



FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

c/o Risk Management Services

February 5th, 2010

FINAL

Salt Spring Island Fire Rescue
105 Lower Ganges Road
Salt Spring Island, BC
V8K 2T1

Attention: Mr. Tom Bremner, Fire Chief – Salt Spring Island Fire Rescue (SSIFR)
Mr. Mike Schubart, Chair – Salt Spring Island Fire Protection District (SSIFPD)

Re: Fire Underwriters Survey – Salt Spring Island Fire Protection District

A survey of Salt Spring Island Fire Protection District's fire defences was conducted from November 25th – 27th, 2009. The results of this survey are now complete and offered for your information. Fire Underwriters Survey (FUS) conducted the assessment primarily for fire insurance grading and classification purposes. The following report provides a brief description of the grading process and outlines significant findings of the assessment. In addition and at the request of SSIFPD, this report also includes comments and general recommendations that are aimed at improving the level of fire protection within the SSIFPD for fire insurance grading purposes.

Note that comments made within this report are general statements giving indication where fire protection improvements can be considered. This report was not commissioned to provide detailed recommendations nor was the assessment an operational audit.

A Fire Underwriters Survey normally includes an evaluation of both fire department operations and emergency water supplies. During the previous survey, emergency water supplies were not evaluated at the request of various waterworks districts and utilities on Salt Spring Island. The main intent of this Fire Underwriters Survey was to ensure that available emergency water supplies were evaluated in addition to updating information on fire department operations in order to produce an up-to-date fire insurance grade reflective of the current levels of fire protection on Salt Spring Island.



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1. Fire Insurance Grading Result

The Public Fire Protection Classification (PFPC) is a numerical grading system scaled from 1 to 10 that is used by Commercial Lines¹ insurers. Class 1 represents 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 multi-family residential, commercial, industrial, and institutional buildings; and course of construction developments.

Fire Underwriters Survey also assigns a second grade for a community's fire protection. The second grading system, entitled Dwelling Protection Grade (DPG), assesses the protection available for small buildings such as single-family dwellings and is used by Personal Lines² insurers.

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

The fire insurance grades that were previously applied to the SSIFPD were as follows:

1. **SSIFPD Public Fire Protection Classification (PFPC)**

- Class 6** Applies to properties insured under Commercial Lines within 5 road km of an SSIFR fire hall, and within 150 metres of a recognized hydrant.
- Class 9** Applies to properties insured under Commercial Lines within 5 road km of an SSIFR fire hall, but are not within 150 m of a recognized hydrant.
- Class 10** Applies to all other properties insured under Commercial Lines.

2. **SSIFPD Dwelling Protection Grade (DPG)**

- Grade 3A** Applies to properties insured under Personal Lines within 8 road km of an SSIFR fire hall and within 300 m of a recognized hydrant.
- Grade 3B** Applies to properties insured under Personal Lines within 8 road km of an SSIFR fire

1 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.

2 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.

hall but not within 300 m of a recognized hydrant.

Grade 5 Applies to all other properties insured under Personal Lines.

Although improvements have been made to the fire protective services in the SSIFPD since the last Fire Underwriters Survey, a change to the PFPC cannot be made until improvements are made to the water supplies in addition to changes to the fire department. As a community develops so too must the level of fire protection in order to maintain its fire insurance grade as was found to be the case during this Fire Underwriters Survey; as a result; the following fire insurance grading classifications will now be assigned to the SSIFPD.

1. SSIFPD Public Fire Protection Classification (PFPC)

Class 6 Applies to properties insured under Commercial Lines within 5 road km of an SSIFR fire hall, and within 150 metres of a recognized hydrant connected to the North Salt Spring Waterworks District (NSSWD) or the Fulford water distribution system.

Class 9 Applies to properties insured under Commercial Lines within 5 road km of an SSIFR fire hall, but are not within 150 m of a recognized hydrant.

Class 10 Applies to all other properties insured under Commercial Lines.

2. SSIFPD Dwelling Protection Grade (DPG)

Grade 3A Applies to properties insured under Personal Lines within 8 road km of an SSIFR fire hall fire hall and within 300 m of a recognized hydrant connected to the North Salt Spring Waterworks District (NSSWD), the Maracaibo Estates Private Water Utility, or the Fulford water distribution system.

Grade 3B Applies to properties insured under Personal Lines within 8 road km of an SSIFR fire hall fire hall but not within 300 m of a recognized hydrant.

Grade 5 Applies to all other properties insured under Personal Lines.

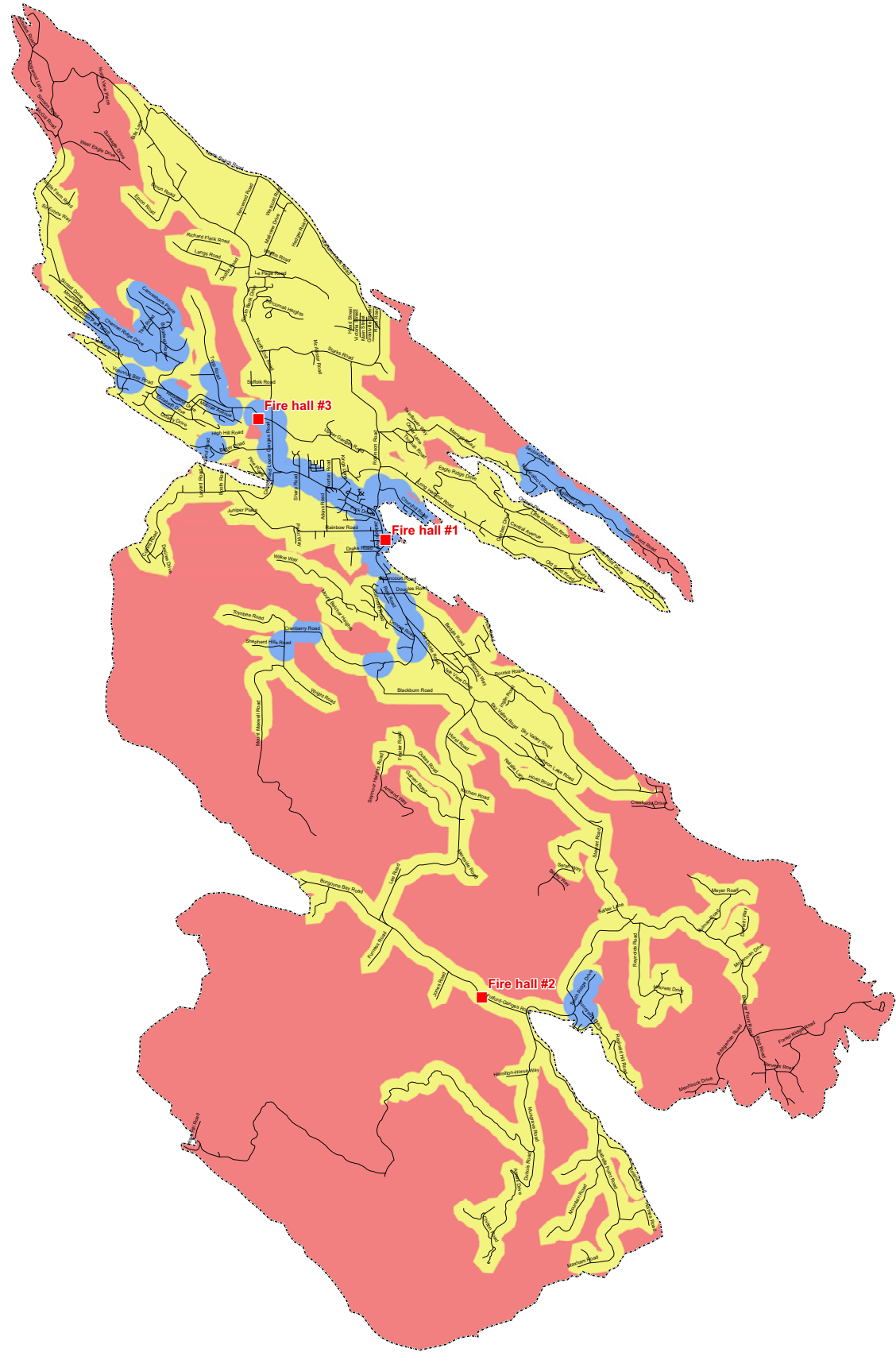
As a result of this assessment, the following water supply systems are recognized by FUS for fire insurance grading purposes (it should be carefully noted that even though these systems are recognised for fire insurance grading purposes, some hydrants on these systems may not be recognised; this is discussed later in this letter):

- North Salt Spring Island Waterworks District (NSSWD) water distribution system
- Maracaibo Estates Private Water Utility
- Fulford water distribution system

The following water supply systems are currently not recognized by FUS for fire insurance grading purposes:

- Scott Point Waterworks District water distribution system
- Mount Belcher ID water distribution system
- Beddis water distribution system
- Cedar Lane water distribution system
- Cedars of Tuam water distribution system
- Fernwood water distribution system
- Harbour View ID water distribution system
- Reginald Hill water distribution system
- High Hill road water distribution system
- Swan Point water distribution system

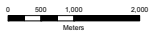
In areas of SSI where non recognized water supply systems are located a fire insurance grading of PFPC Class 9 and DPG 3B applies.



SALT SPRING ISLAND

Figure 1-1 Dwelling Protection Grades

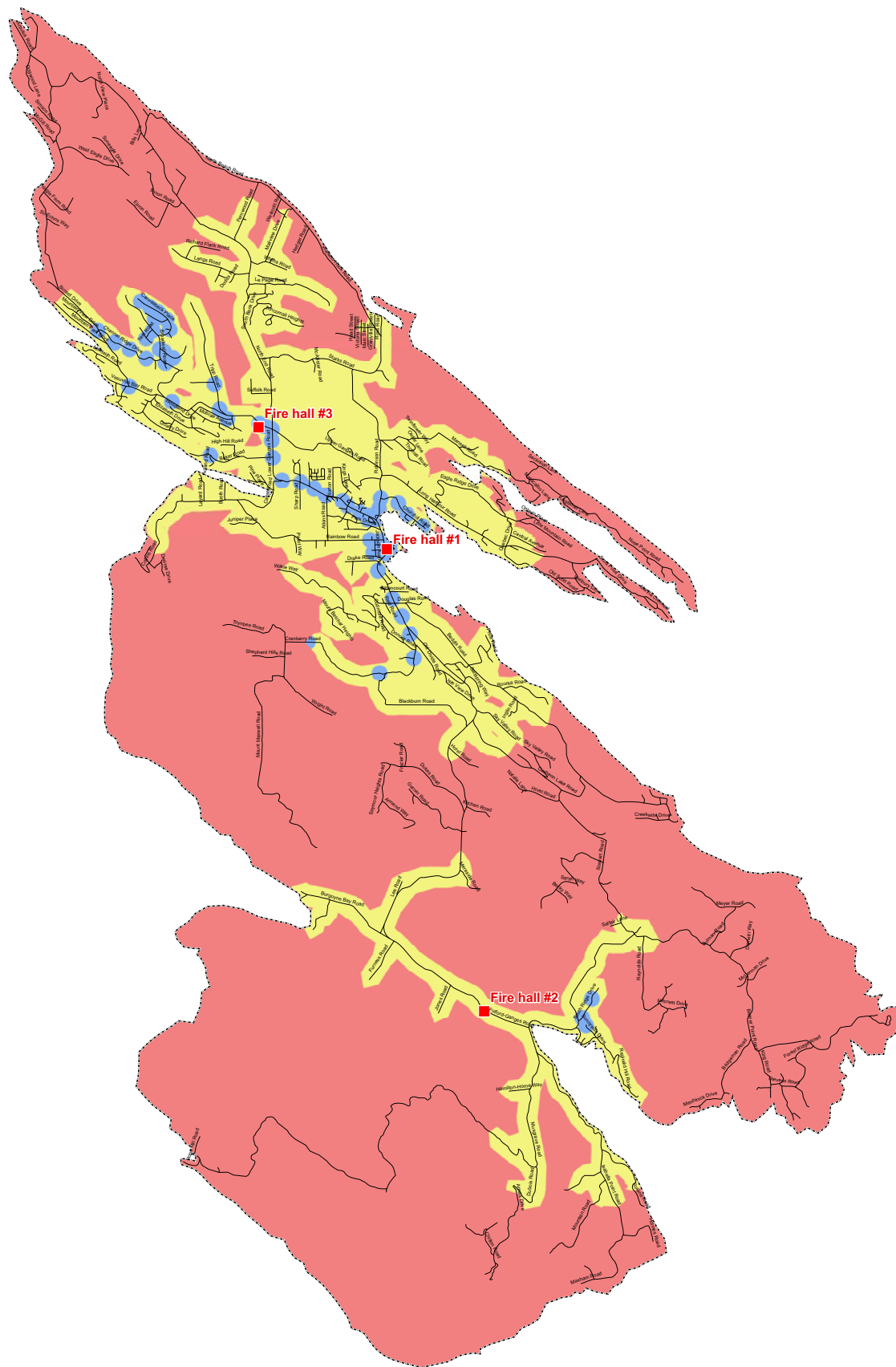
Scale = 1:27,000



Legend

- Fire Hall
- DPG 3A
- DPG 3B
- DPG 5
- Road
- ⋯ Fire Protection Area

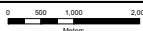
The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.



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Figure 1-2 Public Fire Protection Classifications

Scale = 1:27,000



Legend

- Fire Hall
- PFPC 6
- PFPC 9
- PFPC 10
- Road
- Fire Protection Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

2. 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. Fire Underwriters Survey provides data to program subscribers regarding public fire protection for fire insurance statistical and underwriting evaluation.

Fire Underwriters Survey offices maintain data from surveys on fire protection programs throughout Canada. The results of these surveys are used to establish the Public Fire Protection Classification (PFPC) and Dwelling Protection Grade (DPG) for each community. The PFPC and DPG 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.

2.1. Public Fire Protection Classification System

The Public Fire Protection Classification grading system is a measure of a community's overall programs of fire protection. 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 areas of fire protection are reviewed in the survey and have the following weights within the PFPC grading system:

- Fire Department 40%
- Water Supply 30%
- Fire Safety Control 20%
- Fire Service Communications 10%

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 on the amount of risk they are willing to assume within a given portion of a community, and to set fire insurance rates for commercial properties. Improved fire protection grades may result in increased competition for insurance underwriting companies placing their business within a community. Our analysis indicates that an improved fire protection grade has a positive effect on fire insurance rates.

In addition, PFPC 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.

2.2. Dwelling Protection Grading System

Dwelling Protection Grades are based on a 1 to 5 grading system; DPG 5 indicates little or no fire protection being 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. 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.

Many insurers have simplified the Dwelling Protection 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 2-2 FUS Grades Correlation to Commonly used Insurance Terminology and Simplified Grades.

Table 2-2 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	Table 1	Protected
2		
3A	Table 2	Semi - Protected
3B		
4	Table 3	Unprotected
5		

Improvements that would have a cumulative positive effect on 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 Salt Spring Island Fire Protection District direction in their community fire protection planning – if so desired and supported by the community.

3. Overview of the Assessment Process

There isn't any 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 this 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 on 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 being capable of controlling and extinguishing most fires that may occur.

To achieve this objective, the structure of a fire department must be tailored to the needs of a community, and will vary for each community. Each component of fire defences must be evaluated and developed to achieve the desired and correct level of benefit. For this reason no two fire departments will be the same. Some of the factors that must be balanced and tailored against the fire risk, degree of criticality, community expectation, fire experience, and the ability to financially support this emergency service, are as follows:

- Type, number and condition of fire apparatus
- Pumping capacity
- Response to alarm protocols
- Response times to critical risks
- Adequacy of the fire fighter and emergency responder training program including specialized training
- Emergency communication systems
- Ancillary equipment
- Fire department roster type and response levels
- Fire safety education
- Building controls
- Fire prevention inspections

- Adequacy & reliability of emergency water supplies
- Automatic fire protection systems
- Management of emergency services

FUS examines the entire program of a community's fire defences in order to assess and grade the overall program. For instance, strengths in community fire safety can offset some deficiencies in emergency water supplies, and vice versa. Alternatively, there are some areas within a FUS grading that carry substantial weight, such as:

- The type of manning (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, age and maintenance of fire apparatus and fire suppression equipment,
- The distribution of companies relative to fire risk,
- The availability, adequacy and reliability of emergency water supplies
- Response to alarms procedures, and
- Fire safety inspections.

The Survey has found that SSIFPD has good programs of protection in the areas of:

- Organization, administration, management and planning of the fire department
- Risk and hazard planning programs
- Pre-fire planning program
- Recruit and drill training program
- Officer strength
- Fire prevention and public education programs

Alternatively, the Survey found that improvements would be beneficial in the following protection programs:

- Reliability of response to alarms
- Suitability and functionality of fire stations
- Lack of adequate training facilities
- Emergency water supply coverage across the District

4. Community Risk and Hazard Assessment

4.1. Background

A fire hazard and risk assessment was conducted throughout Salt Spring Island to aid in determining the community's fire protection needs and to assist in assessing the adequacy of the water supply and 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 for determining 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 risk of fire that is present in a given area.

4.2. Fire Risk Assessment on Salt Spring Island

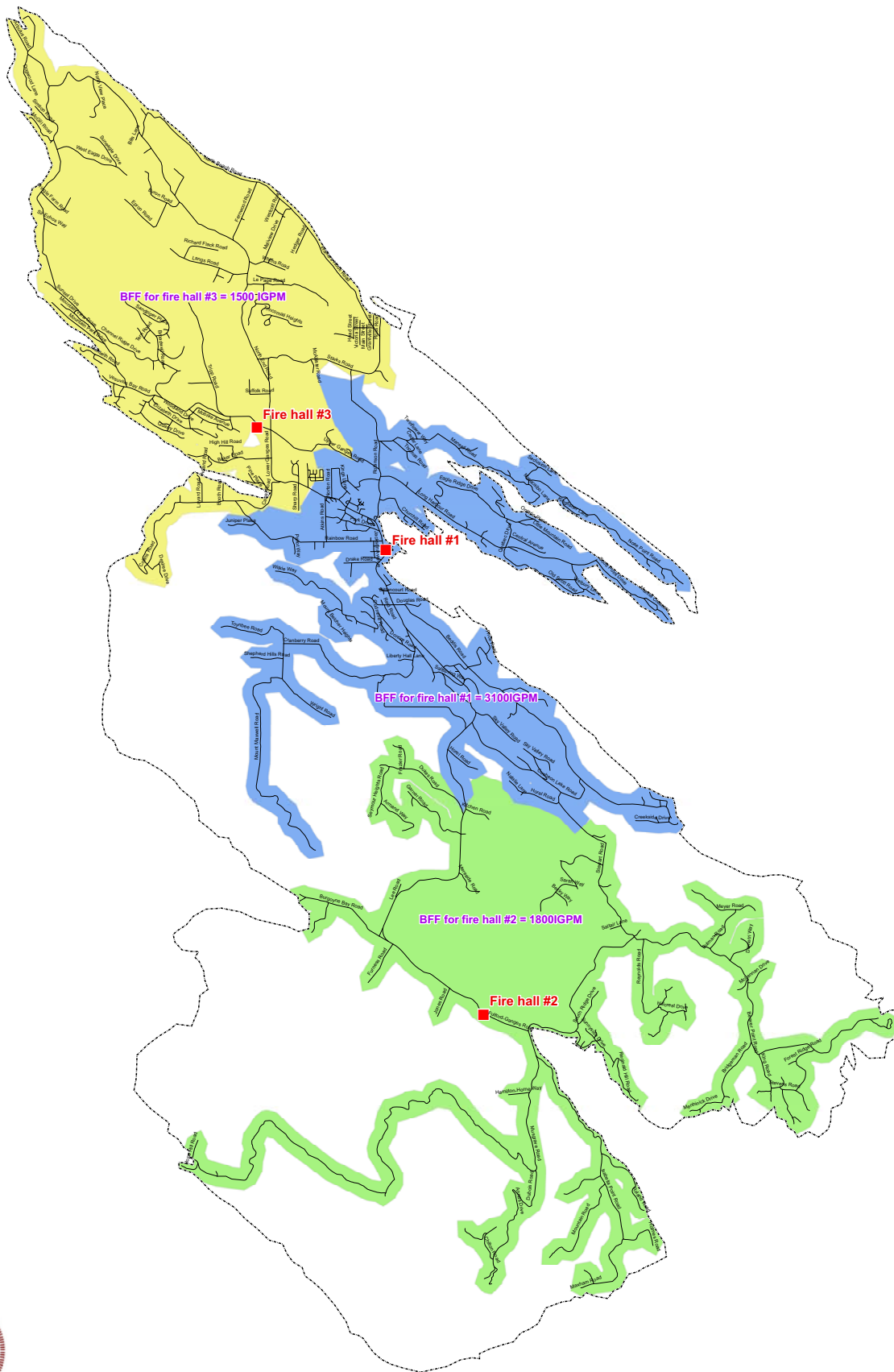
Salt Spring Island building stock consists of:

- Single residential homes
- Multi-family residences and town homes
- Commercial and Mercantile space, such as
 - Restaurants
 - Tourist services
 - Hotels and Motels
- Service buildings
- Light industrial

Required Fire Flows (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 exposures) were calculated for what was considered, in conjunction with the fire department and specific site inspections, to be the major risks within the community and at the same time being representative of the community. In all 50 Required Fire Flows (RFF) were calculated for the community using the methodology described in the Fire Underwriters Survey 1999 Guideline “Water Supply for Public Fire Protection”, see Appendix B.

The previous Fire Underwriters Survey set a Basic Fire Flow for the island; however, in order to better represent the distribution of structures throughout the island, and to make more specific recommendations, Basic Fire Flows were determined for 3 districts (based off of fire hall locations) from the analysis of the required fire flows, as shown in Figure 4-2 Basic Fire Flow by district. It is important to stress that the Basic Fire Flow assigned is not the peak required fire flow and is intended to be adequate for 90% of the typical structure fires that are expected to occur based on the Required Fire Flows calculated during the risk assessment. Notably, Required Fire Flows were not calculated for all buildings throughout the community and specialized risks with high fire flows should be reviewed on an ongoing basis.

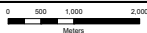
Basic Fire Flows are then used in conjunction with Table 4-2 Fire Underwriters Survey – Table of Effective Response to determine and grade against the requirements for fire insurance grading purposes.



SALT SPRING ISLAND

Figure 4-2 Basic Fire Flow by District

Scale = 1:27,000



Legend

- Fire Hall
- Road
- Fire Protection Area
- BFF for fire hall #1 = 3100IGPM
- BFF for fire hall #2 = 1800IGPM
- BFF for fire hall #3 = 1500 IGPM

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

Table 4-2 Fire Underwriters Survey – Table of Effective Response

The following Table aids in the determination of Engine 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		1 st DUE	2 nd DUE	1 st DUE	TOTAL AVAILABILITY NEEDED			
		L/min	lgpm	Engine	Ladder	Engine Company, Minutes	Engine Company, Minutes	Ladder Company, Minutes	Engine Companies.		Ladder Companies	
		X1000	Range	Companies	Companies				No.	Min.	No.	Min.
1 (a)	Very small buildings, widely detached buildings.	2	400	1	0	7.5	-	*9	1	7.5	*1	9
(b)	Scattered 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	800-1,000	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	1,200-2,000 2,200-2,800	2 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, fire loads, and exposures.	14-16 17-19	3,000-3,600 3,800-4,200	2 2	1 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	4,400-5,000 5,200-60,00	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	7,800-8,400 86,00-9,200 9,400-10,000	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

5. Water Supply Assessment

5.1. Background

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 Basic Fire Flow .
- 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 the 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.

In brief, the situation of the availability of emergency water supplies for fire insurance grading purposes on Salt Spring Island is a complicated one. Many of the systems are aging and administration and governance of the systems can make any changes lengthy. Records of many of the systems are old and outdated, and in many cases conflicting records exist making it a difficult task to truly assess the systems. The majority of the systems seem to have been designed purely for domestic purposes and not for fire protection purposes; however, hydrants have been installed on some of these systems including some installation on 2" mains.

Previous to the survey, it was noted that many of the systems contain a significant amount of 4" mains and in some cases 2" mains which can reduce the available flow. The Water Supply for Public Fire Protection, 1999 states:

".....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 200m. Where longer lengths of 150mm pipe are necessary 200mm or larger intersecting mains should be used"

"The lateral street connection should not be less than 150mm"

AWWA Manual M31 – Distribution System Requirements for Fire Protection states:

"Distribution piping should be sized and spaced to meet design flow. The minimum size of

water mains for providing fire protection and serving fire hydrants is 6-in. in diameter. Larger size mains will be necessary to achieve required fire flow and maintain the minimum residual pressure specified.”

SSIFR noted that there are issues with the water supplies and that they would use hydrants on 4” mains as a secondary source which would be supplemented with tender shuttles and other static sources. Note that the fire response from each fire hall is with a pumper and tender.

It was also noted by the North Salt Spring Waterworks District that there are issues surrounding the delivery of fire flows from 4” mains and testing on these hydrants was not carried out at the request of NSSWD.

Further to these comments, hydrants on 4” mains on Salt Spring Island were not recognised as a water supply point for fire insurance grading purposes; however, it should be carefully noted that the SSIFR stated that they will use all hydrants on Salt Spring Island as a water source even if there are low fire flows available. As already mentioned, these hydrants may only be used as a secondary source which is supplemented with tender shuttles from static sources.

The following water distribution systems were assessed during the survey:

- North Salt Spring Island Waterworks District (NSSWD) water distribution system
- Maracaibo Estates Private Water Utility
- Fulford Harbour Waterworks District water distribution system
- Beddis water distribution system
- Cedar Lane water distribution system
- Cedars of Tuam water distribution system
- Highland water distribution system
- Fernwood water distribution system
- Harbour View ID water distribution system
- Reginald Hill water distribution system
- High Hill road water distribution system
- Erskine Heights Water Utility
- Swan Point water distribution system
- Mount Belcher ID water distribution system
- Scott Point Waterworks District water distribution system

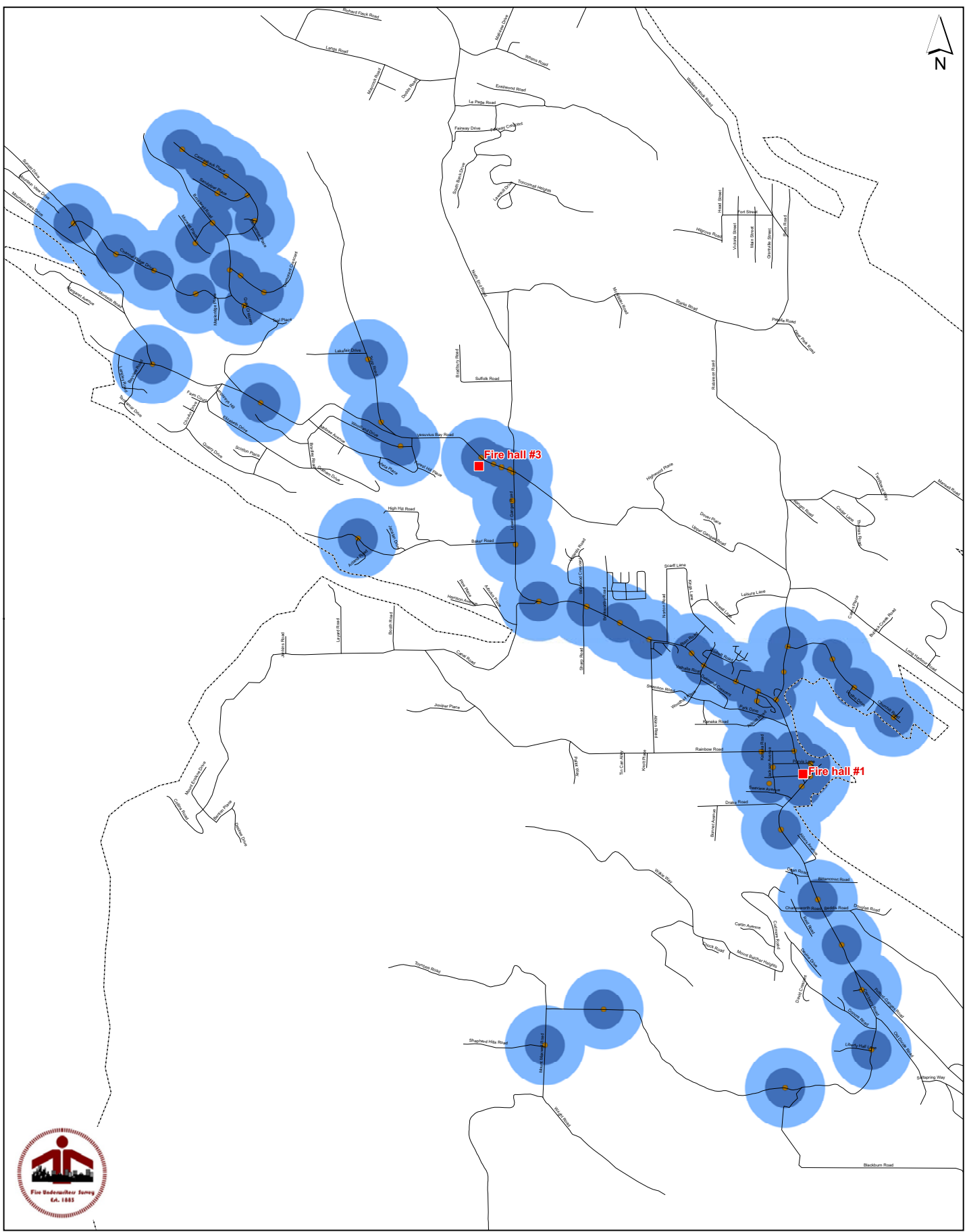
5.2. Brief Overview

5.2.1. North Salt Spring Island Waterworks District (NSSWD) water distribution system

This water distribution system consists of two interconnected systems and was treated as such as part of this survey. The north part of this system is fed from St. Mary’s Lake through pumps with storage on the system; the south part of the system is gravity fed from Maxwell Lake with storage on the system. The initial system was installed in approximately 1913. There are areas of weak flow on this system due to 4” mains. This

system has been recognised for fire insurance grading purposes; however, not all of the 124 hydrants on the system have been recognised, i.e. hydrants on or fed from 4" and 2", see Figure 5-2-1 150m and 300m Recognised Hydrant Coverage Area (NSSWD). This system graded with a relative PFPC 8.

The system specifications can be seen in Table 5-2 Recognised Water Systems Analysis
Also volume analysis can be seen in Figure 5-2 Recognised Water Systems Analysis
Flow test results can be seen in Appendix A



SALT SPRING ISLAND

Figure 5-2-1 150m and 300m Recognised Hydrant Coverage Area (NSSWD)

Scale = 1:9,000



Legend

- Recognized Hydrant
- Fire Hall
- Road
- Fire Protection Area
- 150m Hydrant Coverage Area
- 300m Hydrant Coverage Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

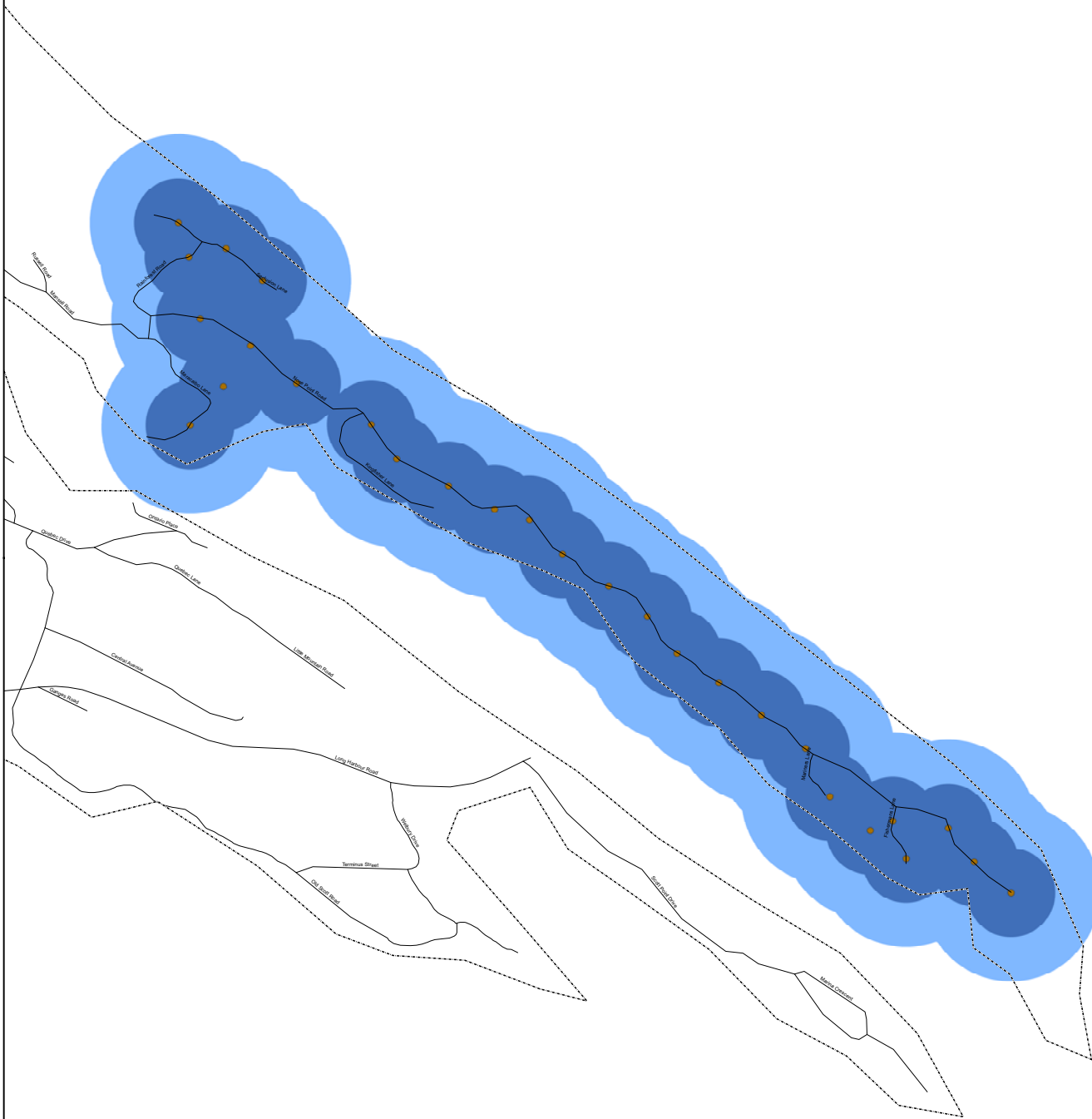
5.2.2. Maracaibo Estates Private Water Utility

The water source for this system, installed in approximately 1980, is from 6 wells which feed to two reservoirs. Most of the system is gravity fed from the reservoirs; however, there is also a fire booster pump in place. All mains on this system are 6" with exception of one short length of 4". There are 28 hydrants on the system which are recognised for fire insurance grading purposes, see Figure 5-2-2 150m and 300m Recognised Hydrant Coverage Area (Maracaibo). This system graded with a relative PFPC 5.

Maracaibo Estates also owns a 1 ton Isuzu truck equipped with a 330 Imp. gallon water tank, pump, foam dispensing equipment, and miscellaneous fire fighting equipment.

During the first flow test on the system, the fire pump do not come online during flow and pressure was less than 20psi.

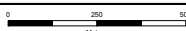
The system specifications can be seen in Table 5-2 Recognised Water Systems Analysis
Also volume analysis can be seen in Figure 5-2 Recognised Water Systems Analysis
Flow test results can be seen in Appendix A









SALT SPRING ISLAND

Figure 5-2-2 150m and 300m Recognised Hydrant Coverage Area (Maracaibo)

Scale = 1:5,000



Legend

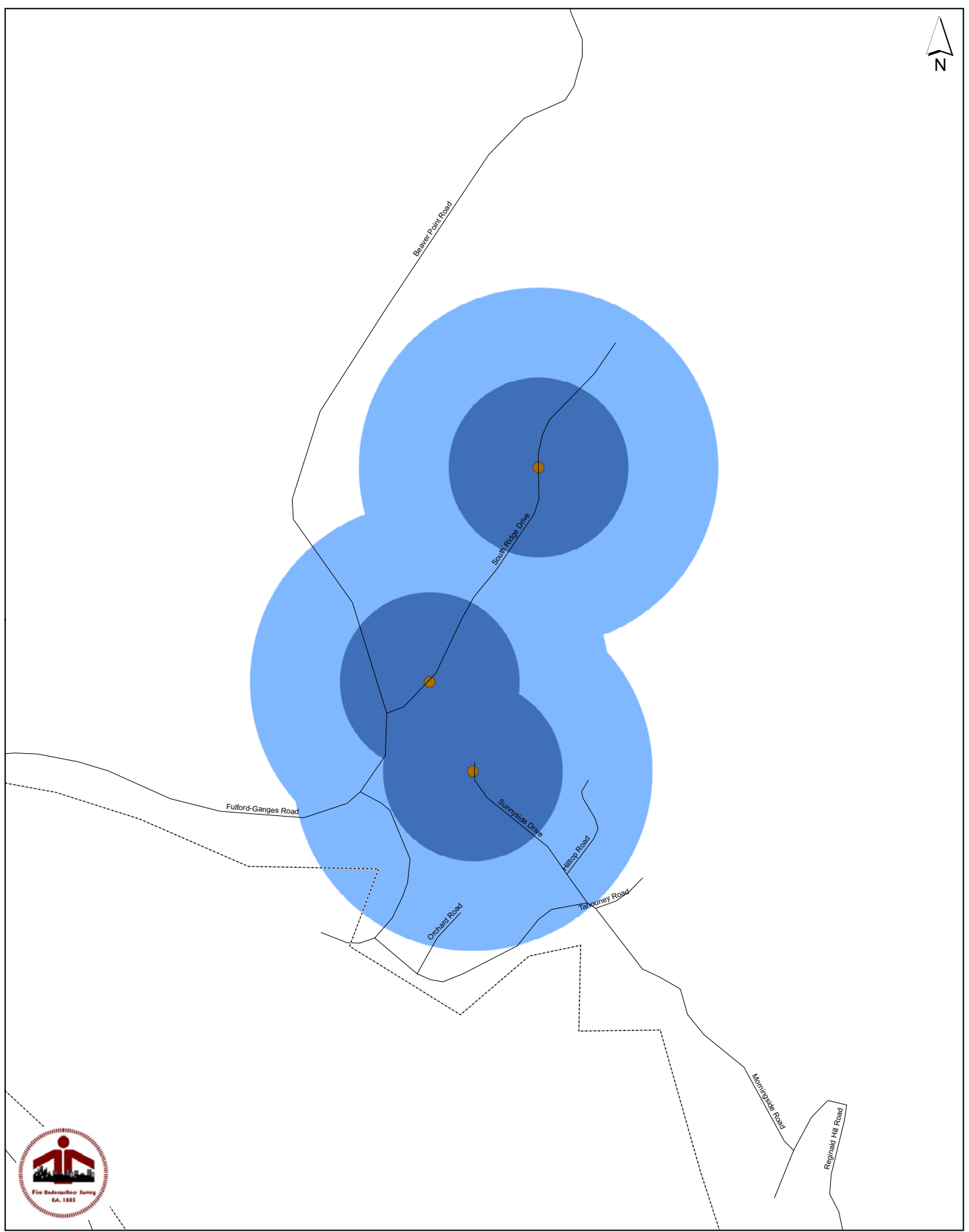
-  Recognized Hydrant
-  Fire Hall
-  Road
-  Fire Protection Area
-  150m Hydrant Coverage Area
-  300m Hydrant Coverage Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

5.2.3. Fulford Harbour Waterworks District water distribution system

Recent additions have been made to this system including 6" mains, 80000 Imp. gallon reservoir, booster pumps and hydrants. The water source is gravity fed from Weston Lake through a DAF multi-media filter to 2 booster pumps to process at 3 l/sec and 2 booster pumps to reservoir at 3 l/sec. 3 hydrants on this system have been recognised for fire insurance grading purposes, see Figure 5-2-3 150m and 300m Recognised Hydrant Coverage Area (Fulford). This system graded with a relative PFPC 8.

The system specifications can be seen in Table 5-2 Recognised Water Systems Analysis
Also volume analysis can be seen in Figure 5-2 Recognised Water Systems Analysis
Flow test results can be seen in Appendix A.









SALT SPRING ISLAND

Figure 5-2-3 150m and 300m Recognised Hydrant Coverage Area (Fulford)

Scale = 1:2,000



Legend

-  Recognized Hydrant
-  Fire Hall
-  Road
-  Fire Protection Area
-  150m Hydrant Coverage Area
-  300m Hydrant Coverage Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

5.2.4. Beddis water distribution system

Water is pumped (2 lake pumps through process at 4 l/sec) from Cusheon Lake through a rapid sand single media filter to 2 booster pumps to reservoir #1 at 4 l/sec and 2 booster pumps to reservoir #2 at 2 l/sec. The two reservoirs have a total capacity of 19000 lgal. The system is composed completely of 4" mains with 9 hydrants. This system does not meet the minimum requirements in order to be recognised for fire insurance grading purposes due to storage requirements and pipe size.

5.2.5. Cedar Lane water distribution system

Work is currently being carried out on this system for domestic supply purposes by the Capital Regional District. Water is supplied to the system from 2 wells (well 1 at 1-3 l/gpm and well 5 at 4-5 l/gpm) through a 20 micron filter with a 12000 lgal storage tank on the system. The system is composed mainly of 4" mains, with two hydrants, and one short section of 6", with one hydrant. This system does not meet the minimum requirements in order to be recognised for fire insurance grading purposes due to storage requirements and pipe size.

5.2.6. Cedars of Tuam water distribution system

Water is supplied from 2 wells at 1-2 l/gpm to a 10000 lgal reservoir and then gravity fed to the system. There are no hydrants on this system and therefore it has not been recognised for fire insurance grading purposes.

5.2.7. Highland water distribution system

Water is pumped from St. Mary's Lake by 2 pumps at 8 l/sec through a multi and carbon filter. 2 booster pumps feed to reservoir #1 at 8 l/sec, 2 booster pumps feed to reservoir #2 at 3 l/sec and 2 booster pumps feed to a pneumatic system at 3 l/sec. The system is composed completely of 4" mains with 10 hydrants on the system. Although this system has been identified by the SSIFR as a secondary source, it does not meet the minimum requirements in order to be recognised for fire insurance grading purposes due to pipe size.

5.2.8. Fernwood water distribution system

Water is pumped from St. Mary's Lake at 5 l/sec through a multi and carbon filter to total storage of 30000 lgal. There are no hydrants on this system and therefore it has not been recognised for fire insurance grading purposes.

5.2.9. Harbour View ID water distribution system

Water is supplied from 3 wells to the storage of 13000 lgal. There are no hydrants on this system and therefore it has not been recognised for fire insurance grading purposes.

5.2.10. Reginald Hill water distribution system

There are two distribution systems, each fed by 2 wells with storage of 5000 lgal. There are no hydrants on these system and therefore have not been recognised for fire insurance grading purposes.

5.2.11. High Hill road water distribution system

Water from two wells is pumped to a 4000 lgal tank and then gravity fed to the system. This system has not been recognised for fire insurance grading purposes due to storage requirements.

5.2.12. Erskine Heights Water Utility

Water from two wells is pumped to a 25000 lgal tank and then gravity fed to the system. The system is composed of both 6" and 4" mains with all hydrants on the 4" mains. This system has not been recognised for fire insurance grading purposes due to pipe size.

5.2.13. Swan Point water distribution system

Water is pumped directly from a well to a fire storage reservoir of 25000 lgal and then gravity fed to the hydrant. Flow testing was carried out on the system and a static pressure of approximately 3 psi was observed. The minimum flow requirements in order to be recognised for fire insurance grading purposes is the provision of minimum flow of 1000 L/min for two hours at a minimum residual pressure of 20 psi; therefore, this system could not be recognised for fire insurance grading purposes.

5.2.14. Mount Belcher ID water distribution system

Water is pumped from 4 wells with a 25000 lgal storage tank on the system which is composed completely of 4" mains. There are 3 hydrants on the system; however, no flow testing was carried out due to main size and at the request of the water system operator and is not recognised for fire insurance grading purposes.

5.2.15. Scott Point Waterworks District water distribution system

This system was not assessed at the request of the Scott Point Waterworks District and will continue to remain unrecognised for fire insurance grading purposes.

Recommendation 1 Review Water Supplies in Accordance with Benchmarks

Following is a summary of some of the more significant requirements of Fire Underwriters Survey against which a water supply is graded for fire insurance purposes (for the complete document covering the requirements of the Fire Underwriters Survey for water supplies, see appendix B). It is recommended that the water distribution systems on Salt Spring Island be reviewed against the Fire Underwriters Survey requirements (while also considering the requirements of the AHJ) in order to identify where upgrades can be made. The installation of a system conforming to all may not be fiscally realistic and necessary upgrades in order to achieve a level of recognition for fire insurance grading purposes should be considered on a case-by-case basis. It should also be noted that the above are solely the recommendations of the Fire

Underwriters Survey for fire insurance grading purposes.

- The minimum size water supply credited by FUS must be capable of delivering not less than 1000 L/min for two hours in addition to any domestic consumption at the maximum daily rate. Ideally the system should be capable of delivering the peak Required Fire Flow for the required duration as set out in the Water Supply for Public Fire Protection, 1999 (see Appendix B) in addition to any domestic consumption at the maximum daily rate
- A fully adequate system can deliver the necessary fire flow at any point in the distribution gridiron for the applicable time period as specified in Appendix B with consumption at the maximum daily rate. This delivery should be possible under certain emergency or unusual conditions. Essentially, the source of supply, including impounding reservoirs and each part of the supply works, should be able to maintain the maximum daily consumption rate plus the maximum Required Fire Flow.
- System design should meet the Required Fire Flows (see Appendix B, Part 2) in the community. As noted, the protection of buildings by automatic sprinkler systems can reduce the Required Fire Flows.
- 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 principal pressure requirement is the ability to deliver water in sufficient quantity to permit fire department pumpers to obtain an adequate supply from hydrants. To overcome friction losses in the hydrant branch, hydrant and suction hose, a minimum residual pressure of 150kPa in the main is required during flow. Residual pressures that exceed 500kPa during large flows are of value as they permit short hose-lines to be operated directly from hydrants without supplementary pumping.
- The effect on adequacy must be considered for such factors as frequency, severity and duration of droughts, physical condition of dams and intakes; effects from earthquakes, floods, forest fires, and ice dams or other ice formations; silting-up or shifting of channels; possibility of contamination of watershed or source; absence of watchmen or electronic supervision where needed. Where there is a risk of disruption, special precautions or alternate supplies should be arranged.
- 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.
- 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. 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. The rate of flow from such storage must be considered in terms of any limitation of water main capacity.
- 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. 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.
- At least a five day supply of fuel for internal combustion engines or boilers used for regular domestic

supply should be provided.

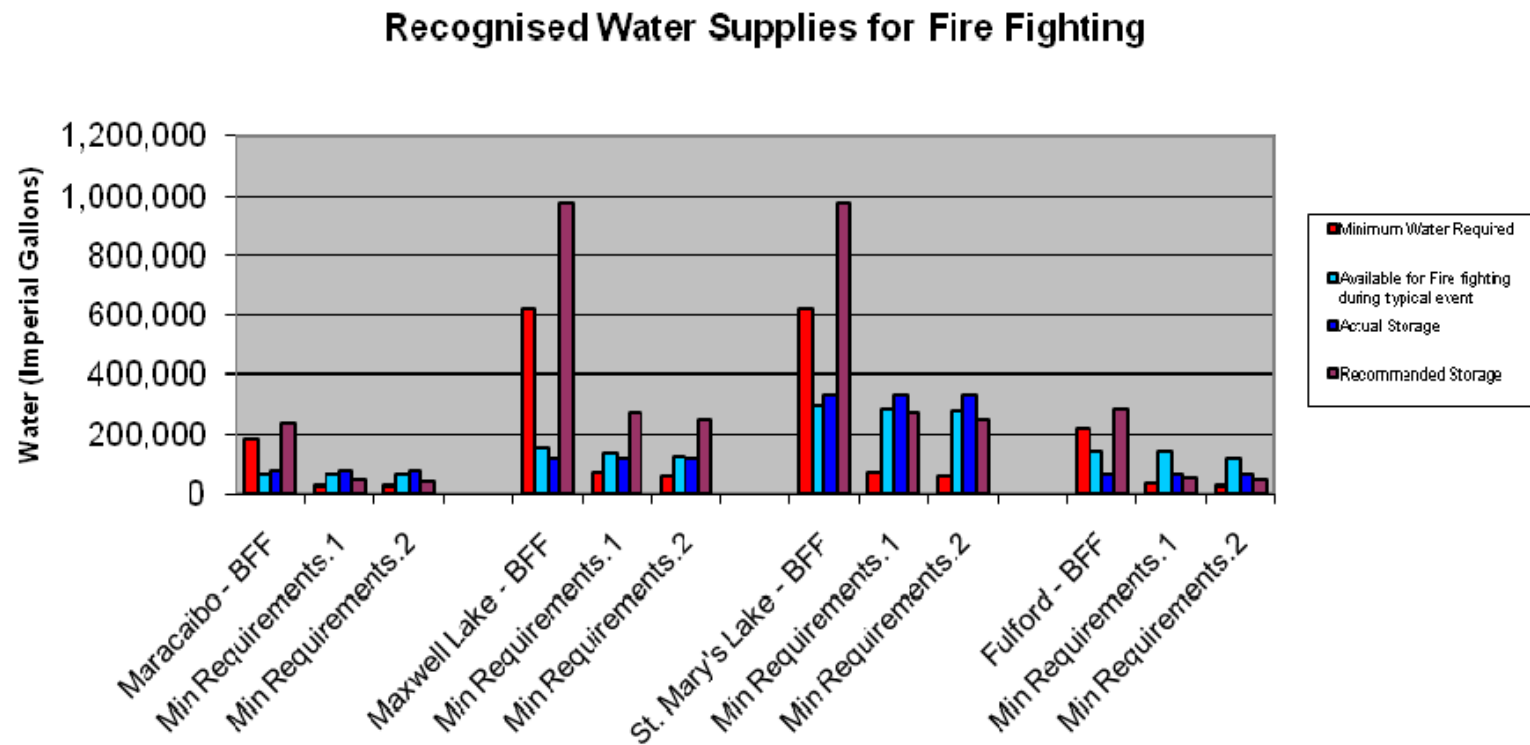
- Pumping stations, treatment plants, control centres and other important structures should be located, constructed, arranged, and protected so that damage by fire, flooding, or other causes will be held to a minimum. They should contain no combustible material in their construction and if exposures exist, suitable protection should be provided.
- All system components, piping and equipment should be so arranged that a failure in any 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.
- Operating personnel should be competent, adequate, and continuously available as may be required to maintain both the domestic and fire services.
- 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 systems 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.
- Mains should be in good condition and properly installed. Normally, pipe rated for a working pressure of 1000kPa is required. 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 a half kilometre intervals and should be equipped with air valves at high points and blow offs at low points. The general arrangement of the system should be considered with respect to the time required to isolate breaks. 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. The gridiron of minor distributors supplying residential districts should consist of mains at least 150mm in size. Where longer lengths of 150mm pipe are necessary, 200mm or larger mains should be used. Where dead-ends 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 this 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.
- Hydrants should conform to AWWA Standard for Dry Barrel Hydrants or ULC listing. Hydrants should have at least two 65mm outlets. Where Required Fire Flows exceed 5000l/min or pressures are low, there should also be a large pumper outlet. The lateral street connection should not be less than 150mm. 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. 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", see Appendix B.
- Hydrants should be inspected at least semi-annually and after use. The inspection should include operation at least once a year. Hydrants should be kept in good condition and suitable records of inspections and repairs be maintained. It is recommended that hydrants are maintained in accordance with AWWA M17.

- 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. Distribution density of hydrants should be in accordance with the Required Fire Flows indicated in the table titled “Standard Hydrant Distribution”, see Appendix B. The planning of fire hydrant locations should be a cooperative effort between the water utility and the fire department.
- Complete, up-to-date plans and records essential for the proper operation and maintenance of the system should be available in a convenient form (preferably digital), 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 plan maps 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.

Table 5-2 Recognised Water Systems Analysis

											Variables --->									
											A	B	C	D	Eq.I	E	Eq.II			
											Required Fire Storage	Domestic Storage (incl. agr.)	Emergency storage	Concurrent Domestic Demand	Recommended storage	Concurrent Domestic Demand	Minimum Storage Req'd	Supply Good?	Supply Adequate?	
Notes --->											BFFxDuration	.25 MDD	.25 (MDD+Fire)	PHDxDuration	MDDxDuration					
Units --->											L. gal	L. gal	L. gal	L. gal	L. gal	L. gal	L. gal	Eq.I	Eq.II	
BFF	Fire Duration	ADD	MDD	PHD	Storage 1	Total Storage	Total Refill Rate	Refill during Event Duration	Total Available Water Resources		derated 25-50%	derated 20-50%								
	igpm	hrs	MGD	MGD	IGPM	L. gal	L. gal	IGPM	L. gal	L. gal	IGPM	L. gal	L. gal	L. gal	L. gal	L. gal	L. gal	L. gal	L. gal	
Maracaibo - BFF	1500	2.0	0.0213		30	72,000	72,000	21.69	2,603	60,203	180,000	5,330	46,333	3,553	235,216	1,777	181,777	NO	NO	
Min Requirements.1	220	2.0	0.0213		30	72,000	72,000	21.69	2,603	60,203	26,400	5,330	7,933	3,553	43,216	1,777	28,177	Yes	Yes	
Min Requirements.2	265	1.5	0.0213		30	72,000	72,000	21.69	1,952	59,552	23,850	5,330	7,295	2,665	39,140	1,333	25,183	Yes	Yes	
Maxwell Lake - BFF	3100	3.0	0.5	694	118,400	118,400	320	57,600	152,320	558,000	125,000	170,750	125,000	978,750	62,500	620,500	NO	NO		
Min Requirements.1	220	2.0	0.5	694	118,400	118,400	320	38,400	133,120	26,400	125,000	37,850	83,333	272,583	41,667	68,067	NO	Yes		
Min Requirements.2	265	1.5	0.5	694	118,400	118,400	320	28,800	123,520	23,850	125,000	37,213	62,500	248,563	31,250	55,100	NO	Yes		
St. Mary's Lake - BFF	3100	3.0	0.5	694	331,200	331,200	160	28,800	293,760	558,000	125,000	170,750	125,000	978,750	62,500	620,500	NO	NO		
Min Requirements.1	220	2.0	0.5	694	331,200	331,200	160	19,200	284,160	26,400	125,000	37,850	83,333	272,583	41,667	68,067	Yes	Yes		
Min Requirements.2	265	1.5	0.5	694	331,200	331,200	160	14,400	279,360	23,850	125,000	37,213	62,500	248,563	31,250	55,100	Yes	Yes		
				0		0		0	0	0	0	0	0	0	0	0	0	NO	NO	
Fulford - BFF	1800	2.0	0.034	47	64,000	64,000	734	88,080	139,280	216,000	8,500	56,125	5,667	286,292	2,833	218,833	NO	NO		
Min Requirements.1	220	2.0	0.034	47	64,000	64,000	734	88,080	139,280	26,400	8,500	8,725	5,667	49,292	2,833	29,233	Yes	Yes		
Min Requirements.2	265	1.5	0.034	47	64,000	64,000	734	66,060	117,260	23,850	8,500	8,088	4,250	44,688	2,125	25,975	Yes	Yes		

Figure 5-2 Recognised Water Systems Analysis



5.3. Water Storage

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 absolute minimum water storage for fire fighting for any water system to be recognized for fire insurance purposes is 24,000 lgal.

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

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:

$$\text{Total Storage Required} = A + B + C + D$$

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 the Peak Hour Demand (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:

$$\text{Minimum Storage Required} = A + E$$

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

Alternatively, to meet the minimum requirements for fire insurance grading, water systems without storage may be able to qualify as an “Adequate Supply” if they are consistently available³.

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

Minimum flow availability = BFF + PHD

Where:

BFF = Basic Fire Flow

PHD = Peak Hourly Demand = (MDD/24) x 2

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 each of the recognised water systems, Figure 5-2 Recognised Water Systems Analysis shows a comparison of the minimum water required (for firefighting) 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 firefighting (including reservoir refill during fire event) and the quantity of water storage in the system. It should be noted that although the recognised water systems meet the minimum requirements for fire insurance grading purposes, the systems do not have sufficient storage to meet the Basic Fire Flow as can be seen in Figure 5-2 Recognised Water Systems Analysis.

Recommendation 2 Flow Test all Hydrants

It has been noted that some flow testing has occurred on Salt Spring Island; however, due to the nature of the water distribution systems it is recommended that all hydrants be flow tested and marked in accordance with NFPA 291 - Recommended Practice for Fire Flow Testing and Marking of Hydrants, recent edition. The

³ For water supplies to be considered to be consistently available, documentation must be provided of water levels of source(s) for a minimum of 25 years (50 years preferred). Additionally, detailed documentation of system reliability (including all main breaks and other service interruptions) must be provided for a minimum of 25 years (50 years preferred)

SSIFR should become familiar with areas of weak flow.

Recommendation 3 Further Establish Water Use Agreements

It was noted that a water use agreement exists with NSSWD; the fire department should continue to establish water use agreements with each water system on the island. Each agreement should contain a hold harmless statement for SSIFPD and SSIFR when using water supplies.

Recommendation 4 Long Range Planning and Awareness of Emergency Water Supplies

Long range planning should focus on the improvement of water supplies for fire protection by making the various water supply boards aware of the adequacy of their water systems in providing emergency water supplies.

Recommendation 5 Install Dry Hydrants on Identified Static Water Supplies

While it has been noted that some dry hydrants have been installed at strategic locations throughout the island, dry hydrants in accordance with NFPA 1142 - Standard on Water Supplies for Suburban and Rural Fire Fighting 2007 Edition should be installed on all static water supply sources used by fire department apparatus as drafting points. All dry hydrants should be maintained in accordance with the standard. The "Fire Underwriters Survey Alternate Water Supplies for Public Fire Protection" (section 2.4) states:

"Fire Underwriters Survey treats dry hydrants with suction points in the same way as it treats standard (pressurized) fire hydrants. Any property within 300 metres of a dry hydrant may be eligible for a Dwelling Protection Grade better than 3B, provided the building is within eight kilometres by road of a responding fire station, the fire department is recognized as meeting the criteria for a Dwelling Protection Grade of 3A or better and the fire department has adequate apparatus to effectively utilize the dry hydrant through suction."

In order for dry hydrants to be considered as recognised for fire insurance grading purposes, SSIFR should complete and return the WS7 – Dry Hydrant Recognition form, see Appendix C, for the following currently installed dry hydrants:

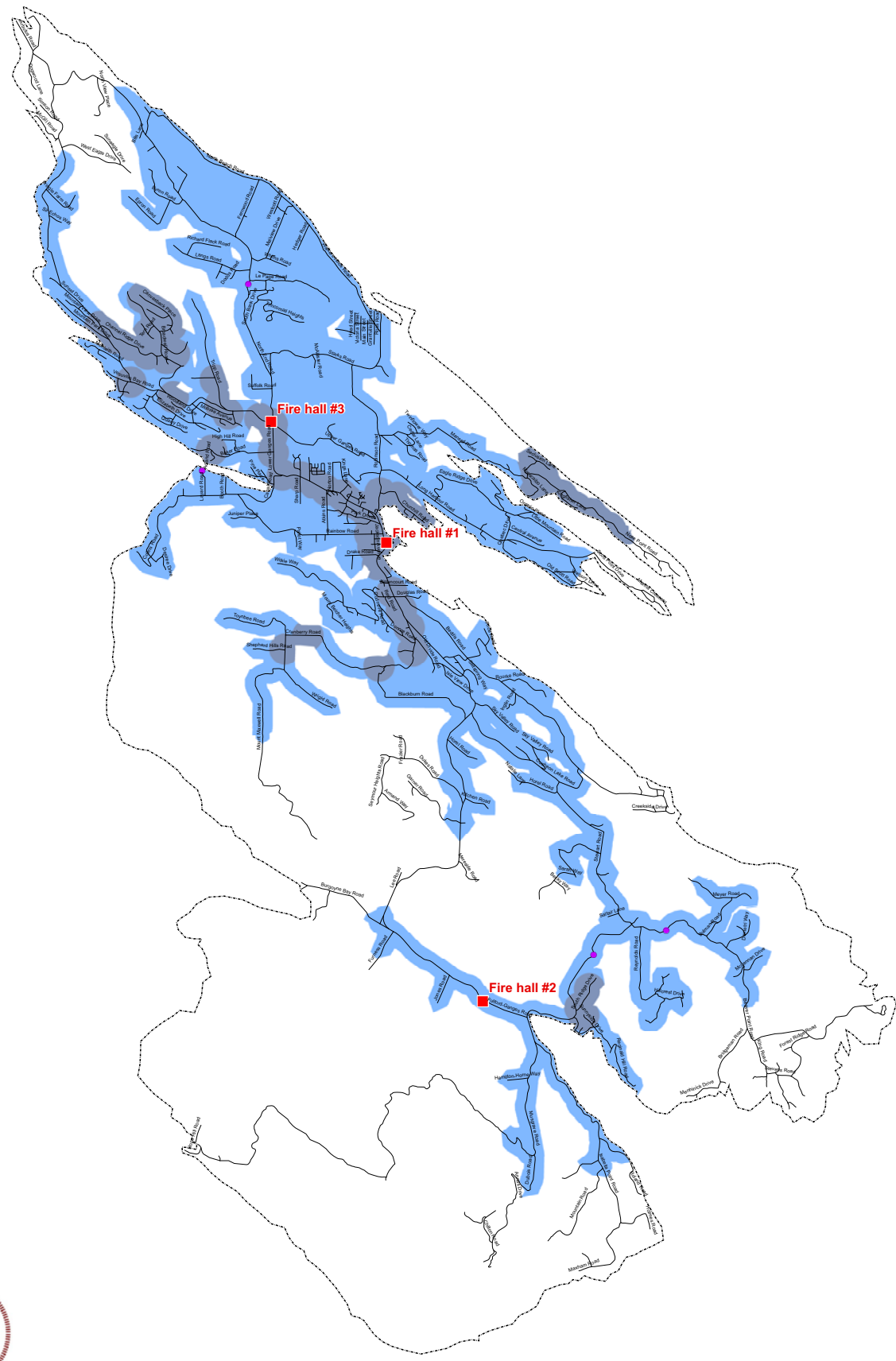
- Dry Hydrant on St. Mary's Lake near the intersection of North End road and Le Page road
- Dry Hydrant on Weston Lake at 756 Beaver Point road
- Dry hydrant on west side of Stowell Lake
- Hydrant on the Swan Point water distribution system

Recommendation 6 Superior Tanker Shuttle Service Accreditation

SSIFR should consider using these static water sources with dry hydrants and/or currently recognised water distribution systems for Superior Tanker Shuttle Service Accreditation for areas not covered by recognised hydrants. Regarding recognition of Superior Tanker Shuttle Service Accreditation by the insurance industry, "Fire Underwriters Survey Alternate Water Supplies for Public Fire Protection" (section 2.5, Conclusion) states:

“While it is up to individual insurers to determine their own level of comfort with recognizing or not recognizing the Fire Underwriters Survey Accredited Superior Tanker Shuttle Service, FUS recommends that accredited services be recognized as providing a reasonable equivalency to hydrant protection. Due to the need for specialized equipment, training and practice to deliver the service, it is imperative that Superior Tanker Shuttle Service be accredited according to a recognizable standard and that re-accreditations occur at a reasonable frequency.”

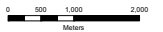
The “Fire Underwriters Survey Alternate Water Supplies for Public Fire Protection” is available for download at www.fireunderwriters.ca. Figure 5-3 Possible Superior Tanker Shuttle Service Accreditation area shows the possible coverage area should the SSIFR achieve Accreditation for each of the fire halls. Note that this figure indicates a coverage area representing 5km road distance from a recognised water supply point and 8km from a fire hall and that these are the benchmarks under which Accreditation occurs. Fire Underwriters Survey should be contacted for further information on Accreditation and testing procedures.



SALT SPRING ISLAND

Figure 5-3 Possible Superior Tanker Shuttle Service Accreditation Area

Scale = 1:27,000



Legend

-  Dry Hydrant
-  Fire Hall
-  Road
-  Fire Protection Area
-  Hydrant Protected Area
-  STSS Response Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

6. Fire Department Assessment

6.1. Apparatus in service

The FUS grading schedule evaluates the needed number of fire apparatus that are in service relative to the community's fire risk and fire hazard. The greater the risk and hazard rating, the more resources are needed to control or suppress a given fire, and consequently the greater the number of fire apparatus that are required. In assessing the number of pumper trucks that can be credited available for service a number of factors are considered including:

- Apparatus type,
- Apparatus condition
- Apparatus age
- Apparatus maintenance programs
- Community emergency response profile requirements
- The number and location of emergency response points

SSIFR apparatus have not changed since the last Fire Underwriters Survey, see Table 6-1 Apparatus Summary; however, due to an increase in the Basic Fire Flow for fire hall #1, the FUS grading schedule calls for 2 pumpers for initial response in each fire district, see Figure 4-2 Basic Fire Flow by district. Due to the proximity of fire hall #1 to fire hall #3, additional credit is received in the fire insurance grading index. Although, the majority of emergency calls may come from the Ganges area, the fire insurance grading index does not consider history of fire events.

Although fire apparatus should respond to first alarms for only the first fifteen years of service up to a maximum of 20 years for small communities and rural centres, FUS continues to partially recognise apparatus over 20 years of age provided the apparatus successfully meets the recommended annual tests and has been deemed to be in excellent condition. Tender T3 has reached 23 years; however, it was credited due to the fact that a replacement has been purchased and should be delivered in January 2010. It was noted that SSIFR has ordered a pumper for delivery in April/May 2010, and that the two mini-pumpers will be replaced with two CAFS systems within the next 18 months. When new apparatus is put into operation, SSIFR should notify FUS.

Table 6-1 Apparatus Summary

Hall	Year	Unit Identification	Vehicle Type	Pump & Tank GPM – Gallons	Manufacturers	Age
1	2003	E-1	Pumper/Rescue	1050 x 700	E-1 - Superior	6
1	2000	T-1	Tanker	420 x 1500	Superior	9
1	1994	M-1	LAV	400 x 200	Pierce / Ford	15
2	1997	E-2	Pumper	1050x 1000	Superior	12
2	1994	T-2	Tanker	420 x 1500	Superior / Freightliner	15
2	1994	M-2	LAV	400 x 200	Pierce / Ford	15
3	1992	E-3	Pumper	1050 x 700	Superior / Pierce	17
3	1986	T3	Tanker	250 x 1500	Anderson/International	23

As already stated, the Basic Fire Flow for the area associated with fire hall #1 has increased to 3100 IGPM. Table 4-2 Fire Underwriters Survey – Table of Effective Response indicates that a ladder apparatus is now required for fire insurance grading purposes. As discussed in the previous Fire Underwriters Survey, when evaluating the building profiles at the future Channel Ridge development, a ladder apparatus will likely be needed.

Recommendation 7 Aerial Apparatus

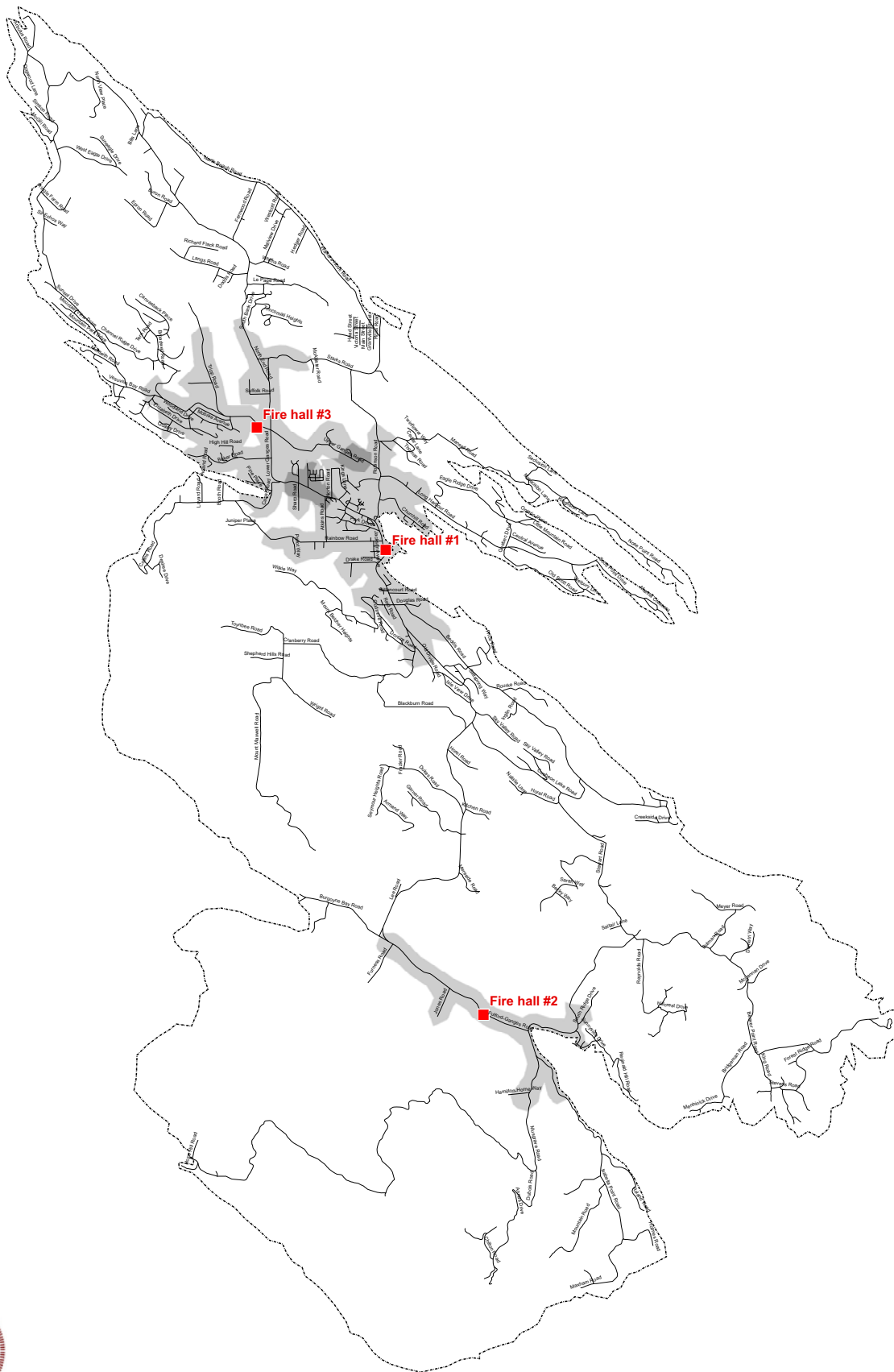
SSIFPD should consider planning the needs and merits of an aerial ladder apparatus to meet the profile of the community and the proposed building stock at the Channel Ridge development.

6.2. Distribution of Response

Maps Figure 6-1a 2.5km Road Response, Figure 6-2b 5km Road Response, and Figure 6-2c 8km Road Response illustrate 2.5km, 5km, and 8km road response distance respectively.

All commercial properties should ideally be located 2.5km road distance from a fire hall and all residential properties should be ideally located within 5km road distance from a fire hall. Figure 6-2a 2.5km Road Response and Figure 6-2b 5km Road Response indicate that the majority of commercial properties conform to this benchmark; however, response to residential properties can be excessive. 8km response by road is the maximum recognisable distance for residential properties for fire insurance grading purposes; therefore, any properties not covered as indicated by Figure 6-2c 8km Road Response are not recognised for fire insurance grading purposes.

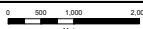
It can be seen that once the Channel Ridge development is completed, commercial properties will likely not receive recognition (pending site layout) for fire insurance grading purposes (maximum recognisable response distance for commercial properties is 5km) as can be seen in Figure 6-2b 5km Road Response. An assessment will need to be completed once Channel Ridge is built in order to determine what effect it will have on the fire insurance grading index, i.e. the development may have an overall negative effect on the PFPC classification.



SALT SPRING ISLAND

Figure 6-2a 2.5km Road Response

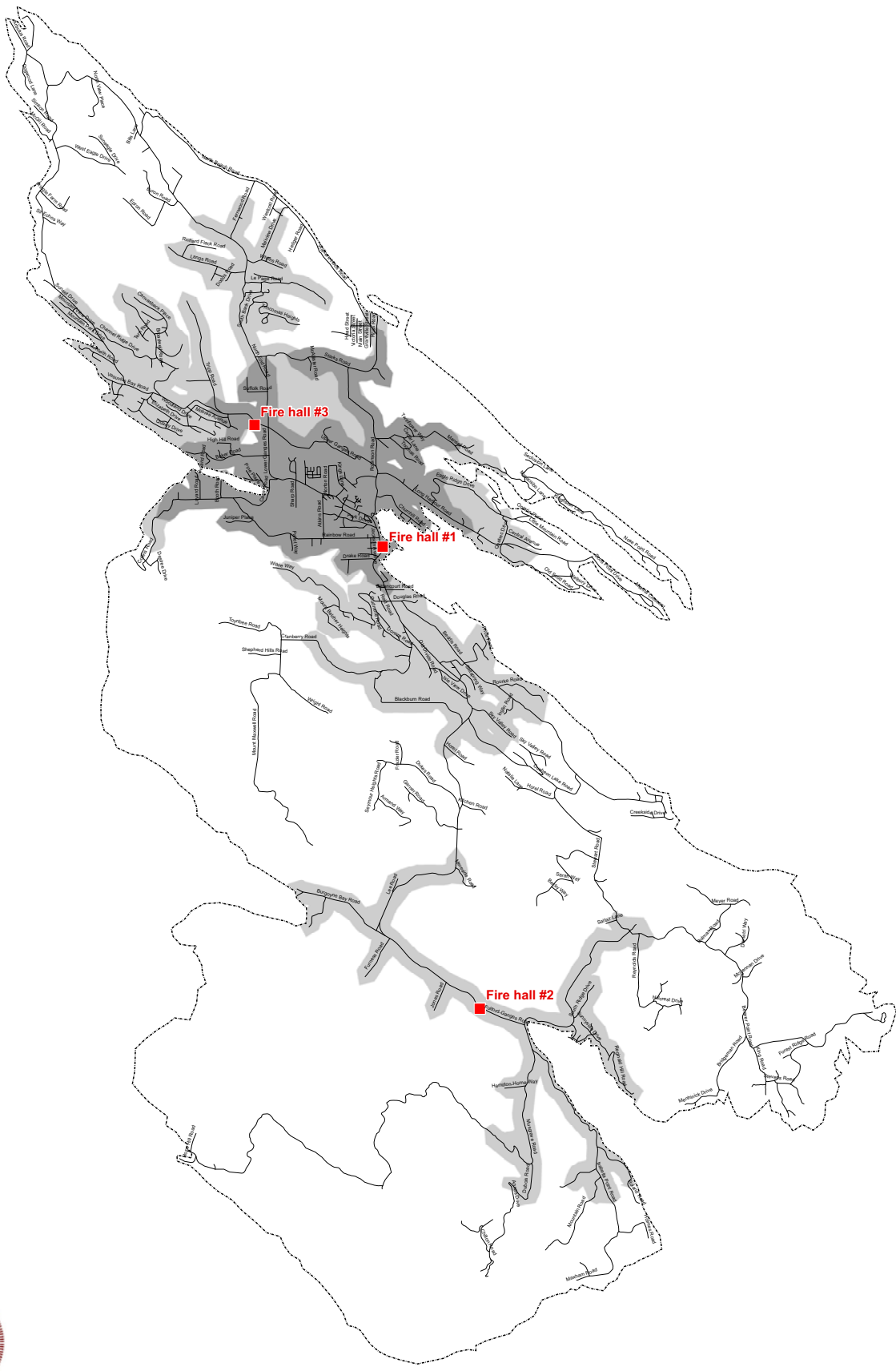
Scale = 1:27,000



Legend

- Fire Hall
- Covered By: One Fire Hall
- Road
- Covered By: Two Fire Halls
- Fire Protection Area

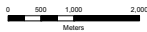
The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.



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Figure 6-2b 5km Road Response

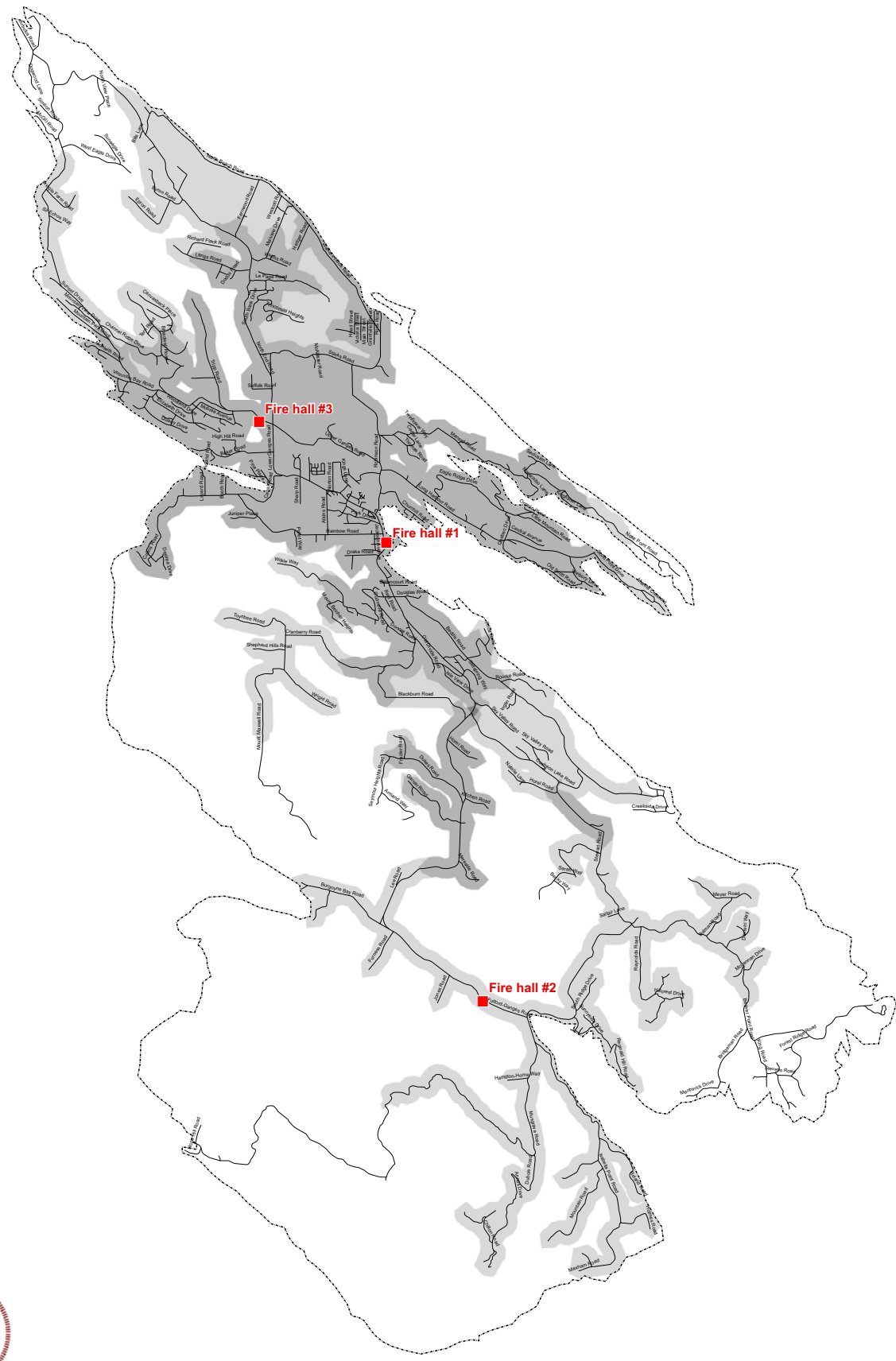
Scale = 1:27,000



Legend

- Fire Hall
- Covered By: One Fire Hall
- Covered By: Two Fire Halls
- Road
- Fire Protection Area

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.



SALT SPRING ISLAND

Figure 6-2c 8km Road Response
Scale = 1:27,000



Legend	
	Fire Hall
	Road
	Fire Protection Area
	Covered By: One Fire Hall
	Covered By: Two Fire Halls
	Covered By: Three Fire Halls

The maps and figures are intended to generally show the areas covered by SSIFR. These maps and figures are not intended to illustrate the exact response distance for each of the areas shown; however, they are intended to be used as a visual tool to assist the readers in showing areas where a delayed response is possible and understanding some of the basic methodologies used within the fire insurance grading. The accuracy of these maps is based on underlying data; field data should be used to confirm this data and accuracy of these maps. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map.

6.3. Design, Maintenance and Condition of Apparatus

The fire insurance grading evaluates the overall maintenance and service program for fire apparatus and equipment. Well documented, preventative maintenance service performed by an in-house mechanical service department is the benchmark used for comparison. Mechanical service should be available on demand when needed.

Since the last Fire Underwriters Survey, the following changes have been noted:

- Fire department pumpers are now serviced annually by Profire
- Individual apparatus service files are now kept
- Software is used to facilitate record keeping
- Replacement of T3 arriving in January

6.4. Number of Chief and Line Officers

The survey found that the number of chief and line officers currently in place whether career or volunteer continues to be sufficient given the number of pumpers in service and response districts.

6.5. Total Fire Force Available

The previous Fire Underwriters Survey credited 37 fire fighters including all line officers whether they are career or volunteer. 53 fire fighters have been credited in the current Fire Underwriters Survey which includes 47 volunteers and 6 career members. It was noted from incident response tracking that the average total turnout to structure fires is 25 for 2008 and 2009.

Career staff normally work day time hours with 2 to 3 members on duty during the week and one member on duty at weekends. A duty crew system is used for 24/7 coverage. All career staff are currently stationed at fire hall #1 in Ganges.

Recommendation 8 Career Fire Fighters

To maintain (considering future development) or improve the commercial classification, the available fire forces should be improved for the SSIFR. Note that the available fire forces can only be improved through the addition of career fire fighters as within the fire insurance grading index volunteers can only be credited up to 50% of the required fire force and are also assigned a lesser credit than career fire fighters, i.e. SSIFR has reached maximum credit for volunteers.

It has been noted that providing further career staffing is being explored in the "Salt Spring Island Fire Protection District 10 Year Plan 2008-2017". Obviously, there are many factors to consider in further career staffing and the fire insurance grading is only one such factor.

6.6. Fire Equipment

This survey found that SSIFR is adequately equipped with ancillary firefighting equipment.

6.7. Training

6.7.1. Training Programs and Qualifications

The SSIFR training program rated highly. Notable changes since the last Fire Underwriters Survey are:

- SOG #3.06.01.01 now requires 100% attendance at training sessions until the completion of basic training and to the satisfaction of the Training Officer.
- BC Fire Fighter Modular Program put in place (NFPA 1001 equivalency).
- SOG #3.06.01 requires members to attend a minimum of 100 hours of regular scheduled training in a calendar year.

These improvements have been credited in the fire insurance grading index.

6.7.2. Training Facilities

Currently, limited training can be carried out at the fire halls and fire fighters need to be sent off island for live fire training instruction. The classroom could not be assessed during the survey due to its use as a polling station.

Recommendation 9 Training Ground

The previous Fire Underwriters Survey identified the need for a fully functional training ground for the SSIFPD which would improve the fire department's training in the following areas:

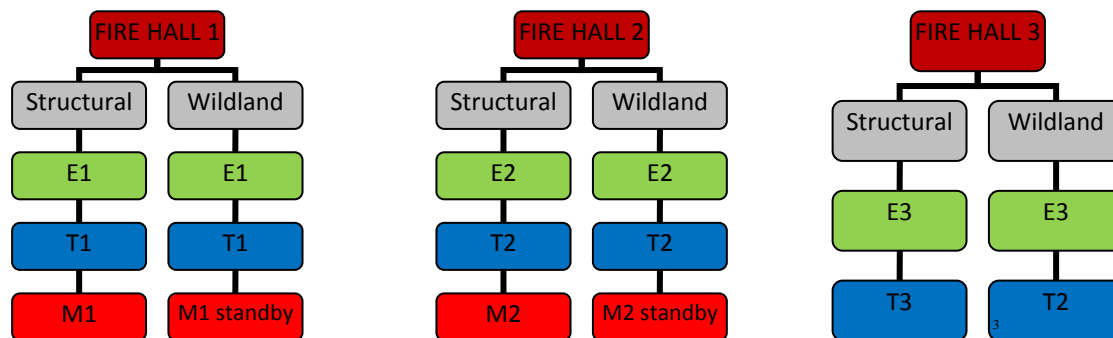
- Recruit driver training
- Pumps and pumping
- Laddering
- Wet drills
- Live fire drills
- Auto extrication
- Vehicle fires
- Forest interface fire training
- Pump service tests
- Improved indoor and outdoor classroom facilities
- SCBA rescue training
- Hazardous material spills response
- Flammable liquid and gas fires

This recommendation still stands. Although the SSIFPD has available property at fire hall #2 that could be used for this purpose, it was reported that local residents have objections.

6.8. Response to Alarms

An “Officers Page” is utilized for incidents other than fire or smoke showing. A general page is used for alarms of fire. Fire fighters respond directly to an incident unless they are close to a fire hall, which is different from the traditional system of responding as a company. Although responding as a company is the preferred approach, previous tracking of calls in the “Salt Spring Island Fire Protection District 10 Year Plan 2008-2017” indicated that response times would be longer if an engine remained at a hall until full crew turnout.

Since the last Fire Underwriters Survey, a pre-arranged fire response has been developed as follows:



Response times were identified in “Salt Spring Island Fire Protection District 10 Year Plan 2008-2017” and targets have been recommended to meet the requirements of NFPA 1720.

6.9. Operating Guidelines

SSIFR has a well developed, comprehensive and current set of operating guidelines. It has been noted that the recommendation from the previous Fire Underwriters Survey regarding developing a standard operating guideline for safety practices and procedures that need to be followed when conducting live fire or similar training has been put in place in the updates to Section 6 of the SOGs.

6.10. Special Protection Requirements

Special protection requirements on SSI include bush and grass fire exposures and marina fire fighting requirements. Previously, an off road air foam (CAFS) light attack vehicle with pump and roll capability was recommended. It was noted that the SSIFR is planning to replace the current mini pumpers with mini pumpers with CAFS within the next 18 months.

It is noted that while the SSIFR has various options for access to a marine vessel, the SSIFR does not currently have dedicated access to a vessel.

6.11. Fire Department Records

SSIFR utilize an internally created custom data collection software program to capture personnel, training, pre-incident planning, fire and hazard mapping, incident reports and fire prevention inspections. Although SSIFR work well with this program, support and maintenance of the system is becoming an issue as the software developer (an ex-member of the SSIFR) is no longer readily available. It was also noted that mechanical service records have improved.

Recommendation 10 Database Management Software

Acquire digital tracking and management software. Several boxed database programs are available that are specifically designed to assist in managing fire departments and consideration should be given to the benefits of using one that is suited to this fire department's needs. When considering the various options for digital tracking and management programs, due consideration should be given to the size of the department and potential integration with other software/platforms that the department (or related departments such as engineering and accounting) may already use.

6.12. Fire Stations

Of the three fire halls, fire hall #2 and fire hall #3 essentially serve the function of satellite fire halls with limited ability to handle administration and training at this time. These fire halls serve the purpose of apparatus storage and response points. It was previously noted that fire hall #2 has sufficient space for adequate training facilities.

Fire hall #1 is the primary fire hall with administration, management, public access, and training activities taking place here; however, the hall has limited space for office, storage, workshop, and classroom/meeting rooms. The building is of wood frame construction and may have seismic issues. Outstanding issues of this fire hall are as follows:

- No adequate training facilities
- Very limited storage space
- Limited workshop space
- Very limited administration office space
- No adequate vehicle exhaust
- Combustible construction
- Excessive public access to the site including public parking on the front apron
- Access and egress issues
- Front apron in poor condition and reported to accumulate water
- Storage space may not be adequate to house an aerial apparatus

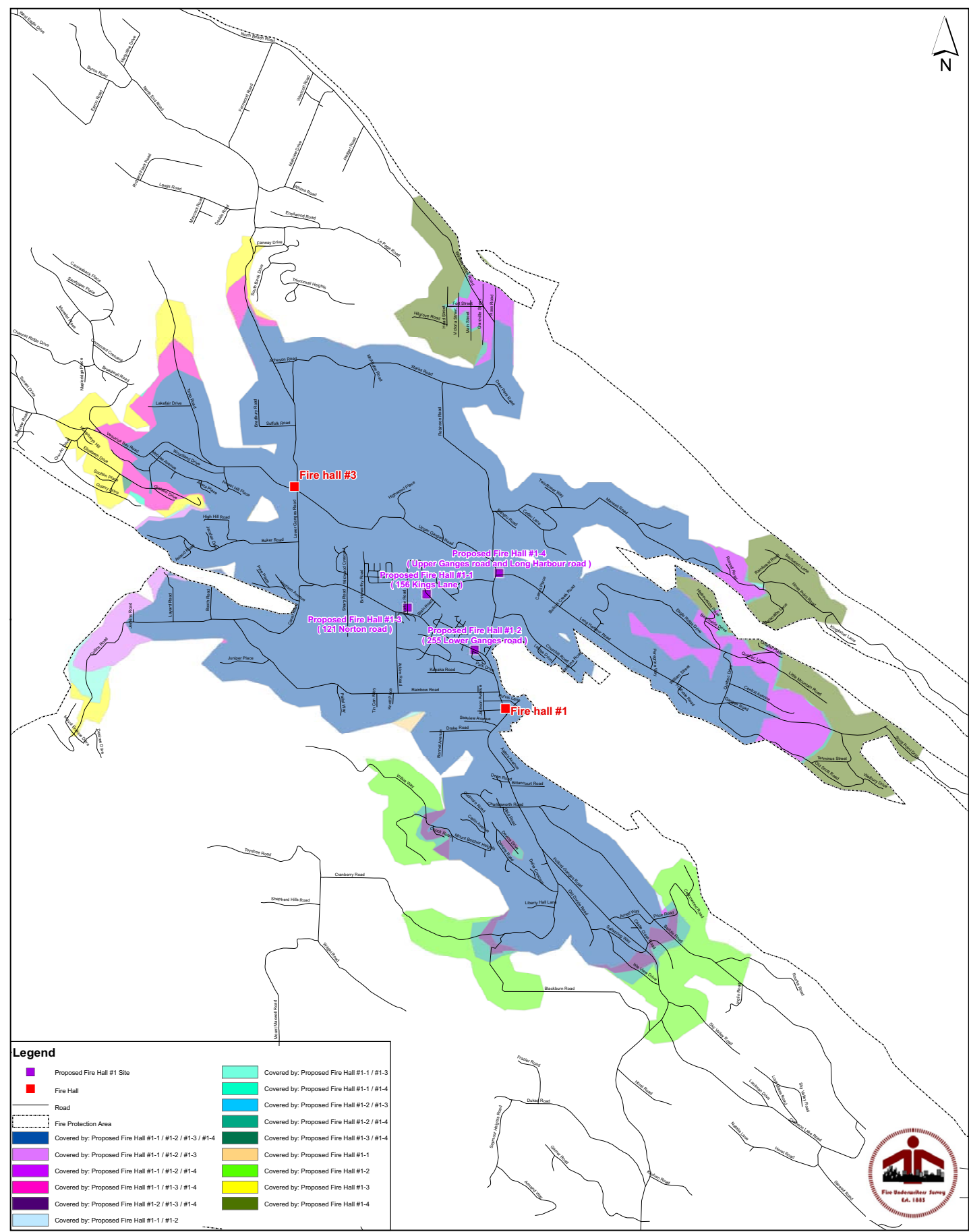
Recommendation 11 Fire Hall Location

It was noted during the survey that consideration of a new location for fire hall #1 is in progress. It is recommended that the location of fire hall #1 be maintained close to the Ganges Village core as already

stated. Figure 6-3 5km Response from Proposed Fire Hall #1 Sites shows the possible 5km road response coverage area for the following locations:

- Upper Ganges road and Long Harbour road
- 156 Kings Lane
- 255 Lower Ganges road
- 121 Norton road

It can be seen from Figure 6-12 5km Response from Proposed Fire Hall #1 that the proposed location will have little effect on the response coverage area from the point of view of road response distance; therefore, the decision on location should not weigh heavily on response area and more on ease of access and egress to major routes. As already discussed in section 6.2, when the Channel Ridge development is completed, the above fire hall locations may not be the optimal fire hall locations and may have an adverse effect of the PFPC classification, noting that commercial properties will likely not be recognised for fire insurance grading purposes (pending site layout). A complete assessment of the effect is beyond the scope of this letter but can be completed separately.



SALT SPRING ISLAND **Figure 6-12 5km Response from Proposed Fire Hall #1 Sites**

Scale = 1:12,500

The maps and figures are intended to generally show a 5km road distance from a fire hall. These maps and figures are not intended to illustrate the exact response distance. Fire Underwriters Survey does not warrant or make any representations with respect to the quality, completeness, currency or accuracy of anything contained in this map, the fitness of this map for any purpose or results obtained using information contained in this map and is not responsible for any action taken in reliance on information contained in this map. In all cases, field data should be used to confirm the data and accuracy of these maps.

6.13. Pre – Incident Planning

SSI FR has a pre-fire planning program in effect with approximately 121 pre plans completed. Apart from the command vehicle these pre plans are not digitally available on apparatus. Credit has been applied in the fire insurance grading index.

Recommendation 12 Make Pre Plans Available on all Pumper Apparatus

Allow pre plans to be digitally available on all pumper apparatus.

6.14. Fire Service Administration

A new fire chief, holding a number of qualifications and certifications, has recently been appointed is contributing to the management and administration of the fire department. It is noted that monthly and year end reports, budget projections and strategic plans are regularly developed.

Since the last Fire Underwriters Survey a 10 year plan has been developed which will continually be updated every 2 years thereby identifying further planning needs. The SSIFPD supports the SSIFR while continuing to meet the levels of service the community is willing to support. The Salt Spring Island Fire Protection District 10 Year plan identifies expected costs.

6.15. Fire Prevention

SSIFPD's fire safety programs have continued to maintain a relative PFPC class 4; notable strengths being in the areas of:

- Public Educations programs
- SOG on annual fire inspections cycle for commercial, mercantile, industrial, public assembly buildings.

Recommendation 13 Reassess Resources to Meet Inspection Frequency

It was noted during the survey that the fire department was having difficulty meeting the inspection frequency as set out in SOG #5.07.01 with approximately 300 inspections not completed for 2009 at the time. It is recommended that SSIFR maintain their inspection frequency through refocusing of inspection duties and resources.

6.16. Emergency Communications

The relative classification in this area of the fire insurance grading index has been maintained at PFPC 4. The previous FUS recommendations still stand.

Recommendation 14 Radio Communications

Incident radio communications should be recorded and archived by the SSIFR. Any dead spots should be removed.

7. Conclusion

This Fire Underwriters Survey found that SSIFR has implemented a sufficient number of the previous recommendations in order to maintain their current overall PFPC and DPG classifications; however, due to the dependence of the fire insurance grading index on water supplies, any future improvement to the PFPC classification will not be possible until improvements are made to the emergency water supplies (note that this is not relevant to the Maracaibo water distribution system which graded a PFPC relative class 5. In this case the PFPC classification is due to the excessive response distance from the fire hall. There is little commercial development in Maracaibo).

As updates to the water systems are complicated, it is advisable, as previously discussed, from the point of view of the Fire Underwriters Survey that SSIFR consider Dry Hydrant Recognition and Superior Tanker Shuttle Service Accreditation.

We would like to thank the Salt Spring Island Fire Protection District as well as the members of the Salt Spring Island Fire Rescue for their valuable and courteous assistance in conducting this survey and preparation of the survey report.

Please note that this report is Private and Confidential. The underlying data of this report has been developed for fire insurance grading and classification purposes.

Sincerely,

Robert McGuinness
Fire Protection Specialist
Fire Underwriters Survey

APPENDIX A – Flow test results

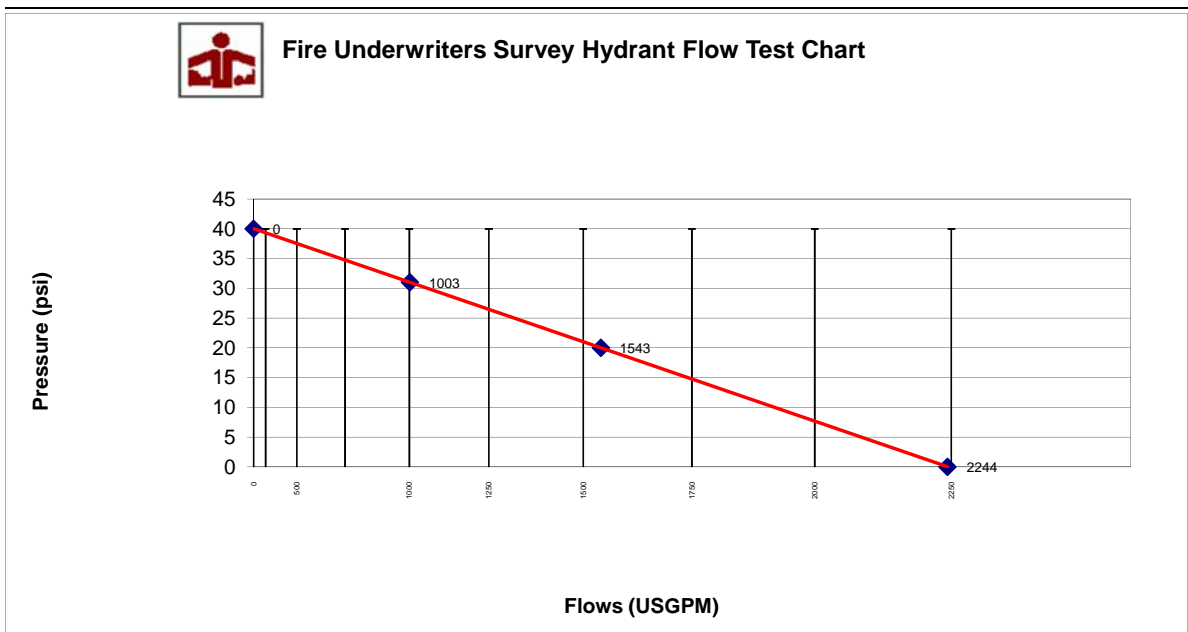
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES



Available Fire Flow Calculator

Name of Risk: <u>SFR + Commercial</u>	Test No: <u>1</u>
Municipality: <u>Salt Spring Island - Fulford</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>26-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2</u>
Occupancy: _____	Sprinklered?: <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: _____ Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Off Beaver Point road</u>	
Flow: <u>Off Beaver Point road</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	Orifice #2
COEFFICIENT:	Orifice #3
PITOT READING:	Orifice #4
GPM:	0
TOTAL FLOW DURING TEST:	0
1003 USGPM	
3795 L/MIN	
835 IGPM	
STATIC READING:	RESIDUAL: 31 PSI
40 PSI	
RATED CAPACITY:	AT 0 PSI 2244 USGPM
1543 USGPM	1869 IGPM
1285 IGPM	8492 L/MIN
5841 L/MIN	
REMARKS:	



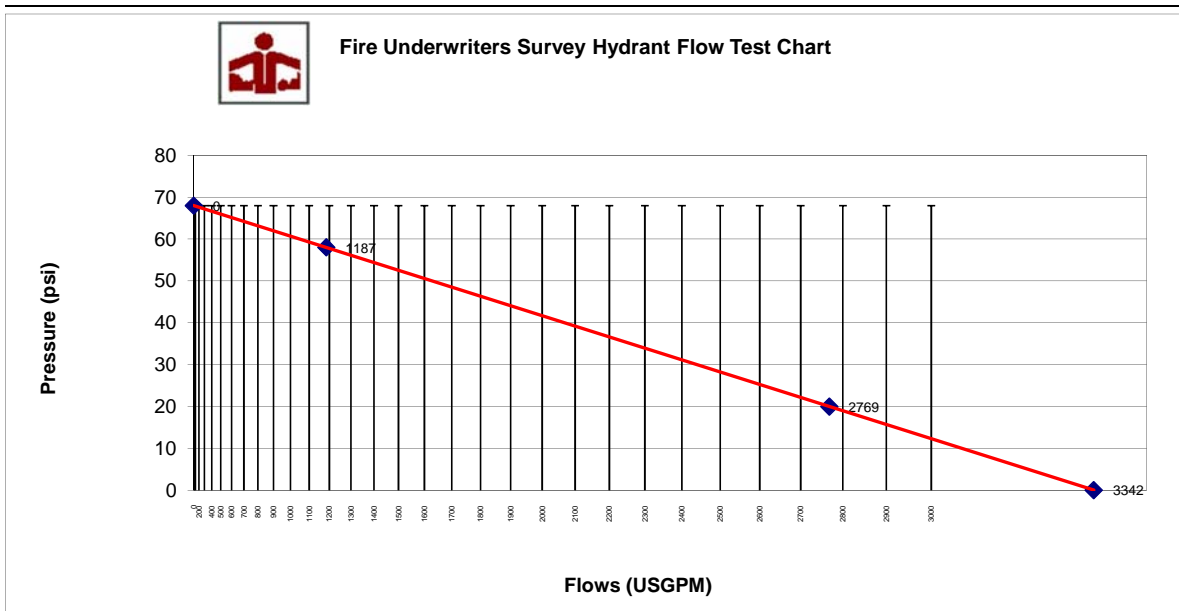
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>2</u>
Municipality: <u>Salt Spring Island NSWWD</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>26-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2 to 3</u>
Occupancy: _____	Sprinklered?: <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: <u>6 inch</u> Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Sanpiper road - Channel Ridge</u>	
Flow: <u>Sanpiper road - Channel Ridge</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	<u>2.5</u>
COEFFICIENT:	<u>0.9</u>
PITOT READING:	<u>50</u>
GPM:	<u>1187</u>
TOTAL FLOW DURING TEST:	<u>1187</u> USGPM
	<u>4492</u> L/MIN
	<u>989</u> IGPM
STATIC READING:	<u>68</u> PSI
	RESIDUAL: <u>58</u> PSI
RATED CAPACITY:	<u>2769</u> USGPM
	<u>2306</u> IGPM
	<u>10480</u> L/MIN
REMARKS:	



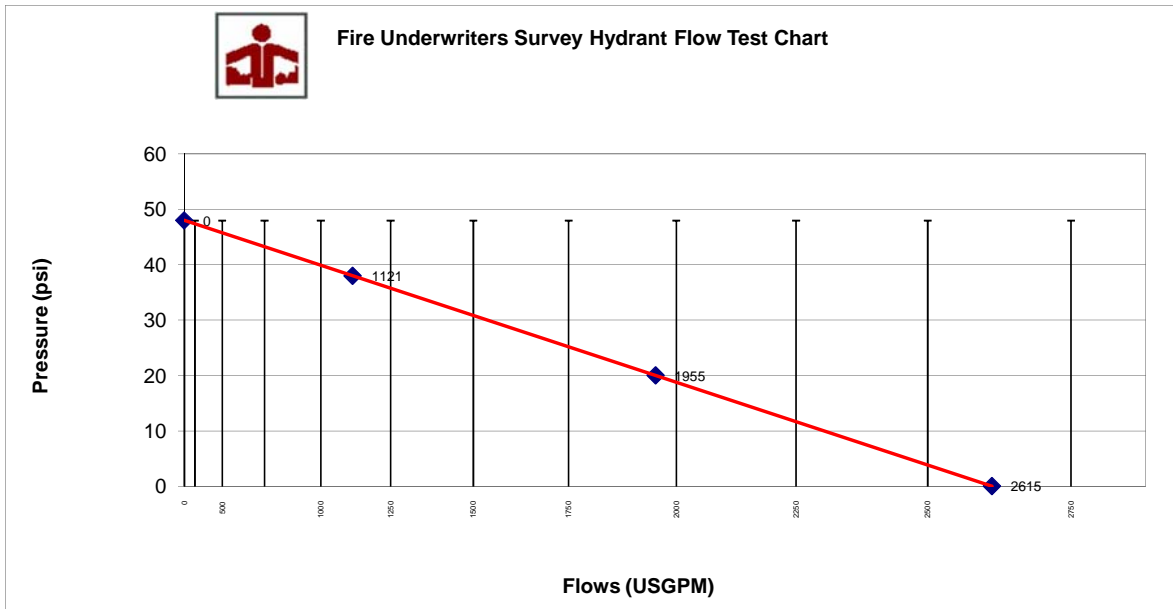
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES



Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>3</u>
Municipality: <u>Salt Spring Island NSWWD</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>26-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2 or 3</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: <u>6 inch</u> Dead End: <u>x</u> Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Boadwell rd at Tern road</u>	
Flow: <u>Murrelet Place at Tern road</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	<u>2.5</u> Orifice #2 _____ Orifice #3 _____ Orifice #4 _____
COEFFICIENT:	<u>0.85</u> _____ _____ _____
PITOT READING:	<u>50</u> _____ _____ _____
GPM:	<u>1121</u> <u>0</u> <u>0</u> _____
TOTAL FLOW DURING TEST:	<u>1121</u> USGPM <u>4243</u> L/MIN <u>934</u> IGPM
STATIC READING:	<u>48</u> PSI RESIDUAL: <u>38</u> PSI
RATED CAPACITY:	<u>1955</u> USGPM AT 0 PSI <u>2615</u> USGPM <u>1628</u> IGPM <u>2178</u> IGPM <u>7398</u> L/MIN <u>9897</u> L/MIN
REMARKS:	



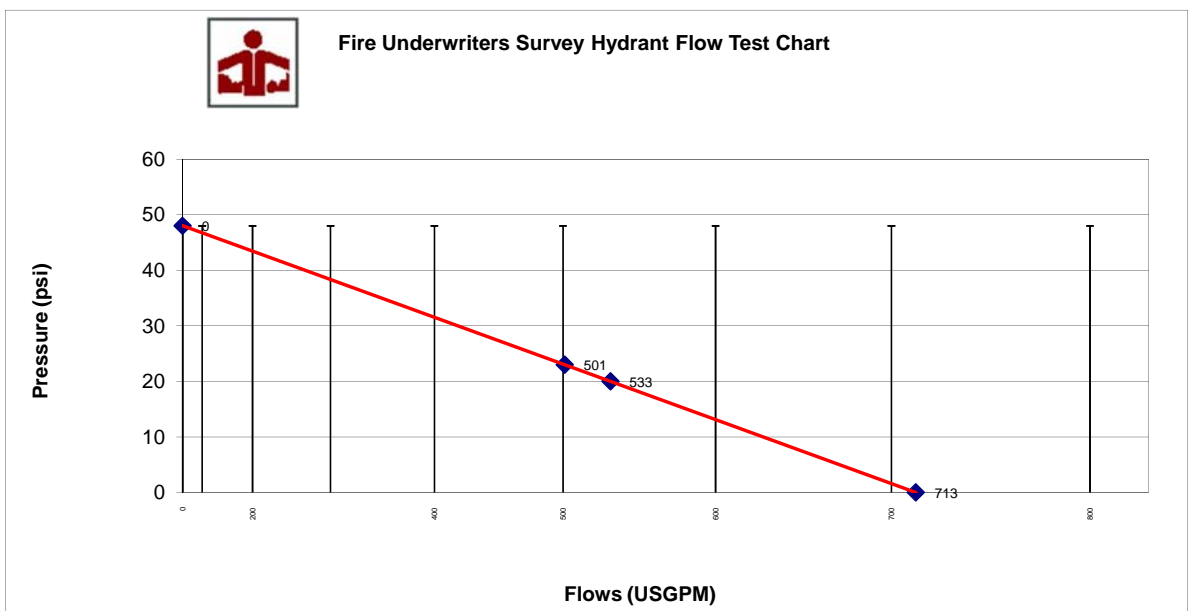
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>4</u>
Municipality: <u>Salt Spring Island NSWWD</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>26-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2 to 3</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: <u>6 inch</u> Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Sunset drive at Channel Ridge drive</u>	
Flow: <u>Sunset drive at Channel Ridge drive</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	<u>2.5</u> Orifice #2 _____ Orifice #3 _____ Orifice #4 _____
COEFFICIENT:	<u>0.85</u> _____ _____ _____
PITOT READING:	<u>10</u> _____ _____ _____
GPM:	<u>501</u> <u>0</u> <u>0</u> _____
TOTAL FLOW DURING TEST:	<u>501</u> USGPM <u>1897</u> L/MIN <u>418</u> IGPM
STATIC READING:	<u>48</u> PSI RESIDUAL: <u>23</u> PSI
RATED CAPACITY:	<u>533</u> USGPM AT 0 PSI <u>713</u> USGPM <u>444</u> IGPM <u>594</u> IGPM <u>2017</u> L/MIN <u>2699</u> L/MIN
REMARKS:	



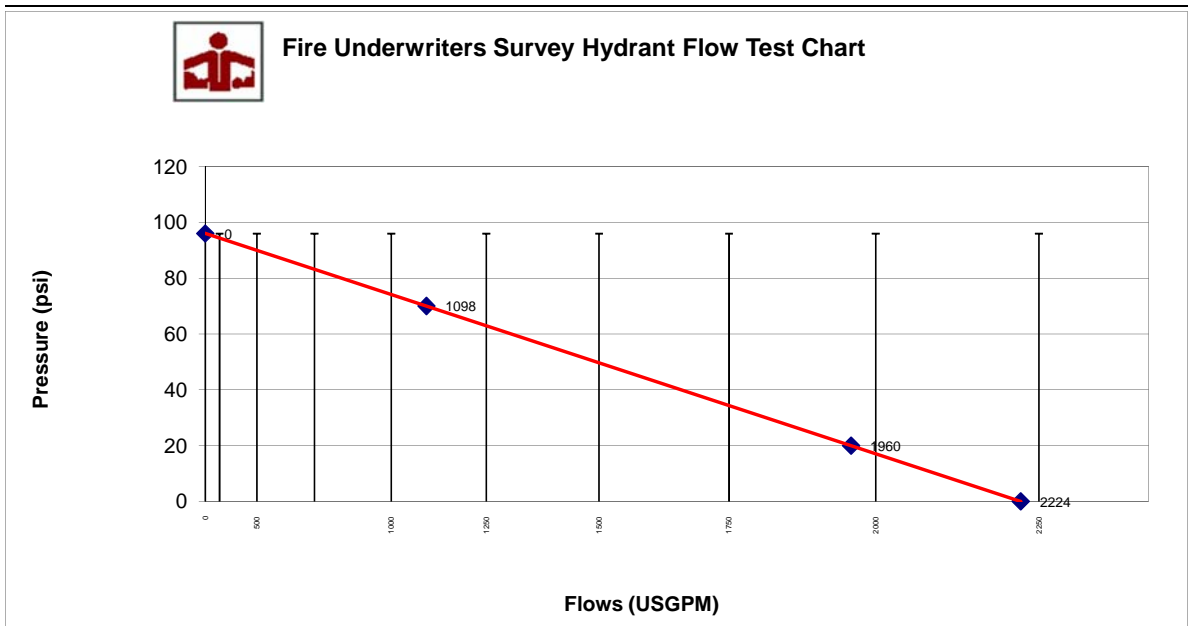
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
A SERVICE TO INSURERS AND MUNICIPALITIES



Available Fire Flow Calculator

Name of Risk: <u>Commercial</u>	Test No: <u>5</u>
Municipality: <u>Salt Spring Island NSWWD</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>26-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: _____ Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Hereford ave</u>	
Flow: <u>Arts Spring centre</u>	
FLOW HYDRANT(S)	Orifice #2 Orifice #3 Orifice #4
SIZE OPENING:	<u>2.5</u> _____ _____
COEFFICIENT:	<u>0.85</u> _____ _____
PITOT READING:	<u>48</u> _____ _____
GPM:	<u>1098</u> <u>0</u> <u>0</u>
TOTAL FLOW DURING TEST:	<u>1098</u> USGPM <u>4157</u> L/MIN <u>915</u> IGPM
STATIC READING:	<u>96</u> PSI RESIDUAL: <u>70</u> PSI
RATED CAPACITY:	<u>1960</u> USGPM AT 0 PSI <u>2224</u> USGPM <u>1633</u> IGPM <u>1852</u> IGPM <u>7419</u> L/MIN <u>8416</u> L/MIN
REMARKS:	



WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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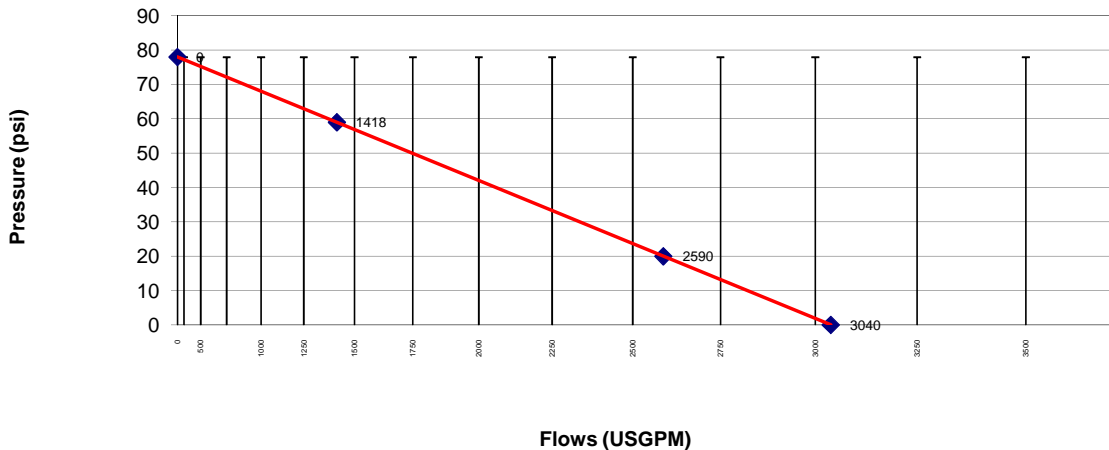


Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>7</u>
Municipality: <u>Salt Spring Island - Maracaibo</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>27-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: <u>6 inch</u> Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Nose Point road</u>	
Flow: <u>Kingfisher lane</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	Orifice #2
COEFFICIENT:	Orifice #3
PITOT READING:	Orifice #4
GPM:	0
TOTAL FLOW DURING TEST:	0
STATIC READING:	RESIDUAL: 59 PSI
RATED CAPACITY:	AT 0 PSI 3040 USGPM



Fire Underwriters Survey Hydrant Flow Test Chart



WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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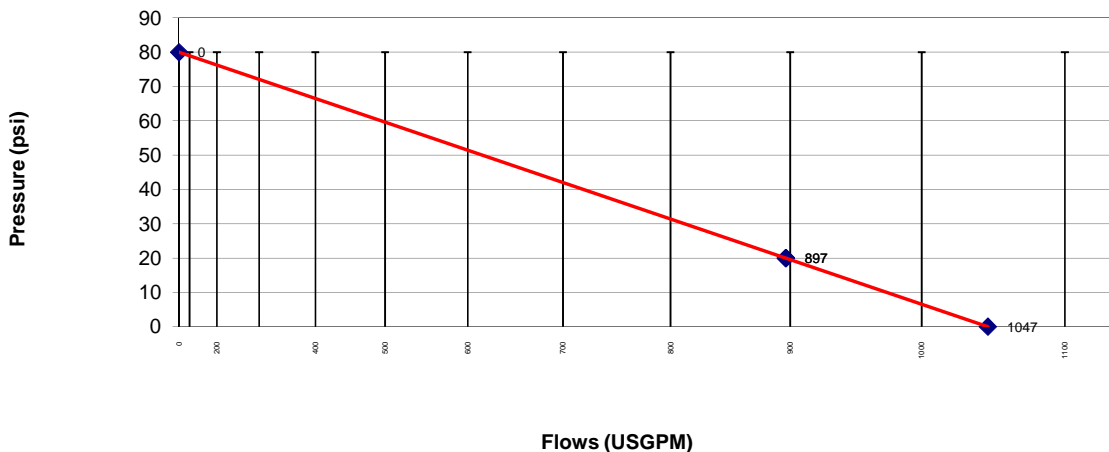


Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>8</u>
Municipality: <u>Salt Spring Island - Maracaibo</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>27-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: <u>6 inch</u> Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>Nose Point road</u>	
Flow: <u>Nose Point road</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	Orifice #2
COEFFICIENT:	Orifice #3
PITOT READING:	Orifice #4
GPM:	0
TOTAL FLOW DURING TEST:	0
STATIC READING:	RESIDUAL: 20 PSI
RATED CAPACITY:	AT 0 PSI
REMARKS:	



Fire Underwriters Survey Hydrant Flow Test Chart



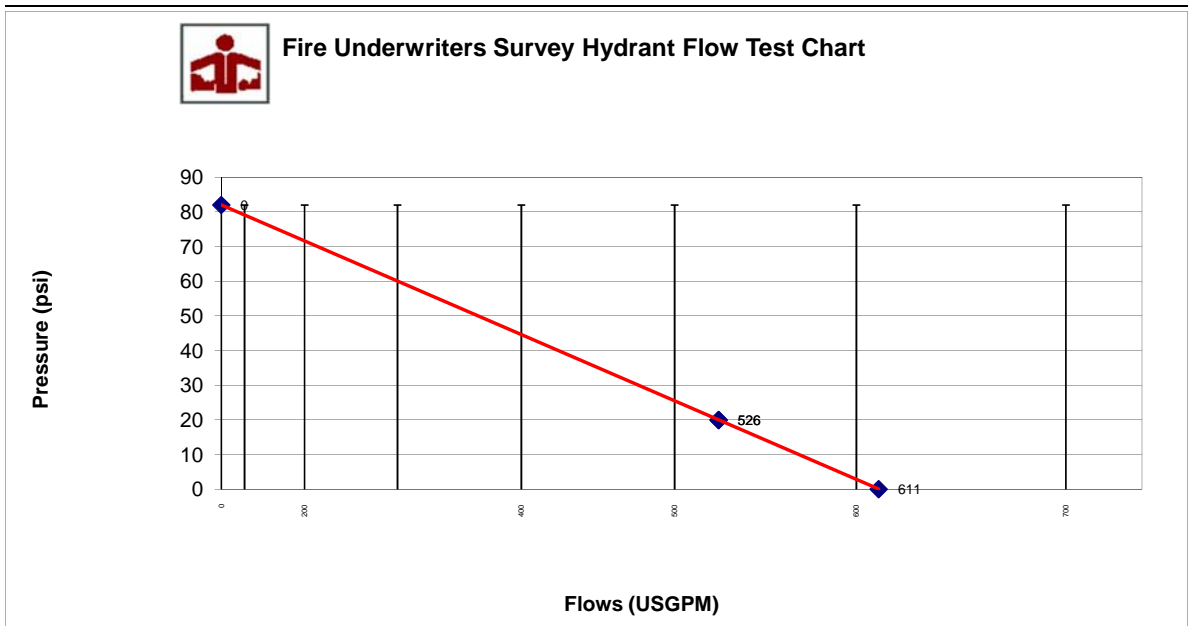
WATER FLOW TEST REPORT

FIRE UNDERWRITERS SURVEY
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Available Fire Flow Calculator

Name of Risk: <u>SFR</u>	Test No. <u>9</u>
Municipality: <u>Salt Spring Island - Maracaibo</u>	Test By: <u>Sunjeev Sodi/RMG</u>
Purpose of Test: <u>Fire Insurance Grading</u>	Date: <u>27-Nov-09</u>
Type of Construction: <u>Wood Frame</u>	
Ground Floor Area: _____	# of storeys: <u>2</u>
Occupancy: _____	Sprinklered? <u>no</u>
Exposures: Front: <u>n/a</u> Rear: <u>n/a</u> Left: <u>n/a</u> Right: <u>n/a</u>	
Size of Main: _____ Dead End: _____ Two Ways: _____ Loop: _____	
Source Reliable: _____ If not explain: _____	
Comments: _____	
TEST DATA:	
Location of test hydrants; Residual: <u>End of Nose Point road</u>	
Flow: <u>End of Nose Point road</u>	
FLOW HYDRANT(S)	
SIZE OPENING:	<u>2.5</u> Orifice #2 _____ Orifice #3 _____ Orifice #4 _____
COEFFICIENT:	<u>0.85</u> _____ _____ _____
PITOT READING:	<u>11</u> _____ _____ _____
GPM:	<u>526</u> <u>0</u> <u>0</u> _____
TOTAL FLOW DURING TEST:	<u>526</u> USGPM <u>1990</u> L/MIN <u>438</u> IGPM
STATIC READING:	<u>82</u> PSI RESIDUAL: <u>20</u> PSI
RATED CAPACITY:	<u>526</u> USGPM AT 0 PSI <u>611</u> USGPM <u>438</u> IGPM <u>509</u> IGPM <u>1990</u> L/MIN <u>2314</u> L/MIN
REMARKS:	



APPENDIX B – Water Supply for Public Fire Protection

**WATER SUPPLY
FOR
PUBLIC FIRE PROTECTION**

1999



FIRE UNDERWRITERS SURVEY

A SERVICE TO INSURERS AND MUNICIPALITIES

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:

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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 of 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 COPYRIGHT I.S.O.

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	Hotels	Prisons
Asylums	Institutions	Public Buildings
Churches	Libraries, except Large	Rooming Houses
Clubs	Stack Room Areas	Schools
Colleges & Universities	Museums	Tenements
Dormitories	Nursing, Convalescent	
Dwellings	and Care Homes	
Hospitals	Office Buildings	

Generally, occupancies falling in National Building Code Groups A, B, C and D are of this class.

Examples of High Hazard Occupancies:

Aircraft Hangars	Linseed Oil Mills
Cereal, Feed, Flour and Grist Mills	Match Manufacturing
Chemical Works - High Hazard	Oil Refineries
Cotton Picker and Opening Operations	Paint Shops
Explosives & Pyrotechnics Manufacturing	Pyroxylin Plastic Manufacturing & Processing
Shade Cloth Manufacturing	Solvent Extracting
Foamed Plastics, Storage or use in Manufacturing	Varnish and Paint Works
High Piled Combustibles Storage in excess of 6.5 metres high	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 – WS7 Dry Hydrant Recognition form



GENERAL

In order for Fire Underwriters Survey to recognise a dry hydrant for fire insurance grading purposes, certain eligibility standards must be met. The following form should be completed and returned indicating that these standards are being adhered to. If you do not supply all the requested information, your application cannot be reviewed.

NOTE: Recognition of a dry hydrant by Fire Underwriters Survey implies that the dry hydrant is suitable for fire insurance purposes. It does not imply that the dry hydrant/water supply will be adequate for fire protection purposes.

WHAT YOU NEED TO INCLUDE WITH YOUR APPLICATION:

Note: To avoid delays, please supply all of the information listed below in a complete and organized format.

	Location	FUS USE ONLY
<input type="checkbox"/> Section 1: Completed application form	Form	<input type="checkbox"/>
<input type="checkbox"/> Section 2: Standards Summary	Form	<input type="checkbox"/>
<input type="checkbox"/> Section 3: Fee Schedule and Cheque for Fee Amount Enclosed \$ _____	Form	<input type="checkbox"/>
<input type="checkbox"/> Photographs showing the entire site in relation to the water source	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Flow test results demonstrating flow capacity through pumper apparatus. Flow tests will be carried out with a pitot gauge, which is calibrated annually, and witnessed by the AHJ or a P.Eng and results signed/stamped	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Fire department Standard Operating Procedures for use of static water supplies.	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Dry hydrant design report showing calculations ensuring the system is designed and constructed to provide a minimum flow of 3800 L/min (1000 USgpm) at draft.	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Dry fire hydrant drawings/plans (an example of this has been provided as well as blank plan sheet)	Plan sheet/ drawing	<input type="checkbox"/>
<input type="checkbox"/> A highlighted map that clearly shows the direction to the proposed site including major landmarks and roads	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Evidence of reliability of static source (50 year drought and flood cycle)	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Test, inspection, maintenance, and repair records for dry hydrant	Attachment	<input type="checkbox"/>
<input type="checkbox"/> Dry hydrant pre-construction permit and record of installation	Attachment	<input type="checkbox"/>



Fire Underwriters Survey
A Service to Insurers and Municipalities

Dry Fire Hydrant
Recognition form

www.fireunderwriters.ca

Page 2 of 8

All documents should be returned to:

Fire Underwriters Survey,
#101, 3999 Henning Drive,
Burnaby, BC,
V5C 6P9



Section 1: Application form

Landowner Information (where hydrant is located)

Name		E-mail Address		
Address				
<input type="checkbox"/> City	<input type="checkbox"/> Town	<input type="checkbox"/> Village	Province	Post Code
		<input type="text"/>		
		Phone	Fax	
		()	()	

Water Source Owner Information (if different from Landowner)

Name		E-mail Address		
Address				
<input type="checkbox"/> City	<input type="checkbox"/> Town	<input type="checkbox"/> Village	Province	Post Code
		<input type="text"/>		
		Phone	Fax	
		()	()	

Dry Hydrant Installation Information

GPS Location:				
Date of Installation		Name of Installation Company		
Contact Name		E-mail Address		
Address				
<input type="checkbox"/> City	<input type="checkbox"/> Town	<input type="checkbox"/> Village	Province	Post Code
		<input type="text"/>		
		Phone	Fax	
		()	()	

Dry Hydrant Design Information (if different from above)

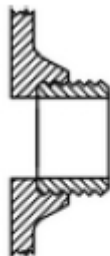
Date of Design		Name of Company		
Contact Name		E-mail Address		
Address				
<input type="checkbox"/> City	<input type="checkbox"/> Town	<input type="checkbox"/> Village	Province	Post Code
		<input type="text"/>		
		Phone	Fax	
		()	()	



Which of these diagrams represents the dry hydrant outlet? *Please check the box*



Outlet smooth and rounded (coef. 0.90)



Outlet square and sharp (coef. 0.80)



Outlet square and projecting into barrel (coef. 0.70)

Responding Fire Hall information

Name of Fire Department		
Name of Fire Chief		
Phone ()	E-mail Address	
Physical Land Address of Responding Fire Hall		
<input type="checkbox"/> City <input type="checkbox"/> Town <input type="checkbox"/> Village	Province	Post Code

Flow Test fire Apparatus

Type	Year of manufacture
ULC Certificate #	Manufacturer
Pump Capacity (lgpm)	Tank Capacity (lgals)

Declaration

I hereby declare that the information contained herein is true and accurate. I have read and understand all of the standards listed in this form. The project is designed to comply with and maintained in accordance with the standards. I understand that failure to comply with any or all of the standards, or providing false information, renders this application and subsequent recognition null and void.

Landowner Signature	Date
---------------------	------



Name of representative of AHJ (please print)	
Representative of AHJ signature	Title of representative of AHJ
Phone ()	Fax ()
E-mail Address	Date <input type="text"/>

LEAVE BLANK – FUS USE ONLY	
Date Application Received	Date Application Completed
Received by	



Section 2: Standards Summary

This sheet describes the standards and conditions that will be met in order for a dry hydrant to be recognised for fire insurance grading purposes. These standards ensure that the dry hydrant conforms to NFPA specifications. By checking the boxes, you certify that your system conforms to the standards.

- Any water supply source used to meet the requirements of this standard is of a quality approved by the AHJ.
- The water supply source is maintained and accessible on a year-round basis.
- The water supply source maintains the minimum capacity and delivery requirements on a year-round basis, based on the 50-year drought for the water source.
- The AHJ enters into a water use agreement when a private water supply source is to be used to meet the requirements of this standard.
- A water source indicator approved by the AHJ is erected at each water point identifying the site for fire department emergency use.
- Any fitting provided at a water source to permit a fire apparatus to connect to the water source is approved by the AHJ and shall conform to NFPA 1963, Standard for Fire Hose Connections.
- Roads providing a means of access to the required water supply are constructed and maintained in accordance with the following:
 - (1) Roadways have a minimum clear width of 3.7 m for each lane of travel.
 - (2) Turns are constructed with a minimum radius of 30.5 m to the centerline.
 - (3) The maximum sustained grade does not exceed 8 percent.
 - (4) All cut-and-fill slopes are stable for the soil involved.
 - (5) Bridges, culverts, or grade dips are provided at all drainageway crossings; roadside ditches are deep enough to provide drainage with special drainage facilities (tile, etc.) at all seep areas and high water-table areas.
 - (6) The surface is treated as required for year-round travel.
 - (7) Erosion control measures are used as needed to protect road ditches, cross drains, and cut-and-fill slopes.
 - (8) Where turnarounds are utilized during fire-fighting operations, they are designed with a diameter of 36.5 m or larger, as required, to accommodate the equipment of the responding fire department.
 - (9) Load-carrying capacity is adequate to carry the maximum vehicle load expected.
 - (10) The road is suitable for all-weather use.
- To promote operational safety and effectiveness, the AHJ determines what training is required.
- A record of each water supply is prepared and periodically updated.
- The records are retained in accordance with the record retention policy of the jurisdiction.
- The AHJ ensures that generally accepted design practices were employed during the following:
 - (1) Dry hydrant(s) location planning
 - (2) The permit process
 - (3) Design criteria
 - (4) Construction
- The planning, permitting, and design processes were completed before the actual construction began.
- Planning was coordinated among public and private entities that could be impacted by the installation of a dry hydrant(s).
- Required permits to install a dry hydrant were obtained prior to installation.
- The AHJ approved all aspects of the dry hydrant(s) design and construction, including the type of materials, pipe size, and system fittings used.
- As a minimum, Schedule 40 pipe and component fittings are used.
- The dry hydrant(s) system is designed and constructed to provide a minimum flow of 3800 L/min (1000 USgpm) at draft. The water supply source for the dry hydrant(s) provides, on a year-round basis, the required quantity of water, as determined in NFPA 1142, Chapter 4, and the minimum flow of 3800 L/min (1000 USgpm) at draft.
- The dry hydrant system is designed and constructed so that slope and piping configurations do not impede drafting capability.
- All exposed surfaces and all underground metal surfaces are protected to prevent deterioration.
- A minimum number of elbows are used in the piping system.
- Suction hose connection(s) are compatible with the fire department's hard suction hose size and conform to NFPA 1963, Standard for Fire Hose Connections. The connection(s) includes a protective cap. The cap and adapter are of materials that minimize rust and galvanic corrosion.
- The dry hydrant(s) system piping is supported and/or stabilized using approved engineering design practices.
- Stabilization or equivalent protection is employed at elbows and other system stress points.



- In addition to strength of materials and structural support criteria, the design specifies appropriate aggregates and soil materials used to backfill/cover piping during installation.
- All connections are clean, and the appropriate sealing materials are used according to manufacturer's specifications so as to ensure that all joints are airtight.
- System strainers are constructed to permit required fire flow.
- Adequate working space is provided around the dry hydrant(s) to provide for a safe working environment.
- The dry hydrant(s) is located such that it is accessible under all weather conditions.
- The dry hydrant system and access to the site is developed in a manner that allows the fire department pump to connect to the hydrant using not more than 6m (20ft) of hard suction hose.
- The dry hydrant(s) is located a minimum of 30m (100ft) from any structure.
- No parking or other obstacles are allowed within 6m (20ft) of the access side of the hydrant(s).
- The dry hydrant(s) is protected from damage by vehicular and other perils, including freezing and damage from ice and other objects.
- The dry hydrant(s) locations are made visible from the main roadway during emergencies by reflective marking and signage approved by the AHJ.
- All identification signs are approved by the highway authority prior to installation if they are to be located on the right-of-way or are subject to provincial laws.
- There is not less than 0.6m (2ft) of water above the strainer and not less than 0.3m (1ft) below the strainer.
- Depth of the water is based on the 50-year drought level for the water source.
- The AHJ ensured that the installation meets all design criteria.
- The dry hydrant(s) is inspected at least quarterly and maintained as necessary to keep it in good operating condition.
- Thorough surveys are conducted, to reveal any deterioration in the water supply situation in ponds, streams, or cisterns.
- Grass, brush, and other vegetation are kept trimmed and neat. Vegetation is cleared for a minimum 0.9m (3ft) radius from around hydrants.
- The hydrants shall be flow tested at least annually with a fire department pump to ensure the minimum design flow is maintained.
- The AHJ shall maintain, in a safe location, maps and records of each dry hydrant installation and the subsequent tests, inspections, maintenance, and repairs to the dry hydrant.

Declaration

I hereby declare that the information contained herein is true and accurate. I have read and understand all of the standards listed in this form. The project is designed to comply with and maintained in accordance with the standards. I understand that failure to comply with any or all of the standards, or providing false information, renders this application and subsequent recognition null and void.

Landowner Signature	Date
---------------------	------

Name of representative of AHJ (please print)	
Representative of AHJ signature	Title of representative of AHJ
Phone ()	Fax ()
E-mail Address	Date



Section 3: Fee Schedule

Information about Fees for Application for dry hydrant recognition

The Fire Underwriters Survey fee for document review and subsequent decision on recognition of dry hydrant for fire insurance grading purposes is \$200.

Fire Underwriters Survey can carry out flow testing for an additional \$250 (not including travel costs).

Activity applied for: <input type="checkbox"/> Document review <input type="checkbox"/> Flow Testing	Amount enclosed \$ Make cheques payable to " "
--	--

LEAVE BLANK – FUS USE ONLY	
Fee received \$	Received by

DRAWINGS OF PROPOSED ACTIVITY SHOULD BE PREPARED IN ACCORDANCE WITH SAMPLE DRAWING

Location Sketch (Indicate scale.) Show route to project site: include nearest main road and crossroad.

DRY HYDRANT SAMPLE DRAWING

Proposed Materials

450mm diameter PVC pipe with perforated inlet screen

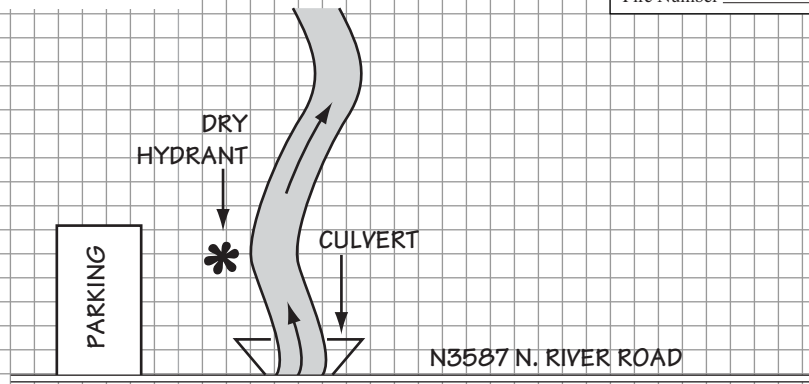
150-300mm diameter rock riprap

Additional erosion controls:



1" = 100'

Fire Number N3587

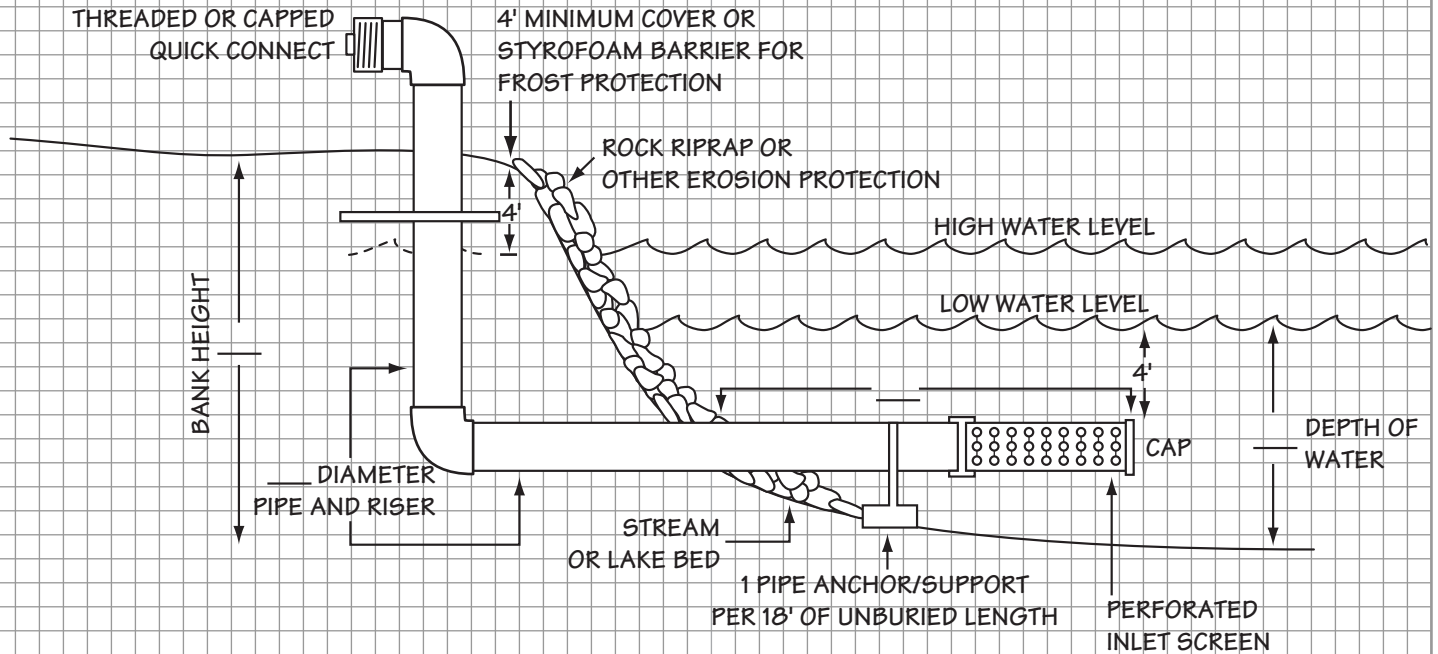


Project Plans. (Include top view and typical cross sections. Clearly identify features and dimensions or indicate scale.) Use additional sheets if necessary.



1" = 8'

Cross Section



Dry Hydrant Plan Sheet

Recognition form

Location Sketch, Proposed Materials and Project Plans

Drawings of proposed activity should be prepared in accordance with sample drawing.

Location Sketch (Indicate scale)

Show route to project site: include nearest main road and crossroad.

N

1cm = _____ m

Fire Number _____



Proposed Materials

Project Plans (Include top view and typical cross sections. Clearly identify features and dimensions or indicate scale.)

Use additional sheets if necessary.

N

1cm = _____ m

Top View



Cross Section