shuttle Accreditation made directly to Fire Underwriters Survey.

3.3.2 The accreditation body will require that applicable forms, maps and documentation of practise test results be submitted, reviewed and accepted prior to scheduling the on-site test.

3.3.3 The accreditation body will require the applicant to provide written confirmation that adequate resources will be in place to respond to emergency calls such that emergency services provided by the fire department are not adversely affected during the on-site test.

3.3.4 If the requirements of sections 2.3.2 and 2.3.3 are met to the satisfaction of the accreditation body, a Superior Tanker Shuttle Service test will be scheduled at a time that is agreed upon with the Fire Department.

3.3.5 If the fire department successfully meets all of the requirements of the on-site test, a Certificate of Accreditation will be issued.

3.4. Accreditation Process – Evidence Based Application

3.4.1 The accreditation body will use the following process to consider an Evidence Based Application for a Superior Tanker Shuttle Accreditation made directly to Fire Underwriters Survey.

3.4.2 The accreditation body will require that applicable forms, maps and documentation of practise test results be submitted, reviewed and accepted prior to scheduling the on-site test.

3.4.3 The accreditation body will require that comprehensive records of actual responses to structure fires wherein shuttle methods and alternative water supplies were utilized to suppress and extinguish fire with successful reduction in property losses and/or exposure protection. All records must be signed as being accurate and true by the responsible official (Fire Chief).

3.4.4 If the requirements of sections 2.3, 2.4 and 3.4 are met to the satisfaction of the accreditation body, a Certificate of Accreditation will be issued.

3.5. Accreditation Process – External Auditor

3.5.1 The accreditation body will use the following process to consider an External Auditor Application for a Superior Tanker Shuttle Accreditation.

3.5.2 The accreditation body will require that applicable forms, maps and documentation of practice test results be submitted, reviewed and accepted.

3.5.3 The accreditation body will require that test results be sealed by a Certified Applied Science or Engineering Technologist, Professional Technologist or Professional Engineer.

3.5.4 If the requirements of sections of sections 2.3, 2.4 and 3.5 are met to the satisfaction of the accreditation body, a Certificate of Accreditation will be issued.

3.6. Certificate of Accreditation Procedure

3.6.1 Where this protocol requires that the certificate of accreditation procedure be conducted, the procedure in this section will be followed.

3.6.2 The accreditation body will issue a Certificate of Accreditation to the applicant, for the appropriate accreditation level, subject to the accredited Fire Department agreeing to continuously maintain and practice Superior Tanker Shuttle Service and be capable of delivering this service at all times.

3.7. Reports by Auditor

3.7.1 Notice of Non-compliance

3.7.1.1. The accreditation process developed by the accreditation body shall contain the necessary procedures to ensure compliance with this protocol and NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, 2007 Edition, Chapters 7 and 8. Where the applying Fire Department is found to be non-complying, written notice will be provided to the Fire Department detailing the non-compliance item and relevant article of reference.

3.8. Notification

3.8.1 Accreditation Test Reports

3.8.1.1. Within 30 days of any accreditation test conducted by a Fire Underwriters Survey auditor, the accreditation body will provide an electronic copy of the accreditation test results, to the applicant Fire Department.

3.8.1.2. Within 60 days of any passed accreditation test conducted by a Fire Underwriters Survey auditor, the accreditation body will make available to the insurance community the results of the accreditation test through submission to the online fire insurance grading index.

3.8.1.3. Within 60 days of receiving complete documentation and results of any passed accreditation test conducted by an external auditor, the accreditation body will make available to the insurance community the results of the accreditation test through submission to the online fire insurance grading index.

3.8.1.4. Within 90 days of receiving complete evidence documentation of the capacity to deliver Superior Tanker Shuttle Service, the accreditation body will make available to the insurance community the results of the accreditation review through submission to the online fire insurance grading index.

3.9. Insurance Industry Notification

3.9.1 The accreditation body will maintain a registry, sorted by Fire Department that contains the following information:

(e) the name of the Fire Department;

(f) the number, type, and age of apparatus owned and utilized in the delivery of Superior Tanker Shuttle Service;

(g) the number, type, and age of Automatic Aid apparatus utilized in the delivery of Superior Tanker Shuttle Service;

(h) the accredited water flow capacity of the Superior Tanker Shuttle Service accreditation;

(i) the applicable accreditation certificate number and date for each accreditation;

(j) any decisions related to the revocation or suspension of an accreditation;

(k) any audit results made available to the insurance community in accordance with section 3.8; and

(l) any other information required to be provided to the public in accordance with this protocol.

3.9.2 The information required to be maintained in accordance with section 3.9 shall be made available on a secure website[1] on the Internet and shall be kept current.

3.10. Audit Cycle

3.10.1 Periodic Audits

3.10.1.1. The accreditation body will audit the Superior Tanker Shuttle Service capacity of a Fire Department with a Certificate of Accreditation, in accordance with the following schedule:

(a) in the second year following the year in which the certificate was issued and every other year thereafter, the accreditation body will undertake a surveillance audit in accordance with the surveillance audit procedure of this protocol; and

(b) in the fifth year following the year in which the certificate was issued and every fifth year thereafter, the accreditation body will undertake a re-accreditation audit in accordance with the re-accreditation audit procedure of this protocol.

[1] The secure website required for the hosting of the registry of information related to Superior Tanker Shuttle Service must be accessible to insurers who participate in funding the Fire Underwriters Survey program and the Fire Insurance Grading Index.

3.11. Surveillance Audit Procedure

3.11.1 Where this protocol requires that the surveillance audit procedure be conducted, the procedure in this section will be followed.

3.11.2 An auditor will remotely collect information and evaluate the ongoing capacity of the fire department to deliver Superior Tanker Shuttle Service. The remote audit will include consideration of the results of the most recent on-site test undertaken in accordance with this protocol and the following:

(a) the documentation of all shuttle operation practices (frequency and results);

(b) the documentation of historical responses where shuttle operations were used in structural fire fighting and the relevant outcomes of such events;

(c) the documentation of apparatus maintenance and replacement programs including specifications of any newly acquired apparatus that will be used in shuttle service;

(d) the documentation of water license agreements and arrangements and any changes to access to water supplies (municipal-type and alternative) that would affect the capacity to deliver shuttle service; and

(e) any changes to the capacity to deliver shuttle service including roster strength (fire fighters), training of fire fighters (and drivers), emergency response points and boundaries.

3.11.3 The auditor will prepare a brief report detailing significant changes and providing a recommendation on whether the accreditation of the Fire Department should be continued, suspended, or revoked.

3.11.4 The accreditation body will review the surveillance report prepared by the auditor.

3.11.5 At any time during the course of the audit, an auditor may request further information from the Fire Department; or, with the permission of the accreditation body and after appropriate notice is given to the appropriate parties (Fire Department, Water Purveyor, etc.), an auditor may attend at the subject location to verify information for the purposes of the audit.

3.12. Re-Accreditation Audit Procedure

3.12.1 Where this protocol requires that the re-accreditation audit procedure be conducted, the procedure in this section will be followed.

3.12.2 An auditor will conduct a standard audit in accordance with the standard audit procedure of this protocol as it applies to an application for accreditation. The audit will also include consideration of the results of the most recent audit undertaken in accordance with this protocol and any of the following that have occurred subsequent to that audit:

(a) the documentation of all shuttle operation practices (frequency and results);

(b) the documentation of historical responses where shuttle operations were used in structural fire fighting and the relevant outcomes of such events;

(c) the documentation of apparatus maintenance and replacement programs including specifications of any newly acquired apparatus that will be used in shuttle service;

(d) the documentation of water license agreements and arrangements and any changes to access to water supplies (municipal-type and alternative) that would affect the capacity to deliver shuttle service; and

(e) any changes to the capacity to deliver shuttle service including roster strength (fire fighters), training of fire fighters (and drivers), emergency response points and boundaries.

3.12.3 If a major non-conformity is identified during the standard audit, the auditor will prepare a brief report detailing all major and minor non-conformities.

3.12.4 The accreditation body will review the audit results prepared by the auditor.

3.13. Suspension and Revocation of Accreditation

3.13.1 Grounds for Suspension

3.13.1.1. The accreditation body may suspend a Fire Department's accreditation where:

(a) suspension is recommended by an auditor;

(b) corrective action requests are not addressed to the satisfaction of the accreditation body;

(c) any fees owed by the Fire Department to the accreditation body have not been paid in full;

(d) a condition of accreditation is not fulfilled;

(e) a Fire Department prevents or obstructs an auditor from conducting or completing an audit; or

(f) a Fire Department is determined to be incapable in whole or in part of continuously delivering the minimum level of service required to be accredited.

3.14. Suspension Process

3.14.1 The following process will apply to the suspension of the accreditation of a Fire Department:

3.14.1.1. The accreditation body will provide notice of the proposed suspension to the accredited Fire Department. The notice will include reasons for the proposed suspension and will indicate that any submissions from the Fire Department will be considered if provided within 30 days of the date of the notice. The notice will also indicate that, if an accreditation is suspended, a failure to remedy the reasons underlying the suspension within 30 days will result in the automatic revocation of the accreditation.

3.14.1.2. The accreditation body, after considering any submissions made by the accredited Fire Department, will provide its decision to the Fire Department on the suspension of accreditation within 15 days of the receipt of any submissions from the Fire Department.

3.14.1.3. If a decision issued by the accreditation body under subsection 3.14.1.2 suspends an accreditation, the decision will also indicate that a failure to remedy the reasons underlying the suspension within 30 days will result in the automatic revocation of the accreditation.

3.14.2 The notice required by subsection 3.14.1.1; any decision made in accordance with subsection 3.14.1.2; and any decision by the accreditation body to reinstate a suspended accreditation in accordance with section 3.17 will be provided to the accredited Fire Department in writing and published to the online Fire Insurance Grading Index.

3.14.3 In addition to the notification requirements in subsection 3.14.2, if the accreditation body suspends the accreditation of a Fire Department, the accreditation body shall immediately notify the Fire Department by telephone.

3.15. Automatic Revocation Process

3.15.1 If a decision issued by the accreditation body under subsection 3.13.1.1 (b) suspends an accreditation, and the Fire Department has not addressed the reasons underlying the suspension within 30 days of the date of the decision to the satisfaction of the accreditation body, the accreditation body will revoke the Fire Department's accreditation.

3.15.2 If a Fire Department's accreditation is revoked in accordance with section 3.15.1 a written notice of revocation will be provided to the Fire Department and copied to the online Fire Insurance Grading Index.

3.16. Appeals and Appeal Process

3.16.1 Decisions Subject to Appeal

3.16.1.1. The accreditation body will establish a two-level appeal process and related procedures and rules consistent with the requirements of this protocol that allows an appeal, by a Fire Department, of a decision by the accreditation body to:

(a) suspend an accreditation;

(b) revoke an accreditation;

(c) not grant an accreditation; or

(d) suspend an accreditation process.

3.16.1.2. The appeal process will be operated in accordance with the following:

(a) all appeals will be conducted in writing;

(b) the adjudicator for the first and second level appeals will be the accreditation body and the management committee, respectively;

(c) to initiate a first level appeal, a notice of appeal summarizing the reasons for the appeal and evidence supporting the reasons must be delivered to the accreditation body within 15 days of the decision being appealed from;

(d) all decisions on a first level appeal will be made in writing and within 30 days of the receipt of a notice of appeal;

(e) to initiate a second level appeal, a notice of appeal summarizing the reasons for the appeal and evidence supporting the reasons must be delivered to the management committee within 15 days of the decision being appealed from; and

(f) all decisions on a second level appeal will be made in writing and within 15 days of the receipt of a notice of appeal.

3.16.1.3. All written decisions made in accordance with section 3.16.1 will be provided to the following persons or entities:

(a) the Fire Department;

(b) the accreditation body or management committee, as appropriate;

(c) the online Fire Insurance Grading Index (though promulgation); and

(d) the national Director of Fire Underwriters Survey.

3.17. Reinstatement of Accreditation under Suspension

3.17.1 Removal of suspension

3.17.1.1. The accreditation body may remove a suspension of an accreditation where the reasons for the suspension have been addressed to the satisfaction of the accreditation body.

Chapter 4

4.0 Accreditation Test Procedure

The standardized procedure for evaluating the capacity to deliver Superior Tanker Shuttle Service

Preamble

This procedure details the procedure for Auditors to conduct Superior Tanker Shuttle Service Tests for agencies that deliver fire protection services in areas where municipal-type pressurized water supply systems do not exist.

Accreditation will be granted by Fire Underwriters Survey™ to a public Fire Department that has documented and implemented a water shuttle system that meets the applicable requirements of the Superior Tanker Shuttle Service Test as detailed in this procedure.

Accreditation Test Procedure

4.1. Applicable Rules of Accreditation test

4.1.1 Superior Tanker Shuttle Service (Superior Tanker Shuttle Service) accreditation districts are limited to

(a) 5 km road distance of the tested Fire Station for properties insured under Commercial Lines, or

(b) 8 km road distance of the tested Fire Station for properties insured under Personal Lines.

4.1.2 An adequate number of Superior Tanker Shuttle Service accreditation tests must be provided for single-family districts and for commercial districts to clearly demonstrate the capacity of the service to be delivered to all areas which will be

accredited. The number of requisite tests and test sites will be determined by the auditor.

4.1.3 Within 2 minutes of arrival (wheel stop) to the test site of the first major piece of apparatus, the department must produce a minimum of 1200 LPM (265 Igpm), and must sustain this minimum flow rate for the test duration.

4.1.4 The minimum test duration will be 90 minutes.

4.1.5 The fire department must be able to deliver the flow rate which will be accredited (if greater than the previously mentioned minimum flow rate) within 10 minutes of arriving at the test site with the first major piece of apparatus (wheel stop).

4.1.6 The volume of water available for fire fighting must be adequate to sustain the accredited flow rate for a duration in accordance with the Fire Underwriters Survey Water Supplies for Public Fire Protection specified fire durations correlating to required fire flows.

4.1.7 Automatic Aid apparatus and companies may be utilized if the shuttle service system is documented in formal agreements and Standard Operating Guidelines for all participating departments.

4.1.8 The water supply for fire fighting (including the test) must come from a source that is available and accessible year round (24 hours per day, 365 days per year). In addition, the supply source must be conveyed through fire hydrant or adequately designed dry hydrant connection. The supply source must be capable of supplying a minimum of 109,000 L (24,000 Imp. gal.). Multiple sources may be utilized.

4.1.9 Roads, lanes and right of ways providing access to alternative water supplies must be continuously maintained and documentation of maintenance programs must be available for review by the auditor.

4.1.10 Sufficient apparatus and fire fighters must be available to provide response to the service area in the event of a fire call during the Superior Tanker Shuttle Service Test.

4.1.11 The selected test site(s) must be located remotely from fire stations and be representative of areas where travel distances to alternative water supply refill points may be comparatively long (ex. 90^{th} percentile). The test site(s) must be agreeable to both the fire department and the auditor. The test site must be a minimum of five kilometres from all water refill points and within eight kilometres of a fire station.

4.1.12 Water from the Pumper at the test site must be supplied to a deluge gun with appropriate smooth bore stacked tips to allow for measurement with a pitot gauge.

4.2. Pre-Test Set up

4.2.1 Ensure that forms Alternate Water Supply Form (WS5) and Appendix A – Additional Information Form (WS6) are completed in full or as applicable. Ensure that Discharge-Time sheets and Fill-time sheets are completed for each tanker listed in section "Available Apparatus for Alternative Water-Supply Operations" (these can be found in WS5).

4.2.2 Ensure that all applicable information and exhibits specified in the WS5 form, (parts B – I), has been provided and reviewed by auditor.

4.2.3 The auditor will evaluate the information requested in sentences 4.2.1 and 4.2.2, as well as fire apparatus, test equipment, test site, water refill site, automatic aid agreements and test procedures; to ensure compliance with this procedure and all relevant standards and specifications are met.

4.2.4 Through evaluating the forms and exhibits provided, the auditor will use judgment to ensure that the Fire Department is capable of safely arranging and carrying out tanker shuttle service without adversely affecting fire protection capacity to the community being tested or to other communities involved in the test procedure.

4.2.5 The Fire Department being tested will have a maximum of 3 attempts to successfully achieve the minimum flow rates:

(a) within 2 minutes of the first major apparatus arriving on scene (wheel stop), a minimum 1200 LPM (265 Igpm) flow rate must be achieved, and

(b) within 10 minutes of the first major apparatus arriving on scene (wheel stop), the accredited flow rate must be achieved (if this amount is greater than the previously specified minimum).

4.2.5.1. If the test does not succeed on the first, second or third attempts, then the test fails.

4.2.5.2. If the rate of flow drops below 1200 LPM (265 Igpm) for longer than 30 seconds or no water is being flowed, the test attempt will be a failure. A subsequent attempt is allowed within 30 minutes The failed test will end and will be restarted from the very beginning of the test. (see Additional notes). A maximum of three attempts will be completed per accreditation visit.

4.2.5.3. If three successive Superior Tanker Shuttle Tests fail, then accreditation will not be granted. Re-application may be made after a period of at least 12 months.

4.2.5.4. Superior Tanker Shuttle Tests that are interrupted are considered non-tests are not counted toward the number of successive tests.

4.3. Layout of Test

4.3.1 Tests should be made during a period of ordinary water supply demand.

4.3.2 An appropriately remote site for flowing water should be selected that is representative of the 90th percentile with respect to travel distances and response challenges. Consideration should be given to remoteness from both water supply points and fire halls.

4.3.3 Once the test site has been selected, due consideration should be given to potential interference with traffic flow patterns, damage to surroundings (e.g., roadways, sidewalks, landscapes, vehicles, and pedestrians), and potential flooding problems both local and remote from the test site.

4.3.4 The test should conform to one of the following scenarios. The set-up for the test should be discussed with the fire department to determine the appropriate scenario with respect to the fire department protocols.

(c) Fire Suppression Apparatus is situated at the test site. Mobile Water Supply Apparatus start at a designated distance from the test site, representative of actual conditions that would be expected during a fire event.

(d) Fire Suppression and Mobile Water Supply Apparatus are in motion from a designated distance from the test site, representative of actual conditions that would be expected during a fire event.

4.3.5 Necessary equipment for the test:

- Stop watch (or other accurate timing device)
- Flow testing equipment (handheld pitot device or pitot device that attaches to deluge gun)
- Relevant pressure gauges. (All pressure gauges should be calibrated at least every 12 months, or more frequently depending on use).

4.3.6 To simulate tests accordingly, fire department personnel are required to wear personal protective clothing. The minimum Personal Protective Clothing (PPC) that should be worn during the test includes trousers, protective boots, jacket, and helmet.

4.3.7 To be credited, personnel participating in the test must arrive on either Fire Suppression Apparatus or Mobile Water Supply Apparatus.

Exceptions may be considered where the fire department has an established alternate protocol with supporting SOG/SOP for transporting fire fighters to fire events.

4.3.8 No equipment is allowed to be situated at the test site prior to testing. All necessary equipment should be carried on appropriate apparatus to the test site as it should be treated like any other structural fire situation.

Exception: Auditor equipment should be attached prior to the test (ex. pitot tube with gauge if appropriate). Doing so before the test ensures no interference will come from the auditor during the test.

4.3.9 A minimum of one auditor will conduct the Superior Tanker Shuttle Service test(s); however, two auditors are ideal. If only one is present, the representative/auditor may optionally have fire department personnel to assists in recording results.

4.4. Test Procedure

4.4.1 Two conditions must be met in order to pass the Superior Tanker Shuttle Service accreditation test:

- within 2 minutes of arrival to the test site (representing a fire site) of the first major piece of apparatus, the department must produce a minimum of 1200 LPM (265 Igpm); and
- the department must sustain this minimum flow rate for the test duration (minimum 90 minutes).
- Note: If a higher flow rate than the minimum will be accredited, then this flow rate must be achieved within 10 minutes of arrival of first major piece of apparatus; and
- the department must sustain this minimum flow rate for the appropriate test duration from the Fire Underwriters Survey water Supply for Public Fire Protection durations for required fire flows

4.4.2 Before testing, ensure that as much relevant information as possible has been completed on the WS5 Alternative water Supplies form.

4.4.3 Using the Hazen-Williams formula, calculate the pitot reading and pressure required to achieve the desired flow rate (to be accredited), which is shown as Q and must be not less than 1200 LPM (265 Igpm):

$$Q = 0.0666cd^2\sqrt{p}$$

Where:
Q= Flow (LPM)
c = coefficient of discharge
d = diameter of the outlet (mm)
p = pitot pressure in (kPa)

Or (as appropriate for US or Imperial units)

$$Q = 29.83cd^2\sqrt{p}$$

Where:
Q= Flow (USgpm)
c = coefficient of discharge
d = diameter of the outlet (inches)
p = pitot pressure in (psi)

$$Q = 24.84cd^2\sqrt{p}$$

Where:
Q= Flow (Igpm)
c = coefficient of discharge
d = diameter of the outlet (inches)
p = pitot pressure in (psi)

4.4.4 Start timing based on the chosen scenario for the test as described in 4.3.4.

4.4.5 Flow rates for the corresponding pitot pressures should be prepared in advance such that the appropriate pitot readings and corresponding flow rates for the orifice being used are known. In this way, the auditor may continuously monitor for the minimum flow rate being supplied.

Where possible, it is suggested that a pitot device that attaches to a deluge gun, as well as a handheld pitot, be used to confirm readings.

4.4.6 When the minimum flow rate is reached, pitot readings and handheld pitot readings must then be taken every 5 minutes, for 2 hours, and recorded in the Test Reading Data part of the Superior Tanker Shuttle Service Accreditation Test Form (see Appendix B). Also, if a pump panel is accessible readings should be taken from the discharge gauge, RPM gauge, suction gauge, and engine temperature gauge.

4.4.7 Data required on the last two pages of the Superior Tanker Shuttle Service Accreditation Test Form, should also be recorded for each relevant apparatus.

4.4.8 Pitot readings should also be constantly observed to ensure that the flow rate DOES NOT fall below the minimum flow rate and/or the accredited flow rate (if higher than the minimum) for longer than 30 seconds. If this condition is not met, the test will be considered a failure and retesting will be subject to 4.2.5.

4.4.9 If the test is considered a success, the remaining sections of the Superior Tanker Shuttle Service Accreditation Test Form must be completed and supplied to the registrar of the Superior Tanker Shuttle Accreditation Tests with forms WS5, WS6, and all relevant documentation.

4.5. Additional Notes:

4.5.1 NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, should be used as the basic standard and primary resource for planning and

executing shuttle operations. Note that to be accredited to deliver Superior Tanker Shuttle Service requires exceeding the NFPA 1142 standard in several key areas.

4.5.2 Operating mobile water supply apparatus under emergency conditions is hazardous and can result in accidents, injuries and deaths. Ensuring that drivers complete a thorough training program prior to being allowed to operate the vehicle under response conditions can minimize the dangers associated with limited experience. The training program should ensure that all provincial operator licensing requirements are met. Additionally, NFPA 1002, Standard for Fire Apparatus Driver/Operator Professional Qualifications, and NFPA 1451, Standard for a Fire Service Vehicle Operations Training Program, should both be used (or other equivalent standards) when developing programs to train and validate drivers of emergency fire apparatus. Fire apparatus used in mobile water supply operations should be designed, constructed and maintained in accordance with CAN/ULC-S515-04 or NFPA 1901, 2009.

4.5.3 Three attempts total are given for the Superior Tanker Shuttle Service accreditation test. For each attempt the fire department must:

- Put all equipment and hoses back on appropriate apparatus. That means port-a-tanks must be emptied and stowed on the original apparatus it was brought to the test on.

- Mobile Water Supply Apparatus are allowed to return to refill points and fill up to begin the test again.

- Fire Suppression and Mobile Water Supply Apparatus will return to starting positions before each test attempt.

5.0 References

1. NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire
2. Fighting
3. NFPA 1901, Standard for Automotive Fire Apparatus
4. NFPA 1911, Standard for Service Tests of Pumps on Fire Department Apparatus
5. Fire Underwriters Survey, "Water Supplies for Public Fire Protection"
6. AWWA, "Distribution System Requirements for Fire Protection, M31"
7. FEMA, "Safe Operation Of Fire Tankers"
8. Sardqvist, Sand Holmstedt, G, "Water for Manual Fire Suppression", Journal of Fire Protection Engineering, Vol.11 209, 2001
9. Baldwin, R., "Use Of Water In The Extinction Of Fires By Brigades", The Institution of Fire Engineers Quarterly, Vol. 31, No. 82, 1972, pp 163–168.
10. Heskestad, G., "The Role Of Water In Suppression Of Fire: A Review", Journal of Fire and Flammability, Vol. 11, 1980, pp 254–262.
11. Rasbach, A., "The Extinction Of Fire With Plain Water: A Review. Fire Safety Science." In: Proceedings of the First International Symposium, 1985, pp 1145–1163.
12. Covey, B.(1999). "The Static Water Supply Program." New South Wales Fire Brigades, Sydney, Australia.

APPENDIX H Public Fire Protection Classification / Dwelling Protection Grade Information

Organization

Fire Underwriters Survey™ is a national organization directed by Risk Management Services (formerly CGI & IAO), an independent private company. Subscribers of Fire Underwriters Survey municipal grading data represent approximately 90 percent of the private sector property and casualty insurers in Canada.

Utilizing the technical staff of Risk Management Services, the organization provides data on public fire protection for fire insurance statistical work and underwriting by most of the member companies of the Insurance Bureau of Canada. It also advises municipalities on deficiencies in their fire defences and recommends improvements to enable them to better deal with fire protection problems.

Qualified surveyors conduct full field surveys of the fire risks and defences in municipalities and built-up communities across Canada and the results of these surveys are used to establish the Public Fire Protection Classification (PFPC) of all communities. While the Survey is not involved in rate-making matters, the information is one of several factors used in the development of property insurance rates, particularly those applying to commercial, industrial, multi-family residential and institutional occupancies (Commercial Lines Insurance).

The PFPC is also used by underwriters to determine the amount of risk they are willing to assume (capacity) in a given community, or section thereof.

The Fire Underwriters Survey also uses PFPC information to develop the IBC Dwelling Protection Grade, which applies to single-family residential building structures (Personal Lines Insurance).

The overall intent of the grading systems is to provide a measure of the ability of the protective facilities of a community to prevent and control the major fires that may be expected to occur, by evaluating in detail the adequacy, reliability, strength and efficiency of the protective facilities. The schedule used does not consider past fire loss records but rather, fire potential based on the risks present in the community.

In the application of the schedule, the fire defence conditions in a municipality are measured against a recognized standard of fire protection. The essential features of a community's fire defences are assessed, including water supply, the fire department, fire prevention, emergency communications, building construction controls and hazards.

Public Fire Protection Classification System

Also known as the Commercial Classification, the Public Fire Protection Classification System is used for all properties that are not single-family dwellings or duplexes. This 10-class system categorizes communities according to a variety of criteria applied to the local fire protection service area fire risk, and fire protection facilities. Properties in a municipality (or fire protection service area) with a better classification generally benefit from reduced insurance rates.

Fire Underwriters Survey goes through a comprehensive process to arrive at its conclusions, following a standardized methodology:

1. Risk and Hazard Assessment
   The "Risk And Hazard Assessment" is an evaluation of the life safety risks, fire loading and risk of fire that is present in a given area. Historical call volumes are also utilized in the evaluation process, along with a response distance review, community growth assessment and assessment of trends of emergency responses. This assessment lays the groundwork to determine fire protection needs within a community and is important in determining organizational structure, personnel requirements, training requirements, fire apparatus and fire equipment needs, response time requirements and adequacy of fire fighting resource distribution.

   The "Risk And Hazard Assessment" includes calculations of Required Fire Flows for structures and zones throughout the community and the calculation of the final Basic Fire Flow which is utilized as the benchmark that the community's fire defences will be measured against.

2. Water Supply for Public Fire Protection Assessment
   This assessment includes conducting a survey of the municipality, examining the water supply facilities, storage facilities and distribution system, and performing hydrant flow testing throughout the community.

3. Fire Defense Assessment
   The Fire Defense assessment consists of surveying the fire department to assess its administration, training programs and facilities, fire stations equipment (including testing and maintenance programs), personal communications, and fire prevention programs.

4. Fire Insurance Grading Evaluation
   The final step in the process includes comparing the required fire fighting resources (based on the calculated benchmarks) to the resources that are available. The final grades are calculated and published in the fire insurance grading index (Public Fire Protection Classifications and Dwelling Protection Grades).

Items reviewed during a typical survey include the following:

	Emergency Water Supplies	**Fire Safety Control**	**Emergency Communication Systems**
Pumpers in Service Ladder Truck Service Distribution of Companies & types of Apparatus Design, Maintenance & Condition of Apparatus Number of Line Officers – Fire Suppression Total Fire Force Available Engine and Ladder Company Unit Manning Master & Special Streams Equipment for Pumpers and Ladders Hose Condition of Hose Training and Qualifications Response to Alarms Fire Ground Operations Special Protection Required Miscellaneous Factors & Conditions Pre-fire Planning Administration	Normal Adequacy of Supply Works Reliability of Sources of Supply Reliability of Pumping Capacity Reliability of Power Supply Reliability, Condition, Arrangement, Operation and Maintenance of System Components Fire Flow Delivery by Mains Reliability of Principal Mains Installation of Pipes Arrangement of the Distribution System Additional Factors and Conditions Related to Supply and Distribution Distribution of Hydrants Hydrants – Size, Type and Installation Hydrants – Condition and Inspection Other Conditions Affecting Adequacy & Reliability Management	General Program Codes & Enforcement Building Code & Enforcement Electrical Code & Inspections	Communication Centre Means of Transmitting Alarms by Public Fire Department Telephone Service Means of Alarm Dispatch Dispatching Services Operations Radio Miscellaneous Factors

The resulting Public Fire Protection Classifications and Dwelling Protection Grades are developed by Fire Underwriters Survey and funded by their subscribers (insurance industry). To summarize the categories:

- A Class 1 rating indicates the best possible protection and Class 10 rating means no Recognized protection.

- Class 2 represents a very strong and reliable degree of protection and prevention that only a few cities with well-staffed and well-organized fire departments and very good water supply systems possess. Vancouver and Toronto and a few other large centers fall into this category.

- Class 3 is a level of superior protection which large cities should be expected to achieve. Municipalities in Class 3 should be able to control most threatening fires and prevent the worst ones from becoming conflagrations.

- Smaller cites with fewer resources are more likely to be in Class 4. These are rated as having less ability to handle potential fires, with less competence in rapid fire suppression.

- Class 5 represents a lesser level of protection for a municipality with a full-time fire department, but is very respectable for a volunteer department.

- Small towns find it too costly to provide the same level of capability to control potential large fires, particularly if they have hazardous occupancies or large blocks of old buildings. Primarily for this reason, the great majority of smaller communities fall into Classes 6 to 8.

- Class 9 represents protection rated at little or no value in controlling serious fire in commercial buildings. Class 10 indicates, technically, no protection.

For more information please contact regional Fire Underwriters Survey offices at:

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800-387-4356	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528

DWELLING PROTECTION GRADES

Introduction

Fire Underwriters Survey (F.U.S.) is a national organization financed and directed by Risk Management Services (formerly CGI and IAO). The organization assesses, evaluates and grades the quality of public fire defences maintained in Canadian municipalities and communities. This technical information is conveyed to FUS subscribers for use in their fire insurance statistical, rating and underwriting programs. FUS member companies provide approximately 90 percent of the private general insurance written each year in Canada.

Major features assessed during fire protection surveys include:

1) Water supply systems
2) Fire department administration and operations
3) Fire service communications
4) Fire safety control including building and fire prevention codes and their enforcement.

These functions are measured against recognized standards of fire protection.

Following the survey and grading, a summary of conditions is forwarded to the municipality. Surveyors are prepared to discuss any comments made with municipal administrators and to assist them in establishing priorities for an improvement program.

Staff members are actively involved in consultations with waterworks departments, consulting firms, fire departments, and various levels of government in providing technical advice on matters relating to municipal fire protection.

Dwelling Protection Grades (D.P.G)

One of the fire insurance classifications we establish and convey to FUS member companies is the Dwelling Protection Grade. The D.P.G. is a numerical system scaled from 1 to 5. One (1) is the highest grading possible and five (5) indicates little or no public fire protection. This grading reflects the ability of a community to handle fires in small buildings (e.g. single family dwellings). Please refer to Table 1 outlining the minimum requirements for each of the 5 grades in this system.

Table 1 - FUS DWELLING PROTECTION GRADES - MINIMUM REQUIREMENTS PER FIRE STATION[1]

DPG DWELLING PROTECTION GRADE	WATER WORKS SYSTEM	FIRE DEPARTMENT		PUBLIC FIRE PROTECTION CLASSIFICATION (PFPC) [2] MINIMUM REQUIREMENTS
		EQUIPMENT	FIREFIGHTERS	
1	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 5 or better	Response from within 8 km by road of a standard pumper[3].	Response of 3 on-duty career members plus fire chief or other officer not required on-duty.	Water Supply and Fire Department must grade PFPC Class 5 or better.
2	Water supply system designed in accordance with Fire Underwriters Survey standard "Water Supply for Public Fire Protection" with a relative classification of 6 or better	Response from within 8 km by road of a standard pumper[3].	Response of 1 on-duty career member and 15 volunteers[4].	Water Supply and Fire Department must grade PFPC Class 6 or better.
3A	Water supply system designed in accordance with, and meeting the minimum requirements[5] of, Fire Underwriters Survey standard "Water Supply for Public Fire Protection"	Response from within 8 km by road of a standard pumper[3].	15 volunteers[4]	No Public Fire Protection Classification required.
3B	Not required	2 units required. Standard pumper[3] plus a mobile water supply (tender) with a combined water carrying capacity of not less than 1500 Imp. Gallons	15 volunteers[4]	No Public Fire Protection Classification required.
4	Not required	Standard pumper[3] or 800 I.gal. tanker with booster pump of 200 I.gpm capacity.	10 volunteers[4]	No Public Fire Protection Classification required.
5	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above.	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above.	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above.	No Public Fire Protection Classification required.

[1] Refer to additional notes and requirements for interpretation
[2] The P.F.P.C. is a sophisticated grading system scaled from 1 to 10. One (1) represents the ultimate degree of protection and 10 indicates little or no fire protection. This system evaluates the ability of a community's fire defences to prevent and control major fires that may occur in commercial, industrial and institutional buildings and/or districts.
[3] A "standard" pumper refers to a triple combination pumper that is equipped with a major pump, water tank and hose compartment. Fire apparatus should preferably be purchased new and listed in accordance with Underwriters Laboratories of Canada (U.L.C.) S515 titled "Standard for Automobile Fire Fighting Apparatus". Used or rebuilt fire apparatus must be subjected to ULC or Underwriters service tests.
[4] Fire department volunteer members should work and reside within a reasonable travel distance to the fire station thus avoiding undue delay when responding to fires.
[5] Absolute minimum water supply volume requirements recognized include a hydrant system capable of delivering 200 I.gpm for 2 hours or 400 I.gpm for 1 hour in conjunction with consumption at maximum daily rate.

ADDITIONAL NOTES AND REQUIREMENTS

DWELLING PROTECTION GRADE 1

1. The water supply system must be equipped with standard hydrants capable of delivering sufficient volume and pressure corresponding to fire protection need. The minimum recognized water must be capable o delivering a minimum of 200 I.g.p.m. for a two (2) hour duration or 400 I.g.p.m. for a one (1) hour duration in conjunction with domestic consumption at the maximum daily rate.

2. At least 3 career fire fighters on-duty 24 hours per day plus a fire chief must respond to fires with apparatus.

3. Fire apparatus must consist of a triple combination pumper rated at 840 I.g.p.m. minimum capacity at 150 p.s.i. and meeting the essentials of Underwriters' Laboratories of Canada (U.L.C.) Standard S515.

4. Equipment must be housed in a well designed and located fire station.

5. Training drills must be held regularly (preferably weekly). Adequate training records must be maintained.

6. An adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc.).

7. The boundary of the protected area must be clearly established and registered with the Provincial Government.

8. Grade 1 applies to dwellings within 8 kilometres by road of a recognized, responding fire station.

DWELLING PROTECTION GRADE 2

1. Same as Dwelling Protection Grade 1 – water supply must meet minimum insurance grading requirements and meet the fire protection needs for the building structures being protected.

2. At least 1 career fire fighter on-duty 24 hours per day plus 15 fully equipped volunteer or off-shift members must respond to fires with apparatus.

3. Fire apparatus must consist of a triple combination pumper rated 840 I.g.p.m. minimum capacity at 150 p.s.i. and meeting the essentials of Underwriters' Laboratories of Canada (U.L.C.) Standard S515.

4. Equipment must be housed in a well designed and located fire station.

5. Training drills must be held regularly (preferably weekly). Adequate training records must be maintained.

6. An adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc.).

7. The boundary of the protected area must be clearly established and registered with the Provincial Government.

8. Grade 2 applies to dwellings within 8 kilometres by road of a recognized, responding fire station.

DWELLING PROTECTION GRADE 3A

1. Same as Dwelling Protection Grade 1 – water supply must meet minimum insurance grading requirements and meet the fire protection needs for the building structures being protected.

2. At least 15 fully equipped volunteer fire fighters must be scheduled to respond to fires with apparatus.

3. Fire apparatus must consist of a triple combination pumper rated at 840 I.g.p.m. minimum capacity at 150 p.s.i. and meeting the essentials of Underwriters' Laboratories of Canada (U.L.C.) Standard S515.

4. Equipment must be housed in a well designed and located fire station.

5. Training drills must be held regularly (preferably weekly). Adequate training records must be maintained.

6. An adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc).

7. The boundary of the protected area must be clearly established and registered with the Provincial Government.

8. Grade 3A applies to dwellings within 8 kilometres by road of a recognized, responding fire station.

DWELLING PROTECTION GRADE 3B

1. Water supply system not required.

2. At least 15 fully equipped volunteer fire fighters must be scheduled to respond to fires with apparatus.

3. Fire apparatus must consist of:

   3.1) A triple combination pumper rated at 840 I.g.p.m. minimum capacity at 150 p.s.i. and meeting the essentials of U.L.C. Standard S515.

   And

   A tanker with a 200 I.g.p.m. permanently mounted pump meeting the essentials of U.L.C. Standard S515.

   3.2) In addition:

      (I) The combined tank capacity of the 2 units must total at least 1500 Imperial gallons.

      (II) A transfer system capable of supplying the pumper is needed. This may be accomplished by pump or dump valve to a portable tank of at least 1000 Imperial gallons capacity.

      (III) Refill capacity from a hydrant system or using a portable or major pump etc. of 100 I.g.p.m. minimum capacity at 40-60 p.s.i. is needed on each unit.

4. Equipment must be housed in a well designed and located fire station.

5. Training drills must be held regularly (preferably weekly). Adequate training records must be maintained.

6. An adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc.).

7. The boundary of the protected area must be clearly established and registered with the Provincial Government.

8. Grade 3B applies to dwellings within 8 kilometres by road of a recognized, responding fire station.

DWELLING PROTECTION GRADE 4[*]

1. Water supply system not required.

2. At least 10 fully equipped, trained volunteer fire fighters must be scheduled to respond to fires with apparatus.

3. Fire apparatus must consist of a minimum of:

   3.1) An 800 Imperial gallon tanker with a 200 I.g.p.m. permanently mounted pump meeting the essentials of U.L.C. Standard S515.

   Or

   3.2) A triple combination pumper rated at 840 I.g.p.m. minimum capacity at 150 p.s.i. and meeting the essentials of U.L.C. Standard S515 when drafting sources are available.

4. Equipment must be housed in a well designed and located fire station.

5. Training drills must be held regularly (preferably weekly). Adequate training records must be maintained.

6. An adequate and reliable means of receiving alarms of fire and dispatching fire fighters is necessary (ex. public fire number, pagers etc.).

7. The boundary of the protected area must be clearly established and registered with the Provincial Government.

8. Grade 4 applies to dwellings within 8 kilometres by road of a recognized, responding fire station.

DWELLING PROTECTION GRADE 5

1. Applies to unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B or 4.

[*] Note – due to the limitations in fire protection, D.P.G. 4 provides, it is seldom assigned

GENERAL COMMENTS

Water Supply

1. Water supply requirements in this information bulletin are strictly minimums and must correspond to fire fighting need. Water works system design should contemplate meeting the recommendations contained in our publication titled "Water Supply for Public Fire Protection".

2. Standpipes are not eligible for fire insurance grading recognition and are not considered the equivalent of a standard fire hydrant. There is no nationally recognized design standard for standpipes. This results in little or no control over their design, construction and installation. Also, friction losses become extreme when large flows are demanded of small diameter piping (i.e. flows required for standard fire department pumpers).

Fire Department

1. A triple combination pumper is equipped with a major pump, water tank and hose compartment. Fire apparatus should preferably be purchased new and listed in accordance with Underwriters Laboratories of Canada (U.L.C.) S515 titled "Standard for Automobile Fire Fighting Apparatus".

   Used or rebuilt fire apparatus must be subjected to ULC or Underwriters service tests.

2. Fire department members should reside within a reasonable travel distance to the fire station thus avoiding undue delay when responding to fires.

3. Fire departments desiring fire insurance grading recognition should be organized on a sound financial basis such as a tax levy. Areas organized on a society or subscription basis will not be recognized because of the difficulty in identifying residents within the protected area who are current members of the society and the lack of guaranteed funds to adequately finance a fire department year round.

General

Many insurance companies have compressed our advisory "5 tier" system for Dwelling Protection Grades (D.P.G.) into a "3 tier" system for underwriting single-family dwellings. Table 2 is provided for information purposes only. Enquiries should be made with local brokers or agents to determine the impact any improvements in D.P.G.'s may have on insurance rates for single family dwellings.

Insurance Bureau of Canada Dwelling Protection Grades. Statistical "5 tier" System.	System Used by Many Insurance Companies Underwriting "3 tier" system.	Insurance Companies refer to this grade as :
1 2 3A**	Table 1	Protected
3B	Table 2	Semi - Protected
4***	Table 2 Or Table 3	Semi – Protected Or Unprotected
5	Table 3	Unprotected

For more information please contact regional Fire Underwriters Survey offices at:

Western Canada	Quebec	Ontario	Atlantic Canada
Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby, BC V5C 6P9 1-800-665-5661	Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2 1-800-263-5361	Risk Management Services Fire Underwriters Survey 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3 1-800-387-4356	Risk Management Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Dartmouth, Nova Scotia B3B 1Y2 1-800-639-4528

** An equivalency to 3A may be granted to communities without hydranted water supplies who achieve Superior Shuttle Accreditation through the Fire Underwriters Survey.

*** Dwelling Protection Grade 4 is treated differently from insurer to insurer based on case-specific relevant conditions