FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

Review of Fire Protective Services For Fire Insurance Grading

Village of Pemberton
BC

FINAL

Public Version
2008

Prepared for:

Village of Pemberton

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REVIEWED
By Michael Currie at 4:50 pm, Sep 04, 2008

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Tables and Figures

1. SCOPE OF OUR ENGAGEMENT

The Village of Pemberton contracted the services of CGI (formerly IAO) to evaluate Pemberton Volunteer Fire/Rescue Departments fire protection programs. The purpose of the assessment is to determine whether the community's current fire insurance grading classifications are representative of the fire protection programs and fire protection resources that are currently in place within the community. A fire insurance grading review is a key part of the assessment process.

The significant findings of the CGI fire protection review were requested to be outlined within a report format. The report will provide an update on Village of Pemberton's fire insurance grading assignments and make recommendations aimed at improving the level of fire protection and improving fire insurance grading classifications of Village of Pemberton.

1.1. Acknowledgement

CGI wishes to thank the Village of Pemberton, the Pemberton Volunteer Fire/Rescue Department, the Public Works Department and all those within the fire protection District and local districts for their valuable assistance in conducting this survey and preparation of this report.

1.2. Distribution of Use

This report, along with the findings and conclusions, contained herein, is intended for the sole use of the Village of Pemberton Volunteer Fire/Rescue Department to assist in the fire protection planning needs of the community.

Judgements about the conclusions drawn, and opinions presented in this report should be made only after considering the report in its entirety. This report is Private and Confidential and is intended for the exclusive use of the Village of Pemberton Volunteer Fire/Rescue Department.

any way for any public or commercial purpose without the express written consent of CGI Insurance Business Services and Fire Underwriters Survey.

1.3. Reliance and Limitation

We have relied on the general accuracy of information provided by stakeholders including the Village of Pemberton and the Public Works Department. However we have reviewed this information for consistency and reasonableness. The accuracy of our conclusions is dependent upon the accuracy and completeness of this underlying data. Therefore any discrepancies discovered in this data by the reader should be reported to us and this report amended accordingly, as warranted.

2. EXECUTIVE SUMMARY

This report outlines the significant findings of a fire protection assessment of the Pemberton Volunteer Fire/Rescue Department. The Village of Pemberton requested CGI Risk Management Services (CGI) to conduct an assessment to evaluate the fire defences in the District for the purpose of insurance grading classifications. A second objective of the study was to evaluate the fire protection needs of the District and make recommendations in areas that would improve the overall level of fire protection as well as fire insurance grading classifications.

In order to determine the fire protection needs in the Village of Pemberton, a fire hazard and life safety assessment was undertaken. The purpose of this review was to identify and quantify fire risk and hazard and life safety issues related to fire protection.

This report focuses upon areas of fire department operations and water supply for fire protection that require upgrades to improve the level of fire protection to correspond with the community's current and future fire risk levels. A number of conclusions have been made as a result of our assessment. Those conclusions, and recommendations to address any concerns raised, are described throughout this report.

This assessment of the Village of Pemberton finds that the Village has made, and continues to make, considerable improvements to the level of fire protection it provides to the community. This assessment also notes that the level of risk and fire load within the community is increasing. Numerous developments are ongoing and planned for the community, and the community has made significant improvements in fire protection, which has largely kept pace with the increases in fire risk level of the community.

The Fire Chief of the Pemberton Volunteer Fire/Rescue Department indicates there is a desire to continue to improve the level of fire protection throughout the protected areas. This is partially motivated by the potential cost benefit of insurance rate reductions but is also motivated by the desire to improve the level of fire safety and life safety throughout the community.

3. SUMMARY OF RECOMMENDATIONS

The following table summarizes the recommendations made during this assessment. The level of importance in the left column indicates the importance of the recommendation with regard to fire insurance grading and the potential for Village of Pemberton to maintain/improve its fire insurance grading classification. It is important to note that the following recommendations may have different levels of importance when considering them from alternative perspectives such as good engineering practices, economic benefit, life safety, etc.

Table 1.3-1 Summary of Recommendations and Importance Level

Importance	Recommendation	Page
Medium	Recommendation 8.2 1 Develop fire protection master plan document	38
Medium	Recommendation 8.2 2 Develop and implement formal organization documents	39
Medium	Recommendation 8.2 3 Improve filing system	42
Medium	Recommendation 8.2 4 Improve documentation of budgets and finances	49
Low	Recommendation 8.2 5 Include apparatus replacement and upgrade fund in budget	49
Low	Recommendation 8.3 1 Complete structural assessment for fire station	56
Low	Recommendation 8.3 2 Plan to replace fire station	56
Medium	Recommendation 8.3 3 Provide exhaust extraction to fire station	57
Low	Recommendation 8.5 1 Decommission 1971 Pumper	64
Medium	Recommendation 8.5 2 Develop and Implement Replacement Schedule for Apparatus	64
High	Recommendation 8.5 3 Test and Submit Results of Tests for Older Apparatus	65
Medium	Recommendation 8.9 1 Ensure Hose and Ancillary Equipment is tested and meets NFPA Standards	69
Low	Recommendation 8.11 1 Develop a formal agreement for Fire Protection Services with Mount Currie	79
High	Recommendation 8.12 1 Improve Available Fire Forces	82
High	Recommendation 8.13 1 Provide a Minimum First Due Pumper Company of 4	83
High	Recommendation 8.14 1 Improve Record Keeping for Training Program	84
Medium	Recommendation 8.14 2 Develop Training Curriculum and Use Database to Record and Monitor Progress	84
Medium	Recommendation 9.2 1 Improve Fire Prevention Program	87
Medium	Recommendation 9.3 1 Improve Driveway and Lane Design for Firefighting Access	88
Low	Recommendation 9.5 1 Develop and implement Pre-incident (pre-fire) planning program	89
Low	Recommendation 9.6 1 Develop a Wildland Interface Risk Management Plan	89
High	Recommendation 10.1 1 Change to Emergency Communication Centre based system	91
High	Recommendation 10.1 2 Implement 9-1-1 emergency call system	91
High	Recommendation 10.1 3 Train dispatchers to NFPA 1061 Standard	91
High	Recommendation 10.1 4 Improve maintenance and redundancy of critical communications equipment	91

4. FIRE UNDERWRITERS SURVEY

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.

Fire Underwriters Survey offices maintain data from surveys on fire protection programs throughout all 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.

4.1. Fire Insurance Grading Classifications

- ***Public Fire Protection Classification***

  The PFPC is a numerical grading system scaled from 1 to 10. Class 1 is the highest grading possible and Class 10 indicates that little or no fire protection is in place. The PFPC grading system evaluates the ability of a community's fire protection programs to prevent and control major fires that may occur in multifamily residential, commercial, industrial, and institutional buildings and course of construction developments.

  Fire Underwriters Survey also assigns a second grading system for community fire protection, referred to as the Dwelling Protection Grade (D.P.G.), which assesses the protection available for small buildings such as single-family dwellings.

- ***Dwelling Protection Grade***

  The DPG is a numerical grading system scaled from 1 to 5. One (1) is the highest grading possible and five (5) indicates little or no fire protection is provided. This grading reflects the ability of a community to handle fires in small buildings such as single family residences.

Table 4.1-1 Village of Pemberton Fire Insurance Grading Classifications

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Village of Pemberton HPA[1]	3A	**3A**	Hydrant Protected Area - detached dwellings within 300 m of fire hydrant
Village of Pemberton	4	**4**	Fire Station Protected Area- detached dwellings within 8 km by road of a Pemberton Fire Hall
Pemberton FPA	5	**5**	Unprotected - detached dwellings NOT within 8 km by road of a Pemberton Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of a Pemberton Fire Hall

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Village of Pemberton HPA	7	**7**	Hydrant Protected - commercial properties within 150 m of fire hydrant
Village of Pemberton	9	**9**	Fire Station Protected - commercial properties within 5 km by road of a Pemberton Fire Hall
Pemberton FPA	10	**10**	Unprotected - commercial properties further than 5 km by road of a Pemberton Fire Hall
Rest	10	**10**	Unprotected - commercial properties further than 5 km by road of a Pemberton Fire Hall

[1] HPA refers to Hydrant Protected Area within fire insurance grading.

4.2. The Public Fire Protection Classification System

The PFPC grading system is a measure of a community's overall programs of fire protection. The DPG grading system only evaluates a fire department's ability to control or extinguish fires in small buildings.

The ability of a community's fire defences are measured against recognized standards of fire protection relative to fire hazard and fire / life safety risk present within the community. The following broad areas of fire protection are reviewed in the survey and have the following weights within the FUS grading system:

Fire department operations	40%
Fire safety control within the community	20%
Fire service communications	10%
Water supplies and distribution system	30%

The above classifications are conveyed to subscribing companies of Fire Underwriters Survey. FUS subscribers represent approximately 85-90% of the fire insurance underwriters in Canada. Subscribers use this information as a basis in their fire insurance underwriting programs to set limits in the amount of risk they are willing to assume within a given or portion of a , and to set fire insurance rates for commercial properties. Improved fire protection grades may result in increased competition for insurance underwriting companies to place their business within a community. Our analysis indicates that an improved fire protection grade has a positive effect on fire insurance rates.

In addition, FUS classifications are a measure of the fire protection within a community. Many progressive communities use the classification system to assess the performance of their fire protection programs, and to plan the direction of fire protective services for the future of the community.

The vast majority of smaller communities fall into Classes 6 to 8. A summary of the Protection Grades assigned to Canadian cities is presented in Table 4.2-1 Protection Grades – Canadian Cities[2]. Alternatively, the Survey found that there are areas within

[2] Source: Fire Underwriters Survey 01-1

the Village of Pemberton protective service programs where improvement is warranted and is recommended. PFPC classifications should not only be viewed in terms of improved fire insurance rates but also as a measure of fire protection that is present within a community.

Table 4.2-1 Protection Grades – Canadian Cities

Class/ Population	1	2	3	4	5	6 - 8	9 - 10
Over 100,000	2	12	15	4	-	-	-
50,000 - 100,000	-	5	18	24	5	2	-
25,000 - 50,000	-	-	13	28	21	13	-
Under 25,000	-	2	7	75	304	1493	1138
Total	**2**	**19**	**53**	**131**	**330**	**1508**	**1138**

Improvements that would have a cumulative positive effect in fire insurance grading classifications and fire protection ability are discussed within this report. The intent of identifying areas where improvements can be made is to provide the Village of Pemberton direction in their community fire protection planning – if so desired and supported by the community.

4.3. The Dwelling Protection Grading System

Dwelling Protection Grades are based on a 1 to 5 grading system; DPG 5 indicates little or no fire protection is available. Most small and midsize communities that have a gradable emergency water supply are assigned a DPG 3A rating, which the insurance industry has termed fully protected. DPG 3B refers to communities, or portions of communities, that have a recognized fire department but are not protected with a recognized water supply[1]. The insurance industry has termed this 'semi-protected'. Within the Fire Underwriters Survey grading, a grade of 3B indicates that the fire department is equipped, trained, prepared and adequately staffed to provide "Standard Shuttle Service" to a fire event within a reasonable response time (i.e. utilize a pumper, tender and various related equipment to deliver water to a fire site and provide structural fire fighting at the fire event).

The protected assignment refers to DPG 1 to DPG 3A. An unprotected designation refers to DPG 5. DPG 3B and 4 are given the semi-protected designation. The lower the DPG assignment is, the larger the discount given in fire insurance rates. The discounts given for an identical property considered fully-protected over those considered unprotected

can be approximately 60%. Where there is sufficient population and sufficient taxation base, the savings generated can more than offset the operating and capital costs of an effective fire service.

A summary of the requirements for fire departments to receive the various protection grades is indicated in Table 4.3-1 FUS Dwelling Protection Grades - Minimum Requirements Per Fire Station.

Table 4.3-1 FUS Dwelling Protection Grades - Minimum Requirements Per Fire Station

DWELLING PROTECTION GRADE	WATER WORKS SYSTEM	FIRE DEPARTMENT		CORRELATION WITH PUBLIC FIRE PROTECTION CLASSIFICATION (P.F.P.C.) See "Note" below
		EQUIPMENT	FIREFIGHTERS	
1	Hydrant system capable of delivering 200 IGPM for 2 hours or 400 IGPM for 1 hour in conjunction with consumption at maximum daily rate.	Response from within 5 miles by road of a standard pumper.	Response of 3 on-duty career members plus fire chief or other officer not required on-duty.	Water supply and fire department must grade Class 5 or better.
2	Same as 1	Same as 1	Response of 1 on-duty career member and 15 volunteers.	Water Supply and Fire Department must grade Class 6 or better.
3A	Same as 1	Same as 1	15 volunteers	Not correlated to Public Fire Protection Classification.
3B	Not required	2 units required. Standard pumper plus a tanker.	15 volunteers	Not correlated to Public Fire Protection Classification.
4	Not required	Standard pumper or 800 I.gal. tanker with booster pump of 200 IGPM capacity.	10 volunteers	Not correlated to Public Fire Protection Classification.
5	Unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B, or 4 above.			

Many insurers have simplified this grading system to a simple three tier system. This is typical for setting insurance premium rates for detached single family residences only. Different insurers utilize the Dwelling Protection Grades differently to set their own rates based on the marketplace and their own loss experiences. The three tier system that is

typically used by many insurers is shown in Table 4.3-2 FUS Grades correlation to commonly used Insurance terminology and simplified grades.

Table 4.3-2 FUS Grades correlation to commonly used Insurance terminology and simplified grades

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 4	Table 2	Semi - Protected
5	Table 3	Unprotected

The fire insurance industry has minimum requirements that communities must meet in order for their fire protection program to receive recognition. The insurance industry sets benchmarks for:

- Fire Department Organization
- Membership
- Training
- Apparatus Requirements
- Fire Suppression Capability, and
- Alarm Notification

4.4. Measuring Fire Risk in This Review

The strength of fire defence within a community depends largely on the will and financial ability of the community to support this emergency service. Fire Underwriters Survey and National Fire Protection Association statistics indicate that the larger the population of a community, the higher the level of fire protection, when measured against the risk of fires within the community. The best scenario for the level of fire protection occurs when expectations of fire suppression and prevention match the community's willingness to pay for this expectation.

Community growth resulting from capital developments increases the level of fire risk, however, the development of fire protective services often falls behind the developments, particularly in communities where growth happens quickly. If the community expectation levels are constant and the fire protective service level is also constant, when the fire risk level increases then the fire protection level relative to the fire risk level decreases and community expectation (for a reasonable level of fire protection) may no longer be met.

Optimum Level of Fire Protection

- *The combination of fire fighting staff and apparatus that delivers a suppression effort commensurate with the fire demand faced, yet representing the most efficient use of resources in a safe and effective manner.*

4.5. Overview of the Assessment Process

There is no one universal model of fire defence that can be applied to all situations or to a community requiring this emergency service. Ideally, the strength of a fire protection program is balanced between the risk of serious fire and the community's fire loss experience. Fire defences should be tailored with these issues in mind. To gauge the needs of the fire service based on experience alone would be to ignore perils that have not yet occurred. Ignoring experience and focusing on risk alone may tend to build-up a fire department force beyond the financial acceptability of the community paying for the service.

FUS measures the ability of a fire department against the risk of fire likely to occur within a community. This measurement is usually not determined by the most significant risk, nor is it based on the average fire risk. Our measurement tends to focus on those structures where there is a considerable risk to fire and life safety, and where total or temporary loss of a particular structure would have a significant impact to a community's tax base and economy. A fire department should be structured and supported to effectively deal with everyday emergencies while at the same time capable to control and extinguish most fires that may occur.

In the case of the Village of Pemberton, the fire protective service was measured in its ability to provide fire protection to the various zones and typical risks found in the community. These zones and risks included (but were not limited to): single family residential; small, medium and large scale commercial buildings, public/institutional zones; and forest interface areas.

- Type of, and number of apparatus
- Pumping capacity
- Response to alarm protocols
- Response times to critical risks
- Adequacy of the fire fighter training program including specialized training
- Emergency communication systems
- Ancillary equipment
- Fire department roster type and response levels
- Fire safety education
- Building controls (application of Building Codes and related standards; plan review process; effective construction inspection and permit process)
- Fire prevention inspections
- Adequacy & reliability of emergency water supplies
- Automatic fire protection systems
- Management of emergency services

FUS examines the entire program of the community's fire defence in order to assess and grade the overall program. There are some areas within a FUS grading that carry substantial weight, such as:

- The type of Staffing (i.e. career fire fighters vs. volunteers),
- The quality of training programs,
- The type of apparatus and ancillary equipment for the hazards present,
- The condition and age of fire apparatus and fire suppression equipment,
- The distribution of companies relative to fire risk, and
- The availability, adequacy and reliability of emergency water supplies.
- Fire prevention and public education programs

5. PROJECT SCOPE AND METHODOLOGY

5.1. Project Background and Objectives

The Village of Pemberton and the Pemberton Fire Protection Areas are experiencing significant growth in terms of building development, resident population and tourists to the region. This trend is expected to continue through the foreseeable future. The need for the fire service and fire/rescue service to keep pace with the anticipated growth has been recognized by community leaders and the fire department.

Previous evaluations (by CGI, formerly the IAO) of the fire department occurred in 1995 and 2001. The fire department has made a wide range of improvements in almost all aspects of the fire department operations since the previous evaluations. These improvements, and the cost to incorporate them, have been accepted within the community. The goal of this assessment is aimed at:

- Evaluate and recognize the fire department's improvement and adjust fire insurance grading classifications accordingly
- Conduct a fire department operational audit in order to determine:
  - fire apparatus and ancillary fire equipment planning needs;
  - fire department management and administration time commitment needs;
  - fire station suitability and planning needs;
  - capability and liability of fire response outside of the PFPA; and
  - 'next steps' (planning) for the fire service.
- Assess the current and anticipated future fire protection and regional rescue needs of the community
- Explore operational alternatives for the regional fire rescue service within Area C of the SLRD.

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
   - Facilities condition, replacement, maintenance
   - Tool and equipment condition, replacement, maintenance
   - Vehicle condition, replacement, maintenance, response procedures
   - Use of technology/radio communication
   - Operational plans and procedures
   - Administrative policies and procedures
   - Organization and reporting relationships
   - Dispatch and records management
   - Recruitment, promotion and training
   - Annual budget including remuneration for officers/members
   - Incident analysis and planning
   - Cost/benefit or suitability of mutual aid/support agreements or other out-of-service area activities including, but not limited to, the highway, Whistler, Lillooet, Mt Currie and Birken
   - Cost recovery opportunities
   - Prevention and public education efforts

3. Fire Prevention Program and 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 Community

7. Develop a Report that Includes Findings and Recommendations

Deliverables:

CGI Municipal Consulting Services will make recommendations for strategic direction, immediate areas for improvement, management action, budgetary direction, and/or initiatives requiring supplemental funding; as well as to comment on areas found to be well-managed.

1. A survey and analysis of operations, facilities, budget, organizational structure, management, policies, functions and activities of the Department;

2. Recommendations to improve the efficiency and effectiveness of the Department, including but not limited to, fiscal efficiency;

3. Recommendations that prepare the Department to meet current (0 to 5 years) and future (6 to 10 years) needs of the community in emergency response preparedness; and

4. Provide assistance with or input into a business case for outside funding to meet the current and future emergency response needs.

The following key contacts were made and provided information throughout the survey and development of report.

- Russell Mack, Fire Chief
- Christian Staehli, Deputy Fire Chief
- Lori Pilon, Chief Administrative Officer of the Village of Pemberton
- Richard Diamond, Planning Technician and Building Inspector
- Dwayne Thefarge, Public Works of the Village of Pemberton
- Various Staff and others.

6. VILLAGE OF PEMBERTON

6.1. General Description

The Village of Pemberton is approximately and 32 km of the Resort Municipality of Whistler on Highway 99. Located 2400 metres below the peak of Mount Currie, the Village is the hub for the Pemberton Valley area.

The Village of Pemberton had a population of 2,192 in 2006 and rose 33.5% from 2001 of 1,642. The Village of Pemberton has a total land area of 4.45 km^2 (2006 Stats Canada).

The climate of the Village of Pemberton is very warm and dry in the summer time and mild and wet in the winter. The regulated temperatures are created by the surrounding Coast Mountains.

With regard to fire protection, the Pemberton Volunteer Fire/Rescue Department provides full service within the boundary limits of the Village and portions of the Squamish-Lillooet Regional District. The coverage area spans approximately 500 kilometres of roads with the rescue truck.

Village of Pemberton Commerce:

The Village of Pemberton's commerce is located in the central commercial area of the village.

Agriculture and forestry are still important aspects of local economy, but tourism and its related services employ the highest percentages of residents: accommodation and food services at 24.3%, followed by arts, entertainment and recreation at 13.3%, and retail trade, also representing 13.3% of the total labour force (2001 Stats Canada). Comparatively, forestry and logging employs 1.8% of Village residents.

6.2. Local Governance

Pemberton was incorporated as a Village Municipality on July 20, 1956. The community is operated by a mayor and council.

6.3. BC Assessment

Excerpt from BC Assessment News Release "Assessment Notices Sent To Property Owners in the Village of Pemberton" January 2, 2008:

> *Assessments are the estimate of a property's market value as of July 1, 2007. This common valuation date ensures that all properties are assessed fairly and there is an equitable base for property taxation.*
>
> *The real estate market creates property value, which is reported annually by BC Assessment. Local governments and other taxing authorities are responsible for property taxation, and after determining their own budget needs this spring, will determine their property tax rates based on BC Assessment's data. Note: Property owners should contact their local government, or taxing authority, for more information about their property taxes.*
>
> *"Most homes in Pemberton are worth more on this year's assessment roll than they were on the 2007 assessment roll," said Grant. "For example, increases of up to 10 percent for single family homes and condominiums are very common."*
>
> *Changes in property assessments are reflective of movement in the local real estate market and can vary greatly from property to property. When estimating a property's market value, a professional appraiser analyzes current sales in the area, as well as considering other characteristics such as size, age, quality, condition, view and location.*
>
> *Overall, the Village of Pemberton's assessment roll increased from $416 million last year to $423 million this year. This growth reflects changing market values for many properties but also includes approximately $2.5 million of subdivisions, rezoning and new construction.*

The examples below demonstrate local market trends for properties by a geographic area; trends are affected by many variables.

Village of Pemberton	2007 Assessment Valuation Date (July 1, 2006)	2008 Assessment Valuation Date (July 1, 2007)
Pemberton – Single Family Dwelling	$391,000	$419,000
Pemberton – 3 Bedroom Townhouse	$279,000	$300,000

There is a notable upward trend in valuations and a considerable increase in the value of protected risks throughout communities protected by the Pemberton Volunteer Fire/Rescue Department.

7. COMMUNITY RISK AND HAZARD ASSESSMENT

7.1. Background

A fire hazard and risk assessment was conducted throughout Village of Pemberton to aid in determining the community's fire protection needs and to assist in assessing the adequacy of the fire department. A risk and hazard assessment, along with a response distance review, community growth assessment and assessment of trends of emergency responses, lays the groundwork to determine fire protection needs within a community. This assessment is important in determining organizational structure, personnel requirements, training requirements, fire apparatus and fire equipment needs, response time requirements and adequacy of fire station location.

The "Risk and Hazard Assessment" is an evaluation of the life safety risks, fire loading and risks of fires that are present in a given area. Historical call volumes are also utilized in the evaluation process.

7.2. Measuring Fire Risk

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 protection 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.

Table 7.2-1 Fire Underwriters Survey - 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, Table 7.2-1 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.

Table 7.2-1 Fire Underwriters Survey - Table of Effective Response

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	BUILDING DISTRICT EXAMPLES	FIRE FLOW		INITIAL RESPONSE TO ALARMS		1ST DUE	2ND DUE	1ST DUE	TOTAL AVAILABILITY NEEDED			
		Approx. L/min X1000	Approx. Igpm Range	Pumper Companies	Ladder Companies	Pumper Company, Minutes	Pumper Company, Minutes	Ladder Company, Minutes	Pumper Co's. No.	Pumper Co's. Min.	Ladder Co's. No.	Ladder Co's. Min.
1 (a)	Very small buildings, widely detached. Scattered	2	400	1	0	7.5	-	*9	1	7.5	*1	9
(b)	development (except where wood roof coverings).	3	600	1	0	6	-	*7.5	1	6	*1	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	2	6	*1	6
3 (a)	Close 3 - 4 storey residential and row housing, small mercantile and industrial.	6-9 10-13	1200-2000 2200-2800	2	1 (if required by Hazards)	3.5 3.5	5 5	*4 *4	2 3	5 6	*1 *1	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	1	3.5 3.5	5 5	4 4	4 5	7 7	1 **1	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 2 2	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

Notes to Table of Effective Response

** A ladder company is required here only when exceptional conditions apply, such as 3 storey heights, significant life hazards.*

*** For numerous or large single buildings over three stories use two ladder companies in 5 minutes.*

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.

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.

7.3. Fire Risk in the Village of Pemberton

The Village of Pemberton is primarily residential. There is a concern with the sizes of some residential structures in the Village of Pemberton. There are approximately 50 Single Family Residential structures with heights of three storeys.

Some roads in the Village of Pemberton are narrow and are not designed with proper turn around areas for the apparatus. This can create an increased risk of fire losses due to access delays in responding to fires, particularly in Multiple Family Residential and Duplex strata areas.

The main commercial area is located centrally in the Village with newer commercial occupancies along Portage Road and Highway 99.

There are four industrial areas within the Village of Pemberton:

- Non-rail related BC Rail Lands within the right-of-way for the mainline.
- The industrial parcel on Highway 99 (north of One Mile Lake Park).
- The Village's Industrial Park located on the road to Mount Currie.
- The Municipal Airport Lands.

The majority of the Industrial Park is undeveloped. The area is zoned for industrial but interspersed among the industrial occupancies are residential structures.

Potential fire hazards were viewed in and around the Village of Pemberton. A number of outdoor tire storage areas were found throughout the village. The largest quantity of outdoor tire storage was located at the occupancy across from the Industrial Park and a smaller amount of outdoor tire storage was viewed outside of Garibaldi Tire Services in the downtown area of the Village.

The Village of Pemberton is almost completely surrounded by forest and is located within a climatic subzone that has been historically influenced by regular wildfires. Urban development has been steadily increasing into the surrounding forested area. This combination has resulted in an increased interface of fire risk. The Village of Pemberton has a Community Wildfire Plan.

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:

1. *Occupancy Risk*: 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")

2. *Fire Flow Demand Zone*: 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")

3. Community: 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")

The community was divided up into geographically similar areas (from the perspective of fire fighting response characteristics) identified as "fire flow demand zones" organized as shown in Figure 7.3-1 Village of Pemberton Fire Flow Demand Zones.

To develop the required fire flows in the various fire flow demand zones in Village of Pemberton, the methodology described in Fire Underwriters Survey 1999 standard "Water Supply for Public Fire Protection" was used. See Appendix B.

Figure 7.3-1 Village of Pemberton Fire Flow Demand Zones

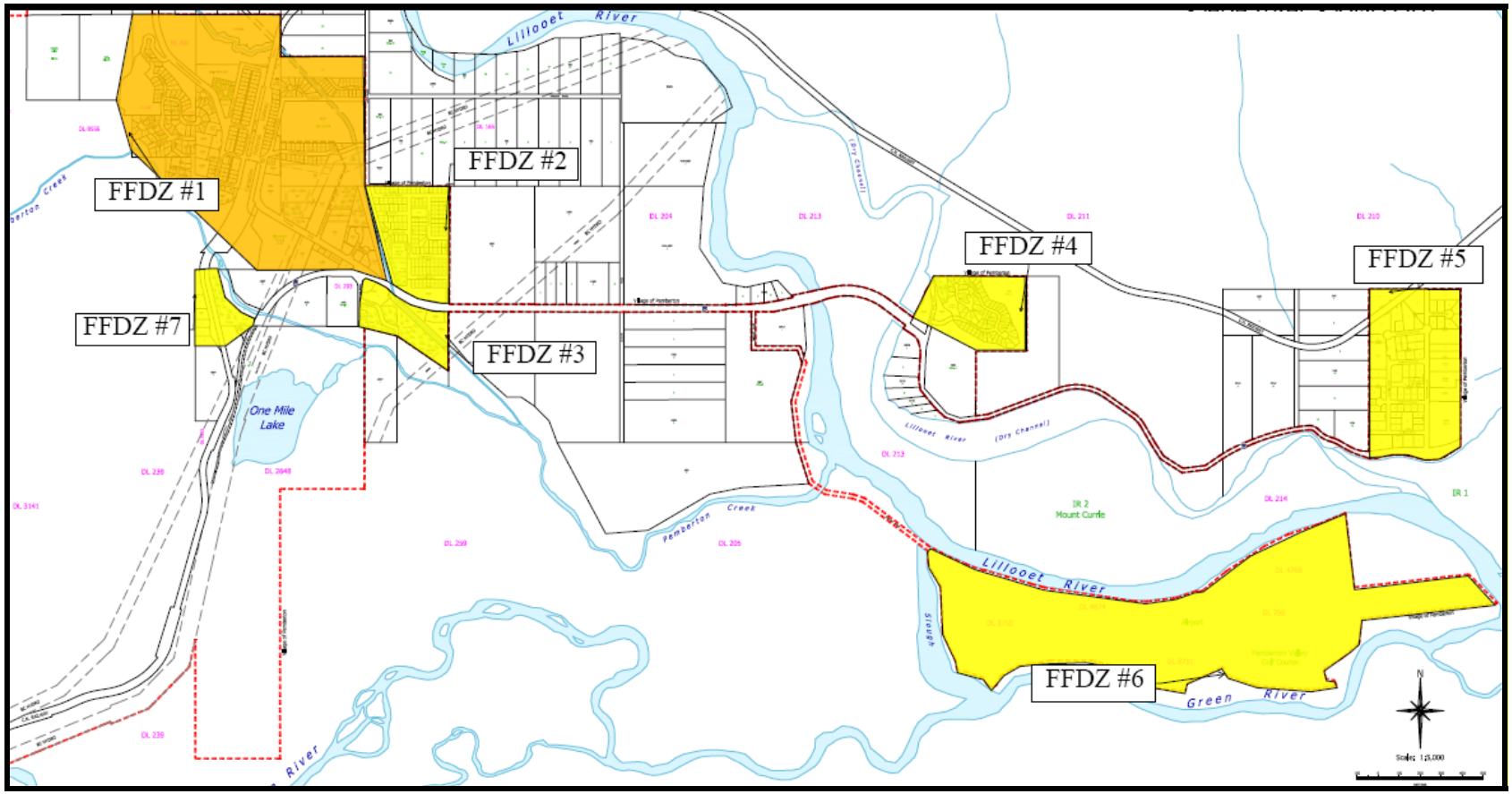


Table 7.3-1 Village of Pemberton Fire Protection Area Fire Flow Demand Zones

Fire Flow Demand Zones (FFDZ)	Fire Zone Risk Rating	Final RFF
1	3(b)	2900 IGPM
2	3(a)	1100 IGPM
3	3(a)	2600 IGPM
4	3(a)	1800 GPM
5	3(a)	1500 IGPM
6	3(a)	1500 IGPM
7	3(a)	2000 IGPM

The required fire flows were calculated for a representative sampling of buildings as well as for a representative sampling of "construction parameter zones". Each "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 Wildland Urban Interface). 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 each fire zone are shown in Table 7.3-1 Village of Pemberton Fire Protection Area Fire Flow Demand Zones. The final fire flows are utilized with associated risk categories from Table 7.2-1 Fire Underwriters Survey - 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 associated with the Village of Pemberton and its Fire Protection Area has been set at:

2600 IGPM

The benchmark requirements of this Basic Fire Flow from Table 7.2-1 Fire Underwriters Survey - Table of Effective Response are as shown in
Table 7.3-2 Summary of Benchmark Requirements for Basic Fire Flow. The community is measured against these benchmarks to establish the fire insurance grading classification.

Table 7.3-2 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
2600 IGPM	3.5 minutes	5 minutes	4	3 companies	6 minutes	1	4

7.4. Future Fire Risk in Village of Pemberton

The Basic Fire Flow of the community has been set at 2600 IGPM. The Basic Fire Flow of the community is not expected to change significantly in the next 10 years; however, major developments and zoning changes may cause the Basic Fire Flow value to increase. The Village of Pemberton is continuously growing each year.

Building starts (number of issued building permits) in the Village of Pemberton are expected to increase significantly prior to the 2010 Olympics due to the events going on in the neighbouring community of Whistler.

Tourism will substantially increase during July of 2008 when a major entertainment festival occurs. Short term (transient) population is expected to increase for the three day festival, sponsored by Live Nation, and is estimated to attract 40,000 people (*reference: Vancouver Sun, March 14, 2008*). Live Nation will be providing two tankers for the duration of the festival. These tankers will be parked near the fire hall and will respond to an event if needed. If the Village's water will be used, it will be for potable use only. Fire hazards are expected to be significant due to large tents set up for the festival. Open fires and fireworks will be prohibited. It should be noted that tents usually have low ignition temperatures, and depending on materials used, may pose a significant life

hazard while burning. Wildland Urban Interface risks may be increased substantially with planned camping for the event. The BC Forest Protection Branch will have an Initial Attack (I.A.) crew dedicated to the site of the festival.

Major growth in commercial, industrial and multi-family residential occupancies as well as tourism are the most influential factors on the Basic Fire Flow assigned to the Village of Pemberton.

Currently, The Village of Pemberton has two major construction projects that include a community centre with a library and a commercial/residential building on Portage Road similar to the one adjacent to it on Portage Road.

Ongoing residential growth, community build-up and expansion of Village lands (through annexation) may result in weaker distribution of resources if additional resources (ex. pumpers, fire stations, etc.) are not acquired. Typically, as more areas of a community are built-up, fire fighting capacity and ability to respond to concurrent events also needs to be built up.

It is expected that as the community continues to grow, the total fire load (and associated level of fire risk) will increase; however, the type of risk within the community is expected to remain primarily residential.

From the perspective of insurers, the level of fire risk is a function of several key factors (each of which are influenced by a number of sub-factors) that include:

i. **Likelihood** of fire event occurring
    a. Influenced by many risk factors
    b. Occupancy type (industrial, commercial, multi-family residential)
    c. WUI - wildland urban interface exposures and Climatic conditions
    d. Presence of combustibles, presence of ignition sources
    e. Quantity of area protected, number of buildings/risks
    f. Population demographic
ii. **Consequence** of fire event occurring
    a. Loss of life
    b. Density of population
    c. Number of persons expected to be affected

d. LOSS OF PROPERTY and PROPERTY VALUES

e. Loss of business, employment, tax revenue, economic impacts

iii. **Controls in place to prevent** fire event from occurring

a. Codes, Bylaws and enforcement measures

b. Fire Prevention Program

c. Community and building design

iv. **Controls in place to reduce impact** of fire event that occurs

a. Quality and availability of fire department

b. Number of staff and quality of training program

c. Number of apparatus and quality/reliability of equipment

d. Availability and reliability of adequate water supplies for fire fighting

When there is an increase in the quantity of values that are being protected by a fire protective service organization, the level of fire protective service typically must increase to meet the increased risk levels. If the level of fire protective service remains a constant during the rise of protected property values, then the rated overall level of risk increases and the fire insurance grade typically reflects this.

8. FIRE DEPARTMENT ASSESSMENT

8.1. Fire Department Profile

The Pemberton Volunteer Fire/Rescue Department is a paid on call fire department. The department has a total of 32 members who primarily live and work in the Village of Pemberton or in the areas surrounding Pemberton including Whistler.

The Pemberton Volunteer Fire/Rescue Department is operated and funded by Village of Pemberton. It was formed in October 1969 and operated under the provisions of the Pemberton Fire Protection Bylaw No. 68.

The Pemberton Volunteer Fire/Rescue Department provides fire protection to the Village of Pemberton and parts of the surrounding rural areas between the Ryan River Bridge, Mount Currie, and Highway 99 South to Tisdale. Pemberton Fire Rescue covers an area of approximately 500 sq.km.

The primary service the fire department provides is structural fire protection; however the department also provides some emergency medical assist services in addition to motor vehicle accident response and water rescue.

8.2. Fire Department Operations and Administration

The fire fighters are all paid on call. The position of Fire Chief, Deputy Chief and Prevention Officer are part time positions. The Fire Chief, Deputy Chiefs, and Captains receive an honorarium and the training officer/Captain is given an added bonus. The fire fighters are paid to attend practice. Dispatch personnel are available 24/7 and are paid on a shift basis. Each shift is 24 hrs.

The Pemberton Volunteer Fire/Rescue Department has a By-Law for Establishing and Regulating the Fire Department.

Officers:

1. Russel Mack, Fire Chief
2. Christian Staehli, Deputy Chief
3. Richard Doucet, Deputy Chief
4. Ben Hansler, Fire Prevention
5. Peter Schimek, Training Officer

The Fire Chief's background information was not available.

The Deputy Chief has various First Aid training with a current First Responder Level 3 certification. The deputy also has Live Fire 1 and 2 certifications. Through Whistler/Blackcomb the deputy chief has Progressive Discipline Levels I, II, and III and Conflict Resolution Level I, II, and III. Also has completed Train the Trainer, Pinpoint and Record, and Time Management through Management Tools Incorp. (MTI)

8.2.1. Administration Effectiveness

The Fire Department is primarily administered by the Fire Chief. The Chief delegates some administrative tasks to the officers. The Chief's administrative responsibilities include:

8.2.1.1. Planning and establishing direction

The fire department does not currently have a formal master plan document and in the absence of such a plan is moving forward by evaluating the level of risk in the community and adding resources when possible to protect the risks in the community. This is normal for small communities and as the Village of Pemberton continues to grow the need for more formalized planning will increase. The fire department administration has done an excellent job in establishing resources that are appropriate to the level of risk in the community.

Recommendation 8.2-1 Develop fire protection master plan document

To improve the level of fire protection in the community to keep pace with anticipated growth, the fire department should develop a master plan document. This will greatly assist the fire department in ensuring that a reasonable level of protection is maintained during community growth periods. The document should be created in conjunction with

the Official Community Plan (or community master plan) and should be updated regularly to reflect changes and remain relevant.

8.2.1.2. Structuring

The organizational structure of the fire department is well established and like most fire departments is based on a militaristic model. However the fire department does not have an established organization mission statement, organization chart or job descriptions for the various key positions (chiefs, officers, etc.). The lack of formal organization is common in small fire departments but can result in obstacles and liability for the department in issues of succession and accountability.

Recommendation 8.2-2 Develop and implement formal organization documents

To improve the level of organization throughout the fire department, and to improve the succession capacity of the department, an organization mission statement should be developed. Additionally, an organization chart and job descriptions for the various key positions (chiefs, officers, etc.) should be developed and updated on an ongoing basis.

8.2.1.3. Coordinating Operations

The current administration has been effective in coordinating the activities of the fire department and over the past several Fire Underwriters Survey assessments the fire department has been noted to have become progressively more professional and organized.

The fire department has a set of Standard Operating Guidelines however they were not readily accessible during the assessment. The Standard Operating Guidelines are reportedly outdated and not well organized. SOG's are very important to establish a reasonable and documented level of safety for fire fighters and officers both on the fire ground and in training. The department's lack of a well organized set of SOG's increases the risk of liability should an accident or injury occur.

To provide a reasonable level of safety and organization and to reduce the risk of liability, the fire department should develop a comprehensive set of Standard Operating Guidelines. At a minimum the guidelines should include specific procedures for handling the events specified in the WCB Occupational Health and Safety Regulations,

Reference: OHS Regulation › Part 31 Firefighting

31.5 Procedures

(1) Written procedures must be established and followed by a fire department or industrial fire brigade to

(a) manage and track firefighters at an emergency incident,

(b) manage exposure to bloodborne pathogens,

(c) manage stress arising from an emergency incident that is likely to cause adverse health effect to firefighters,

(d) provide for effective traffic control at emergency incidents, and

(e) operate firefighting vehicles during emergency and non-emergency travel.

(2) Written procedures must be established and followed by a fire department or industrial fire brigade for the following situations, where applicable:

(a) fires in buildings 7 storeys or over;

(b) firefighting over water and underground;

(c) fires and other emergency incidents involving hazardous substances;

(d) rescue from high angles, confined spaces, trenches, excavations and water;

(e) disaster planning and response;

(f) electrical emergencies.

8.2.1.4. Conducting programs

On an ongoing basis the current administration has developed and implemented an effective training program for fire fighters and officers. The administration has also successfully initiated a fire prevention inspection program and is developing this program on an ongoing basis.

8.2.1.5. Staffing and recruiting

The administration has been very effective in recruiting volunteer fire fighters for many years. This is one of the most significant ongoing challenges for any fire department administration and is critical to the successful operation of the fire department. The roster size of the fire department is evaluated in greater detail in section 8.12 Available Fire Force.

8.2.1.6. Training and evaluating

As noted previously, the administration has successfully developed and implemented a training program for fire fighters and officers. The program is considered to be good, however the program lacks effective recording of training activities and scheduling of future activities. Recommendations for the training program can be found in section 8.14 Training & Qualifications.

8.2.1.7. Acquiring apparatus and equipment

The fire department administration has done an excellent job of acquiring an appropriate amount of apparatus for the community and this has a significant impact on the fire insurance grades of the community. Acquisition of fire protection related equipment is also very good.

Recommendations for the training program can be found in section 8.5 Apparatus and Equipment.

8.2.1.8. Developing and implementing apparatus/equipment maintenance programs

The apparatus maintenance program is rated as good, however could be further improved with better organization and documentation of activities that are needed. Notably, the apparatus maintenance program is poor in most small communities and the fire department administration has done very well in this area.

8.2.1.9. Budgeting and maintaining financial records

The financial recording systems have progressively improved in recent years. The fire department budget documentation is semi-organized, however could be further improved.

8.2.1.10. Liaising with government(s) and reporting

The fire department administration has an excellent relationship with the Village of Pemberton local government as well as neighbouring governments in the area.

8.2.1.11. Public relations and education

The current administration has limited resources for public relations however operates several successful local fire prevention public education programs.

8.2.2. Administrative Record Keeping

The fire department primarily utilizes hard copy file management systems. These systems were adequately set up in filing cabinets, however file organization was considered to be poor. A clear filing system was not in place and files were not organized by subject area or date. File labelling was inconsistent and in some cases files were difficult to locate or could not be located.

Recommendation 8.2-3 Improve filing system

Lack of effective filing systems can result in loss of efficiency and increased risk of liability for the department. Filing systems in the fire department administration should be improved. Strong consideration should be given to moving to an electronic recording system specifically designed for fire protection services.

8.2.3. Finances – Capital and Operational Budgets

As communities grow there tends to be an increased interest in providing reasonable levels of fire protection. The primary motivation for providing fire protection is life safety. Providing reasonable levels of fire protection can have a significant cost impact also.

The inherent cost of purchasing the assets required to provide fire protection and to operate a fire protection service are important limiting factors in the quality of fire protection service programs. However it should be noted that investment fire protection services has cost benefits also. Indirectly, the prevention of fires as well as the successful suppression of fires can have a dramatic impact on the continuity and viability of businesses throughout a community (and related employment). Additionally, provision of fire protection service levels that are recognized for fire insurance grading purposes can have an impact on the cost of insurance for property owners.

The Village of Pemberton Fire Department has operated with the following budgets in recent years.

Table 8.2-1 Pemberton Fire Rescue Budget Summary 2001-2008

FIRE PROTECTION ITEM	2001	2002	2003	2004	2005	2006	2007	2008
	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget
Reserve (Prior Year Surplus/Deficit)			-4,741		-32,426	32,284	22,180	
MFA Proceeds						235,000		
SLRD Outside Fire District Contribution								
Grants							5,000	5,000
REQUISITION			-201,669		-311,711	335,038	357,634	393,313
TOTAL REVENUES	0	0	-206,410	0	-344,137	602,322	384,814	398,313
Fire Protection Expenses (Shared)								
F/D - Honorarium & Wages	83,615	102,418	111,704	131,000	147,950	166,424	174,745	183,607
F/D - Other Personnel Exp	12,304	11,768	8,151	11,400	13,500	19,000	8,500	8,662
F/D - Fire Prevention	467	525	551	1,000	1,200	1,248	1,248	1,285
F/D - Training	10,047	11,605	5,301	12,300	12,900	13,416	13,416	13,818
F/D - Stations	8,394	9,450	9,923	10,900	11,445	19,760	19,760	19,885
F/D - Equipment Operations	25,921	33,081	37,332	42,700	64,150	68,416	99,010	102,248
F/D - Fees & Supplies (Sundry)	10,913	20,093	13,776	14,697	17,988	18,708	18,708	18,824
F/D - Debt Servicing - Interest						17,871	9,854	10,411
F/D - Debt Servicing - Principal							19,573	19,573
Ladder Truck (VOP only)				11,475	13,500			
F/D Fire Cmte Contingency					14,132			
subtotal	**151,661**	**188,940**	**186,738**	**235,472**	**296,765**	**324,843***	**364,814**	**378,313**
F/D - Capital Expense (Shared)			19,672					
Fire Protection Equipment								
Cap Exp, Fire Protection	31,243	27,677		21,200	30,800	13,600	10,000	10,000
Protection - Fire						235,000		
Fire Equipment (Ladder Truck)			36,763	5,000	10,000	10,000	10,000	10,000
Fire Hall			60,000		6,572	6,509		
Contingency								
	31,243	**27,677**	**96,763**	**26,200**	**47,372**	**265,109**	**20,000**	**20,000**
TOTAL FIRE DEPARTMENT OPERATIONS	**182,904**	**216,617**	**283,501**	**261,672**	**344,137**	**602,322***	**384,814**	**398,313**

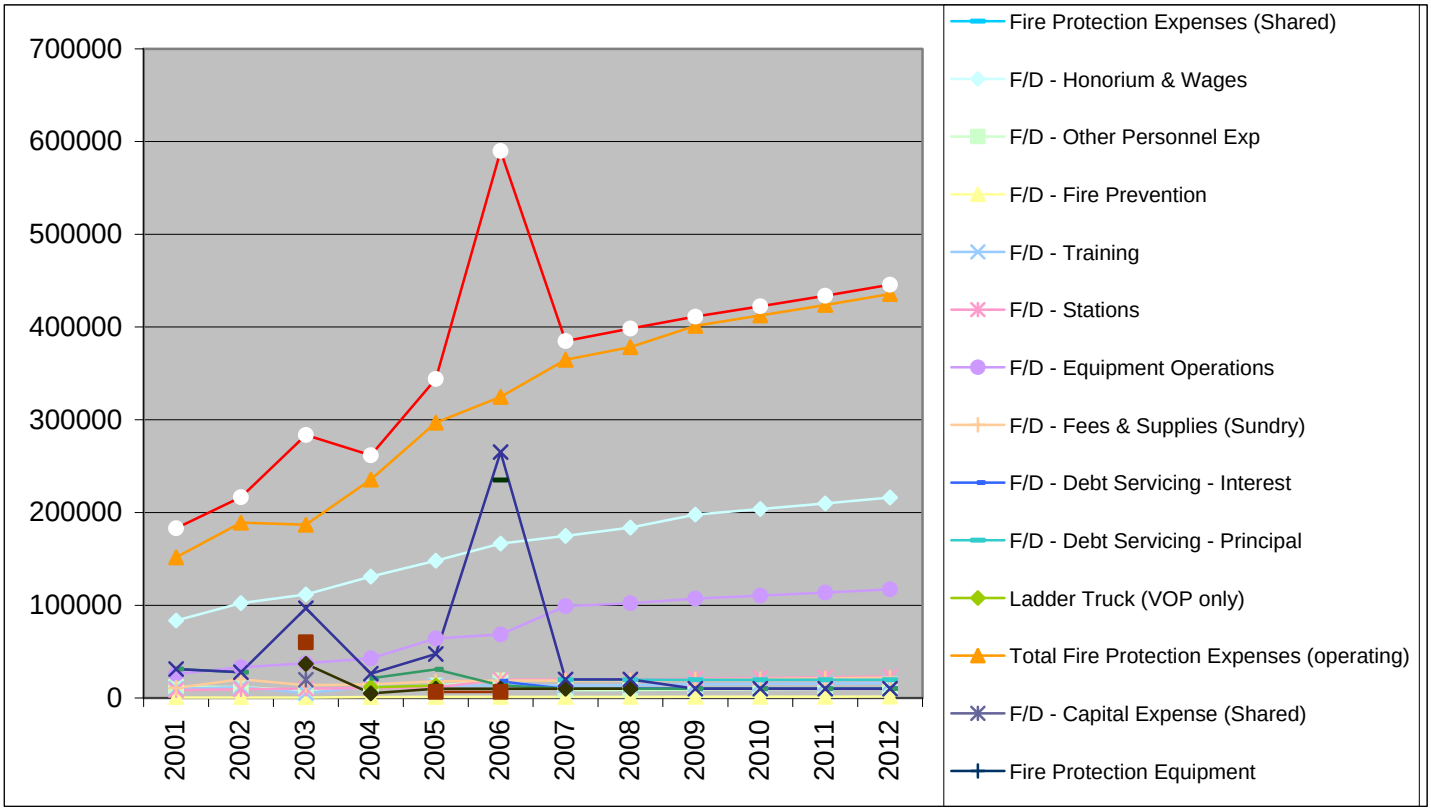
* The budgeted amount ($337,213) differs from the sum of expenses ($324,843) resulting in a difference of $12,370. This discrepancy has not been clarified.

FIRE PROTECTION ITEM	2001	2002	2003	2004	2005	2006	2007	2008
	Budget	Budget	Budget	Budget	Budget	Budget	Budget	Budget
Fire Truck LSA#28						-9,902		-30,000
Rescue Services Operations								
PRIOR YEAR SURPLUS (DEFICIT)			18,097		-1,589	-4,496		
REQUISITION			-15,491		-36,461	44,065	43,834	43,834
TOTAL REVENUE	0	0	2,606	0	-38,050	39,569	43,834	43,834
Rescue Service Expense								
F/D - Rescue Personnel Call-Out			15,500					
F/D - Rescue Veh. Exp.	12,322	12,411	19,322	38,050	38,050	39,569	43,834	43,834
Cap Exp - Rescue Service	1,797	2,100						
RESCUE SERVICE (Shared)	**14,119**	**14,511**	**34,822**	**38,050**	**38,050**	**39,569**	**43,834**	**43,834**
TOTAL FIRE & RESCUE OPERATIONS	**197,023**	**231,128**	**318,323**	**299,722**	**382,187**	**629,521**	**428,648**	**442,147**
SURPLUS/DEFICIT			37,428					
% Increase excluding debt servicing & fire truck purchase						5.70%	3%	3%

The figures in the budgets from recent years are typical for a fire department serving a community of approximately 3,000 residents. Notably, there are several visible trends in the budgets associated with fire protection. As can be seen in the following figure, there is a trend toward an increased budget for honorariums and wages. This increased investment in fire protection will be reflected in reduced fire losses throughout the community and improved (or maintained) fire insurance grades.

There is a notable spike in capital costs in 2006. This is normal as all fire departments have a periodic need for capital expenditure (usually apparatus replacement or upgrade, or fire station replacement or upgrade). Progressive communities have an ongoing capital budget for asset replacements and upgrades. Additionally, developers can be charged for the procurement of assets that will be required to protect the sub-divisions that are developed such as fire stations and apparatus.

Figure 8.2-1 Pemberton Fire Rescue Budget Trend Lines



The following table and figures are provided for comparative purposes. Communities with similar characteristics (populations and levels of fire protection) are shown for information and comparison only. The data provided is limited in several ways. Data for all years is not available, so a single year (from between 2006-2008) is shown. It is important to note that numerous variables cause budgets for municipalities and fire protection services to fluctuate from year to year. The following example budgets are considered to be representative of typical years, however the degree of fluctuation for each of the locations has not been analysed extensively.

Table 8.2-2 Statistical comparison of Pemberton to similar communities

Statistical Comparisons	Pemberton	Bowen Island	Grand Forks	Tumbler Ridge	Elkford
	2007	2006	2007	2008	2006
Fire Services Cost as a percentage of Municipal Operating Budget					
Municipal Budget (Budgeted or Actual) $	4,410,992	4,309,741	7,597,242	11,847,457	5,839,136
Budgeted or Actual Fire Services Cost $	384,814	233,215	503,227	690,377	398,897
Fire Cost as a % of Municipal Budget	8.7%	5.4%	6.6%	5.8%	6.8%
Public Fire Protection Classification	7	8	6	6	6
Fire Service Cost to Population Ratio					
Population (from Stats Can 2006 Census)	2,192	3,362	4,036	2,454	2,463
Municipal Budget to Population Ratio	$2,012	$1,282	$1,882	$4,828	$2,371
Fire Service Cost per capita	$176	$69	$125	$281	$162
Fire Protection Budget as a % of Property Assessment					
Fire Services Budget	384,814	233,215	503,227	690,377	398,897
Assessed Property Values (full)	423,000,000	1,600,000,000	463,000,000	402,700,000	322,000,000
Ratio (cost per $1000 assessed value)	$0.91	$0.15	$1.09	$1.71	$1.24
Fire Fighters per 1000 Population					
# of career fire fighters and officers	1.5	0.5	2	1	1
# of auxiliary fire fighters and officers	30.5	28	42	20	25
Population	2,192	3,362	4,036	2,454	2,463
Career fire fighters per 1,000 population	0.68	0.15	0.50	0.41	0.41

The following figures provide a graphical representation of the data in this table.

It is important to stress that the data presented here is only a single year representation and the available data does not represent the average value per year, but is rather intended to represent a single typical year. In all of the communities shown, there are years where cost for fire protection spikes due to large capital purchases/investments such as fire apparatus and fire stations.

Figure 8.2-2 Municipal Budget Cost per Capita

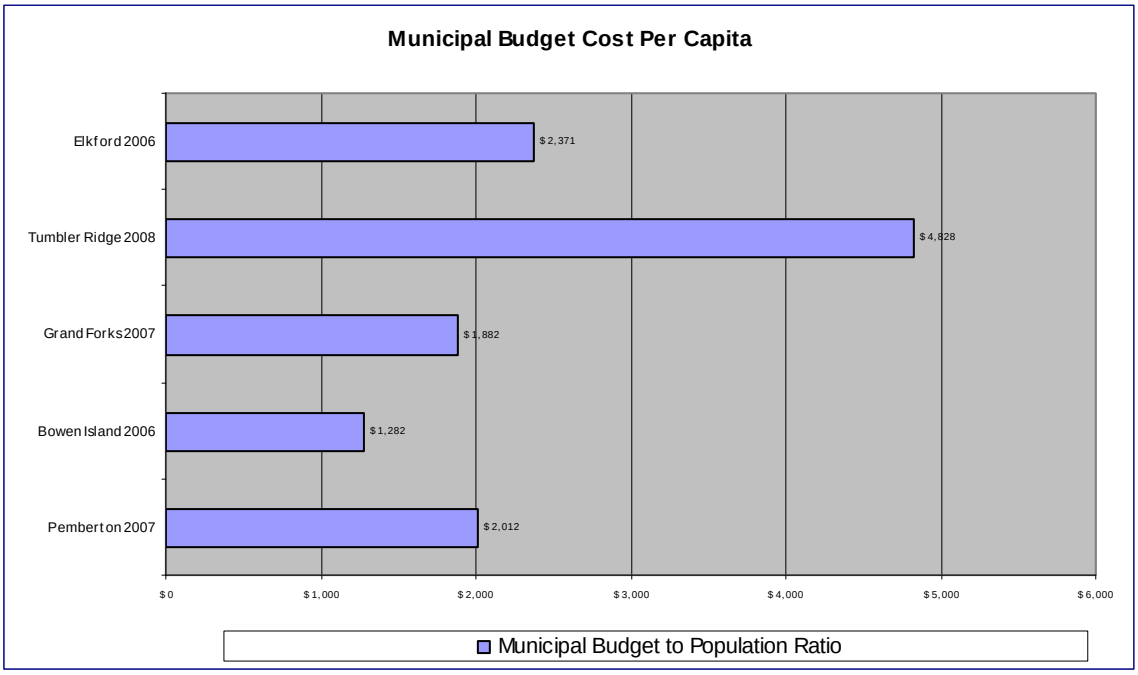
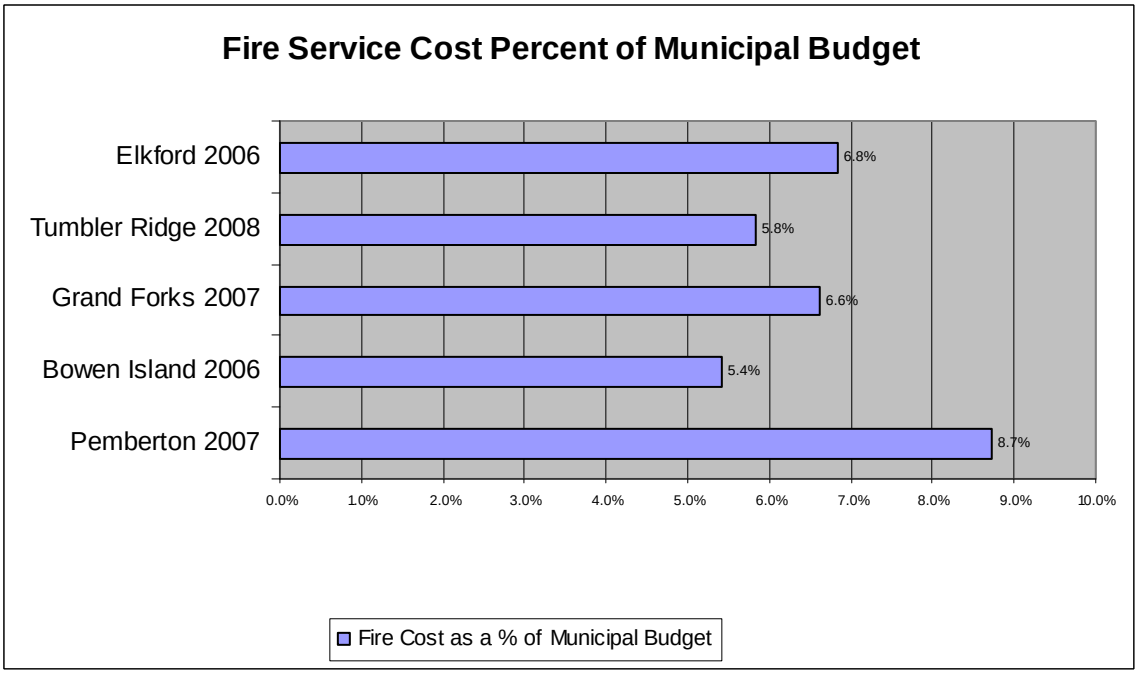
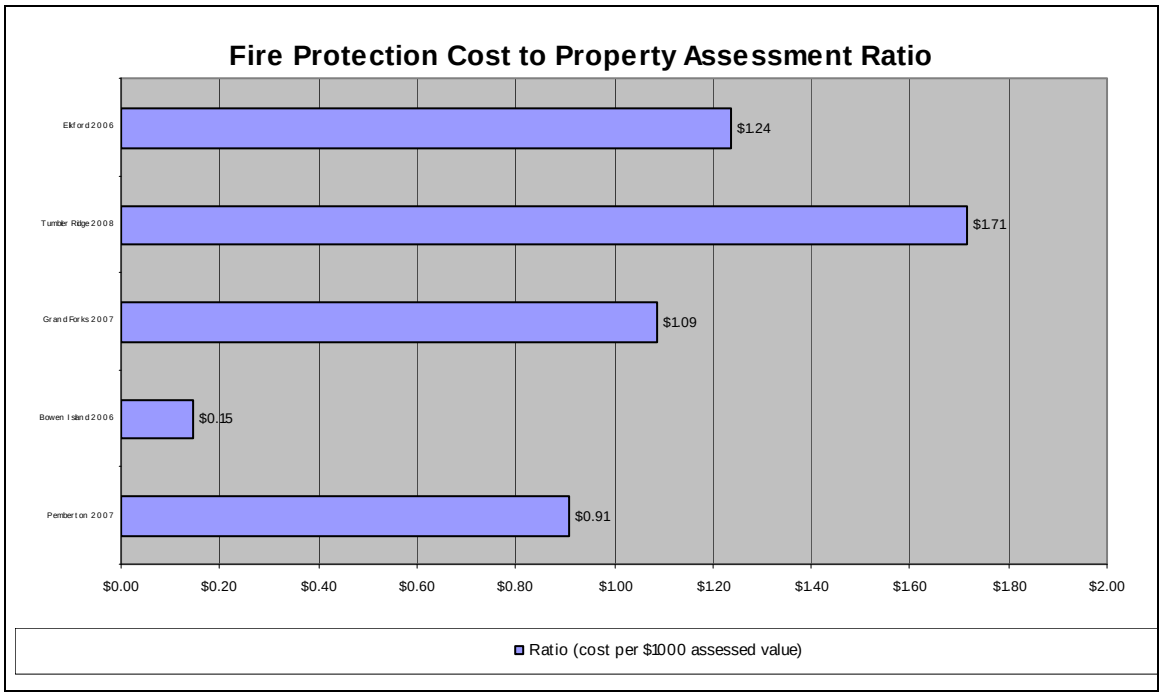


Figure 8.2-3 Fire Service Cost Percent of Municipal Budget



The cost percent of the total municipal budget for the Village of Pemberton fire protection services is slightly higher than the communities selected for comparison. This is partially due to the staffing costs and the implementation of the fire prevention program. This program is extremely important to the reduction of overall fire losses and associated business interruption in the community. A detailed assessment of the savings resulting from reduces fire losses is beyond the scope of this study, however should be noted to be significant.

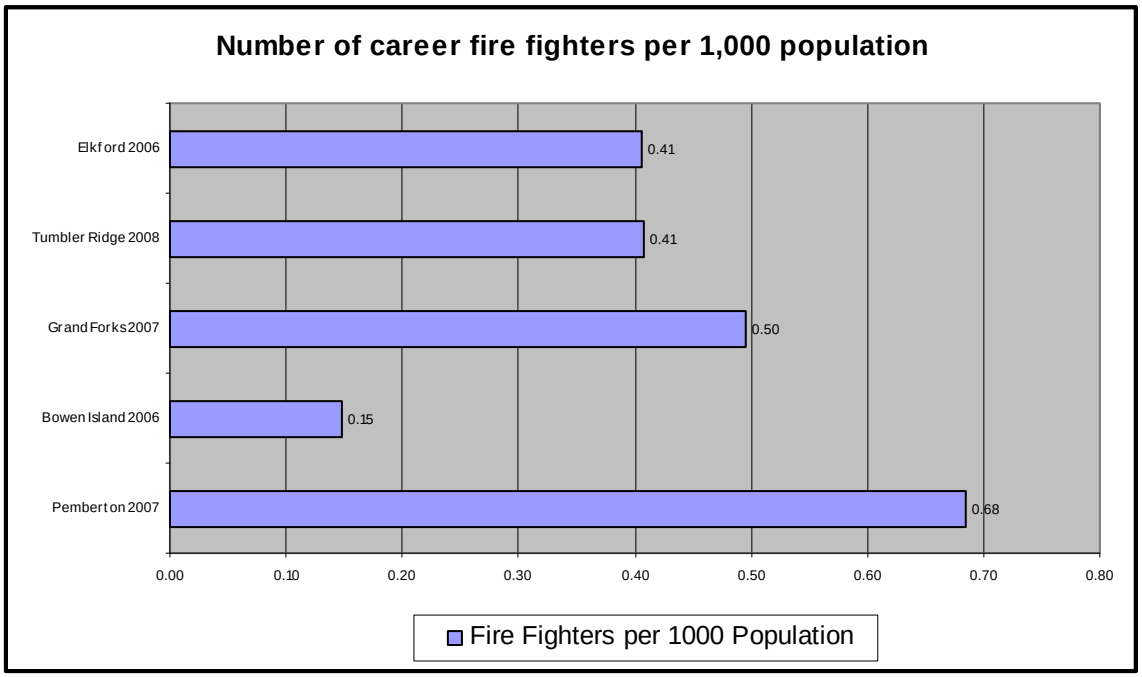
Figure 8.2-4 Fire protection to property assessment ratio



The values considered here are from the most recently available BC Assessment news releases. The values are the "total assessment roll". Note that the year of the assessment roll does not necessarily correspond to the year of the municipal budget. Data for the municipal budgets was limited to what was available whereas the assessment roll data was primarily from 2007-08. However all data for this analysis is from between 2006 and 2008 and provides a rough estimate that is considered to be typical (or in the order of).

Notably, the cost of fire protection services per thousand dollars of assessed values is lower than average and is indicative of efficient use of spending on fire protection service assets and programs.

Figure 8.2-5 Number of career fire fighters per 1,000 population



This table utilizes a value of 1.5 for career fire fighters for the Village of Pemberton and includes credit for the fire prevention officer's part-time paid services.

Overall, the Pemberton Fire Department is doing well by comparison with regard to spending an appropriate amount of funds to provide a reasonable level of fire protection services. Recent improvements in record keeping and administration for finances should be maintained and improved upon.

Recommendation 8.2-4 Improve documentation of budgets and finances

The fire department should continue to develop and improve a well-documented budget every year. Further steps should be taken to provide a high level of organization and documentation at a granular level in budgeting.

Recommendation 8.2-5 Include apparatus replacement and upgrade fund in budget

Budgeting should be expanded to include apparatus replacement and upgrades funds (as well as station replacement and upgrades). This will help the community to plan and be prepared to provide a reasonable level of fire protection for developments that are constructed.

8.2.4. Cost Benefit of Investment in Fire Protection

8.2.4.1. Background

Fire protection service and risk levels in communities throughout Canada are assessed and assigned fire insurance grades and classifications by Fire Underwriters Survey. The fire insurance grading classifications are used by fire insurance underwriters to determine the amount of risk they are willing to accept within a given community, area 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 significant fire or life safety event occurring within a community. This system is used for Commercial Lines[4] insurance.

[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.

[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.

Table 8.2-3 FUS Grades correlation to commonly used Insurance terminology and simplified grades

Personal Lines IBC Dwelling Protection Grades Statistical "5 tier" System.	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 3A	1 2 3 4	Table 1	Protected
3B 4	5 6 7	Table 2	Semi - Protected
5	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 8.2-3) 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.

8.2.4.2. Personal Lines: Dwelling Protection Grades

The protected assignment refers to DPG 1 to DPG 3A. An unprotected designation refers to DPG 5. DPG 3B and 4 are typically given the semi-protected designation, although in some cases DPG 4 may be treated as unprotected. The lower the DPG assignment the larger the discount given in fire insurance rates. The discounts given for a property considered semi-protected over an identical property considered unprotected have typically been found to be in the range of 60%±. Where there is sufficient population and sufficient taxation base, the savings generated can more than offset the operating and capital costs of a fire service.

The approximate base rates of a national underwriter of single family residences are displayed below. These rates were compared with the rates of other companies to ensure their competitiveness and reasonable accuracy. Fire insurance cost is typically based upon the replacement value of building and contents. (Additional options are available that tend to increase the cost of base coverage rates which are not included in the following table.) The following sample rates do not apply to manufactured homes, which are evaluated with a different methodology.

Table 8.2-4 Comparison of Insurance Premium Cost between Protection Classifications

Replacement Value	Unprotected Rate[5]	60±% reduction	Semi Protected Rate[5]	32±% reduction	Fully Protected Rate Error! Bookmark not defined.
100,000	1165		465		315
125,000	1470		585		400
150,000	1750		700		475
175,000	2040		815		555
200,000	2300		915		625
250,000	2790		1110		755
300,000	3290		1310		890
350,000	3750		1495		1015
400,000	4200		1675		1140
450,000	4655		1855		1260

8.2.4.3. Commercial Lines: Public Fire Protection Classifications

The second grade that communities are interested in is the Public Fire Protection Classification. This grade is calculated from a comprehensive evaluation of the community and fire defence capabilities. This grade is a number between 1 and 10 with 1 being superior fire protection and 10 being unprotected. The PFPC grade of a community is a significant factor that most insurance companies use to set insurance premium rates for all buildings that are not single family dwellings. All such buildings are referred to as “commercial”. This includes assembly, institutional, industrial, multi-family residential and all others with the noted exceptions of single family and duplex structures.

The protected assignment typically refers to PFPC 1 to PFPC 4. An unprotected designation refers to PFPC 8 to PFPC 10 whereas PFPC 5 to PFPC 7 are typically given

[5] Rates are representative of base cost (comprehensive all risk) for single family non pre-manufactured homes

the semi-protected designation. The lower the PFPC assignment the larger the discount given in fire insurance rates and the greater that the insurer capacity will be.

The PFPC classification is also used to determine capacities[6] for almost all insurers in Canada.

Many factors affect "commercial" property insurance premium rates. The Public Fire Protection Classification is significant, however it is important to note that there are many other significant factors that will affect insurance premiums in commercial properties. Such factors include but are not limited to: construction (combustible, noncombustible, etc.); building size; building value; type of occupancy; type of business; etc.

For information purposes, several insurance companies were contacted and quoted rates for commercial lines insurance policies were provided to illustrate the influence the Public Fire Protection Classification System has on insurance premiums.

Table 8.2-5 Example Commercial Insurance Premiums at varying PFPC Classifications

	PFPC Insurance Premium per Year[7]			PFPC Insurance Cost Forecast over 10 years[7]		
Occupancy	**8**	**7**	**6**	**8**	**7**	**6**
Office	$ 2,982	$2,900	$ 2,647	$ 29,820	$ 29,000	$ 26,470
	Saving:	*3%*	*9%*			
Manufacturing (Wood)	$ 18,706	$15,437	$ 17,868	$ 187,060	$ 217,180	$ 178,680
	Saving:	*17%*	*18%*			
Hotel	$ 47,057	$45,821	$ 39,938	$ 470,570	$ 458,210	$ 399,380.00
	Saving:	*3%*	*13%*			
Apartment Complex	$ 13,281	$12,710	$ 11,828	$ 132,810	$ 127,100	$ 118,280
	Saving:	*4%*	*7%*			

For further illustration, the following table was developed to forecast what insurance premium savings would be if the community improved its Public Fire Protection

[6] Capacity: The largest amount of insurance an insurer or a reinsurer is willing or able to underwrite. The term can refer to an insurer's capacity on one individual, one area or community, or to the insurer's capacity for all its business.
[7] Insurance Premiums have been calculated for $250 million in insured properties

Classification from PFPC 8 to PFPC 7 or PFPC 7 to PFPC 6. The cost savings were forecast over a 10 year period and were calculated for $250 million of each example risk type.

Table 8.2-6 Cost Benefit Forecast (10 year) of Varying Improvements to PFPC[5]

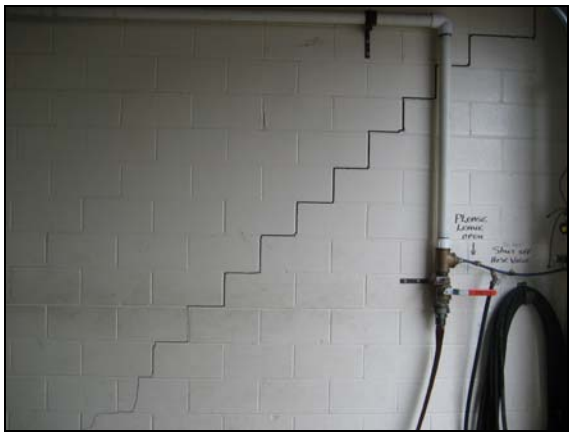
	Public Fire Protection Classifications Insurance Cost Forecast over $250 million of each risk type				
Occupancy	**8**	**7**	**6**		
					Cost Benefit between
Office	$3,388,636	$3,295,454	$3,007,954		
	Saving:	*$93,181*		--->	$93,181
Manufacturing (Wood)	$9,353,000	$7,718,500	$6,935,000		
	Saving:	*$1,634,500*		--->	$1,634,500
Hotel	$3,921,416	$3,818,416	$3,328,166		
	Saving:	*$103,000*		--->	$103,000
Apartment Complex	$3,320,250	$3,177,500	$2,957,000		
	saving:	*$142,750*		--->	$142,750

Average	$493,357

As can be seen, the cost benefit of achieving a lower fire insurance grading can be significant. Communities can achieve lower fire insurance grades by providing an improved level of fire protection and reducing their fire risk.

8.3. Fire Station Suitability

The fire hall is owned by the Village of Pemberton and is a two storey shared building. The first floor is used by the fire department only and the second floor is occupied with offices used by the Squamish-Lillooet Regional District. The construction of the building is post and beam and is of combustible construction. The roof construction is flat with tar and gravel finish. The roof serving the aerial apparatus is a flat roof constructed with wood truss. The Pemberton Volunteer Fire/Rescue Department operates out of 5 bay doors, 2 doors measuring 10'x10', 2 doors measuring 12'x10' and one door measuring 13.5'x14'. Heating in the hall is supplied by electric heating units and electric baseboard heating in the office area.



The fire station is generally in fair condition, however concrete block walls were noted to be cracked in some areas and the degree of reinforcing is unknown.

The recent addition of a larger bay suitable for housing the aerial apparatus has not been completed due to lack of adequate funding. The interior of the new bay is exposed and combustible and is at an increased risk of fire damage due to the lack of interior finish materials such as drywall.

The station lacks adequate storage space and currently the SCBA refill station is located on the apparatus bay floor between apparatus. Notably, the apparatus bay area has not been provided with exhaust extraction equipment.

Recommendation 8.3-1 Complete structural assessment for fire station

To ensure that the fire station is not at risk of structural failure, a structural assessment should be conducted.

Recommendation 8.3-2 Plan to replace fire station

As the Pemberton Fire Department grows, the Village should plan to replace the existing fire station within approximately 5 to 10 years. Plans for the replacement fire station should include adequate facilities for

- administration (office space for chief, administrator, fire prevention and training officers)
- training (space and facilities for training a larger roster (dependent on expansion of roster size)
- apparatus and equipment space

- supplies storage
- emergency communications
- lounge and recreation area for volunteers.

The future fire station should be a dedicated building that is not shared with other agencies nor used for purposes other than fire protection.

Recommendation 8.3-3 Provide exhaust extraction to fire station

To reduce the exposure of fire fighters to hazardous fumes from vehicle exhaust, the fire station should be provided with exhaust extraction systems that are designed to be used for emergency apparatus (quick release, ceiling hung, etc.).

8.4. Distribution of Resources and Response Times

Resources for fire fighting are centrally located within the Village of Pemberton and the Fire Protection District. All fire fighters live within ten minutes of the fire hall. Approximately six fire department members work in the Village. The majority of other fire department members work between the Village of Pemberton and the Resort Municipality of Whistler.

The Village of Pemberton is bisected by a railway track with one main road way that crosses this track; however there is an alternate route that is past the high school with an underpass. The Village would be without fire protection services if the routes were blocked due to a major train derailment. It would hinder response for fire department members who are on side that does not have the fire station.

Response distances to residential occupancies within the Village are within 8 km of road travel distance with the majority being less than 5 km from the fire hall. Most commercial occupancies are within 2.5 km of road travel from the fire hall.

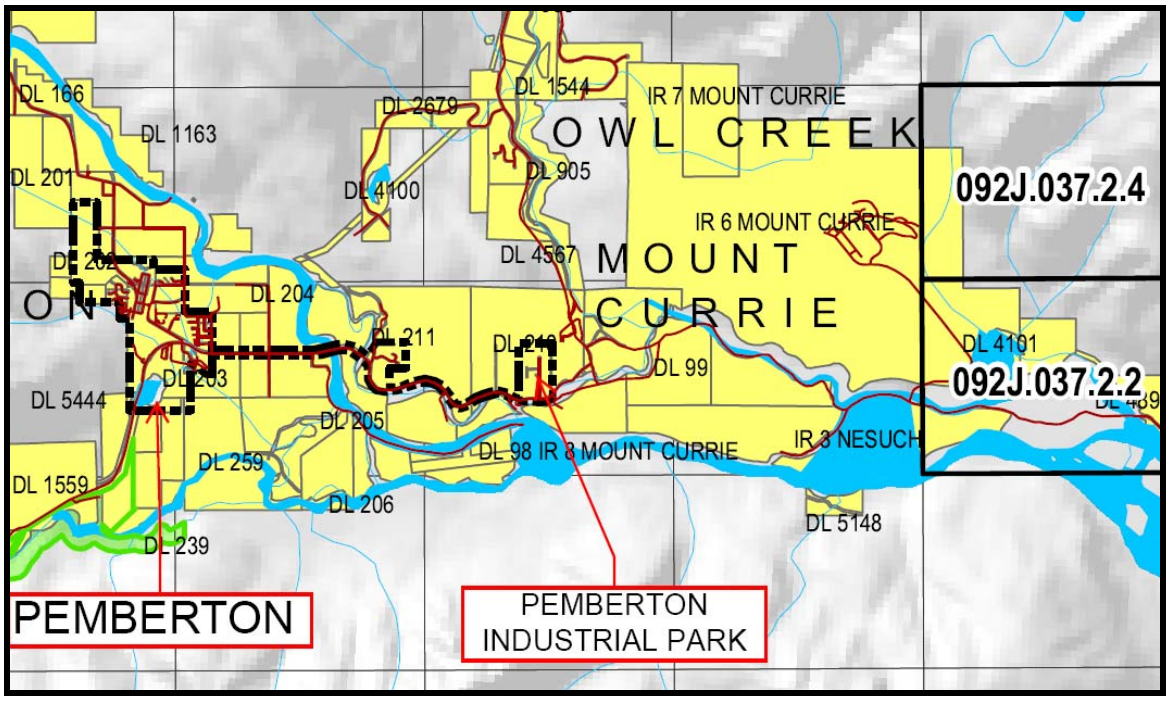
Industrial occupancies are generally greater than 5 km in road travel from the fire hall. The Village's Industrial park is approximately 7 km from the fire hall. Due to a response distance greater than 5 km by road from the fire station to the industrial park area, this area is graded as unprotected for Commercial Lines insurance (note that single family residential and duplex properties may still receive protected status if they are within 8 km road response).

Response to properties in the Fire Protection District (contract protection areas of the Squamish-Lillooet Regional District) varies, but in many cases is greater than 8 km in road travel distances from the fire hall.

The Village of Pemberton is considered to be reasonable well-served by one fire station in the majority of areas, however adding additional fire stations may be a topic for consideration, particularly when considering providing fire protection services to areas outside the current Village boundaries (either by expansion or contract) and/or providing a reasonable and recognized level of service to the Pemberton Industrial Park.

Adding additional fire stations may prove challenging with regard to recruiting/providing an adequate number of fire fighters to respond to a potential new fire station. As Mount Currie currently does not have a fire station, consideration should be given to establishing a partnership between Mount Currie and Pemberton to provide a new fire station that would provide An improved level of service to both areas.

Figure 8.4-1 Village of Pemberton Boundary, Industrial Park and Mount Currie



It may be feasible to select a site for a new fire station that would provide a response by road to the Pemberton Industrial Park of less than 5 km as well as a response by road to the majority of Single Family Residential and duplex properties within Mount Currie. There are a number of advantages to this partnership:

1. Fire station could be operated and owned by Village of Pemberton / Pemberton Fire Rescue; properties protected would receive fire insurance grades associated with Pemberton
2. Fire fighters from Mount Currie could be integrated to department giving a base of fire fighters toward available fire forces at the fire station
3. Apparatus from Mount Currie could be housed at the station and credited

If a new fire station is considered by the Village of Pemberton, the first priority should be to provide a reasonable and recognized level of protection to all areas within the legal boundaries of the Village. The location for a possible new fire station should be appropriate to achieve the maximum cost benefit to property owners within the Village and within the boundaries of any partners.

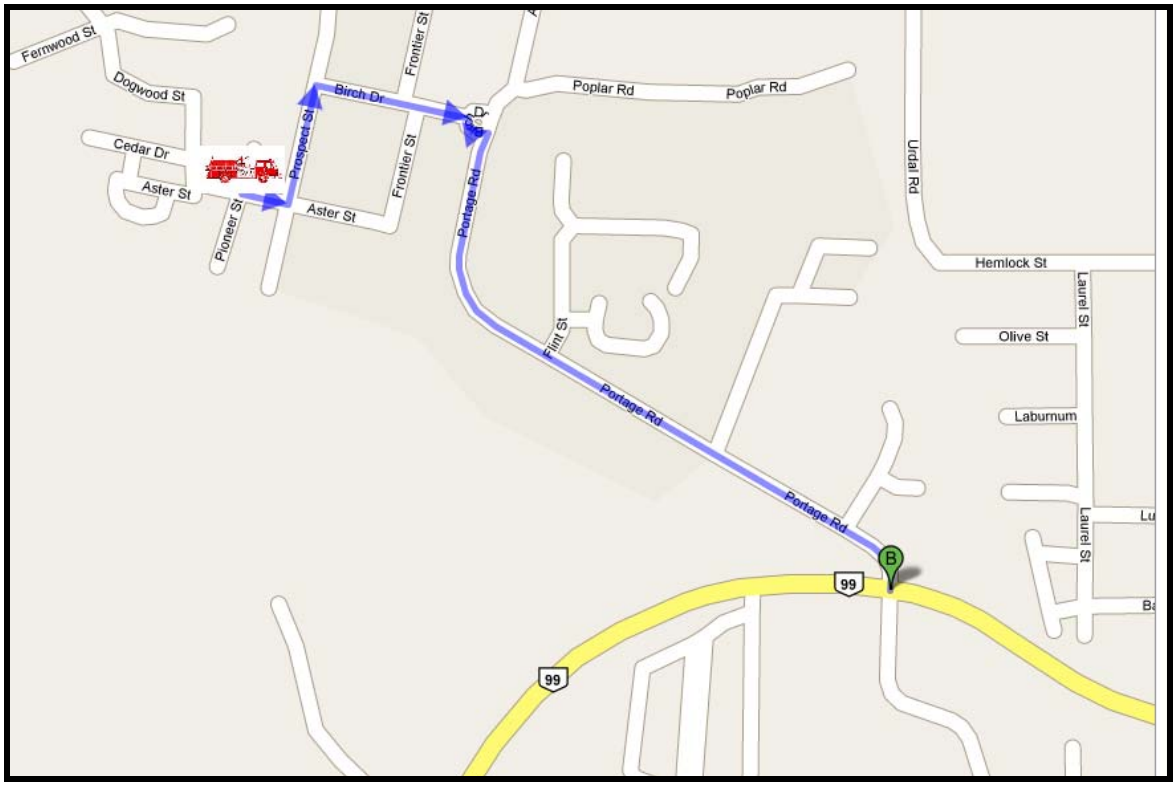
8.4.1. Boundary Expansion – One Mile Lake

The Village of Pemberton is currently planning to annex lands outside of the Village boundaries to the west of the Village. These lands are being developed as Light Industrial zones. The expansion will extend the boundary of the Village to a distance of approximately 8 km +/- from the fire station (toward Whistler).

Similarly to the Industrial Park to the east of Pemberton, properties that are insured under Commercial Lines which are built further than 5 km by road from the Pemberton fire station will be graded as unprotected (within the fire insurance grading).

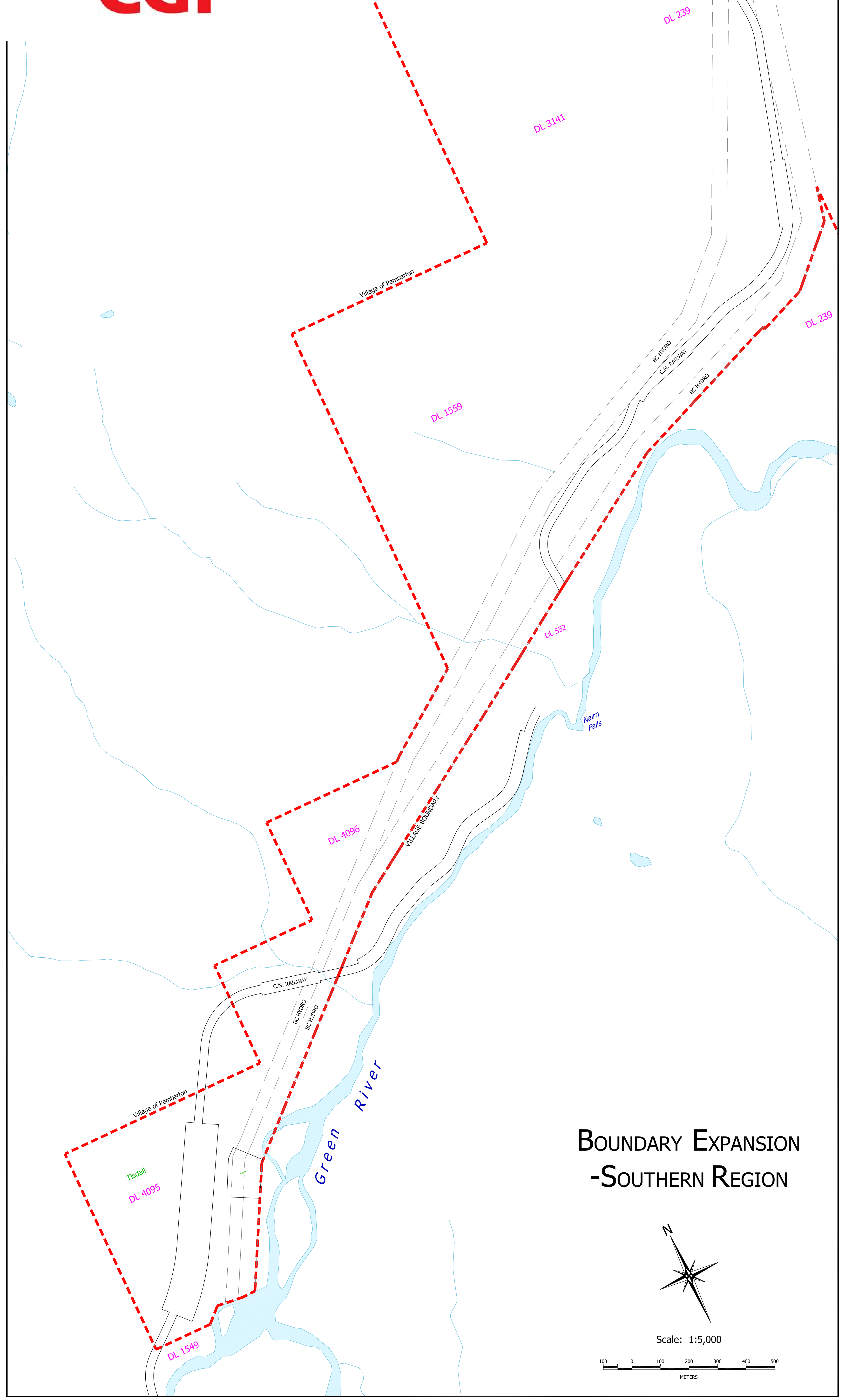
Theoretically, if the fire station were relocated to the intersection of Portage Road and Highway 99, approximately 1.2 km of road response could be reduced from the responses to both the existing industrial area as well as the proposed expansion area to the south.

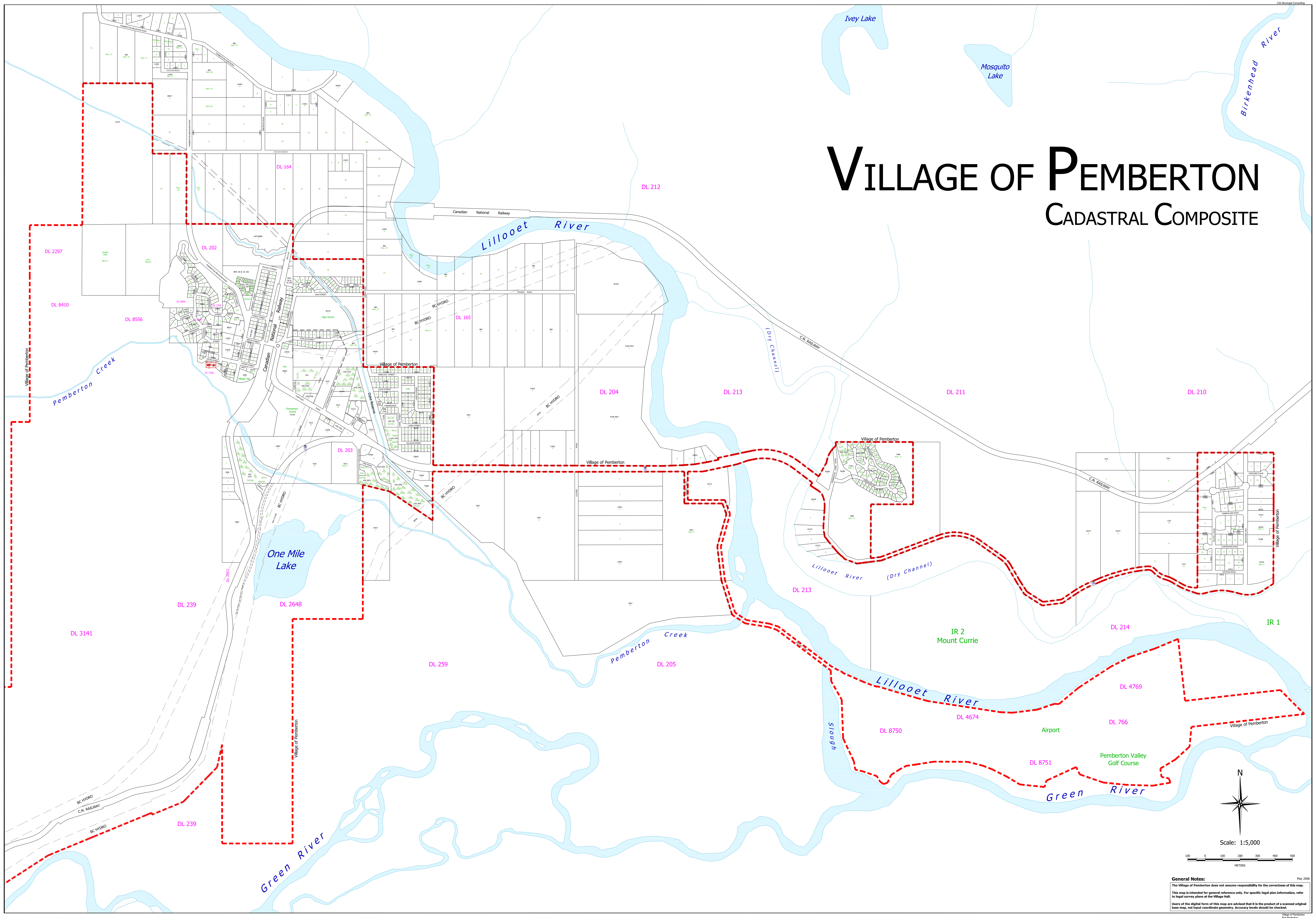
Figure 8.4-2 Map: Relocation of fire station to reduce response distance to Industrial Park and Tisdall Expansion



This might allow some of the Commercial Lines insured properties in each of these areas to receive the protected grade of the Village of Pemberton, however repositioning the station to this location may not be easily accomplished and there may not be a net benefit when the cost of re-locating the fire station is compared to the cost savings on insurance for affected properties.

Figure 8.4-3


Boundary Expansion
-Southern Region
One Mile Lake
DL 2648
DL 239
DL 3141
DL 1559
DL 552
DL 4096
DL 4095
DL 1549
Village of Pemberton
BC HYDRO
C.N. RAILWAY
Nairn Falls
Green River
Tisdall
Scale: 1:5,000
METERS


Village of Pemberton
Cadastral Composite
Ivey Lake
Mosquito Lake
Birkenhead River
Lillooet River
Pemberton Creek
One Mile Lake
Green River
Slough
(Dry Channel)
DL 212
DL 164
DL 2297
DL 202
DL 8410
DL 8556
DL 165
DL 204
DL 213
DL 211
DL 210
DL 203
DL 239
DL 2648
DL 3141
DL 259
DL 205
DL 214
DL 4769
DL 4674
DL 766
DL 8750
DL 8751
IR 2
Mount Currie
IR 1
Airport
Pemberton Valley Golf Course
Canadian National Railway
C.N. RAILWAY
BC HYDRO
Village of Pemberton
Scale: 1:5,000
METERS
General Notes:

The proposed expansion to the south of the Village will have an impact on the fire insurance grades of Pemberton (Public Fire Protection Classification) as an increased percentage of properties insured under Commercial Lines will be situated beyond the reasonable response distances set out in Table 7.2-1 Fire Underwriters Survey - Table of Effective Response.

The impact will not be overly significant initially, however as the number of properties that are constructed in the southern boundary expansion area increases, the deficiency assigned to the Pemberton Fire Department in the area of Resource Distribution will increase correspondingly. This is also the case for the existing Pemberton industrial Park to the east of the Village.

8.5. Apparatus and Equipment

The Pemberton Fire Department has a strong apparatus fleet that has been well-maintained and has been replaced and updated with a reasonable frequency. One piece of apparatus is over 30 years old and is not recognized for fire insurance grading purposes, however is credited as a reserve apparatus.

The current in service apparatus of the Village of Pemberton Fire Department is as follows:

Table 8.5-1 Apparatus Summary

Year	Manufacturer Spec	Type	Age in 2008	Pump Capacity (IGPM)	ULC Listed?	Pumping Credit Capacity %	Credited Pump Capacity (IGPM)
2006	Ford F 555 4x4 Crew Cab	C.A.F. Unit	2	250	4314C	50%	125
1996	Hub Freightliner	Pumper	12	1050	43C	100%	1050
1981	International	Ladder Truck 55’	27	1050	3526C	50%	525
1983	GMC Hub	Pumper	25	800	3040C	80%	600
1971	Ford Thibault	Pumper 750	37	750		Reserve	Reserve
1993	Ford F350 4x4	Rescue Truck	15				
1995	Zodiac 12’ Hard Bottom	Rescue Boat	13				
					Total credited capacity:		2300 IGPM

Emergency apparatus is not recommended for first line service past the age of twenty years. This is due to increasing unreliability of the apparatus and its mechanical systems as the apparatus ages. In cases where small communities are not able to implement a replacement schedule for apparatus that meets these criteria, credit for apparatus may be extended past the age of twenty years, conditionally based upon the service records, apparatus quality and annual test results. Under no circumstances are apparatus credited beyond the age of 30 years. See Appendices C and D.

Pemberton currently has 2 pieces of apparatus that are between the age of 20 and 30. Each of these pieces of apparatus should be on a replacement schedule that is reasonable for the community and the taxation base to support.

Within the fire insurance grading system communities are measured in their ability to consistently deliver the calculated required fire flows to each area of the community. The required fire flows are then evaluated and a Basic Fire Flow is assigned based on providing adequate resources for 90% of the required fire flows in the community.

Rescue Boat

The Pemberton Volunteer Fire/Rescue Department operates a 12 ft Zodiac Rescue Boat with a 60hP horse power outboard motor, this zodiac is for water-based Search and Rescue operations.

Recommendation 8.5-1 Decommission 1971 Pumper

To reduce the risk to the life safety of fire fighters utilizing the apparatus, the 1971 Pumper should be removed from service. Alternatively, this apparatus can be kept in reserve for emergency situations (such as engine break-down, etc.); however, due to excessive age and resultant safety issues, the apparatus should be decommissioned. See Appendix C and Appendix D.

Recommendation 8.5-2 Develop and Implement Replacement Schedule for Apparatus

Fire Underwriters Survey does not recognize apparatus for small communities over the age of 20 years, however 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 is not recognized beyond 30 years of age due to unreliability factors. To ensure that the Village of Pemberton's fire insurance grades are not adversely affected, an apparatus replacement schedule should be developed, particularly for the apparatus exceeding 20 years in age. An apparatus replacement schedule should be developed to address aging apparatus. See Appendix C and Appendix D.

Table 8.5-2 Recommended actions and replacement schedules for Pemberton appartus fleet

Year	Manufacturer Spec	Type	Age in 2008	Pump Capacity (IGPM)	Recommended action	Recommended Replacement Schedule
2006	Ford F 555 4x4 Crew Cab	C.A.F. Unit	2	250	Maintain	20 year
1996	Hub Freightliner	1st line Pumper	12	1050	Schedule replacement by 2016; demote and maintain as second line	20 year
1981	International	Ladder Truck 55’	27	1050	Schedule replacement by 2011	25 year
1983	GMC Hub	2nd Line Pumper	25	800	Schedule replacement by 2013; demote and maintain as reserve pumper	25 year
1971	Ford Thibault	Pumper 750	37	750	Decommission	NA
1993	Ford F350 4x4	Rescue Truck	15		Maintain	As needed
1995	Zodiac 12’ Hard Bottom	Rescue Boat	13		Maintain	As needed

Recommendation 8.5-3 Test and Submit Results of Tests for Older Apparatus

The Pemberton Volunteer Fire/Rescue Department has apparatus that exceeds 20 years in age. It is recommended that the apparatus be replaced with newer apparatus. Until older apparatus is replaced, units should be tested annually in accordance with the Fire Underwriters Survey service and road tests. Test results should be submitted annually to the Fire Underwriters Survey.

8.6. Ladder Service

The fire protection service area has approximately 15 buildings (insured under Commercial Lines Insurance) that are 3 storeys or greater. There are approximately 50 residential buildings that are 3 storeys or greater. Several industrial occupancies have been constructed in the industrial park where an elevated master stream will be needed to effectively fight fires.

The municipal fire insurance grading system (Public Fire Protection Classification) is used to evaluate the level of fire risk and fire defence within all communities across Canada. This system stipulates that communities having 5 or more buildings of 3 storeys or greater in height should be capable of responding with an aerial apparatus within a

reasonable response time as detailed in the Fire Underwriters Survey Table of Effective Response (attached).

Excerpt from: Fire Underwriters Survey Technical Manual:

> *"The number of ladder trucks required to be in service (ladder companies) is determined mainly by use of Table of Effective Response. A ladder company is required when a municipality has 5 buildings that are 3 stores or higher; 5 buildings which have a required fire flow of 15,000 L/min (3300 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."*

Due to the risk profile of the community, the Village of Pemberton requires ladder service. The department is currently equipped with a 1981 ladder truck. However the ladder apparatus is 27 years old (in 2008) and may receive reduced credit going forward due to reduction overall mechanical reliability and age factors. (Note that apparatus is not recognized after 30 years of age for fire insurance grading purposes.) See Recommendation 8.5-2 Develop and Implement Replacement Schedule for Apparatus.

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

8.7. Pumping Capacity

The Pemberton Volunteer Fire/Rescue Department has a credited pump capacity of 2300 IGPM.

The Basic Fire Flow assigned to community is 2600 IGPM. It should be noted that many areas of the community are residential and have required fire flows of 1000-1200 IGPM.

The community is rated as being slightly deficient in its ability to provide the Basic Fire Flow.

8.8. Apparatus Maintenance Programs

General repairs are conducted at a local garage, Tookalook Auto, a licensed inspection shop. The mechanic specializes in automotive maintenance.

Pumps are serviced annually by Hub; however, the pumps were not tested the previous year due to Hub technicians retiring. This resulted in the remaining service technicians being over loaded. The pumps are scheduled to be tested in the first week of April of 2008. *Note: HUB technicians are certified technicians (NFPA 1071 Standard for Emergency Vehicle Technician Professional Qualifications 2006 Edition).*

The fire apparatus preventive maintenance program is rated as good.

8.9. Fire Fighting Ancillary Equipment and Hose

The fire department has a total of 3000’ of 1 ½” hose, 1200’ of 1 ¾” hose, 100’ of 2” hose, 5000’ of 2 ½” hose, 1000’ of 3’ hose, and 1100’ of 4” hose.

Engine 1 contains 1050’ hose at 3”, a 200’ hose at 2 ½” pre connect, a 200’ hose at 2 ½” spark, a 100’ hose at 2” spark, two 200’ hoses at 1 ¾” pre connect, three 200’ hoses at 1 ½” pre connect, a 150’ hose at 1 ½” spark, 500’ of 2 ½” attack line hose, and a 50’ hose at 4” spark.

Engine 11 (CAFS) contains 700’ of hose at 1 ½”, a 100’ hard attack hose at 1 ½”, and two suction links at 3” and 1000’ long.

Ladder 1, the aerial, contains two 200’ hoses at 1 ½” pre connect, a 200’ hose at 2 ½”, 600’ at 4”, and 600’ of hose at 2 ½”.

The reserve pumper contains two 200’ of attack line hose at 1 1/2”.

Table 8.9-1 Summary of Hose on Apparatus

Unit #	Apparatus	Amount of Hose						
		Preconnect	1 ½"	1 ¾"	2"	2 ½"	3"	4"
1	Engine		750'	400'	100'	900'	1050'	50'
11	CAFS		800'				1000'	
1	Ladder		400'			800'		600'
	Reserve Pumper		400'					
Total			2350	400'	100'	1700'	2050	650
Recommended per pumper company		400'	600’			1200’		

The fire department has a reasonable amount of hose.

Hoses are visually checked after each use and are hung horizontally in the fire hall when they need to be dried. Hoses are marked when purchased.

Table 8.9-2 Fire Fighting Ancillary Equipment: Ladders and Foam

Unit No.	Ladders per company				FOAM per apparatus unit			
	ROOF	EXTENSION		ATTIC	TYPE	AMOUNT	METHOD OF P/UP	TYPE OF NOZZLES
		> 35’	< 35’					
Eng. 1	1-16’	40’	24’	1	Class A	4 containers	Auto	Not determined
Res. 1			24’ 14’					
Ladder 1					Class A	2 containers	Auto	Not determined
Eng. 12			24’ 12’		Class A	6 Containers	Auto	Not determined

Ground ladders are not tested in accordance with NFPA 1932 *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders*, 2004 Edition.

Recommendation 8.9-1 Ensure Hose and Ancillary Equipment is tested and meets NFPA Standards

Ensure Fire Fighting ancillary equipment and hoses are 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*, recent edition and NFPA 1932, *Standard on Use, Maintenance, and Service Testing of In-Service Fire Department Ground Ladders*, recent edition. Failure of equipment, especially during an emergency situation can result in increased loss of life and or property damage. Testing should also be done on a regular basis and recorded.

8.10. Fire Protective Clothing & Breathing Apparatus

The Pemberton Volunteer Fire/Rescue Department is well equipped with turnout gear and equipment. Most of the gear is new and is generally replaced every 5 years. The turnout gear and equipment is washed in house and inspected bi-weekly and during practice. Any deficiencies are shown to the officer in charge and if deemed unsafe or questionable, a spare is given.

The Pemberton Volunteer Fire/Rescue Department owns and utilizes eighteen SCBA unit.

All breathing apparatus have PASS alarms attached. The alarms are checked every practice and each call as part of the rig checks. Every mask contains a voice amp that is tested in the same manner as the SCBA.

Maintenance of SCBA equipment is planned and recorded.

Quantitative fitting tests are used by the Pemberton Fire/Rescue Department for SCBA equipment. If a face mask can not be fit properly, an alternative mask will be made available.

8.11. Provision of Fire Protection to Areas Outside of the Village of Pemberton

In the past, the Village of Pemberton has had various formal and informal service agreements in place to provide fire protection to service areas outside of the boundaries of the village, most notably the service to the Pemberton Fire Protection Specified Area

(specific areas within the SLRD). In many cases, fire protection services (and other services) have been provided to areas where no service agreement or contract was in place. Recently the Village of Pemberton has identified this issue and resolved to either;

1. Develop a formal service agreement or contract for services provided to the unincorporated areas of the SLRD (that are currently being served), or
2. Cease all services being delivered to areas not under contract in the absence of a contract or agreement.

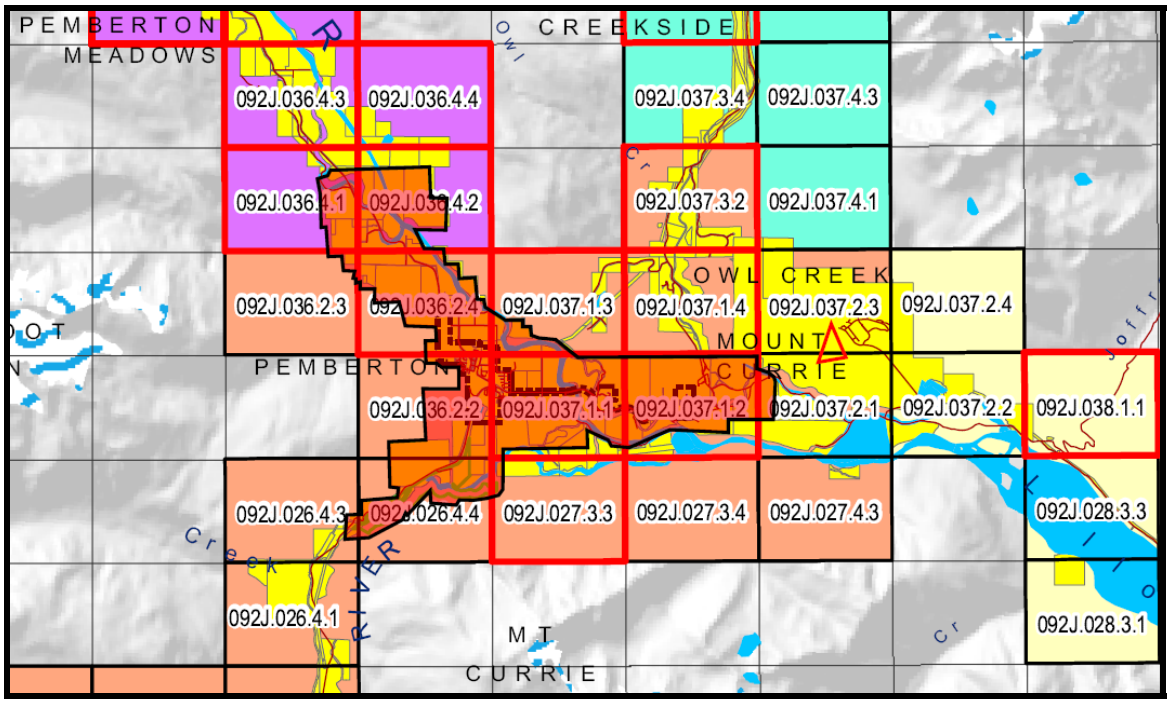
The most significant issue in the provision of fire protection services to the areas outside of the boundaries of the Village is the cost associated with the fire protection services. Related issues include, but are not limited to

- Liability Issues. Liability transferred to Village of Pemberton and Fire Department during incident responses
- Resource Availability. Assets such as fire fighters and apparatus are extremely limited and responses to properties within the Village may be delayed or inadequate due to responses to properties that may be located at substantial distances from the Village
- Fire insurance grading cost benefit. The cost benefit (through reduced insurance rates) are only being received by the residents of the Village of Pemberton and, to a lesser degree, the residents within the Pemberton Fire Protection Specified Area of the SLRD

8.11.1. Contract Fire Protection and Agreements

The Pemberton Fire Department has historically provided fire protection to the both the Village of Pemberton and the Pemberton Fire Protection Specified Area. The northern border of the Pemberton Fire Protection Specified Area is the Ryan River and the southern border stops just before the Rutherford power plant. The fire district also stops at the railroad track in Mount Currie.

Figure 8.11-1 Map of Pemberton Fire Protection Specified Area (estimated boundary)[8]



The service level that the Pemberton Fire Department currently provides to the Village of Pemberton is reasonably good with regard to resource distribution with the exception of the industrial park area. The Pemberton Fire Department also provides fire protection to the Pemberton Fire protection Specified Area of the SLRD. Providing this service reduces the level of coverage (see Section 8.4 Distribution of Resources and Response Times) within the Village of Pemberton, however not to an unreasonable level. The Pemberton Fire Department responds to approximately 250 calls per year, of which approximately 50% or more of the responses may be to areas outside of the Village.

Whether or not the Pemberton Fire Department should respond to areas outside of the Village must be should carefully considered as the responses themselves result in periods of time where fire fighting resources (apparatus and man power) are not available to property owners in the Village. This is an important consideration as the property owners in the Village have paid for the development and acquisition of fire protection assets through taxation and organization.

[8] Boundaries of the Pemberton Fire Protection Specified Area shown here are based on historical Fire Underwriters Survey data and may not be representative of current boundary locations.

Responses to areas outside the Village are particularly onerous due to the length of response times resulting from long response runs. The Pemberton Fire Department has limited resources (apparatus and manpower) and when responding to calls outside of the Village boundaries, the protection available to properties within the Village is reduced.

Considering that the Pemberton Fire Department has a slightly deficient pump capacity with regard to protecting the areas within the boundaries of the Village and the distribution of resources (one fire station) is limited, the provision of additional contract fire protection to areas outside of the Village boundaries increases the risk of inadequate resources within the Village boundaries if a concurrent event should occur.

The use of the Village of Pemberton fire apparatus and resources to provide fire protection to outside areas also results in mechanical stress on equipment and various other costs. Providing services to outside contract areas may spread the emergency resources of the Village thin, and care should be taken to provide coverage to the Village through aid agreements, etc. during times when fire protection resources are deployed outside of the Village.

8.11.2. Options For Fire Protection Of Areas Outside Of The Village

One of the key questions behind the Village of Pemberton 1996 study (conducted by the IAO, see Appendix E) was whether the Pemberton Fire Department could take a direct role in providing fire protection services to the Pemberton Meadows area. Currently, there are additional questions regarding how providing fire protection services outside of the Village could benefit those areas outside and how providing fire protection services to such areas would affect the fire protection levels to the Village.

The Village of Pemberton fire protection resources are currently in use at close to the maximum acceptable level with regard to distribution of resources (see Section 8.4 Distribution of Resources and Response Times). Any expansion of the current protection area boundaries (Village of Pemberton and Pemberton Fire Protection Specified Area) without the addition of commensurate fire protection resources such as additional fire stations, manpower (fire fighters) and apparatus, may adversely affect the fire insurance grade of the Village of Pemberton. Currently, the Village of Pemberton includes an area (the Industrial Park) primarily used for Commercial Lines insured properties that is graded as unprotected (within the fire insurance grading system) due to lack of resources (response greater than 5 km by road from nearest fire station). Additionally, a significant number of properties insured under Personal Lines located within the Pemberton Fire Protection Specified Area are graded as unprotected (within the fire insurance grading system) due to lack of resources (response greater than 8 km by road from nearest fire station).

However if additional fire protection resources (fire stations, fire fighters, apparatus and equipment) are acquired, it may be possible to expand the service areas without adversely affecting fire insurance grades.

Considering the response distance limitations, the benefit of contracting fire protection from the Village of Pemberton is limited to properties that are within close proximity to the Village.

Several options for providing protection to properties outside of the Village of Pemberton have been considered and the recommended course of action is to provide additional fire protection resources to the Village of Pemberton Fire Department that will allow the

department to maintain a continuous level of protection within the Village and provide a reasonable level of protection to outside areas that elect to contract fire protection services. This method is likely to be the most cost effective method and would provide the cost benefit from the reduced insurance rates to the outside area property owners in the fastest way possible.

The recommended course of action will include elements such as:

- the construction of small satellite fire stations within the specified fire protection service areas outside of the Village
- the expansion of the roster to include fire fighters who live and work in the vicinity of the satellite fire stations
- the expansion fire protection service programs to include station coverage (moving apparatus from station to station, activating fire fighters, etc.) during call outs

Additional options will be detailed in the full report, however the recommended course of action will be explored in the greatest detail as it offers the greatest benefits to the entire area including the Village and the outside areas.

8.11.2.1. Option 1 - Maintain current boundaries and services

The Village of Pemberton could maintain current service levels and boundaries. To implement this option, the Village should formalise service agreements and contracts and develop clear protocols (Standard Operating Guidelines) for what services should be provided where they should be provided, and to specifically document the limitations of the fire department to clarify any ambiguous areas with regard to coverage.

This option would provide the Village of Pemberton with an ongoing reasonable level of service. This level of service may be diluted to a certain degree due to ongoing development within the current Village Boundaries. This option does not provide a reasonable or recognized level of service to certain areas where response distances are beyond the maximum recognized for fire insurance grading purposes (Industrial Park and remote areas of the Pemberton Fire Protection Specified Area).

8.11.2.2. Option 2 – Expansion

The Village is currently planning to expand its boundaries to include the area to the southwest of the Village (Tisdall). The current fire protection resources are spread thin and this expansion will create further strain on the resources. As properties are developed in the Tisdall Expansion Area and the Pemberton Industrial Park, the percentage of properties that have excessive response distances (responses greater than 5 km for Commercial Lines insured properties) will increase and the deficiency of the Pemberton Fire Department would increase in the area of Resource Distribution, unless adequate resources were added.

The expansion to the southwest will not have an immediate impact on the fire insurance grades in Pemberton, however planners for the Village should be aware that the response distance for fire protection from the current fire station location is considered excessive for Commercial Lines insured properties. Expansion to this degree should include plans for provision of fire protection to this area as it is developed.

8.11.2.3. Option 3 - Contraction

Contraction of fire protection service area boundaries has not been considered in depth, however as the Village of Pemberton expands its boundaries, consideration should be given to withdrawing from contractual fire protection service agreements and focusing fire protection resources on the Village areas.

8.11.2.4. Option 4 - Regionalization

The areas surrounding the Village of Pemberton, particularly outside of the Pemberton Fire Protection Specified Area currently receive poor fire protection or no fire protection whatsoever. On many occasions, the Pemberton fire Department has responded to calls in these areas without any agreement in place based on a perceived morale duty. This is commendable however the Fire Department may be exposing the Village to liability risk in responding to calls without any form of agreement or contract in place.

Consideration should be given to the Regionalization model. This model has been used very effectively in the Regional District of Kootenay Boundary where the Regional District has developed a partnership with the City of Trail. In this area, several

neighbouring communities work together sharing resources of fire protection under a single banner. This model has resulted in significantly improved levels of fire protection for lower costs to taxpayers.

The recommended model for the Village of Pemberton and the SLRD would be very similar. The Village of Pemberton would provide Fire Department management and administration and would oversee training programs, administration, fire prevention, public education and emergency communications. Small, satellite fire stations would be set up in the smaller communities surrounding the Village and response would be supported from the Village of Pemberton Fire Station as well as from the other neighbouring fire stations. Individual fire stations would have apparatus and fire fighters assigned specifically to them, however would not need to meet the normal minimum allowable standards of the Fire Underwriters Survey to be recognized as they would not be stand alone fire departments. This model would also allow for a greater level of cover in protection during incidents and would reduce the risk of inadequate coverage resulting from concurrent fire events.

Implementing a strategic area approach as suggested here would improve (reduce) the time frame in which the local property owners would receive a cost benefit from an improved fire insurance grade (and corresponding fire insurance rates).

8.11.3. Response Distance and Coverage Standards

When considering the possible alignments and locations of fire stations, 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 apparatus fleet; and the response distance are among the most important factors.

Response distance from fire station to property has a large influence on the insurer's 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 8.11-1 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[9]

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.

8.11.4. Fair And Equitable Sharing Of Cost For Fire Protection

The fire insurance grading system can be used as an effective cost benefit to encourage property owners to elect to pay for fire protection through taxation. Ideally, the additional cost of taxation would be completely offset by the reduction in insurance premiums such that a property owner would not be out of pocket. However this is not generally the case. Normally, the cost of fire protection services exceeds the reduction in insurance premiums to varying degrees. That being said, the value of fire protection can not be overstated and although property owners may not experience a net cost benefit, the improvement in life safety and property protection has an inherent value.

[9] 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.

The property owners within the Village of Pemberton (insured under both Commercial and Personal Lines) currently experience a significant cost reduction on insurance rates based on the fire insurance grades associated with the Village. Properties in the Pemberton Specified Fire Protection Service Area, experience a lesser cost benefit.

If the Village of Pemberton elects to continue to offer fire protection services to outside areas, a method of re-imbursement will need to be established. Lack of a contract for fire protection reduces the reliability of fire protection and increases the liability of all parties involved.

A common method of payment for contract fire protection services is the hourly rate for responses, however rates are typically set very high to include the overhead cost of developing and maintaining fire protection services and resources. This method can work to the advantage of one party or the other but often does not favour both.

A better approach is the development of a cost sharing protocol that includes detailed assessment of the overall cost of the fire protection service and a detailed breakdown of use of the service. Typically this analysis would be done on a year-to-year basis however it may be preferable to look at a broader time frame such as 5 to 10 years. Ideally, this method should allow both parties to see the true cost of the fire protection service (including cost of assets) and to share equitably in the payment for the service. If the fire protection resources are deployed optimally, it may be possible to largely offset the costs of fire protection through insurance rate reductions.

8.11.5. Recommended Course of Action

The Village of Pemberton is encouraged to work with the SLRD to establish a contract for fire protection. The Village is also encouraged to carefully review the fire protection resources and the limitations of the current resources. Once a contract for fire protection is in place, it will be important for the Village to continue to invest in fire protection resources to ensure that a reasonable level of service is maintained within the Village at all times.

The Pemberton Fire Protection Specified Area being protected should be clearly mapped and property owners who in the past were protected without any agreement should be encouraged to establish a fire protection plan or contract with a fire protection agency.

They should also be informed that protection can not be provided without a contract in place.

8.11.6. Automatic Aid & Mutual Aid Agreements

The Village of Pemberton has mutual aid agreements with the Resort Municipality of Whistler (32 km) and the District of Lillooet (74 km). The agreement with Whistler was updated in 2004 and the agreement with Lillooet was updated in 2005. These aid agreements are formalised and allow Pemberton to request aid from either community if circumstances dictate that local resources are inadequate.

The Village of Pemberton does not receive any first alarm automatic aid from any fire departments that are located outside of its area. Due to the length of response delays (due to distances between communities) for responses coming to Pemberton from Whistler or Lillooet, no credit within the fire insurance grading is given to Pemberton with regard to companies, apparatus, pumping capacities, or other.

The Village of Pemberton and the Mount Currie Fire Department have an informal mutual aid agreement. Notably, the Mount Currie Fire Station recently burnt down and apparatus is being housed in of the Village of Pemberton's buildings. The Mount Currie Fire Department has 2-3 volunteer members on average. It is also important to note that Mount Currie provides the water supplies for domestic use (including industrial uses) and fire protection to the Pemberton Industrial Park.

Recommendation 8.11-1 Develop a formal agreement for Fire Protection Services with Mount Currie

To reduce the risk of liability losses and to ensure that both the receiver and provider are in agreement upon, and aware of service levels and limitations, Fire Protection Aid Agreements for services between Mount Currie and the Village of Pemberton should be formalised in writing and mapped out to indicate specific areas where service levels exist and do not exist. The agreement should take into account foreseeable events and situations are provide a framework for response.

Due to Mount Currie's lack of fire fighting resources, consideration should be given to developing a contract for fire protection services with Mount Currie that could involve exchange of services (ex. water supplies exchanged for fire protection).

8.12. Available Fire Force

The Pemberton Fire Rescue Department consists of paid on call members (volunteers). Fire department personnel include the 1 Fire Chief, 2 Assistant Chiefs, 3 Officers, 16 Fire Fighters and 10 Probationary Fire Fighters for a total of 32 members.

Pemberton has a Basic Fire Flow benchmark of 2600 IGPM in 2008.

This benchmark includes 3 pumper companies and 1 ladder company being available to respond continuously, year round. For the purposes of fire insurance grading, the benchmark number of career fire fighters per company is 6 (including officers). Therefore, the benchmark number of career fire fighters that Pemberton is measured against is 24 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 Pemberton, 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) [10]

- 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).
- Support capacity from mutual and automatic aid companies is credited on a different schedule.

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

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

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

Pemberton Volunteer Fire/Rescue Department roster includes the following:

Personnel	Pemberton FD	Credited Fire Force
Chief	1	0
Deputy Chief	2	2
Line Officers	3	3
Fire Fighters	16	16
Pro. Fire Fighters	10	0
Jr. Fire Fighters	0	0
Total:	32	21

The total available fire force for the Pemberton Volunteer Fire/Rescue Department is based on a roster strength of 21 Fire Fighters.

The Pemberton Volunteer Fire/Rescue Department had an average turnout of 7.37 Fire Fighters responding per call in 2006.

The credited available fire force (FFEU) for the Pemberton Volunteer Fire/Rescue Department is then
1/3 of the average turn-out = 2.46 FFEU.

No additional credit (FFEU) for automatic aid (or mutual aid) is available to Pemberton due to response distances:

- Aid from the Whistler Fire Department: no credit (travel distances exceed 25 km).
- Aid from the Lillooet Fire Department: no credit (travel distances exceed 25 km).

The total Fire Fighter Equivalent Units in the available Fire Force for Pemberton is
2.46 FFEU + 0 FFEU = 2.46 FFEU

This number is less than 50% of the required fire force (based on the Table of Effective Response and the Basic Fire Flow of 2600 IGPM) and is therefore acceptable. (Not more than 50% of the available fire force can come from FFEU through volunteers and aid, etc.)

The Benchmark Fire Force is 24 career fire fighters and the Pemberton Volunteer Fire/Rescue Department has a credited Available Fire Force of 2.46.

The Pemberton Volunteer Fire/Rescue Department is deficient by 90% in this area of the fire insurance grading.

This is the most significant fire insurance grading deficiency for the Pemberton Volunteer Fire/Rescue Department; however, it is important to note that this level of deficiency is not uncommon for a community of this size.

Recommendation 8.12-1 Improve Available Fire Forces

To maintain or improve the commercial classification, the available fire forces should be improved for the Pemberton Volunteer Fire/Rescue Department. Note that the available fire forces can be improved through additional volunteers up to 50% of the required fire force. (In the case of Pemberton, the required force is 24, so the maximum available fire force that can be provided through volunteers and other FFEU sources is 12).

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.

8.13. Planned Responses

General alarm calls result in paging of all members.

Minimum number of apparatus and personnel responding to Initial Alarm of fire from department are as follows:

	Engines	Ladder/Aerial	Chiefs	Vol. Fire Fighters
Dwelling	3	1	2	12
Structures other than dwelling	2		1	9
High rise structure (over 10m)	3	1	2	16

Engine 1: normally operates with 3-4 fire fighters, but usually 5 fire fighters.
Ladder 1: is usually operated by a driver only.
Rescue 1: 1-2 fire fighters
Engine 11: 3-4 fire fighters

Recommendation 8.13-1 Provide a Minimum First Due Pumper Company of 4

To provide a minimum level of safety for fire fighters responding to fires, the first engine should have a minimum company of 4 (including 1 captain).

Reference OHS Regulation › Part 31 Firefighting

31.23 Entry into buildings

(1) When self-contained breathing apparatus must be used to enter a building, or similar enclosed location, the entry must be made by a team of at least 2 firefighters.

(2) Effective voice communication must be maintained between firefighters inside and outside the enclosed location.

(3) During the initial attack stages of an incident at least one firefighter must remain outside.

(4) A suitably equipped rescue team of at least 2 firefighters must be established on the scene before sending in a second entry team and not more than 10 minutes after the initial attack.

(5) The rescue team required by subsection (4) must not engage in any duties that limit their ability to make a prompt response to rescue an endangered firefighter while interior structural firefighting is being conducted.

8.14. Training & Qualifications

8.14.1. Training Provided

Training is conducted bi-weekly and as needed for special training. Non-probationary members train every second week, while probationary members train every Monday for three to three and half months. Training usually lasts for 2½ to 3½ hours

The Pemberton Volunteer Fire/Rescue Department has no fire fighters certified to NFPA 1001 Level 1 or to NFPA 1001 Level 2. Fire fighter training is based on ISFTA manuals, and is set up by the departments Training Officer.

Specialized training is done for motor vehicle accidents and some high angle rescue. There are no specialized risks in the Village of Pemberton.

The Pemberton Fire Department has one NFPA certified trainer or equivalent. The training is done through IFSTA manuals and the J.I.B.C

8.14.2. Training Program Records

Tracking of fire department training is currently limited. The Fire Department has recently acquired a piece of software to track and maintain records for all aspects of the Fire Department administration and operations.

Recommendation 8.14-1 Improve Record Keeping for Training Program

To improve the effectiveness of the overall training program, detailed records should be kept for each area of the training program as well as for each member of the fire department. Ideally, the records should be organized in a database so that they can easily be queried for deficient areas. An effective record keeping program is an integral component of planning for future training also.

8.14.3. Training Facilities

The Pemberton Volunteer Fire/Rescue Department has a training centre located at the airport. Scrap cars are provided for auto extrication training, and an old rail car that is used to set up fire scenarios. The fire fighters are sent to other training centers when possible. Several fire departments in the area travel to Pemberton to use the training equipment and locations available in Pemberton.

Recommendation 8.14-2 Develop Training Curriculum and Use Database to Record and Monitor Progress

To improve the quality of the fire departments training program, a detailed curriculum should be developed. The curriculum should include qualitative and quantitative goals and benchmarks that each firefighter and officer can work towards. Additionally, a database program should be developed to record, monitor, and note deficient areas.

9. FIRE PREVENTION PROGRAM AND FIRE SAFETY CONTROL

Fire Prevention and 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.

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

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

The building inspector is an employee of Village of Pemberton. The Village of Pemberton provides Building Permits and reviews plans, etc. for new construction.

Key Codes and Standards:

National: National Building Code
National Fire Code

Provincial: British Columbia Building Code
British Columbia Fire Code

Municipal: Village of Pemberton Zoning Bylaw No. 466, 2001

9.1.1. Automatic Sprinkler Protection

Within By-law No. 518, 2003 Fire Sprinklers are required to be installed in accordance with NFPA 13 *Standard for the Installation of Sprinkler Systems*, in "fire zones" within Pemberton. Fire Zones include multi family residential zones, industrial zones, commercial zones and comprehensive development zones as set out under the Village of Pemberton Zoning By-law No. 466, 2001.

Automatic fire protection sprinklers have been installed in some buildings throughout the community. Automatic sprinkler protection systems appear to be typically 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 occupancies that contain high occupant densities and increased life safety risks[11]. Additionally, the BC Building Code does not require existing buildings to be brought up to meet current code requirements. As such, many buildings throughout the community are not sprinkler protected.

Where sprinkler systems are required, sprinkler system designs are reviewed for compliance with NFPA 13, Standard for the Installation of Sprinkler Systems by the Village of Pemberton Planning Department and the Fire Department. The Pemberton Fire Department does not inspect all sprinkler systems annually.

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. Statistically, properly designed, installed and maintained sprinkler systems have been shown to reduce fire losses significantly and reduce the number of lives lost to fire.

[11] Note: many municipalities now require sprinkler systems (by Bylaw) in many occupancies not specifically required by the NBC or BCBC.

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

The Pemberton Fire Department has a Fire Prevention Inspection program. In 2007, there were a total of 39 fire inspections that were conducted. There were a total of 145 business licences that were issued in 2007. It is the goal of the prevention department to have all of the businesses inspected in 2008.

Recommendation 9.2-1 Improve Fire Prevention Program

To improve the level of fire prevention and reduce the overall fire risk in the community, the Fire Prevention Inspection Program should be improved to include a minimum of one inspection per year for all hotels, public buildings and industrial occupancies in the Village. Increased inspection frequency should be provided to occupancies with increased fire risk and/or life safety issues.

The Village of Pemberton should consider providing a full time Fire Prevention Officer (Local Assistant to the Fire Commissioner) to conduct inspections on a reasonable frequency schedule. If the community can not regularly conduct fire prevention inspections, due to a lack of resources, consideration should be given to outsourcing fire prevention inspection related services.

Reference: FIRE SERVICES ACT [RSBC 1996] CHAPTER 144

Municipal duty to inspect hotels and public buildings

Section 26

(1) A municipal council must provide for a regular system of inspection of hotels and public buildings in the municipality.

(2) A municipal council may authorize persons, in addition to the local assistant, to exercise within the municipality some or all of the powers under sections 21 to 23. The information gathered in the inspection process should be utilized in developing the pre-incident plans for the community as well.

9.3. Road Design and Fire Apparatus Access

Access for fire department apparatus was noted to be problematic in several areas of the Village. Some Strata development areas such as Cottonwood Park for example, do not provide an adequate means of turn around capacity for fire department apparatus.

Access was also problematic in the Plateau area of the Village. Narrow driveways, sharp corners (switch backs), and hills were noted to impede fire department access. Some single family residential units that were built on hills that have narrow drive ways that may not be accessible with fire department apparatus.

Recommendation 9.3-1 Improve Driveway and Lane Design for Firefighting Access

To reduce the risk of response delays resulting from poor access design for lanes and driveways, consideration should be given to making the Fire Department the AHJ (or participant) for driveway and access lane design and construction. Additionally, consideration should be given to adopting NFPA 1141, Standard for Fire Protection in Planned Building Groups for road and subdivision access design parameters.

9.4. Public Education Program

Fire prevention activities include:

- Fire Prevention Week
- School Tours
- Fire Extinguisher Demos
- Fire Hall Tours

It is the goal of the prevention department to have a smoke detector awareness program in 2008, as well, to have live extinguisher training available to community groups, including schools.

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

9.5. Pre-Incident Planning

No pre-planning is conducted by the Pemberton Volunteer Fire/Rescue Department at this time.

Recommendation 9.5-1 Develop and implement Pre-incident (pre-fire) planning program

To improve the effectiveness of the fire department and reduce the losses resulting from fire, an action plan for development and implementation of a comprehensive Pre-Incident (pre-fire) Planning Program should be developed and implemented. Acquire access to NFPA 1620, *Recommended Practice for Pre-Incident Planning* and develop pre-plans accordingly.

9.6. Wildland Urban Interface Risk Assessment

The Village of Pemberton has completed a Wildland Urban Interface Risk Assessment and has WUI Interface Protection Program known as the Village of Pemberton Community Wildfire Plan 2005. Several areas in the Village of Pemberton were identified as being at risk of a wildfire.

Recommendation 9.6-1 Develop a Wildland Interface Risk Management Plan

Utilizing the Wildland Urban Interface Risk Assessment Study, the fire department and Regional District should develop a Wildland Urban Interface Risk Management strategy that prioritizes the level of risk and consequence associated with the various items identified in the original study and plots a course of action for reducing risk to acceptable levels.

10. EMERGENCY COMMUNICATIONS

10.1. System Description

The Village of Pemberton operates an independent system of emergency communications. The Village does not utilize a 9-1-1 system and the number to call in case of emergency is 604-894-6412. Pemberton Fire Rescue responds to approximately 250 calls per year. The number of calls per year is expected to increase as population growth and development continue in the serviced areas.

The emergency communications system is not based out of an Emergency Communications Centre. The system is made up of independent dispatchers with cell phones. When the emergency number is called, the on-shift dispatcher receives and handles the call by cell-phone and utilizes the cell phone to dispatch the fire department as appropriate. The actual dispatch call is routed through an Interconnect device in the fire station which transmits the radio signal to firefighters radios. A spare Interconnect device is available at the fire station.

The system utilizes five part-time dispatchers who are paid for their services. The head dispatcher is in charge of organizing the schedules for dispatchers, ensuring that there is adequate coverage of shifts and training new dispatchers.

Each dispatcher is provided with civic maps and are reportedly familiar with the community of Pemberton.

Dispatchers are scheduled to dispatch for 24 hour shifts.

The emergency communications systems within Pemberton provide a means for transmitting alarms to fire department personnel, however are not generally designed in accordance with NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems. The system works and is reasonable for a small community however the system lacks the reliability of a system designed to meet this standard.

Recommendation 10.1-1 Change to Emergency Communication Centre based system

To improve the reliability of the emergency communications systems, the Village of Pemberton should consider changing the emergency communications systems from the current cell phone based system to a system based around an emergency communications centre designed in accordance with NFPA 1221. it may be possible to contract this service to a nearby communications centre.

Recommendation 10.1-2 Implement 9-1-1 emergency call system

To improve the capacity for citizens to contact the fire department as quickly as possible and to reduce response times, the Village of Pemberton should implement a 9-1-1 call service.

Recommendation 10.1-3 Train dispatchers to NFPA 1061 Standard

To improve the reliability and effectiveness of the dispatchers in Pemberton, all dispatchers should be required to be trained in accordance with NFPA 1061, Standard for Professional Qualifications for Public Safety Telecommunicator, as appropriate for their position.

Recommendation 10.1-4 Improve maintenance and redundancy of critical communications equipment

To reduce the risk of emergency communications systems failures, all components of the emergency communications systems, including cell phones chargers, batteries, etc. should be regularly maintained (preventive maintenance) and should have redundant back up equipment available at all times.

11. 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 7.3 - Fire Risk in the Village of Pemberton) 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.

11.1. Separate Water Systems / Districts Overview

Water supplies for Public Fire Protection are provided within the Village of Pemberton. Single-Family & Multi-Family Residential Strata areas are provided private hydrants. Water to Pemberton's Industrial Park is provided from Mount Currie. No further information is known about the Mount Currie Water System.

11.2. Water System Evaluation Results

11.2.1. Village of Pemberton

The Village of Pemberton has a medium sized water system that serves the community. The water is not treated, but treatment is planned in the future. The Village of Pemberton's Industrial Park has water supplied from the Mount Currie water system. Hydrants in that area are owned and maintained by the Village.

The sources of supply for the water system include two ground water wells with a third well planned for 2010. Well 192 (Well 1 built in 1992) is capable of pumping 149.94 IGPM. Well 297 (Well 2 built in 1997) is capable of pumping 833 IGPM. Well 192 can be limited by sediment around the pump. The well pumps do not automatically switch on/off if one stops working. The pumps have to be manually switched on and off. Only one pump is active at a time. Well 297 is used the majority of the time with Well 192 as a back-up. The well pumps are not monitored by telemetry. An auto-dialer system is used to contact staff when the reservoirs hits 8 feet (50% capacity).

The ground water wells pump water up to a 360,000 Imperial Gallon reservoir through a 200 mm (8 inch) force main. Water from the reservoir is then gravity fed into the distribution system through a 300 mm (12 inch) main that decreases to 250 mm (10 inch) main.

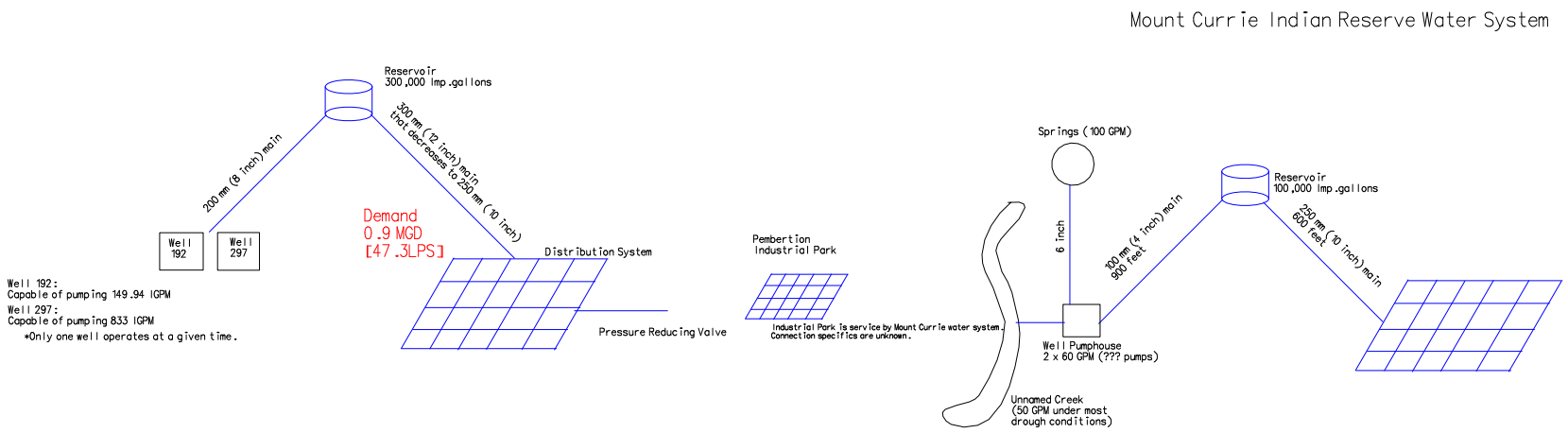
The water supply system would be 100% affected if a major power outage occurred because there is no back-up power supply. There would be a twelve hour gravity fed supply if a power outage occurred. The Village of Pemberton received grant funding to purchase a generator for a back-up power supply. The Village received the new generator in April 2008.

The water supply system has approximately 81 hydrants and 1 pressure reducing valve. Inspection and maintenance frequency for hydrants is annual. Complete hydrant tear-down occurs on an annual basis and are repaired as needed. There are approximately 10-12 private hydrants that are installed in Strata areas. The water distribution system is not currently mapped (GIS).

Hydrant distribution (spacing) was weak in some residential areas of the Village. Only one hydrant was installed along the residential area of Prospect Street. No hydrants were found along Frontier Street parallel to Prospect. The Cottonwood Court Strata only had one private hydrant to cover four buildings.

RevNo	Revision note	Date	Signature	Checked

Figure 11.2 | Pemberton Water Supply Simplified Sketch



Itemref	Quantity	Title/Name, designation, material, dimension etc			Article No./Reference	
Designed by		Checked by	Approved by - date	Filename	Date 2008	Scale NTS
Fire Underwriters Survey					Simplified Water System Schematic	
					Edition	Sheet

11.3. Volume of Stored Water for Fire Fighting and Domestic Use

The determination method of Required Fire Flows (RFF), Basic Fire Flows (BFF), fire event duration and minimum hydrant distribution is detailed in the Fire Underwriters Survey document "Water Supplies for Public Fire Protection". See Appendix B.

The maximum capacity of the reservoirs and the refill rate of the reservoirs (for the typical fire event duration) is de-rated with a safety factor for the calculation of the total available water resources for fire fighting.

Table 11.3-2 Summary of Recommended and Required Water Volumes for Fire Fighting summarizes the minimum required fire storage volume (BFF for the typical fire event duration) for each water system (column referred to as "Req'd Fire Storage"). Table 11.3-2 Summary of Recommended and Required Water Volumes for Fire Fighting also shows the recommended emergency storage (.25 of sum of "Req'd Fire Storage" and Domestic Storage).

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

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

Equation I) $Total\ Storage\ Required = A + B + C + D$

Where:

A = fire protection storage capacity as calculated (based on 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 demand capacity; (Calculated volume equal to PHD flow rate for the typical fire event duration)

Water supply systems designed to provide fire protection should meet the following to be considered an "**Adequate Supply**" with regard to 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:

Equation II) *Minimum Storage Required = A + E*

Where:

A = fire protection storage capacity as calculated (based on 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 noted 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 above noted formulas are 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 should be designed and constructed such that water supplies are uninterrupted even during system maintenance, main breaks, reservoir cleaning, extended periods of drought, and catastrophic events (such as seismic events, wind storm, 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.

For the water system Figure 11.3-1 shows a comparison of the minimum water required (for fire fighting) to the recommended storage capacity (to qualify as a "Good Water Supply"). The figures also show the amount of water that is actually available for fire fighting (including reservoir refill during fire event) and the quantity of water storage in the system.

As noted in Table 11.3-2 Summary of Recommended and Required Water Volumes for Fire Fighting and Figure 11.3-1, the Village of Pemberton has storage capacities that are

not considered to be adequate (for the minimum storage capacity with regard to fire fighting).

Improvements made to water supply systems for fire fighting should be reported to Fire Underwriters Survey.

The following tables summarize 4 events. The first two events consider only well pump 192 operating and the next two events consider only well pump 297 operating. The two events consider for each of the well pumps are a typical residential fire requiring 1,000 IGPM flow rates, and the Basic Fire Flow design fire requiring 2,600 IGPM. Notably the two different events have significantly different durations and associated required volumes.

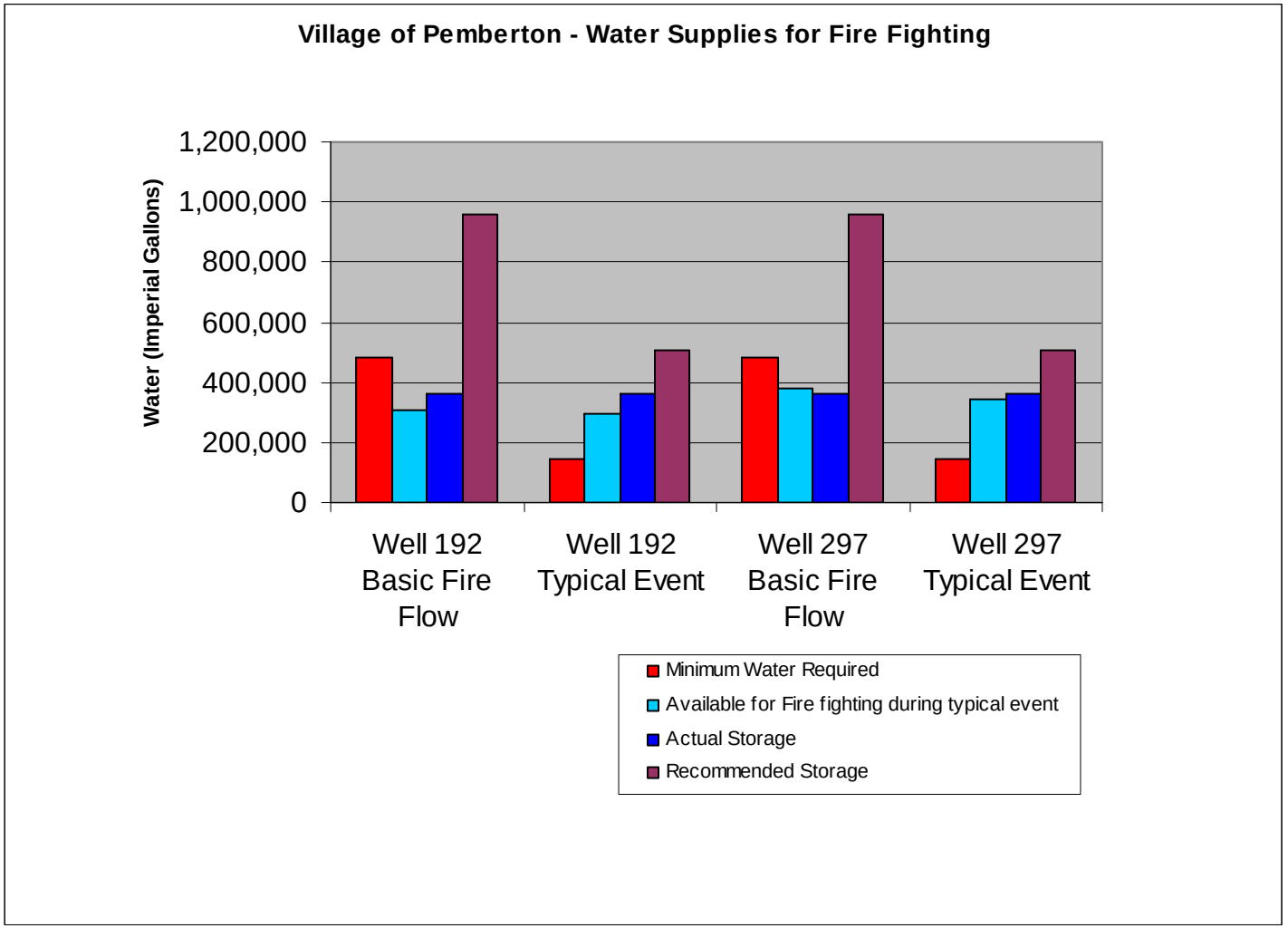
Table 11.3-1 Available Water Resources for Fire Fighting

	MDD	PHD	Total Storage	Total Refill Rate	Refill during Event Duration	Total Available Water Resources
Notes --->				derated 25-30%		
Units --->	*MGD*	*IGPM*	*I. gal*	*IGPM*	*I. gal*	*I. gal*
Pemberton						
Well 192 Basic Fire Flow	0.9	1250	360,000	112.5	16,875	304,875
Well 192 Typical Event	0.9	1250	360,000	112.5	10,125	298,125
Well 297 Basic Fire Flow	0.9	1250	360,000	624.75	93,713	381,713
Well 297 Typical Event	0.9	1250	360,000	624.75	56,228	344,228

Table 11.3-2 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 20-50%	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*
Pemberton															
Well 192 Basic Fire Flow	2600	2.5		0.9	1250	304,875	390,000	225,000	153,750	187,500	956,250	93,750	483,750	NO	NO
Well 192 Typical Event	1000	1.5		0.9	1250	298,125	90,000	225,000	78,750	112,500	506,250	56,250	146,250	NO	Yes
Well 297 Basic Fire Flow	2600	2.5		0.9	1250	381,713	390,000	225,000	153,750	187,500	956,250	93,750	483,750	NO	NO
Well 297 Typical Event	1000	1.5		0.9	1250	344,228	90,000	225,000	78,750	112,500	506,250	56,250	146,250	NO	Yes

Figure 11.3-1 Recognized Water Supplies for Fire Fighting



11.4. Available Fire Flows

The water supply system's capacity to deliver fire flows was reviewed. The ability of the system to provide the calculated required fire flows for individual locations is indicated in Table 11.4-1 Pemberton Flow Test Results.

Table 11.4-1 Pemberton Flow Test Results

Test	Location	RFF of Risk (IGPM)	Flow (USGPM) At 20 psi	Flow (IGPM) At 20 psi	Deficiency IGPM
Test 1	Hydrant 79	1300	2378	1981	no deficiency
Test 2	Bottom of Hill 3rd Hydrant Near House 1744	1100	761	634	466
Test 3	Hydrant 60 - Fire Department Burn Building	400	736	613	no deficiency
Test 4	Parking Lot Hydrant 40	2400	910	758	1642
Test 5	Hemlock & Laurel	900	803	669	231
Test 6	Hydrant 36 Hwy 99 and entrance to gas station	900	1322	1101	no deficiency
Test 7	Entrance to Cottonwood/Hwy99	1800	802	668	1132
Test 7	Entrance to Cottonwood/Hwy99	1100	802	668	432
Test 8	near 7464 Dogwood	1100	1064	886	214
Test 9	Aster St & Prospect St	4400	1273	1060	3340

Notably, the water supply system is incapable of providing the calculated required fire flows in a number of locations. Furthermore, the deficiency is significant in several areas. See recommendations.

Full Flow Test Results are provided in Appendix A.

11.5. Water Supplies Recommendations

Recommendation 11.5-1 Improve Overall Redundancy of the Water System

The Pemberton Water Supply System has very little redundancy. Water is pulled from wells (two sources) individually, and pumped through a single main to the reservoir, and water is gravity fed to the distribution system through a single main. If any individual component between the source and the distribution system fails, the Village's water supplies would be severely impacted. In some cases, water supplies would be completely unavailable (ex. water main failure between reservoir and distribution system). If a failure of any of these components occurs during a fire event, the results could be disastrous.

To improve redundancy of the system two main options should be considered:

Option 1: Twin the mains between the reservoir and the distribution system. Twinning the mains increases the redundancy allowing continuous flow if a break were to occur in either of the mains. This option only reinforces the redundancy of the water mains, not the rest of the components of the system.

Option 2: Install a separate reservoir (preferably in a separate geographic location) with its own source that would connect to the distribution system. Ideally the separate reservoir would be gravity fed, however if the reservoir is fed by pumping, then back power and equipment should also be considered.

Option 2 would provide a good level of redundancy for the water supply system. If any part of the first system fails the second system would still be able to provide water to the distribution network.

Option 2 may also help to improve available fire flows in some areas dependent upon the specific design. This option would also help to satisfy Recommendation 11.5-4 Provide Additional Water Storage Capacity.

Other recommendations for improving redundancy of other components are noted in Recommendation 11.5-2 Provide Back-up Pump for Primary Pump(s) and

Recommendation 11.5-3 Provide Back-up Power Supply for Primary System Components.

Recommendation 11.5-2 Provide Back-up Pump for Primary Pump(s)

To maintain a reasonable degree of redundancy and to ensure that there is no interruption of water supplies during break downs, maintenance, etc. a back-up pump should be kept on hand for primary pumps within the system.

Reference: *Reference: 1999 Standard - FUS Water Supply for Public Fire Protection*

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. (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.

Recommendation 11.5-3 Provide Back-up Power Supply for Primary System Components

Plans for the delivery of fire flows of the required durations throughout power outages should be formalised. Consideration should be given to providing back-up power to the most significant pumps in the water supply system.

Water systems should be provided with back-up power for all key components (including pumps, telemetry, etc.) This will reduce the risk of fire losses resulting from insignificant water supplies at the fire scene.

Reference: 1999 Standard - FUS Water Supply for Public Fire Protection
"Electric power supply to all 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."

Recommendation 11.5-4 Provide Additional Water Storage Capacity

Lack of adequate water supplies during a fire event may result in increased risk to life safety of building occupants and fire fighters. Additionally, lack of adequate water supplies for fire fighting may result in increased property losses and increased property insurance rates.

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 11.3-2 Summary of Recommended and Required Water Volumes for Fire Fighting.

Recommendation 11.5-5 Provide Hydrants for All SFR Properties

Hydrant distribution should be improved such that all single family residences (and duplexes) are located within 300 metres (1000 feet) (hose lay) of fire hydrants. This standard is accepted and utilized by insurers across Canada to reduce the amount of time that it takes fire fighting crews to start the initial attack on a working fire. The standard of 1000 feet for residences and duplexes ensures that firefighters will be able to set up and start their attack without excessive hose lay times and travel distances between apparatus and fire.

Recommendation 11.5-6 Improve Water System Available Fire Flows to Meet Calculated Fire Flow Requirements

Fire flows were noted to be sub par and/or inconsistent in some of the industrial and commercial zones throughout the Village of Pemberton. 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 and industrial areas, the 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.

Recommendation 11.5-7 Improve use of Technology to Manage, Plan and Optimize Water System

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
- a digital record keeping system.

Recommendation 11.5-8 Improve Record Keeping of Daily Water Usage

The Pemberton Water Works Department should develop the ability to track water usage through metering and/or other methods available. This data is important in calculating storage requirements for the system.

Recommendation 11.5-9 Develop Formal Water Supply Plan for Non-Hydrant Protected Areas; Consider Dry Hydrants

The Pemberton Volunteer Fire/Rescue Department protects a Fire Protection District that has many areas without hydranted water supplies. In these areas, the fire department responds utilizing the onboard water storage of the apparatus. The department does not have a tanker to shuttle water. The engine on scene will pump water from its 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 protection area boundaries.

Consideration should be given to installing dry hydrants in strategic locations to minimize travel times during operations. All dry hydrants should be installed in full compliance with NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting, 2001 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.

To increase the reliability of the department's water capacity a tanker for shuttling water for areas without hydranted water supplies should be incorporated.

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.

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12. FIRE INSURANCE GRADING CLASSIFICATION REASSIGNMENT

The results of our assessment indicate that previous published grades for the community remain reasonably accurate with respect to the fire protection capacities served. Although the level of fire risk has increased, the level of fire protection has also been improved and the previous grading has successfully been maintained.

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 Village of Pemberton FPA. (Specified FPA within Squamish-Lillooet Regional District) and more specifically the following areas within the boundaries of the FPD. The following section will be completed after all report corrections have been made.

Table 11.5-1 Village of Pemberton Fire Insurance Grading Classifications

SUB DISTRICT(S) and (contract protection areas)	DPG previous	DPG 2008	COMMENTS
Village of Pemberton HPA[12]	3A	**3A**	Hydrant Protected Area - detached dwellings within 300 m of fire hydrant
Village of Pemberton	4	**4**	Fire Station Protected Area- detached dwellings within 8 km by road of a Pemberton Fire Hall
Pemberton FPA	4	**4**	Unprotected - detached dwellings NOT within 8 km by road of a Pemberton Fire Hall
Rest	5	**5**	Unprotected - detached dwellings further than 8 km by road of a Pemberton Fire Hall

SUB DISTRICT(S) and (contract protection areas)	PFPC previous	PFPC 2008	COMMENTS
Village of Pemberton HPA	7	**7**	Hydrant Protected - commercial properties within 150 m of fire hydrant
Village of Pemberton	9	**9**	Fire Station Protected - commercial properties within 5 km by road of a Pemberton Fire Hall
Pemberton FPA	9	**9**	Unprotected - commercial properties further than 5 km by road of a Pemberton Fire Hall
Rest	10	**10**	Unprotected - commercial properties further than 5 km by road of a Pemberton Fire Hall

[12] HPA refers to Hydrant Protected Area within fire insurance grading.

13. PROJECT CONCLUSIONS

The Village of Pemberton continues to grow and the fire risk and fire load in the community continue to increase due to ongoing development. This trend is expected to continue for the foreseeable future.

The most significant deficiency observed throughout this study of the Pemberton Volunteer Fire/Rescue Department was the fire department's available fire force. This area is significantly deficient when measured against the benchmark of the required number of fire personnel and companies for the Basic Fire Flow associated with the Village of Pemberton in the Table of Effective Response. Other areas where improvement is encouraged are discussed within the report.

The Village of Pemberton's water supply system is deficient in several areas as compared to the level of fire risk in the community. In particular, the water system was noted to be deficient and requires improvements in the areas of minimum storage capacities available and the capacity to provide the calculated required fire flows in several areas of the Village. Recommendations are discussed within the report and improvements are encouraged.

The distribution of resources is becoming weaker in Pemberton and the proposed expansion to include the Tisdall area in the Village boundaries will further weaken resource distribution. As the community expands and permits new developments to occur, the Village should continue to invest in fire protection resources to provide a reasonable level of fire protection to existing areas as well as new.

Appendix A

FIRE UNDERWRITERS SURVEY
Village of Pemberton
FLOWTESTING 2008

Test	Location	RFF of Risk (IGPM)	Flow (USGPM) At 20 psi	Flow (IGPM) At 20 psi	Deficiency IGPM
Test 1	Hydrant 79	1300	2378	1981	no deficiency
Test 2	Bottom of Hill 3rd Hydrant Near House 1744	1100	761	634	466
Test 3	Hydrant 60 - Fire Department Burn Building	400	736	613	no deficiency
Test 4	Parking Lot Hydrant 40	2400	910	758	1642
Test 5	Hemlock & Laurel	900	803	669	231
Test 6	Hydrant 36 Hwy 99 and entrance to gas station	900	1322	1101	no deficiency
Test 7	Entrance to Cottonwood/Hwy99	1800	802	668	1132
Test 7	Entrance to Cottonwood/Hwy99	1100	802	668	432
Test 8	Benchlands near 7464 Dogwood	1100	1064	886	214
Test 9	Aster St & Prospect St	4400	1273	1060	3340

Gmap Link

WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES

Available Fire Flow Calculator

Name of Risk:	Industrial Site (Bottle Depot)	Test No.	FlowTest(1)
Municipality:	Pemberton, Village of	Test By:	M.C.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	ordinary or non-combustible?		
Ground Floor Area	~30,000 SQ.FT +/-	# of storeys	1=2
Occupancy	Comb. + 10%	Sprinklered?	Yes
Exposures	Front: - Rear: - Left: 5% Right: 5%		

Size of Main: ? Dead End: Two Ways: Loop: Y

Source Reliable: If not explain:

Comments: Water Supplied from Mt. Currie

TEST DATA:

Location of test hydrants; Residual: Hydrant 79

Flow: Hydrant 77

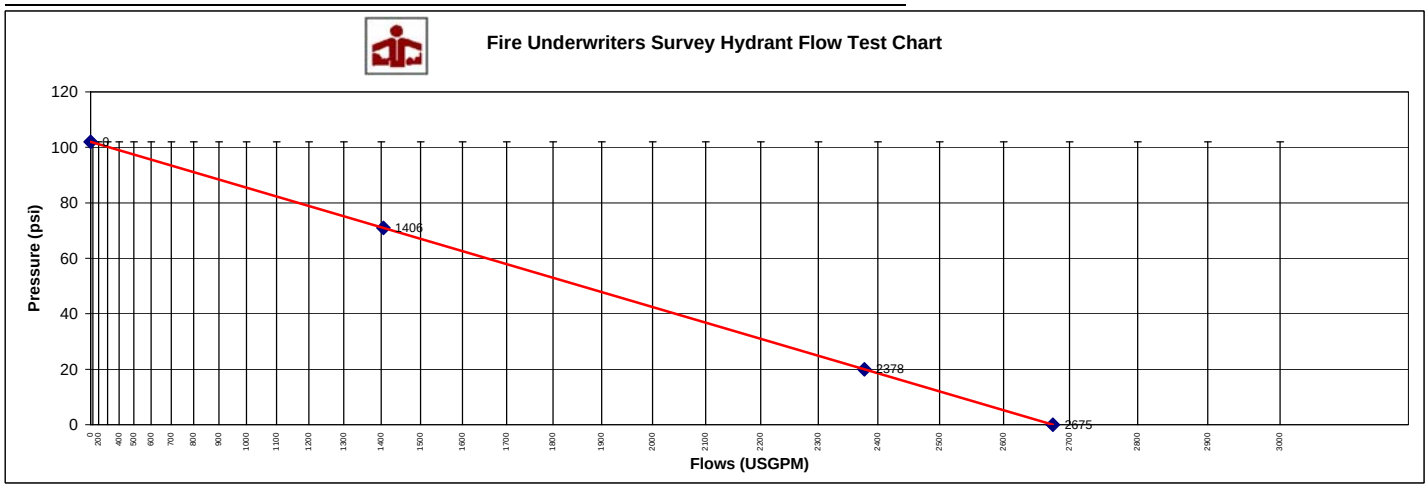
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	58		
GPM:	1406	0	0

TOTAL FLOW DURING TEST: 1406 USGPM

STATIC READING: 102 PSI RESIDUAL: 71 PSI

RATED CAPACITY: 2378 USGPM AT 0 PSI 2675 GPM

REMARKS:



Public Version

Provided by:
Fire Underwriters Survey
Municipal Engineering Division

3999 Henning Drive
Burnaby, BC V5C 6P9
1-800-665-5661

WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES

Available Fire Flow Calculator

Name of Risk:	Plateau-SFR-Large (Strata-Private)	Test No.	Flowtest(2)
Municipality:	Pemberton, Village of	Test By:	M.C.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Combustible		
Ground Floor Area	1500 SQ.FT	# of storeys	3
Occupancy	Typ-15% to -20%	Sprinklered?	No
Exposures	Front: 30m Rear: - Left: 3-10m		Right: 3-10m

Size of Main: ? Dead End: Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Bottom of Hill 3rd Hydrant Near House 1744

Flow: Top of Hill

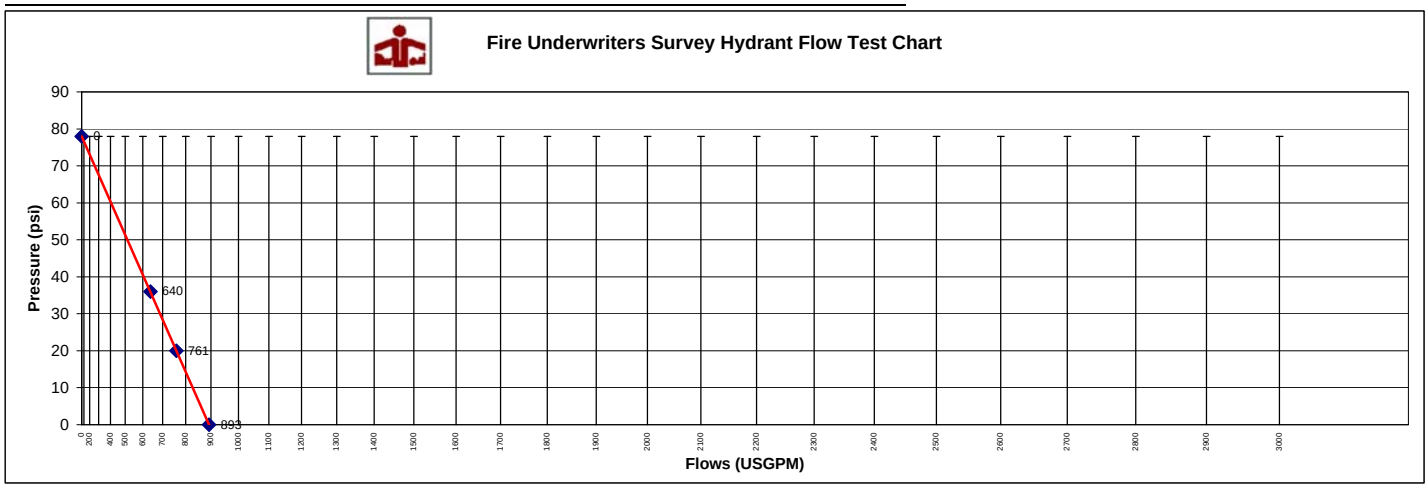
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	12		
GPM:	640	0	0

TOTAL FLOW DURING TEST: 640 USGPM

STATIC READING: 78 PSI RESIDUAL: 36 PSI

RATED CAPACITY: 761 USGPM AT 0 PSI 893 GPM

REMARKS:



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3999 Henning Drive
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WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES

Available Fire Flow Calculator

Name of Risk:	Airport Area	Test No.	Flowtest(3)
Municipality:	Pemberton, Village of	Test By:	S.S.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Combustible		
Ground Floor Area	1500 SQ.FT	# of storeys	2
Occupancy	H20 Treatment Plant (Waste Water)	Sprinklered?	Yes
Exposures	Front: >45 Rear: >45 Left: 20-30m	Right:	>45

Size of Main: ? Dead End: Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Hydrant 60 - Fire Department Burn Building Property

Flow: By Treatment Building

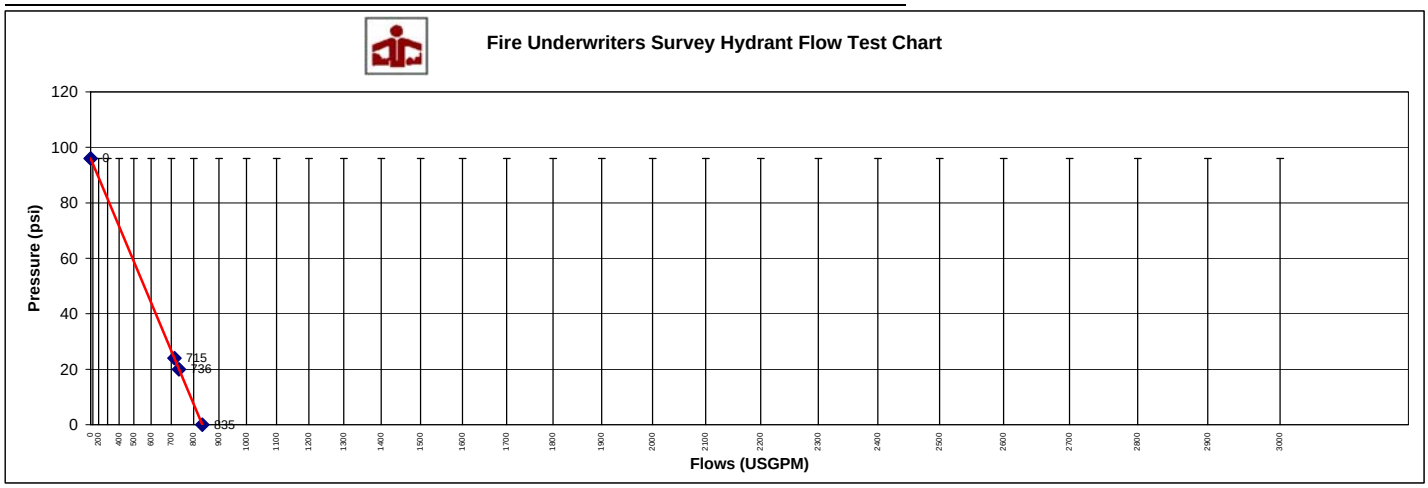
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	15		
GPM:	715	0	0

TOTAL FLOW DURING TEST: 715 USGPM

STATIC READING: 96 PSI RESIDUAL: 24 PSI

RATED CAPACITY: 736 USGPM AT 0 PSI 835 GPM

REMARKS:



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WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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Available Fire Flow Calculator

Name of Risk:	Pemberton Valley Lodge	Test No.	Flowtest(4)
Municipality:	Pemberton, Village of	Test By:	S.S.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Combustible		
Ground Floor Area	24 suites per floor, 350 SQ.FT per floor	# of storeys	3
Occupancy	Hotel	Sprinklered?	Y
Exposures	Front: >45 Rear: 20-30m Left: 10-20m (C3H8	Right:	10-20m

Size of Main: ? Dead End: Yes Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Parking Lot Hydrant 40

Flow: Parking Lot Hotel, closer to propane tank

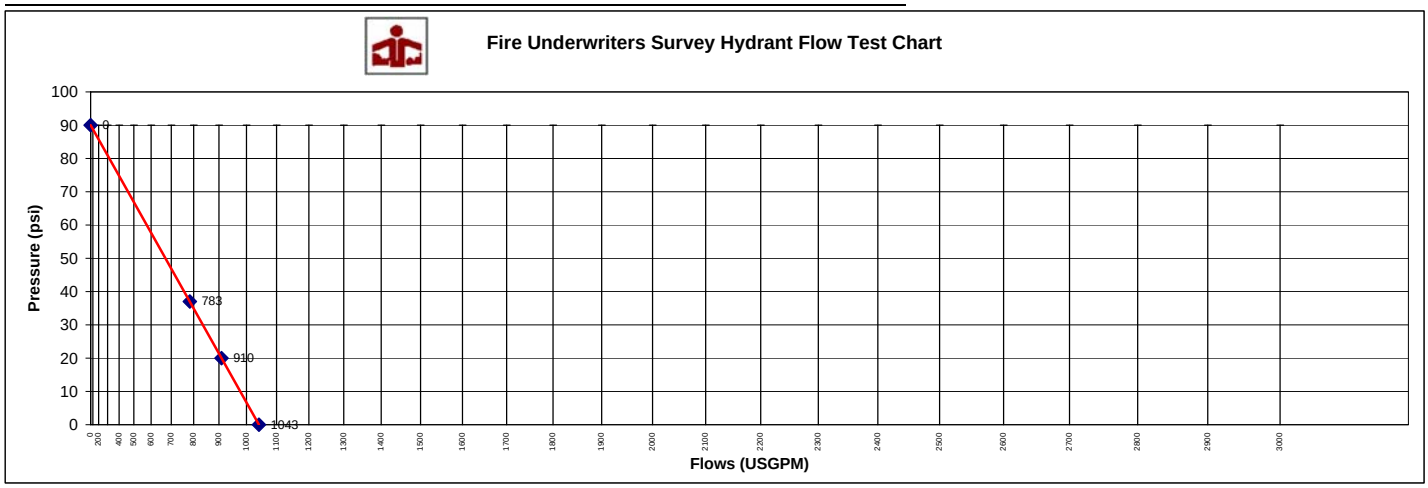
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	18		
GPM:	783	0	0

TOTAL FLOW DURING TEST: 783 USGPM

STATIC READING: 90 PSI RESIDUAL: 37 PSI

RATED CAPACITY: 910 USGPM AT 0 PSI 1043 GPM

REMARKS:



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	SFR Area	Test No.	Flowtest(5)
Municipality:	Pemberton, Village of	Test By:	M.C.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Wood Frame-Combustible		
Ground Floor Area	1000 SQ.FT	# of storeys	2
Occupancy	SFR	Sprinklered?	No
Exposures	Front: 30-45m Rear: >45 Left: 3-10m		Right: 3-10m

Size of Main: Dead End: Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Hydrant 49 (Hemlock & Laurel)

Flow: Hydrant 50 (end of street Hemlock St)

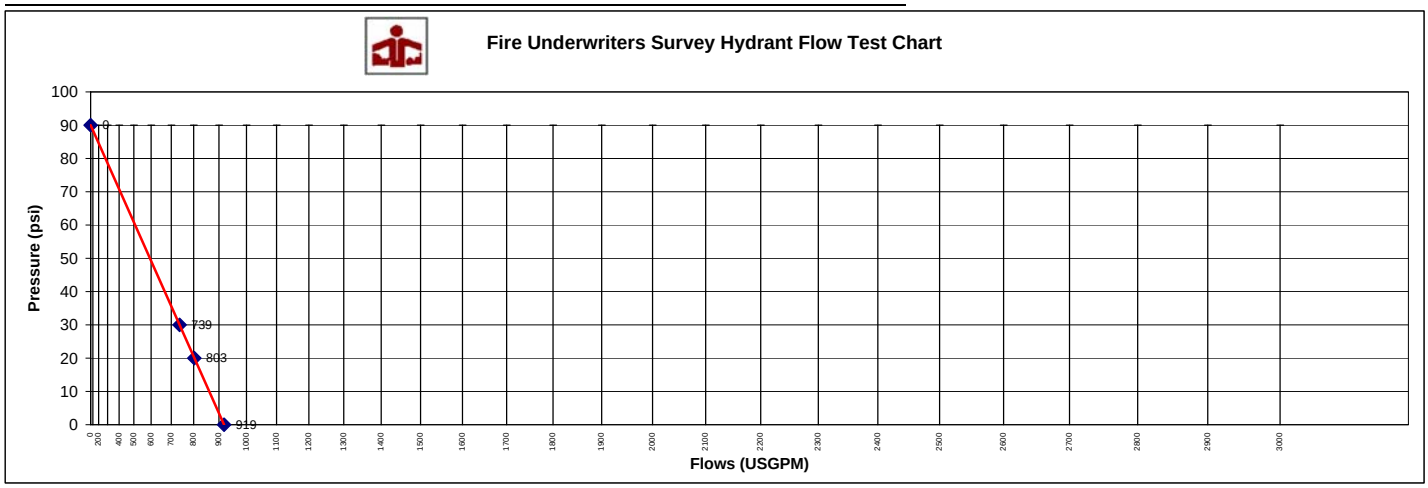
FLOW HYDRANT(S)			Orifice #2	Orifice #3
	SIZE OPENING:	2.5		
	COEFFICIENT:	0.99		
	PITOT READING:	16		
	GPM:	739	0	0

TOTAL FLOW DURING TEST: 739 USGPM

STATIC READING: 90 PSI RESIDUAL: 30 PSI

RATED CAPACITY: 803 USGPM AT 0 PSI 919 GPM

REMARKS: Hydrant Extremely Tight to open



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	Pioneer Junction Store/McDonalds	Test No.	Flowtest(6)
Municipality:	Pemberton, Village of	Test By:	M.C.
Purpose of Test:	Fire Inurance Grading	Date:	
Type of Construction	Combustible		
Ground Floor Area	1500 SQ.FT	# of storeys	1
Occupancy		Sprinklered?	No
Exposures	Front: >45 Rear: >45 Left: >45	Right:	>45

Size of Main: ? Dead End: Two Ways: Loop:

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Hydrant 30

Flow: Hydrant 36 Hwy 99 and entrance to gas station

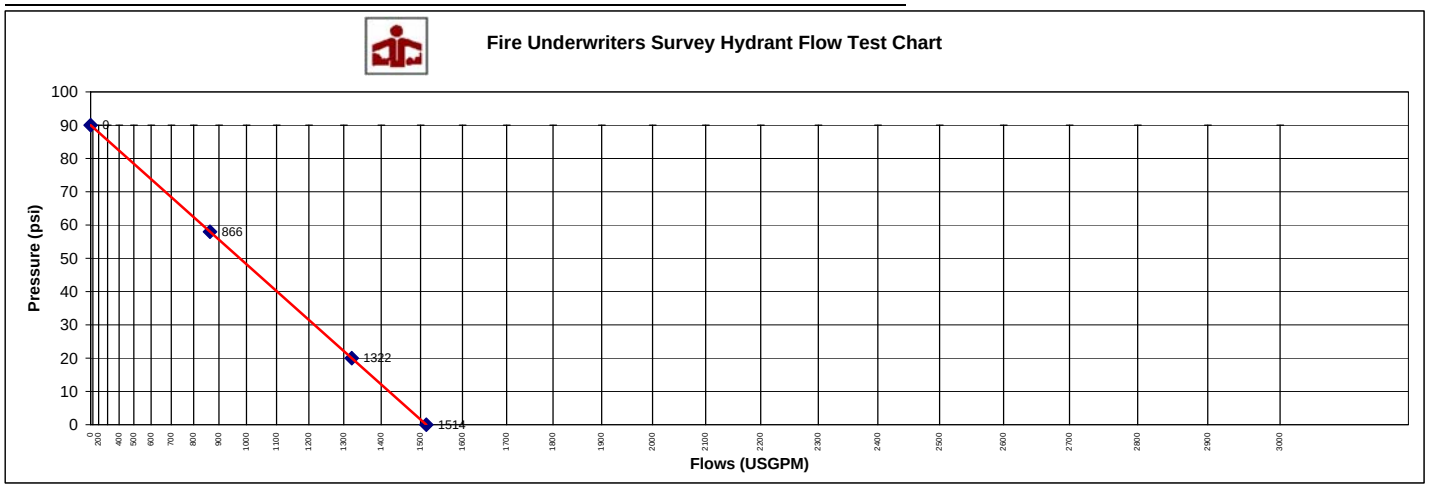
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	22		
GPM:	866	0	0

TOTAL FLOW DURING TEST: 866 USGPM

STATIC READING: 90 PSI RESIDUAL: 58 PSI

RATED CAPACITY: 1322 USGPM AT 0 PSI 1514 GPM

REMARKS: Closest to Peaks MFR-Strata



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

Name of Risk:	Pemberton Community Centre (Under Construction)	Test No.	Flowtest(7)
Municipality:	Pemberton, Village of	Test By:	M.C.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Heavy Timber		
Ground Floor Area	6000 SQ.FT or more	# of storeys	2
Occupancy	Community Centre-Library	Sprinklered?	No, Sprinkler but will when completed
Exposures	Front: Rear: Left: Right:		

Size of Main: ? Dead End: Two Ways: Loop: ?

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: Entrance to Cottonwood/Hwy99

Flow: 2nd in on Cottonwood

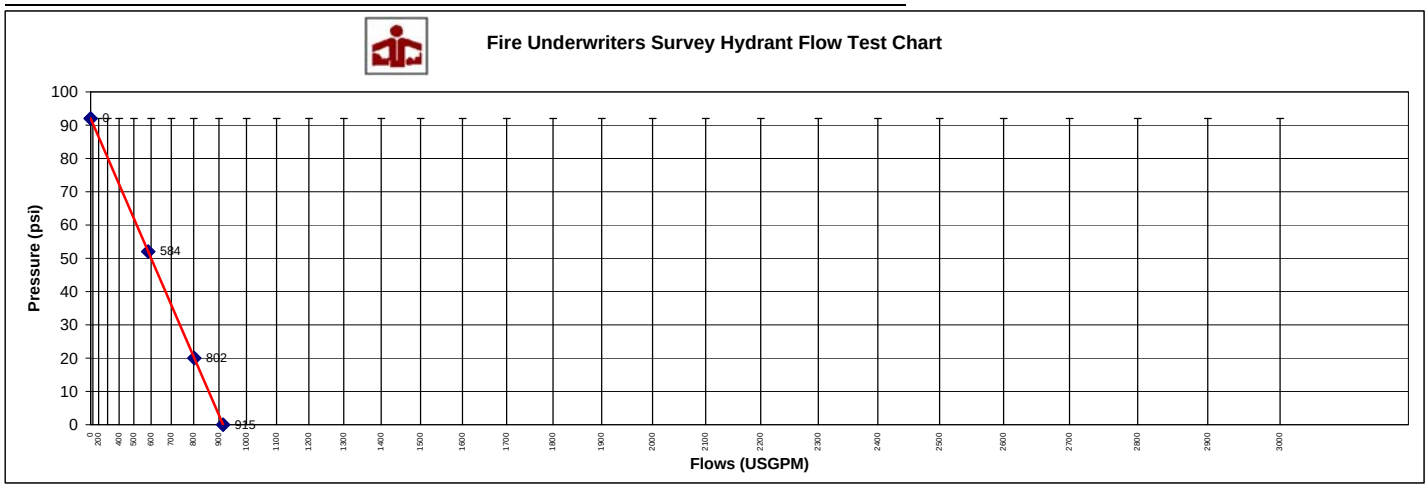
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	10		
GPM:	584	0	0

TOTAL FLOW DURING TEST: 584 USGPM

STATIC READING: 92 PSI RESIDUAL: 52 PSI

RATED CAPACITY: 802 USGPM AT 0 PSI 915 GPM

REMARKS: Flow Initial was 20 psi, then a sudden drop occurred 10 psi, Guage: Settled at 63 psi then dropped to 52 psi



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Available Fire Flow Calculator

Name of Risk:	Benchlands Area - In Development SFR residential	Test No.	Flowtest(8)
Municipality:	Pemberton, Village of	Test By:	M.K.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	In development		
Ground Floor Area		# of storeys	0 for nw
Occupancy		Sprinklered?	no for now
Exposures	Front: Rear: Left:		Right:

Size of Main: ? Dead End: Two Ways: Loop: Yes?

Source Reliable: If not explain:

Comments:

TEST DATA:

Location of test hydrants; Residual: No Hydrant Number near 7464 Dogwood

Flow: Below Guage Hydrant on Dogwood

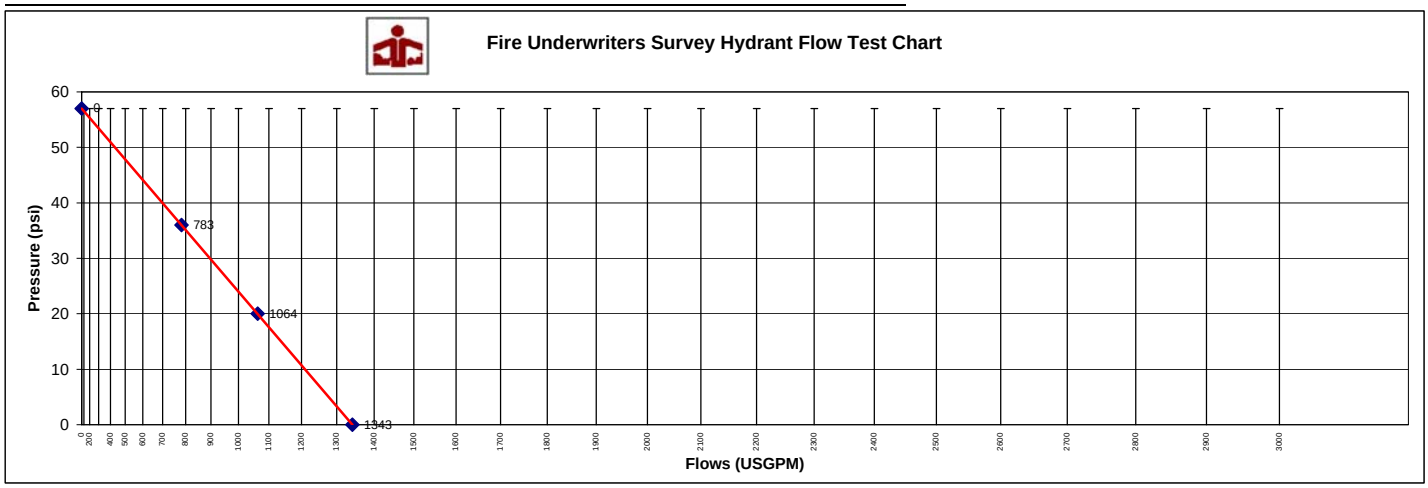
FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	18		
GPM:	783	0	0

TOTAL FLOW DURING TEST: 783 USGPM

STATIC READING: 57 PSI RESIDUAL: 36 PSI

RATED CAPACITY: 1064 USGPM AT 0 PSI 1343 GPM

REMARKS:



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WATER FLOW TEST REPORT

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Available Fire Flow Calculator

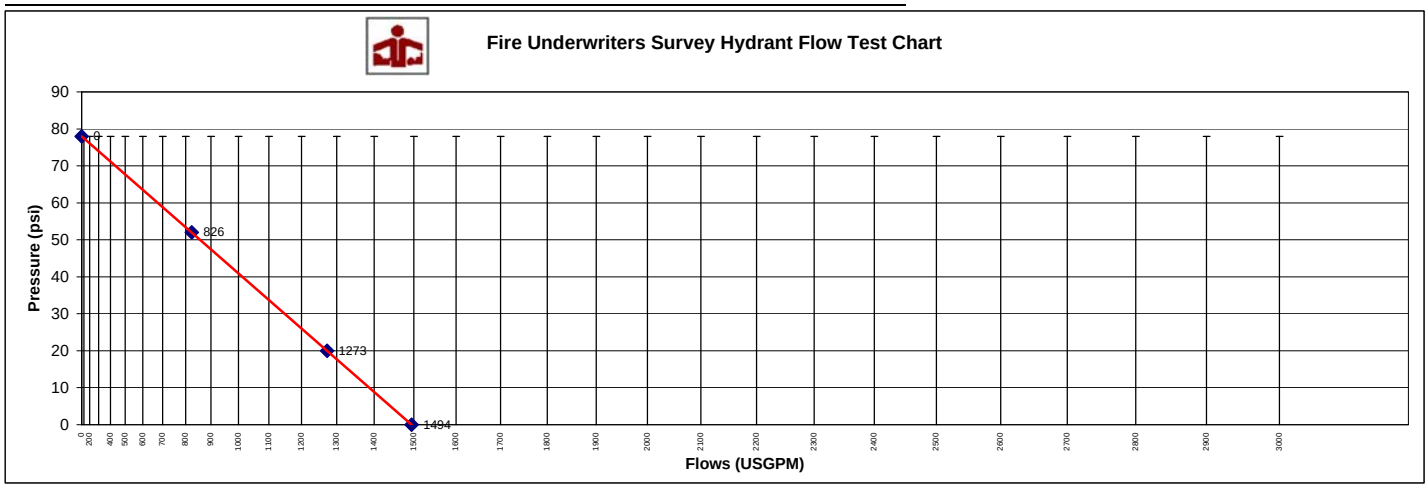
Name of Risk:	Pemberton Hotel	Test No.	Flowtest(9)
Municipality:	Pemberton, Village of	Test By:	S.S.
Purpose of Test:	Fire Inurance Grading	Date:	11-Mar-08
Type of Construction	Combustible		
Ground Floor Area	1400 sqmetres	# of storeys	2
Occupancy	commercial	Sprinklered?	No
Exposures	Front: Rear: Left: Right:		

Size of Main: Dead End: Yes Two Ways: Loop:
Source Reliable: If not explain:
Comments:

TEST DATA:
Location of test hydrants; Residual: Hydrant #2 - Aster St & Prospect St
Flow: Hydrant #3 - Frontier St

FLOW HYDRANT(S)		Orifice #2	Orifice #3
SIZE OPENING:	2.5		
COEFFICIENT:	0.99		
PITOT READING:	20		
GPM:	826	0	0

TOTAL FLOW DURING TEST: 826 USGPM
STATIC READING: 78 PSI RESIDUAL: 52 PSI
RATED CAPACITY: 1273 USGPM AT 0 PSI 1494 GPM
REMARKS:



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Appendix B

WATER SUPPLY
FOR
PUBLIC FIRE PROTECTION

1999

FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

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For further information on this document or any matters relating to the Fire Underwriters Survey please contact the appropriate offices of CGI Risk Management Services (formerly the Insurers' Advisory Organization) as follows:

Western Canada	CGI Risk Management Services Fire Underwriters Survey 3999 Henning Drive Burnaby BC V5C 6P9	Local: 604-6841581 Toll Free: 1-800-665-5661 Fax: 604-688-6986
Central Canada	CGI Risk Management Services Fire Underwriters Survey Suite 800, 7015 Macleod Tr. SW Calgary Alberta T2H 2K6	Local: 403-296-1300 Toll Free: 1-800-465-4264 Fax: 403-296-1316
Quebec	CGI Risk Management Services Fire Underwriters Survey 1611 Crémazie Blvd. East Montreal, Quebec H2M 2P2	Local: 514-735-3561 Toll Free: 1-800-263-5361 Fax: 514-844-0777
Ontario	CGI Risk Management Services Fire Underwriters Survey Lock Box 200 150 Commerce Valley Drive, West Markham, Ontario L3T 7Z3	Local: 905-882-6300 Toll Free: 1-800-387-4356 Fax: 905-695-6543
Atlantic Canada	CGI Insurance Business Services Fire Underwriters Survey 238 Brownlow Avenue, Suite 300 Park Place Center Dartmouth, Nova Scotia B3B 1Y2	Telephone: 902-423-9287 Toll-Free: 1-800-639-4528 Fax: 902-423-7376

FIRE UNDERWRITERS SURVEY is financed by the Canadian Insurance industry and utilizes technical staff of CGI Risk Management Services (formerly the Insurers' Advisory Organization Inc.) Its purpose is to survey fire protection conditions in Canadian communities and municipalities, providing data and advisory services to fire insurance underwriters and public officials concerned.

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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

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:

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Appendix D

NFPA 1901
Standard for
Automotive Fire Apparatus
2003 Edition

Annex D Guidelines for First Line and Reserve Apparatus

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

D.1 Brief Summary.

To maximize fire fighter capabilities and minimize risk of injuries, it is important that fire apparatus be equipped with the latest safety features and operating capabilities. In the last 10 to 15 years, much progress has been made in upgrading functional capabilities and improving the safety features of fire apparatus. Apparatus built prior to 1991 might have few of the safety upgrades required by the 1991 and subsequent editions of the NFPA fire department apparatus standards or the equivalent Underwriters' Laboratories of Canada (ULC) standards. Because the changes, upgrades, and fine tuning to NFPA 1901 since 1991 have been truly significant, especially in the area of safety, fire departments should seriously consider the value (or risk) to firefighters by keeping pre-1991 fire apparatus in first-line service.

The 1991 edition of the NFPA fire department apparatus standards included, among many other things, requirements for fully enclosed riding areas, stronger aerial ladders, auxiliary braking systems, reflective striping, improved warning lights, and no roof-mounted audible warning devices. The 1991 editions have been recognized as the benchmark from which the new, improved apparatus have evolved. It is recommended that only apparatus that meet the 1991 or later editions of the NFPA apparatus standards or that are refurbished in accordance with NFPA 1912 be permitted to operate in first-line service, to ensure that the latest improvements and upgrades are available for the firefighters.

It is recommended that apparatus built to meet the 1979 or 1985 edition of NFPA 1901 (or equivalent ULC standards) be placed in reserve status and upgraded to incorporate as many features of the post-1991 fire apparatus as possible *(see Section D.3)*. Apparatus not built to NFPA apparatus standards or manufactured prior to 1979 (over 24 years old) should be considered for upgrading or replacement.

D.2 Discussion.

It is a generally accepted fact that fire apparatus, like all types of mechanical devices, have a finite life. How long that is depends on many factors. Some of those factors are mileage, quality of the preventative maintenance program, quality of the driver training program and rules enforcement, quality of the original builder and components, availability of parts, and custom or commercial chassis to name a few. In the fire service, there are fire apparatus with 8 to 10 years of service that are just plain worn out. There are also fire apparatus that were built with quality components, that had excellent maintenance, and that have responded to a minimum number of runs that are still serviceable after 20 years. Most would agree that the quality and timeliness of maintenance are perhaps the most significant factors in determining how well a fire apparatus ages.

Prior to 1991, the fire department apparatus standards were basically “reactive standards.” That is to say, if something proved out in field use for a few years, it might have been suggested for inclusion in

NFPA 1901. It was a very basic standard. After forming a Safety Task Group within the Fire Department Apparatus Committee in the late 1980s and looking at the current status of the standard, the Committee decided to become proactive and to greatly enhance the value of the standard for the fire service.

The completely revised 1991 edition was the result of the efforts of many task groups and the full committee's strong desire to make the automotive fire apparatus standards more “safety oriented and user friendly.” In 1991, four standards were actually issued: NFPA 1901, *Standard for Automotive Fire Apparatus*; NFPA 1902, *Initial Attack Fire Apparatus;* NFPA 1903, *Mobile Water Supply Fire Apparatus*; and NFPA 1904, *Aerial Ladder and Elevating Platform Fire Apparatus*.

Contained within the 1991 editions of the fire department apparatus standards were requirements for such items as increased battery capacity to ensure starting under most conditions; intersection lights for increased visibility; removal of all roof-mounted audible warning devices to reduce hearing problems; a flashing light in the cab to warn if a cab or body door is open; a backup alarm; an automatic transmission to make it easier to drive (unless the purchaser had a specific reason for a manual transmission); fully enclosed riding areas with reduced noise (dBA) levels to keep the crew members safe, warm (or cool), and informed as to what is happening; seats and seat belts for all crew members riding on the apparatus; failsafe door handles so the sleeve of a coat will not inadvertently catch a handle and open a door; and signs requiring everyone to be seated and belted.

In the pump area, the standard specified that 3 in. (76 mm) or larger valves be “slow close,” that caps be tested to 500 psi (3400 kPa), that an intake relief valve be provided to help manage incoming pressure, that 30 degree sweep elbows be provided on the discharges to eliminate hose kinking, and that all 3 in. and larger discharges be eliminated from the pump panel to reduce the possibility of injuries to the pump operator.

In the body area, the minimum step surface size and load-carrying capabilities were increased, handrails were required to be slip resistant, and reflective striping was required on all four sides of the apparatus. Electrical system requirements for line voltage were upgraded to require the use of “listed” components that were grounded.

Many requirements were added to increase the operating capabilities of all aerial devices. For aerial ladders, the minimum design strength of the rungs was increased, a height requirement for the hand rails was specified, a minimum load carrying requirement for folding steps was specified, and the aerial ladder had to have a minimum carrying capacity of 250 lb (114 kg) at the tip at zero degrees elevation at maximum extension. Where a water tower was equipped with a ladder, the same requirements that applied to an aerial ladder were required of the ladder on the water tower.

The carrying capacity of elevating platforms at zero degrees full extension was raised to 750 lb (340 kg). Elevating platforms were also required to have handrails, breathing air available in the platform (with low air warning capability) for at least two firefighters, and a water curtain cooling system under the platform.

All aerial devices had to be capable of supporting a static load of 1½ times their rated capacity in any position. A requirement for a stabilizer movement alarm and reflective striping with warning lights was added. Interlocks to prevent inadvertent movement to an unsupported side and to prevent raising the aerial device prior to the stabilizers being deployed were specified. One hundred percent nondestructive tests became a requirement with increased safety and strength of materials also being required.

All this happened in just the 1991 editions of the NFPA apparatus standards. Subsequent revisions in 1996 and 1999 further enhanced the safety and operating characteristics of all the apparatus. For example, the 1999 edition included chapters on quints and mobile foam apparatus, further defined slip resistance of stepping and walking surfaces, called for better mounting of equipment in the driving and crew compartment, required predelivery testing of foam systems, and specified that fill stations for breathing-air cylinders be designed to totally contain a rupturing cylinder.

D.3 Upgrading or Refurbishing Fire Apparatus.

Any apparatus, whether in first-line or reserve service, should be upgraded as necessary to ensure that the following features are included as a minimum:

(1) Fully enclosed seating is provided for all members riding on the fire apparatus.
(2) Warning lights meet the current standard.
(3) Reflective striping meets the current standard.
(4) Slip resistance of walking surfaces and handrails meets the current standard.
(5) A low voltage electrical system load manager is installed if the total continuous load exceeds the alternator output.
(6) Where the GVWR is 36,000 lb (16,000 kg) or more, an auxiliary braking system is installed and operating correctly.
(7) Ground and step lights meet the current standard.
(8) Noise levels in the driving and crew compartment(s) meet the current standard.
(9) Engine belts, fuel lines, and filters have been replaced in accordance with the manufacturers' maintenance schedule(s).
(10) Brakes, brake lines, and wheel seals have been replaced or serviced in accordance with the manufacturers' maintenance schedule.
(11) Tires and suspension are in serviceable condition.
(12) All horns and sirens are relocated from the roof to a position as low and as far forward as possible.
(13) Seat belts are available for every seat and are new or in serviceable condition.
(14) Sign plates are present stating no riding on open areas.
(15) A complete weight analysis shows the fire apparatus is not over individual axle or total GVW ratings.
(16) The fire pump meets or exceeds its original pump rating.
(17) Alternator output meets its rating.
(18) Water tank and baffles are not corroded or distorted.
(19) A transmission shift pump interlock is present and working properly on vehicles equipped with an automatic transmission.
(20) All loose equipment in the driving and crew areas is securely mounted to prevent its movement in case of an accident.
(21) The radiator has been serviced in accordance with the manufacturers' maintenance schedule and all cooling system hoses are new or in serviceable condition.
(22) If so equipped, the generator and line voltage accessories have been tested and meet the current standard.
(23) If equipped with an aerial device, a complete test to original specifications has been conducted and certified by a certified testing laboratory.

Fire department administrators and fire chiefs should exercise special care when evaluating the cost of refurbishing or updating an apparatus versus the cost of a new fire apparatus. A thorough cost-benefit analysis of the “value” of upgrading or refurbishing a fire apparatus should be conducted. In many instances, it will be found that refurbishing costs will greatly exceed the current value of similar apparatus.

Apparatus not built to NFPA apparatus standards or manufactured prior to 1979 (over 24 years old) should be considered for upgrading or replacement.

Appendix E

1. INTRODUCTION

At the request of the Village of Pemberton, this office was asked to undertake a feasibility study to determine the merits of extending the Pemberton Fire Protection Specified area to protect an area north of Pemberton, known as Pemberton Meadows. Area residents had expressed interest to the Squamish-Lillooet Regional District for basic fire protection service.

Subsequent meetings and clarifications with the Pemberton Administrator revealed a need to examine the current operation of the Pemberton Volunteer Fire Department. There was some concern within the community that recent and projected community growth would require improvements to the level of fire protection services provided by the Pemberton Fire Department.

2. BACKGROUND

The terms of reference for this study were set during an initial meeting held on November 9, 1995, in the Pemberton Municipal Hall. The following representatives from the Village of Pemberton and the Squamish-Lillooet Regional District were in attendance:

Bryan Kirk	Clerk/ Treasurer, Village of Pemberton
Richard May	Councilor, Village of Pemberton
Milt Fernandez	Fire Chief, Village of Pemberton
Susan Gimse	Director, Electoral Area C, Squamish-Lillooet Regional District
Ivan Knowles	Administrator, Squamish-Lillooet Regional District

This meeting focused primarily on the feasibility of establishing fire protection services for the area known as Pemberton Meadows, located to the north of the Pemberton Fire Protection Area (FPA) in electoral area "C" of the Squamish-Lillooet Regional District (SLRD). The representatives from the SLRD and Pemberton agreed that the existing Pemberton Fire Department could assist in some role in the establishment of this proposed service. The objectives of the SLRD are to provide a minimum level of structure fire protection in order to receive reductions in fire insurance premiums over current levels in the unprotected area.

This study, in part, will address the following issues as presented or suggested in this meeting:

- Is it feasible for the existing Pemberton FPA to extend its boundaries to include the proposed unprotected area, or should a new FPA be formed?

- Will a fire station be required, or can this service be 'borrowed' from the Pemberton FPA? If required, where is the most suitable location for the fire station?

- What is the benefit to the Village of Pemberton to provide fire protection services for the proposed area?

- What will be the equipment, fire apparatus, manning, and fire hall requirements for the proposed area, whether protected by the Pemberton FPA or as a new service?

- What are the financial implications for the establishment of this service?

The meeting participants also requested an analysis of:

- Assessment of fire department operations.
- Adequacy of existing fire apparatus.
- Evaluation of current fire hall.
- An analysis of the adequacy of fire department communication systems
- Training.
- Feasibility of Providing Fire Protection Services to the Ivey Lakes, Owl Creek and Walkerville areas.

Two site visits to the Pemberton area were necessary to gather the necessary information for this study. In addition, numerous phone interviews were conducted on various issues with members of the Pemberton municipal staff and fire department personnel. Historical information of previous fire department surveys conducted by the Fire Underwriters Survey (FUS) were also reviewed.

During the first visit to the Pemberton area (November 9, 1995), a meeting between the SLRD and Pemberton officials was attended. A brief interview with both the Pemberton Administrator and Fire Chief was conducted. A comprehensive 'drive through' survey to review travel times and structural conditions in Pemberton Meadows was also conducted.

The second visit to the Pemberton area (January 16 &17, 1996), consisted of a detailed review of the structural conditions in the Village of Pemberton and the Pemberton FPA. Locations of fire hydrants with respect to structures important to the tax base of Pemberton were also examined. Interviews were arranged with the officers of the Pemberton Fire Department, the Pemberton Fire Chief, several fire fighters, and the Pemberton Administrator. A detailed 'drive through' review of the region to the east of Pemberton was also conducted including the Pemberton Airport, Pemberton Industrial Park, the Mount Currie area, Walkerville, Ivey Lakes, and the under construction development at the Owl Creek site.

Valuable assistance was provided by the administrative members of the Pemberton Municipal Department, Pemberton Fire Department, and the Squamish-Lillooet Regional District for the preparation of this report. We would like to formally thank all departments for their contribution to this report.

3. SCOPE

In our review of the fire protection services provided by the Pemberton Fire Department, emphasis was placed on the current level of this service compared against recognized standards of fire protection. From this information the current Fire Underwriters Survey grading for the community was then determined.

The Fire Underwriters Survey grading system is a valuable tool for the identification of weaknesses in a fire departments structure, or where improvements could be made. Therefore, where appropriate, recommendations will be made or, areas of weaknesses will be suggested.

This report will not identify all that could be improved, but instead will focus on improvements in broad subject areas. Simply put, our review of the Pemberton Fire Protection Area will not be an in depth study of fire department operations but instead will highlight areas that can easily be addressed by the community.

4. PEMBERTON MEADOWS - REQUIREMENTS FOR THE ESTABLISHMENT OF FIRE DEPARTMENT FIRE PROTECTION SERVICES

4.1. COMMUNITY OBJECTIVES

The rural community, located to the north of the Pemberton Fire Protection Specified Area, have approached the Squamish-Lillooet Regional District to investigate the requirements for the establishment of fire protection services to the area. The goal of the residents is to reduce the cost of fire insurance premiums for building structures located within the unprotected area. The proximity of the Pemberton Fire Department and Pemberton FPA tends to suggest that the costs of providing this service could be reduced if this service was borrowed or shared with the Pemberton FPA.

The Pemberton FPA referred to in this report, and for the purposes of this report, is defined as the Village of Pemberton and the Pemberton Fire Protection specified Area. The Pemberton FPA is an existing agreement between the Village of Pemberton and the Squamish-Lillooet Regional District to provide fire protection services to a specific area within the regional district adjacent to Pemberton.

The insurance industry has established minimum guidelines and requirements for the recognition of fire protection status within communities. Generally, most insurance companies use the fire protection guidelines established by the Fire Underwriters Survey (FUS) as the basis for their underwriting of property fire insurance policies. The FUS grading schedule is a measurement of a community's ability to control and extinguish fires likely to occur. The FUS grading schedule will be used throughout this report as a means of comparison and benchmark when considering the requirements that must or are recommended to be in place for the establishment or improvement of fire protection services.

Currently, the insurance industry would consider this area unprotected against fire, meaning that fire department response is non-existent. Fire insurance premiums would reflect this unprotected status. Once a community is considered protected by a recognized fire department fire insurance premiums can be dramatically reduced.

4.2. DESCRIPTION OF AREA

The proposed Pemberton Meadows fire protection area is a rural area situated to the north of the Pemberton FPA in the Pemberton Valley. The area runs in a north-westerly direction. For the most part, this area is a narrow strip of land running along side the Lillooet River. The Pemberton Valley is serviced by one major roadway originating in the Village of Pemberton.

The proposed fire protection area, as defined by the SLRD, is approx. 17.3 road kilometres (10.75 miles) long, starting at the northerly border of the Pemberton FPA and stretching to 1.4 Km past the Hurley River Road junction. The area encompasses District Lot 185 through to District Lot 1290B.

Building structures in the Pemberton Valley consist mainly of single family dwellings and farm buildings. The area is unimproved with most of the area in the agricultural land reserve (ALR). Commercial development is negligible. Most of the structures reviewed were constructed with wood frame building materials.

Table 1 outlines population versus assessed property values in the Pemberton Meadows proposed fire protection area.

Table 1 - Population Versus Assessed Property Values - Pemberton Meadows

No. of Building Lots	No. of Buildings and or Improvements	Assessed Value	Population
120	86	12,762,500	300 - 340

Statistics supplied by the Squamish - Lillooet Regional District

4.3 REQUIREMENTS FOR FIRE PROTECTION STATUS

Fire protection status is normally granted by the property insurance industry when it can be demonstrated that a fire department is sufficiently organized, trained, equipped, and able to respond to fires in their incipient stages with the reasonable ability to extinguish the fire and limit the amount of property damage. The insurance industry normally rewards a community for the level of fire protection in place within the community. These rewards are typically in the form of cheaper property fire insurance premiums.

The property insurance industry assesses the fire risk in commercial and single family residential structures separately through two grading systems. Structures within a rural community are normally residential in nature therefore this discussion will focus on the standards that must be in place to meet the requirements for fire protection status. In most cases however, it can be shown that communities that satisfy the minimum level of fire protection requirements for residential single family dwellings usually satisfy the minimum requirements for commercial developments and receive a commercial fire protection grade.

Typically, the means by which a rural community can support a fire department are limited. Factors such as the population of the community will effect the amount the community can afford to spend on fire protection services. It follows then that the quality or level of fire protection is directly related to the population that must support this service - and the level (financial commitment) that they are willing to support this service.

The fire insurance industry has divided its fire protection grading system (Dwelling Protection Grade) for residential buildings into five (5) categories and, as stated, are based on the quality of fire protection within the community. The requirements for the five Dwelling Protection Grades (DPG) are summarized in Appendix A. A DPG of one (1) represents a superior level of residential fire protection and usually is only granted to larger municipal centres. A DPG of five (5) represents little or no fire protection. Most rural communities and municipal centres fall within a DPG of either three (3) or a four (4). A DPG class of 3 represents communities that have both an approved fire department service and approved water supply to aid fire departments in the extinguishment of fires. The quality of the fire department and the quality, reliability and strength of the water supply are determinants on whether a community is recognized as a DPG class 3. Water supplies must normally be available to the fire department via an approved hydranted

water distribution system. Recognition is also granted when delivered in suitable volumes by approved tanker trucks (DPG 3B).

A DPG of four (4) is granted to communities with the minimum level of fire protection without a recognized water supply or water delivery system.

Pemberton Meadows proposed FPA would logically fall within the DPG 3B or DPG 4 category provided they satisfied the insurance industries minimum level of fire protection requirements. These dwelling protection grades would apply whether the proposed FPA was part of the Pemberton FPA or as a distinct fire protection district. The DWG is applied to the community and not to the fire department that provides the service.

The difference in the assignment of a DPG of 3B over a DPG of 4 is dependent on two factors with all other aspects of the fire department operation and structure being equal. The two factors being manpower requirements and water tanker shuttle requirements. The minimum manpower requirements for a DPG of 3B is 15 fire fighters compared to 10 fire fighters for a DPG 4. In addition to a standard fire pumper truck, a credit for water tanker shuttle service is applied when the water is delivered in suitable volumes, within a specified duration, using an approved vehicle to any location within the fire protection area.

The separate requirements between a DPG of 3B and 4 are summarized in part in Table 2.

Apparatus and Manpower Requirements For Dwelling Protection Grades 3B & 4		
DPG	Apparatus Requirements	Staffing Requirements
3B	1 - Triple combination pumper rated at 500 Igpm minimum capacity at 150 psi **and**, 1 - Tanker with a 200 Igpm permanently mounted pump. The combined tank capacity of the two units must total 1500 Igal. A portable tank of at least 1000 Igal. is also required.	15
4	1 - Triple combination pumper rated at 500 Igpm minimum capacity at 150 psi **or**, 1 - 800 Igal. tanker with a 200 Igpm permanently mounted pump	10
Note 1: Fire apparatus must meet the essentials of U.L.C. standard S-515		
Note 2: For complete summary of requirements see Appendix A		

A DPG of 3B represents a superior form of fire protection over that of DPG 4, and is recommended for this community. Once the commitment for fire protection services is accepted, the community should strive to provide the highest level of fire protection possible within its means, for the protection of all building structures and citizens. Residents, paying for this service should be reasonably assured that the level of fire protection within the community is adequate for the protection of life and property. In fact, they will expect that adequate fire protection be in place. Therefore, its incumbent that once the decision is made for fire protection services, the community should provide the highest level it can reasonably be expected to support. For residential properties, insurance companies may not make a distinction between these two grades.

Other basic criteria that must be in place before fire protection status is granted by the fire insurance industry is summarized as follows:

[redacted]

4.2.1. Organization

The fire protection area must be organized under sound financial and legal basis and be registered with the province of British Columbia. The borders of the FPA must be clearly defined. Pemberton Meadows proposed FPA will therefore either be an extension to the existing Pemberton Fire Protection Specified Area, or registered as a new entity. The proposed fire department service should be financially supported by tax levy from residents of the community.

Fire protection service can also be provided under contract by an established fire department outside the fire protection area provided they are able to respond to fire emergencies in arrangements outlined in this report.

The fire protection service must be organized with one person (fire chief) responsible for the operation and management of the fire department. Again, this can be a contracted service.

For fire insurance grading purposes the response area of the FPA must be limited to a maximum area of 8 km. by permanent road from the responding fire station. This 8 km. limiting distance is based on the length of time it takes for a fire department to respond to a fire situation and have the reasonable ability to extinguish a fire before the structure is loss or can spread to adjacent structures. The limiting distance also takes into account the length of time it usually takes for the fire fighters to formalize at the fire station before proceeding to the fire scene. The 8 km. limiting distance is only valid for small buildings. Larger buildings and commercial ventures should be protected in accordance to the “Table of Effective Response” provided later in this report.

The 8 km limiting distance is recognized by fire protection researchers and the majority of fire insurance companies as the maximum distance possible whereby a fire department has a reasonable opportunity to extinguish a small structure fire, if reported in its incipient stage. However, there are fire insurance companies that are willing to extend the 8 km. limiting distance to 13 km. Structures outside the 8 km. limiting distance can negotiate with individual insurance companies for reduce fire insurance premiums - however they should not be reasonably assured that efficient fire department response will be adequate to save the structure.

In the FUS grading system fire department response over 8 km from the fire station results in deficiency points being applied to the grading. The FUS grading system realizes that if an initial fire call is sufficient distance from the fire station, a subsequent fire call at the opposite end of the FPA is probably in jeopardy.

4.2.2. Membership

The fire department must have an active membership which is capable of providing a normal minimal response to fire alarms. Fire fighters should reside and also be available within a reasonable distance to the fire station during working hours. Fire fighters should also reside and/or work within 8 km of the fire station.

The fire department can be organized on a volunteer, paid on call, or salaried structure. Most smaller communities usually support volunteer fire departments.

The minimum number of trained active fire fighters supporting the FPA is 10 members in addition to the chief officers. However the recommended minimum number of fire fighters is 15. See Appendix A.

4.2.3. Training

Training must be conducted for all active members on a regular basis. A minimum of 48 hours a year or one training session per week is considered acceptable for small communities. Training should consist of fire ground operations, fire apparatus training, post fire mop-up, equipment maintenance, etc.

4.2.4. Alarm Notification

An acceptable reliable means of prompt notification to the fire fighters must be in place. Normally, smaller communities rely on a pager system for 24 hour notification to firefighters of alarm. A pager should be available to each registered fire fighter.

A fire emergency number must be published and known to the community. A method of reliable 24 hour receipt of emergency calls must be in place with provision for back-up procedures.

4.2.5. Fire Apparatus

The fire apparatus requirements for smaller communities have previously been discussed with the minimum fire insurance requirements based on the Dwelling Protection grade desired by the community. Fire Apparatus must be suitably be designed and equipped to meet the essentials of the ULC standard S-515. Older apparatus must be tested yearly to ensure compliance with the ULC standard. For fire insurance grading purposes fire apparatus older than 20 years of age is not acceptable for first response to fire alarms. However, if the apparatus is suitably maintained,

serviced and annually tested, a 25 year age restriction may be granted by the fire insurance industry.

The equipment requirements for both triple combination pumper and tanker are outlined in the appendix of the ULC standard S515. For fire insurance grading purposes an equipment list is provided in Appendix B of this report for both pumpers and tankers. Note that these lists identify the equipment which is expected to be available on each vehicle.

4.2.6. Fire Station

The fire apparatus must be housed in a well designed and heated fire station. Provisions should be made to provide administration facilities, training facilities, equipment storage facilities, and hose washing and drying facilities. The building should be secure and provided with adequate fire alarm communication systems. Consideration should be given to the number of fire apparatus that will be housed for both the present and future situations.

In some circumstances it may be acceptable to limit the size of a fire station to house the fire apparatus and fire fighter equipment only. Provision should still be made for a designated alternate location for training, administration, and equipment maintenance facilities. This sometimes arises in rural communities when the fire station acts as a satellite fire hall to a main fire station. While sometimes acceptable, this situation is not desirable - it is always preferable to provide training at the fire station where the fire apparatus is housed to allow fire fighters to become more familiar with the equipment.

4.2.7. Fire Safety Control

Fire prevention programs and building and electrical code enforcement programs should be in place within the community. The fire chief should work closely with local building code officials to ensure fire fighting issues are addressed in building construction.

4.2.8. Water Supplies

The fire department should have a reliable means of replenishing both the pumper and tanker following a fire emergency. The proposed FPA needs to develop strategically placed drafting points that are available throughout the year, 24 hours per day. These can include the construction of drafting points along the Lillooet River, dry hydrants supplied by ground water, wells, and direct connections to irrigation systems. Selection of the appropriate refill point should depend on the speed of access and refill time.

4.3. MERITS OF AN ASSOCIATION WITH THE PEMBERTON FIRE DEPARTMENT

One of the leading questions behind this study was whether the Pemberton Fire Department could take a direct role in providing fire protection services to the Pemberton Meadows area. Following FUS guidelines and good fire protection practice, the Pemberton Fire Department should not be providing service to this area out of the existing Pemberton fire station. The 8 km. limiting distance from the Pemberton fire station would not extend to any portion of the proposed FPA. Relocating the Pemberton fire station to provide coverage is also impractical. The Pemberton Fire station is in an ideal location in that it is able to cover most of the existing Pemberton Fire Protection Specified Area within 8 km. of the fire station. Relocating the Pemberton fire station would leave a larger portion of the existing FPA exposed while only protecting a small portion of the proposed FPA.

It follows then that the Pemberton Fire Department will not directly influence the fire protection requirements and fire insurance grading for the proposed FPA.

However, an association between the proposed and existing FPA may have merit in that costs to establish and maintain a fire department in the proposed FPA are possible. These are discussed elsewhere in this report.

4.4. RECOMMENDATIONS FOR THE ESTABLISHMENT OF FIRE PROTECTION IN THE PROPOSED PEMBERTON MEADOWS FIRE PROTECTION AREA

As previously discussed, to be effective, and to ensure fire insurance recognition status the proposed fire department should be located within 8 km. of all boundaries. While this is not possible, since the proposed FPA is approx. 17.3 Km. long, a fire station should be located as close as possible to the centre of the proposed FPA.

During the initial meetings in Pemberton it was revealed that there was a property close to the centre of the proposed FPA that was offered for donation to the SLRD for the purposes of erecting a fire station. The “Roland’s” property is located approx. 8 km. from the south border of the proposed FPA and approx. 9.3 km. from the north border.

The un-serviced lot is ideally located along a straight stretch of the Pemberton Meadows Roadway.

Another property, the "McCormick's", was also suggested to be available for a fire station. The McCormick proposal came complete with an open ended barn for the storage of the fire truck. Under this proposal the barn was to be improved to act as a fire station. The McCormick property is not as centrally located as the Roland property, situated approx. 10.4 km. from the south border and approx. 6.9 km. from the north border of the proposed FPA.

In choosing one of these properties over the other the biggest consideration should be given to the property that is within 8 km. of the greatest number of structures within the FPA. A survey should reveal that the Roland property would serve the greater number of properties. The cost to convert a barn to a fire station compared to constructing a new fire station should be less. However, the cost to convert the barn on the McCormick property could be substantial. It would have to be ensured that the barn is structurally sound In addition, the barn was without a floor structure and end wall. The barn is un-insulated and un-serviced. Interior construction and finishing would be required.

Constructing a new fire station has its advantages in that the community has input into the design of the fire station. The building which must be serviced and heated throughout the year can be constructed "power smart" to reduce utility costs. Facilities such as training rooms and administration areas, if desired and afforded by the community, can be tailored to fit the design of the fire station.

With a provincial government grant (B.C. 21) available to cover up to 50% of the cost to construct fire stations in rural areas it may be more of an advantage to erect a fire station tailored to suit the needs of the community, while remaining affordable to the community.

The two options presented in Table no. 3 represent suggested operating and capital expenditure costs that may be realistic for the establishment of a fire department in Pemberton Meadows. The figures described are estimates only and could vary with building and market conditions. The figures presented are based on what it is estimated the community can afford and what they should strive for. Both options include used fire apparatus. The difference between the two options is that option 2 does not include a tanker truck. In Appendix C the suggested capital and operating costs are summarized in further detail.

Table 3 - Summary of Suggested Annual Capital and Operating Costs						
Category	**Capital Costs**		**Annual Cost**		**Tax Assessment per $1000.**	
	Option 1 (DPG 3B)	**Option 2 (DPG 4)**	**Option 1**	**Option 2**	**Option 1**	**Option 2**
Firehall	$50,000	$50,000	$5,151.	$5,151		
Pumper	$40,000	$40,000	$5,951.	$5,951		
Tanker	$40,000	N/A	$5,951	$0.00		
Equipment	$35,000	$35,000	$8,617.	$8,617.		
Annual Operating Budget	$10,000	$10,000	$10,000	$10,000		
		Totals:	$35,570	$29,619.	2.79	2.32

Referring to Table 1, with a population base of 320± and an assessed value for properties with improvements of approx. $12,762,500, it is apparent that the tax base in the Pemberton Meadows area will not support substantial capital and operating costs to establish a fire department. With this in mind it may be realistic that the community can afford a fire station that does little more than house the fire apparatus and equipment. If an association with the Pemberton Fire department is formed then training and administration could all be done at the Pemberton Fire Hall.

In Appendix C we have allowed $100,000, for the construction of a very basic fire station. This figure would include constructing the building, servicing the lot, and provide for alarm communications into the building. This figure is general in nature without knowing the true building costs in the Pemberton area. If the BC 21 grant is applied for and received this figure is reduced to $50,000, which is the figure used in our calculations.

Appendix D contains literature on BC 21 Community Project Program Guidelines. (Note that this literature quotes $30,000, as the maximum grant however, it's been learned that $50,000.00 can be awarded.)

Fire apparatus and equipment is another major expenditure for communities forming fire protection services. Our recommendation to this community is to strive for a DPG 3B which would require both a triple combination pumper and water tanker. New fire apparatus in the low end of the market will run between $165,000, to $225,000, and is not realistic for this community because of the low tax base. To keep the costs of financing low $40,000.00 for used fire apparatus for each vehicle is suggested and

could be supported by the tax base. Option #2 does not include a water tanker and therefore in that scenario the DPG would be reduced to four (4).

Care must be exercised when purchasing used fire apparatus. To meet FUS requirements fire apparatus must meet the essentials of the ULC standard S-515 over the life of the vehicle. The age of the vehicle is also an important consideration. The vehicle should not be used for first alarm response after 20 years of age, although 25 years of age is sometimes granted by the fire insurance industry. Vehicle financing should not exceed the life of the vehicle in first alarm response, but instead should be retired before that time to allow the community to put aside funds for the next fire apparatus purchase

Ancillary equipment and turn-out gear are also substantial costs for a new fire department. It is understood that some equipment may already be available to Pemberton Meadows. Without knowing the type of equipment or its quality it is suggested that $35,000.00 be financed for the purchase of equipment. For comparison, $50,000, would well equip a fire department. Surplus equipment may be available from the Pemberton Fire Department or other fire departments at reasonable terms.

The annual operating budget of the fire department must also be considered in the start-up costs for the fire department. For a small, totally volunteer fire department $10,000 per year is considered the minimum amount that might support the cost of fire department operations. Training allotment would be minimal if this figure is used.

Operating costs can include the following:

- Equipment and vehicle maintenance repair and operating costs.
- Fire hall maintenance and utility costs.
- The cost of alarm communication
- Fire fighter training costs.
- Administration costs

Table 3 presented the financed costs (if appropriate) of a suggested budget that the tax payers in Pemberton Meadows may be able to afford. Table 3 is used to establish the cost per $1000, of assessed values in the proposed FPA. Figures from various other B.C. communities indicate that residents have supported a tax assessment for fire protection services in the range of $1.50 to $2.60 per $1000.00 of assessed value. In Pemberton Meadows however, the actual number of tax payers able to pay for the service should be reviewed and, will dictate the rate that could be paid per assessed value. It is estimated that there may only be between 75 and 100 individuals in Pemberton Meadows able to pay taxes.

Fire insurance premiums are reduced significantly when a community becomes protected by a fire department. Normally, the reduction in fire insurance premiums more than offset the annual cost to provide fire protection services. Table 4 indicates a conservative reduction of 45% in fire insurance premium savings for typical dwellings if the proposed FPA is granted a DPG of 3B from unprotected status.

The percentage decrease in fire insurance premiums is approximate in nature and is affected by factors such as:

- Insurance company holding the policy
- Limits of coverage's
- Type of dwelling
- Age of the building,
- Discounts, etc.

Mobile homes are not included in the reductions identified in Table 4. Reduction in fire insurance premiums for mobile homes is considerably less than conventional dwellings.

Table 4

Suggested Fire Insurance Premium Reductions For Residential Properties

Fire Insurance Coverage	Example of Estimated Fire Insurance Premium Costs for Areas Considered Unprotected	Example of Est. Fire Insurance Premium Costs for Areas with a DPG of 3B at a 45% Reduction
$60,000.00	$650.00	$358.00
$100,000.00	$950.00	$523.00
$150,000.00	$1,500.00	$825.00

Note: Table has not considered mobile homes

4.6 ASSOCIATION WITH THE PEMBERTON FIRE DEPARTMENT

There may be many benefits that have a financial and other positive impact on the proposed FPA if there is an association with the Pemberton Fire Department. This association could be in the form of an expansion of the Pemberton FPA to include Pemberton Meadows, or it could be an agreement for specific services.

In any case, the requirements for fire apparatus, location of fire hall, fire equipment, manpower and communication requirements must be in place in the proposed FPA.

Some of the areas where Pemberton Meadows FPA could benefit from the Pemberton Fire Department are as follows:

- The requirement for a fire chief for the proposed FPA could be shared with Pemberton. If an honorarium or salary is proposed for this position theses costs can be proportioned.

- The fire chiefs responsibility includes administration. The associated costs could then be shared.

- The Pemberton FPA utilizes a simple but potentially effective alarm communication system. The system could be expanded to cover the proposed FPA reducing the costs of two separate systems.

    - Training sessions, equipment, and literature could be shared between fire departments to reduce costs and to standardize fire departments are called upon to work together at a fire scene.

    - Fire fighting equipment costs could be shared or borrowed when capital expenditures are required or repairs are necessary.

    - If the proposed fire hall lacks sufficient space for training, administration, or equipment maintenance such as hose drying the Pemberton fire hall could be utilized.

    - Fire Department aid from the Pemberton Fire Department could be established to protect against simultaneous fire emergencies.

- Lower operating budget and initial capital expenditure costs.

4.5. BENEFITS TO THE VILLAGE OF PEMBERTON FOR AN ASSOCIATION WITH THE PROPOSED FPA.

There may not be significant benefits to the Village of Pemberton for an association with the proposed Pemberton Meadows FPA. Beyond any financial implications a merger or agreement may have, benefits that would improve the fire department operation or fire emergency response is negligible.

The sharing of the fire chief's duties between the two communities would reduce the time available the fire chief spends administering the Pemberton Fire Department. Presently the Pemberton Fire Chief's position is voluntary, requiring other means of support, which ultimately determines the amount of time that can be spent on fire department administration. By administering two fire departments the fire chief's available time is further reduced.

If an association between the Pemberton Fire Department and the proposed FPA is formed the financial impact to the fire department's budget should be passed along to the proposed FPA. If appropriate these costs should include:

- The shared cost of Fire Chief salary or honorarium
- Fire department administration costs
- The cost of receipt and dispatch of fire alarm calls based not on the number of calls to the FPA but on the percentage increase the service costs to provide.
- The cost to Pemberton of shared training. These costs should be based on the number hours of training per year for each fire fighter. Costs could also include training equipment expenses and their depreciation.

- If fire fighting equipment is shared or borrowed the proposed FPA should contribute to an equipment replacement fund.

- If the proposed FPA utilizes the Pemberton Fire Station for training, storage or equipment repair then rental, storage and utility costs should be passed along.

- If a fire department aid agreement is reached between the two departments then the cost per occurrence should be passed along to the Proposed FPA.

To summarize, any additional costs the Pemberton Fire Department incurs to assist in the start-up and operation of the Pemberton Meadows FPA should be passed along t the new fire department proportionate to the effect the new service will increase the operating budget of the Pemberton Fire Department. For the most part these costs should not be passed along on a per occurrence basis which may be an ineffective method of determining the true cost to the Pemberton Fire Department and Pemberton tax payers.

5. PEMBERTON FIRE DEPARTMENT - OPERATIONAL AND ORGANIZATIONAL REVIEW OF FIRE PROTECTION SERVICES

5.1. OBJECTIVES

The purpose behind this fire department review is to determine the organizational and operational level of competency of the fire department, and to measure the level of Fire Protection in place to protect the community against fire emergencies likely to occur. In addition, recommendations will be made for the improvement of fire protection services.

Our review will examine the adequacy of fire protection throughout the Pemberton Fire Protection Area which includes areas of the Squamish - Lillooet Regional District, to the north, south and east of the Village of Pemberton.

To analyze the effectiveness of fire protection services four major areas of concern must be reviewed:

- Fire Department Operation, Organization and Training
- Alarm Communications
- Fire Prevention and Fire Control
- Water Supplies for Fire Fighting

The adequacy, reliability and strength of water supply systems for fire fighting purposes is critical for the building structures they are meant to protect. Current water supply information was not provided for this study, and tests were not conducted to evaluate the systems strength due to winter conditions at the time of the survey. Therefore, past information from the previous Fire Underwriters Survey (FUS) inspection (1982) will be used for the purposes of this report. It is our understanding that very little has been improved with the waterworks system since the last survey with the exception of the replacement and size upgrade of the transmission line from the storage reservoir to the distribution system. A study to evaluate the adequacy of the Pemberton water supply system is being commissioned in 1996.

The areas of concern have been reviewed against established methods of fire protection. For quantitative purposes the FUS grading system has been used for the evaluation. The current FUS grading for the Pemberton FPA based on the 1982 survey is as follows:

- PFPC of 8 for commercial structures within 8 km. of the Pemberton fire station and,

- DPG of 3A for single family residential buildings within 1000 feet of an approved fire hydrant.

For areas outside the 8 km's from the Pemberton fire station and within the Pemberton FPA a PFPC of 9 has been assigned.

The approved hydrants referred to include all existing hydrants in the village of Pemberton. All other areas within 8 km of the fire station have a current DPG of 4. Areas outside 8 km of the fire station but with the Pemberton FPA are considered unprotected and should be assigned a DPG of 5.

The PFPC referred to stands for Public Fire Protection Classification and is a grading system used by FUS to evaluate the level of fire protection commercial buildings and large structures within a community. A PFPC of one (1) represents a superior level of fire protection and is usually only within reach of larger municipal centres with a tax base larger enough to support superior levels of fire protection. Currently only one city in Canada has a PFPC of 1. A PFPC of 10 represents little or no fire protection is in place.

Up to 90% of the fire insurance companies across Canada use the FUS grading system for the bases of their statistical, rating and underwriting programs.

The Fire Underwriters Survey historical information shows that a PFPC of eight (8) is not unreasonable for the Pemberton FPA based on the population present within the community, however a PFPC of 7 is certainly within reach of a smaller community. The difference between these two classifications in the eyes of the fire insurance underwriting industry is a reduction of up to 15% in fire insurance premiums for commercial properties.

A DPG of 3A is standard in most communities having an adequate water supply. In the FUS grading system an improvement beyond 3A is only possible where the fire department has, among other benefits, full time fire fighters.

At the completion of this survey the Insurance Bureau of Canada will be informed of any major alterations in the delivery of fire protection services that have been made. This information will be supplied to their member companies. Based on our review changes to the FUS grading will not me made at this time, with the exception of the identification of the unprotected area within the FPA to the east of Pemberton.

5.2. DESCRIPTION OF AREA

The Pemberton FPA covers the Village of Pemberton and areas to the north, south and east of the village within the Squamish - Lillooet Regional District.

Almost all of the area to the north of the Pemberton fire station is within 8 km. The area is mainly rural but does include a small mixed commercial/residential area. The area south of the Village is mostly undeveloped with maximum travel distances near 8 km. East of the Village is mainly rural but does include an industrial park, an airport and the community of Mount Currie. The fire protection area extends to approx. 9.3 km from the fire station. The 8 km. distance from the fire station ends near the centre of Mount Currie. The Mount Currie Reserve lands adjacent to Mount Currie Community are protected by their own fire department.

5.3. REVIEW OF WATER SUPPLY FOR FIRE FIGHTING

As previously stated few details have been provided regarding improvements to the water supply system. In the village of Pemberton the distribution system is fed from a single transmission main from a 0.1 million gallon storage reservoir supplied by the Pemberton Creek, the only source. The distribution system consists mainly of small diameter mains. Extent of looping is not known. Hydrant locations within the Village of Pemberton are fairly adequate, although some areas require better protection. At the time of the Inspection some hydrants in residential districts were buried by snow piles from snow clearing.

The basic fire flow for the Village of Pemberton has been adjusted to 2250 gpm and represents the amount of water that may be necessary for a two hour duration to suppress a fire likely to occur for several of the larger, seriously exposed, unsprinklered wood frame buildings within the community. Required fire flows for other buildings may be higher or lower than 2250 gpm, but this figure would seem to best fit the community.

The Pemberton Building Department should review the basic fire flow of the community, along with the pumping capacity of the fire department, for each new building development proposal.

Few details are known regarding the hydranted water distribution system north of the Village and are not considered for credit in the FUS grading system. These hydrants are sporadically placed and would appear not to be maintained. The Pemberton Fire Department stated that they are not maintained, have inferior fire flows, and will not use these hydrants to pressurize their pumpers in a fire situation.

A private water system exists in the Pemberton Industrial Park. These hydrants appear to be fed from an above ground water cistern. It was not determined whether these hydrants were charged with water or the capacity of the cistern. This water system is not recognized for fire insurance purposes.

The hydranted water distribution system in the Mount Currie area belong to the Mount Currie Indian Band and, are not part of this study. Agreements to use these hydrants for fire emergencies are not in place.

5.3.1. WATER SUPPLY RECOMMENDATIONS

With few details supplied regarding the Pemberton water distribution system recommendations for improvement cannot be accurately made. However the following comments should be considered and investigated.

1. The Pemberton Water Works Department should continue to improve the system by:

    - Upgrading the size of mains within the distribution system. Avoid dead end mains and increase the number of loops within the distribution system.

- Improve the storage capacity of the system to approach the basic fire flow rate of the community for the fire duration with domestic consumption at the maximum daily rate. Ignoring domestic consumption the current capacity of the system is considered a minimum of at least 38% deficient with respect to the basic fire flows within the community.

- Improve the reliability of the system which could be accomplished by either twinning the main transmission line or by providing alternate sources of supply or providing 'storage above' the distribution system.

2. Future improvements to the water distribution system should consider the fire flows necessary within the community. Improvements to the water distribution system should be designed in accordance to the recommendations outlined in the FUS guide, "Water Supply for Public Fire Protection, A Guide To Recommended Practice".

3. The fire department should continue their practice not to use or rely on the water distribution system north of the Village. The liability issues associated with this system could be substantial including:

    - collapsing the system by drawing more water with the pumper trucks from the system than is available.

    - failure to extinguish a fire while using the system because of lack of fire flows

    - residents of the Pemberton FPA within the area served by this distribution system should be informed by registered letter that these hydrants will not be used in a fire emergency. Any misconception by these residents that they have superior fire protection over other areas without hydrants should be removed.

        - For fire insurance recognition of these hydrants the system should be upgraded and maintained in accordance with the following guides and standards:
            - N.F.P.A. 1231 - Water Supplies For Suburban And Rural Fire Fighting,
            - FUS Publication - Water Supply For Public Fire Protection
            - AWWA Manual M17 - Installation, Field Testing, and Maintenance of Fire Hydrants.

4. All areas within the boundaries of the Village of Pemberton served by a water distribution system, including the Pemberton Industrial Park should be designed and maintained in accordance with a local bylaw established for the purpose of ensuring that life and property can be adequately protected from fire.

   For application of fire insurance recognition of the water distribution system in the Pemberton Industrial Park design, installation and maintenance details should be provided to the Insurers, Advisory Organization Inc. (IAO) for review.

5. A water distribution system, or an adequate and immediate means of drafting should be available to protect the proposed commercial developments at the Pemberton Airport.

6. An agreement with the Mount Currie Indian Band should be pursued for the use of their hydrants to use in a fire emergency or as a quick and reliable means of refilling the Pemberton water tanker.

5.4. FIRE SAFETY CONTROL

Fire Safety Control considers the enactment and enforcement of laws and ordinances within a community for the purposes of protecting life and property. Public education of fire safety issues are also of importance.

Typical with smaller communities and volunteer fire departments, the Pemberton Fire Department doses not appear to have a coordinated program for addressing fire prevention issues within the community. Building inspections related to fire safety issues occur on infrequent and unscheduled basis. Documentation of an inspection, recommendation, and follow-up program was not available. Building inspections do occur but documentation of the quality, frequency, and type of occupancy inspected was not available.

Public awareness programs of fire related issues are also not in place.

Consultation between the Pemberton Fire Department and the Pemberton Building Department does occur for new development proposals. However, the extent to which the fire department is able to influence fire safety issues and factors that will assist the fire department in attacking a structure fire seem in doubt.

For fire safety control in buildings to be effective, laws and ordinances should be place to address the particular concerns of the community. The fire chief or his representative must have real power to address fire safety issues for both new construction and existing buildings through inspection.

For any building inspection program of fire safety issues the inspectors charged with this responsibility must be sufficiently trained for this function. Experience with knowledge of the Building and Electrical codes is paramount. Volunteer departments may have particular difficulty in supporting this function. Factors such as lack of training, lack of money for external training, financial incentive for the fire department to become involved with inspections, the commitment to set-up and administer the program, and community cooperation with the inspection and enforcement program, tend to limit the fire departments involvement in this area.

For the Village of Pemberton to improve their overall level of fire defense, and consequently their PFPC rating, one of the areas that must be addressed is fire safety control. Normally, for volunteer fire departments the fire chief is assigned to administer and/or conduct fire safety control. For the program to work effectively any enumeration or compensation paid for this position must include the requirement for fire safety control. Accountability then forces adequate administration and documentation. Training, experience, and familiarity with the appropriate laws and standards must also be considered for this position.

As stated, the Pemberton Fire Department does consult on building developments with the Pemberton Building Department. This relationship should also be in place with the SLRD for the entire Pemberton FPA, with compensation involved. If the goal of the community is better fire protection than the standards and regulations in place shouldn't end at the Village boundaries.

5.4.1. FIRE SAFETY CONTROL RECOMMENDATIONS

1. Clearly defined, administered, and documented fire safety control programs should be in place in Pemberton. These fire safety control programs should include but are not limited to:

- Public education programs

- Building inspections for electrical, building, and fire code violations. Emphasis to be placed on hazardous electrical conditions, maintenance of exit ways and exit doors, emergency lighting facilities, integrity of fire walls and separations and maintenance of fire detection and suppression devices such as:
  - Smoke and heat detectors
  - Fire extinguishers
  - Kitchen suppression systems
  - Automatic sprinkler systems, etc.

- Building inspections for the identification of hazardous materials, conditions, and operations

- Implementation of controls into new building proposals to ensure adequate fire ground operations in the event of a fire emergency. These controls must suit the fire fighting ability of the Pemberton Fire Department.

2. Adequate training experience, and enthusiasm is required for those responsible for fire safety control. Not only does funding for training be available but the appropriate individual must be found for this role.

3. There must be an adequate means in place to ensure that the program will be administered sufficiently. Put another way, if under the control of the Fire Chief, accountability must be shown to determine that a certain percentage of time is devoted to fire safety control. Any compensation paid for the position of Fire Chief must include provisions for fire prevention.

4. The agreement for fire protection services between the SLRD and Village of Pemberton should include required fire prevention services and fire code, building code and electrical enforcement.

5. The duties, scope and powers of the fire department and fire chief should be defined in local statute.

5.5. ALARM COMMUNICATION

Reliable and accurate communications are essential in the fire defenses of a community. Fire emergencies are normally escalating situations and speed of reaction to a request for help from the public is essential. The applicable provisions of the current addition of National Fire Protection Association Standard No. 1221, Public Fire Service Communication, are recognized as the standard for fire alarm communications for public service.

The system of receipt and transmittal of fire calls in the Pemberton FPA is typical of other communities receiving similar numbers of fire calls. The system of alarm communication was identified by some of the fire department officers as an area of concern and discontentment. The system itself, for the number of fire calls received, while not a sophisticated system, is considered to be both reliable and satisfactory for the number of fire calls received. Problems that were presented during the field inspection revealed that management of the system required the majority of improvement.

As is the case with any category or function of fire protection, improvement is always desired. Alarm communication is no exception. Improvements to the Pemberton communication system would be viewed favorably in the FUS grading system, but the system used is typical, and with some adjustment or refinement to the system substantial improvement will be made. For major improvements to the communication system the NFPA standard referenced above should be consulted. Alternatively, the responsibility of alarm communication could be transferred to private companies specializing in this field.

Senior Pemberton fire personnel expressed concern with the communication system, in that there was not a reliable means of back-up should the dispatcher be unable to receive or transmit fire calls. The dispatcher does not have a designated replacement when unable to perform their duty. Nor would they have the immediate ability to alert fire fighters promptly if their radio unit was not operational. An alternate or reliable means of communication is desirable for an alarm communication system. To provide some reliability the dispatch centre should be provided with a back-up radio or at the very least back-up battery charger for the existing radio.

Designated replacement personnel for the alarm communication system should be assured by the dispatcher. The replacement should be approved by the fire department and municipal administration before being accepted for this position. Accurate recording of duty personnel in log books forces accountability.

Another concern expressed by the fire fighters was that there wasn't a substantial degree of separation between the fire department and dispatch. Alarm communication is a function of fire department operations and should be controlled to a certain extent by the fire department. However, alarm communications should operate by a set of rules and guidelines that would prevent any interference or distraction of duty. Written policy statements outlining rules of conduct and standard operating procedures should be in place for receipt, transmittal, logging off and on, or the transferring of assignment. Direct interference to dispatch by the fire department should only be through a set of written procedures and rules.

In Pemberton, compensation is paid for alarm receipt and dispatch services. Because this is an emergency system for the protection of life and property, Pemberton should expect a certain level of reliability and professionalism from this position. Compensation paid for this service should be related somewhat to the importance of the service.

Other recommendations for the Pemberton Fire Department alarm communication system include:

- In addition to the personalized alarm call form used by the department, the dispatcher should also be recording all incidents of alarm in a log book, as they occur. The log book becomes the official record of the alarm incident. All aspects of the alarm call should be recorded. This log book should remain in the possession of the dispatcher.

- The personalized alarm call form that is given to the fire department from the dispatch office should be recorded by the fire department in their own log book, upon receipt. Recalling the events of an emergency a year after it occurs from information recorded on a slip of paper is not recommended.

- Tapes recording alarm incidents must be properly labeled with dates and stored in a safe, fire resistant location.

- Dispatch should be equipped with a set of maps of the fire protection area. These maps should indicate street addresses, hydrant locations, and occupancies.

- 24 hour, 365 days per year, communication repair service should be available for the vital components of the alarm communication system. The repair company should be able to supply emergency replacement components should the length of repair be extended.

- A standard operating procedures and training handbook should be developed for the dispatcher. This would not only define the procedures the dispatcher was to follow for every given emergency but would standardize what the fire fighters would expect from the dispatcher during an emergency.

- The alarm communication equipment should be relocated out of the fire chief's office and into the truck bay area, such as along the west wall. This is considered a safer environment than its present location, although a dedicated closet or room would be preferred.

5.6. FIRE DEPARTMENT OPERATIONS

The four areas that will be commented upon as part of fire department operations include:

1. **Administration**
2. **Training**
3. **Response to alarms**
4. **Adequacy of major apparatus and fire hall**

Our comments for each of these topics will not be going into great detail but will tend to highlight the level of adequacy or indicate where improvements could be made. Formal recommendations will be made where appropriate.

For fire insurance grading purposes, should the community choose to keep the fire department operations as is, the PFPC rating of the community will not change. If the community wishes to improve the level of fire defense within the community and/or improve their PFPC rating then improvements to the fire department operation will be necessary.

Pemberton is experiencing a substantial growth spurt. To meet the fire protection challenges presented by this growth, improvements should be made to the fire department. A superior level of fire protection over the present level should help to encourage future growth by providing a safer environment, and by reducing the cost of fire insurance.

5.6.1. FIRE DEPARTMENT ADMINISTRATION

The decision to change from a volunteer fire department with a volunteer fire chief to one with a paid fire chief is a difficult one. For most communities the deciding factor for this change is the work load imposed on the fire chief in the administration of his/her duties. The amount of administration is usually reflected by the size of the fire department, size of the community, the rate of growth in the community, and by the level of fire protection the community expects.

Delegation of responsibilities is often difficult for the volunteer fire chief. Many volunteers consider their service during emergencies the extent of their commitment. The fire chief usually relies on his/her officers for fire ground command, training, building code inspections, etc. Still the demands on the fire chief to administer all these programs and others can be overwhelming.

It is often difficult to improve a PFPC rating in a community with a volunteer fire department because of the level of organization in all aspects of fire department operations that is required. The exception of course, is in smaller communities with a well managed fire department, strong water supply, a commitment to fire prevention, and strong volunteer presence.

The costs to a community to pay the salaried wage, plus benefits, of a fire chief can be considerable. The community must ensure that value is returned for this position. That value should be in the form of a well managed fire department with additional fire protection improvements within the community, such as fire prevention and inspection duties. If that value is returned by the paid position usually a lower PFPC rating will result. For many communities the difference between an improved PFPC rating and their current rating is effective and progressive management.

For a community to commit to a full time position of fire chief, the chosen individual, in addition to the traditional well rounded skills, leadership, and knowledge a fire chief must have, should possess strong management skills. The majority of time spent by the salaried fire chief will be spent in management and the improvement of the fire department and fire protection within the community.

There was a suggestion in Pemberton that perhaps a salaried fire department position be given to the training officer rather than the fire chief. It's believed that this could cause more problems than solve. While training is of great importance, a paid position should focus on many other aspects of fire department operations. A paid training officer may tend to alienate the importance of the fire chief or regulate the position to that of figure head. The fire chief should be knowledgeable in all aspects of fire department operations including training.

At the present time Pemberton may not be ready or require a full time fire chief. Growth in the community is occurring at a substantial rate but the community is still small enough that the volunteer fire chief could still be effective, and make considerable improvements to the fire department operation. This is not to say that a paid fire chief's position will not be necessary in the upcoming years. The Pemberton administration should consider that this position will be required in the near future. In

the interim, the community has the ability to decide the qualities, background, and experience of the individual that will be chosen. If Pemberton decides to select someone from the community ample time can be spent grooming the candidate.

In order for the fire department to go forward and to meet the challenges of community growth the current fire chief should receive the necessary training and support that will be required. The existing fire chief has seen Pemberton through many years of growth and has made many improvements to the department. The Pemberton Fire Chief should be congratulated for his effort and commitment to the fire department and to the community and deserves consideration for any future paid position that may be created. The point that must be made is that in order for the fire department to substantially improve, management systems must also improve. The Pemberton Fire Chief will be forced to adapt to these changes and will be forced to upgrade skills as well.

If the community decides on the position of fire chief, consideration could be given to combining this position with the permits and inspection department to save costs in the early stages of the position.

Some of the areas where fire department management noticeably required improvement are listed below. Again, the areas identified are typical of all relatively small volunteer fire departments.

- Record keeping
- Standard operating procedures
- Fire safety plans/ hazard identification, and
- Fire fighter moral

5.6.2. TRAINING

A fire fighter training session was not reviewed as part of this study. The Pemberton training officer is relatively new to the fire department and to that position. However, the training officer seemed to be quite motivated to improve fire fighting skills of the department, and appeared to command the respect of the other fire fighters.

The training and education of members of the department on the job or by outside resources should provide the personnel with the abilities to perform their managerial, fire command, fire fighting, fire prevention or other specialist functions effectively in a manner commensurate with the size of the fire department and the fire potential of the municipality.

It is essential the fire department have a competent and uniform ongoing training and drill program appropriate to the nature of the probable fire fighting problems to be faced by the fire fighters.

The training program should be developed on a yearly schedule to cover all aspects that face the fire fighting force. The schedule should include outside training and familiarization with the fire attack necessary on buildings in the community critical to the community tax base and where extreme hazards exist.

Adequate training of new recruits separate from that of experienced fire fighter should be available. Required examinations at critical stages in fire fighter development should be held regularly.

Training aids and resources appear to be available to the Pemberton fire fighters; however the ongoing use of these materials and devices is questionable. On the two occasions a field inspection of the fire station occurred, the video recorder was not available for use.

The community should adequately support the training efforts of the fire department. Sufficient funds should be available in the fire department budget for training aids, training equipment, and upgrading of fire fighters skill. The budget should also include the money available to keep the training officer's skill updated and abreast of changes in fire fighting technology.

Facilities of training are not suggested for this community at this time because of its relative size.

5.6.3. RESPONSE TO ALARMS

With the purchase of the 1996 triple combination pumper/tanker the Pemberton Fire Department dramatically improved its available pumping capacity within the community. Without receiving credit for the aging 1972 Thibault pumper the deficiency between the basic fire flow of the community and the total pumping capacity of the two remaining pumpers is not substantial, considering the size of the community. The new 1996 pumper should service the needs of this community for many years. Improvement should only be necessary should the community's basic fire flow start to increase.

There are other options available to the community to ensure their pumping capacity remains relatively close to the basic fire flow of Pemberton.

The 1992 Thibault is not included in our calculation of total pumping capacity. Our understanding is that this pumper will be stripped of its fire fighting equipment to outfit the new pumper. Only if this vehicle is properly equipped will Pemberton receive some credit towards its pumping capacity. This vehicle can still play a useful role in the fire defenses of the Pemberton FPA as a reserve pumper. Pumpers kept in reserve are used to replace first line vehicles if they experience downtime. In the FUS grading system credit is given for having reserve pumpers in place.

The community should ensure that the pumping capacity of their fire apparatus remains relatively close to their basic fire flow rate. Two methods can be used to place controls on building development within the community. The first control is to limit the size, height, occupancy, and exposures of all new development. The Pemberton Building Department should ensure that fires likely to occur in all new developments, and exposures to those developments, can be adequately extinguished with the existing two pumpers. The required fire flow all new developments should not exceed the available pumping capacity. To determine the factors that will affect the required fire flow for a development the guide, "***Water Supply For Public Fire Protection***" should be consulted.

The second control the Village of Pemberton should place on new development is the requirement for automatic sprinkler systems. Automatic sprinkler systems if properly designed, monitored and maintained are an effective alternative to manual fire suppression tactics. Being an automatic system, designed for the degree of hazard present within a building, the water necessary to extinguish a fire will likely be much less than if fought manually by the fire department. The ***Water Supply for Public Fire Protection*** guide suggests that when a building is sprinklered, the water necessary for manual fire fighting tactics can be reduced by half.

The central location of the Pemberton fire hall adequately allows for efficient fire department response times to most areas of the Village. The one obstacle that could delay the initial response is the BCR rail line. To ensure that the fire department response time remains effective, volunteer fire fighters should live and work in the vicinity of the fire station for first response to fire calls.

Three significant areas within the Pemberton FPA presently do not have fire apparatus response within the travel times recommended by FUS. Table 5, '*Table of Effective Response'* indicates the recommended number of pumper company's responding to a fire emergency within a specified response times in accordance with the fire potential as determined by calculation of required fire flows. The length of travel response time is directly related to the distance from the fire hall to the risk being assessed. (Note, the response times indicated in this table do not include the length of time necessary for fire fighters to gather at the fire station, equip themselves before responding to a fire emergency, although it is taken into consideration.)

Table 5 - Table of Effective Response

Group	Description Examples	Fire Flows Approx. Gpm Range	1st Due Pumper Company Minutes	2nd Due Pumper Company Minutes	Total Needed Pumper Companies No.---------- Min.	
1 (A) (B)	Very small buildings, widely detached. Scattered development (except where wood roof coverings)	400 600	7.5 6	- -	1	7.5
2	Typical modern, 1-2 storey residential subdivision 10 to 20 ft. Detached	800-1000	4	6	2	6
3 (A)	Close 3-4 storey residential and row housing, small mercantile and industrial	1200-2000 2200-2800	3.5 3.5	5 5	2 3	5 6
3 (B)	Seriously exposed tenements. Institutional. Shopping centre. Fairly large areas and fire loads, exposures	3000-3600 3800-4200	3.5 3.5	5 5	4 5	7 7
4 (A)	Large combustible institutions, commercial buildings, multistory with exposures	4400-5000 5200-6000	2.5 2.5	4 4	6 7	7.5 7.5
4 (B)	High fire load warehouses and buildings like 4(a)	6200-6800 7000-7600	2.5 2.5	3.5 3.5	8 9	8 8
5	Severe hazards in large area buildings usually with major exposures. Large congested frame districts.	7800-8400 8600-9200 9400-10000	2.0 2.0 2.0	3.5 3.5 3.5	10 12 14	8 9 9

Note: Ladder Company response removed from table.

The major areas identified that fall outside the recommend response times for 1st and 2nd company response are the Pemberton Airport, the Pemberton Industrial Park, and the commercial developments in the Mount Currie area. Any long range fire protection planning for this community should consider these excessive response times and take steps necessary to provide a reasonable degree of fire protection to these areas.

A satellite fire station located between Pemberton and Mount Currie would reduce response times and provide better coverage to the region. The satellite hall would have to be adequately equipped with fire apparatus, equipment and manpower. The location selected would be strategically placed to serve the airport, industrial park and Mount Currie.

Another alternative to improve the fire protection to this region would be to develop a fire protection contract with the Mount Currie Native Fire Department to provide automatic response to the Eastern Portion of the FPA. For an agreement such as this to relieve any liability issues the Pemberton FPA must be assured the Mount Currie

Native Fire Department is active, properly trained, equipped, and willing to automatically respond. Any contracts signed must be endorsed by signature with the band council on a yearly basis preferably coinciding with each election of band council. Currently the Mount Currie Fire Department is recognized in the FUS grading schedule.

Residential and Commercial areas within the Pemberton Fire Protection Area but outside the 8 km response distance of the Pemberton fire station would also benefit from an agreement between the two communities. Both Pemberton and the SLRD should consider the liability issues of allowing new building development in the Mount Currie area when response times are excessive. Property owners should be informed that fire protection response could be less than what is generally acceptable and perceived to be provided elsewhere in the FPA.

In addition to an agreement for fire protection services with the Mount Currie Fire Department consideration should be given to providing in the future a satellite fire hall station at the airport. The number of flights now may not yet warrant improved response times. However, Pemberton should consider the ramifications of delayed response to the airport. The retired 1972 pumper could be useful for this purpose for its remain life. If this vehicle is properly equipped for fire fighting, including foam capabilities it could be acceptable to the insurance industry for up to 6 more years if strictly maintained. Fire fighters responding to the airport should also be trained for the specialized fire fighting that may be encountered.

It is also recommended that Pemberton strongly consider mandatory automatic sprinklers for all developments at the airport and for the industrial park as a first level of response to a fire emergency.

5.6.4 FIRE APPARATUS, EQUIPMENT, FIREHALL

The fire apparatus now in place in Pemberton will serve the community well for a number of years. The 1996 Pumper/tanker should be available for 15 years of first alarm response and an additional 10 years if properly maintained for 2nd alarm response.

The 1983 Pumper/tanker has 2 more years of first alarm response and could remain in service until 2008. Pemberton should monitor the capabilities of the fire pump closely after 15 years of age.

When fire apparatus reaches 15 years of age the community should be making decisions regarding its future service life. Is it in the best interest to keep the vehicle for an additional 10 years as 2nd line response or in reserve, or should it be sold for its retail value at 15 or 20 years of age? At that time 15 year age mark a contingency fund should begin for the vehicles future replacement.

The modified water tender, while not currently eligible for fire insurance recognition, is a valuable aid for rural aid in the community. For fire insurance recognition, one of the two portable pumps kept on this vehicle must be permanently mounted and meet the requirements of ULC-S-515 standard. See Appendix A. If the community follows these recommendations, they would be eligible for an improvement in their Dwelling Protection Grade from their current grade of 4 to 3B.

The current practice of responding to fire emergencies only in the Village with the 1996 pumper/tanker, and using the 1983 pumper/tanker in combination with the water tender to rural areas is recommended. However, both vehicle responses should be equally equipped with specialty equipment such as fire fighting foam and extrication equipment, to enable the fire department to deal with simultaneous emergencies in different parts of the community.

The 1996 pumper, if responding only to hydrant protected areas, generally doesn't require the 1000 gallon water tank but could have been adequate with 500 gallons. The 1000 gallon tank may be useful down the road if the vehicle is used in rural areas or in resale value.

Proper maintenance is critical for the successful and continued operation of fire apparatus. Fire apparatus can generally sit for extended periods of time between emergencies. These periods of inactivity tend to be damaging to their fire pumps. Fire

pumps should be operated weekly including in the winter months. Simply cycling the water from the water tank through the pump and back to the tank on a regular basis will help ensure the pump and its components remain lubricated. Yearly pump maintenance by a qualified fire pump service technician for all pumpers is strongly recommended.

Fire apparatus should always be maintained so that there isn't a delay in fire response. Scheduled maintenance is a prerequisite. Battery chargers should always be employed.

The Pemberton Fire department is generally adequately equipped. Areas where significant improvement is need is in the number of feet and type of fire hose kept on the fire apparatus, number and type of nozzles, number of SCBA units, and salvage equipment. Refer to Appendix B and ULC S-515 for specific requirements.

The practice of purchasing used fire hose should be carefully considered. Fire hose is critical to fire ground operations. Any time spent evaluating or repairing fire hose on the fire scene is wasted time. Once pressurized by pumper fire hose must be handled with care - weaknesses in the jacket or at the coupling can be dangerous for the fire fighter. If the practice of purchasing used hose is continued the age and type of hose should be revealed by the seller. All hose should be adequately tagged for its age. Generally, 6 to 10 years is the recommended life span of fire hose including synthetic types. The fire department should ensure that they do not purchase natural fibre used hose because of the lack of washing and drying facilities in the fire hall.

Of the fire hose reviewed stored on the fire apparatus, the hose was considered dirty and lacking normal maintenance. Maintenance and proper storage of fire hose will greatly improve its life.

The addition of the new pumper/tanker will require adjustment to the fire station, which is equipped to handle only 4 vehicles. Emergency vehicles, including the reserve pumper and the rescue van should not be stored outside the fire hall.

Consideration should be given to removing the rescue boat to another location, parking the reserve pumper in its place behind the water tender and allowing the new pumper/tanker ample space.

The fire hall while not equipped with any provisions for training is otherwise generally considered adequate for the size of the community. The criteria for constructing a new location should be based on the need for specialized training facilities, additional parking bays, number of fire fighters, and congestion between the fire department and the municipal activities on the 2nd floor. An outdoor practice area is also a great benefit to the fire department. The two storage rooms could be better utilized and organized. A room should be dedicated in a suitable location for the communication equipment.

Automatic door openers for the bay overhead doors should be provided for faster response. Emergency lighting and smoke detectors should be located throughout.

6.0 FIRE PROTECTION FOR IVEY LAKES, WALKERVILLE AND OWL CREEK DEVELOPMENT

The Ivey Lakes, Walkerville and Owl Creek Development were examined to determine if either the population or the tax base were sufficient to support a fire department. It has been concluded, from the information provided from the SLRD, that the area cannot support fire protection services at this time. Both the number of tax payers and the assessed value of property that could be taxed are insufficient. Table 6 summarizes this information.

Table 6
Population Versus Assessed Property Values
Ivey Lakes, Walkerville, Owl Creek and Region

No. of Building Lots	No. of Buildings and or Improvements	Assessed Value	Population
68	37	8,077,000	75-100

Statistics supplied by the Squamish - Lillooet Regional District

Once the Owl Creek Development is complete the number of lots in the area will increase to 105. At that time, assuming that all additional lots support a tax base, it may be feasible to re-assess the situation.

It is estimated that a minimum of 100 tax payers equally supporting a assessed property values of at least 12 to 15 is necessary before substantial reductions in insurance savings could be realized.

The ideal location for a fire station for this area is at the BC Hydro substation, District Lot 7739. Ivey Lakes, the eastern border of the Pemberton FPA, and the last lot in the Owl Creek Development are all within 8 km. of this location.

6. APPENDIX A

6.1. SUMMARY OF DWELLING PROTECTION GRADES

The D.P.G. is a numerical system scaled from 1 to 5. One (1) is the highest grading possible and 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).

6.1.1.1. DWELLING PROTECTION GRADE 1

1. The water supply system must be equipped with standard hydrants capable of 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 500 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 (e.g. 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 5 miles by road of a recognized, responding fire station.

6.1.1.2. DWELLING PROTECTION GRADE 2

1. The water supply system must be equipped with standard hydrants capable of 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 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 500 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 (e.g. 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 5 miles by road of a recognized, responding fire station.

6.1.1.3. DWELLING PROTECTION GRADE 3A

1. The water supply system must be equipped with standard hydrants capable of 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 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 500 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 (e.g. 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 5 miles by road of a recognized, responding fire station.

6.1.1.4. 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 500 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 (e.g. 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 5 miles by road of a recognized, responding fire station.

6.1.1.5. DWELLING PROTECTION GRADE 4

1. Water supply system not required.

2. At least 10 fully equipped volunteer fire fighters must be scheduled to respond to fires with apparatus.

3. Fire apparatus must consist 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 500 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 (e.g. 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 5 miles by road of a recognized, responding fire station.

6.1.1.6. DWELLING PROTECTION GRADE 5

1. Applies to unprotected communities or communities not qualifying for Grades 1, 2, 3A, 3B or 4.

6.1.1.7. Additional Notes regarding Dwelling Protection Grades

6.1.1.8. Water Supply

1. Water supply requirements in this information bulletin are strictly minimums needed to obtain fire insurance grading recognition. 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).

6.1.1.9. 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”.

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 no 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.

7. APPENDIX B

7.1. SUMMARY OF FIRE APPARATUS EQUIPMENT

7.1.1.1. PUMPER EQUIPMENT

7.1.1.2. Pump Capacity:

7.1.1.3. Minimum 3000 L/min (625 I.g.p.m.) with a minimum 4000 L/min (840 I.g.p.m.) preferable in hydrant protected areas.

7.1.1.4. Water Tank Capacity:

Minimum 1400 L (300 Imp. gals) with a minimum 2200 L (500 Imp. gals) preferable.

7.1.1.5. Ladders:

One extension of minimum 7.3m (24 ft.) with 10.7m (35ft.) may be desirable; one roof 3.7m (12 ft.) minimum, with a 4m (14 ft.) desirable; one folding 3m (10 ft.).

7.1.1.6. Hose:

65mm (2 1/2") - 360m (1,200 ft.) (Rubber lined) minimum. Larger water supply hose may be carried as long as at least 180m (600 ft.) of 65mm (2 1/2") carried for hand lines.

38mm (1 1/2") or 45mm (1 3/4") - 120m (400 ft.) (rubber lined) plus at least one 60m (200 ft.) preconnected line.

7.1.1.7. Foam Equipment:

One nozzle, one eductor, minimum 45 L (10 gals) of foam concentrate.

7.1.1.8. Nozzles:

In hydrant protected areas, one portable deluge gun with 30 mm (1 1/4"), 38mm (1 1/2") and 45mm (1 3/4") tips; a 50mm (2") tip should be also carried on those pumpers over 3000 L/min (625 I.g.p.m.) capacity; and a large combination nozzle of minimum 2000 L/min (420 I.g.p.m.) capacity.

One distributor (cellar) nozzle.

At least three combination 65mm (2 1/2") nozzles. At least on straight stream nozzle is also required.

At least two combination 38mm (1 1/2") nozzles or a minimum of one for each 38mm (1 1/2") or 45mm (1 1/3") preconnected line.

7.1.1.9. MOBILE WATER SUPPLY FIRE APPARATUS EQUIPMENT

Water Tank Capacity:

4500 L (1000 Imp. gals) minimum with a minimum of 7800 L (1500 Imp. gals) preferred, equipped with a quick dump valve of at least 200mm (8").

Ladders:

One extension of 7.3m (24') minimum.

Hose:

65mm (2 ½") - 60m (200')
38mm (1 ½") - 120m (400')

Nozzles:

Two 38mm (1 ½") combination.

Miscellaneous Equipment:

1 portable pump with minimum 9m (30') of hard suction hose and a strainer.
1 65mm (2 ½") floating strainer.

1 portable tank of minimum 4500 L (1000 Imp. gals) capacity.
1 first aid kit.
2 self-contained breathing apparatus (minimum 30 minute rating) with at least 1 spare air cylinder each.

Other Equipment:

38m (125') of 13mm (½") utility rope
1 axe
2 hand lanterns
2 portable extinguishers
1 crowbar, 1m (36") minimum
1 pike pole 1.8m (6') minimum
4 back pack pump type extinguishers
2 hay forks (3-tine)
1 gated wye (1 65mm (2 ½") to two 38mm (1 ½"))
1 suction drain down strainer for use with Port-A-Tank
2 wheel chocks
Insulated bolt cutters
1 65mm (2 ½") double female cplg.
1 65mm (2 ½") double male coupling
1 hydrant wrench
2 shovels
2 spanner wrenches
6 fire brooms
1 hydrant gate valve
1 ice auger, 200mm (8") minimum

8. APPENDIX C

SUMMARY OF DEBT FOR CAPITAL EXPENDITURES, ANNUAL OPERATING COSTS, AND CALCULATION OF TAX RATE

The following options are shown as examples of the annual capital costs the proposed Pemberton Meadows FPA will face. The interest rate used and the amortization period are estimates only of the financing terms that may be available to the Squamish - Lillooet Regional District.

Option 1 -construct 1 fire station financed over 20 years with interest rate of 8.5%
-apply government grant to 50% of the cost of construction
-purchase 1 used pumper financed over 10 years at interest rate of 8.5%
-purchase 1 used tanker financed over 10 years at interest rate of 8.5%
-finance equipment purchase over 5 years at interest rate of 8.5%

	Annual Dept. Payment
-buildings - $100,000. - $50,000.	$ 5151.
-vehicles - $40,000. + $40,000.	$11902.
-equipment - $35,000.	$ 8617.
-annual operating cost - $10,000.	$10000.
Total:	$35570.

Total Assessed Value of the Proposed FPA: $12,762,500

Tax Rate per $1000. of assessed value: $2.79

Option 2 -construct 1 fire station financed over 20 years with interest rate of 8.5%
-apply government grant to 50% of the cost of construction
-purchase 1 used pumper financed over 10 years at interest rate of 8.5%
-finance equipment purchase over 5 years at interest rate of 8.5%

Option 2 cont.

	Annual Dept. Payment
-buildings - $100,000. - $50,000.	$ 5151.
-vehicles - $40,000.	$ 5951.
-equipment - $35,000.	$ 8617.
-annual operating cost - $10,000.	$10000.
Total:	$29619.

Total Assessed Value of the Proposed FPA: $12,762,500

Tax Rate per $1000. of assessed value: $2.32

Option 3 -construct 1 fire station financed over 20 years with interest rate of 8.5%
-apply government grant to 50% of the cost of construction
-purchase 1 used pumper financed over 10 years at interest rate of 8.5%
-purchase 1 used tanker financed over 5 years at interest rate of 8.5%
-finance equipment purchase over 5 years at interest rate of 8.5%

	Annual Dept. Payment
-buildings - $100,000. - $50,000.	$ 5151.
-pumper truck - $50,000.	$ 7439.
-tanker truck - $40,000.	$ 9848.
-equipment - $40,000.	$ 9848.
-annual operating cost - $10,000.	$15000.
Total:	$47,286.

Total Assessed Value of the Proposed FPA: $12,762,500

Tax Rate per $1000. of assessed value: $3.71