VILLAGE OF HARRISON HOT SPRINGS
NOTICE OF MEETING AND AGENDA

REGULAR COUNCIL MEETING

Date: Tuesday, February 19, 2019
Time: 7:00 p.m.
Location: Council Chambers, 495 Hot Springs Road
Harrison Hot Springs, British Columbia

1. CALL TO ORDER		
Meeting called to order by Mayor Facio.		
2. INTRODUCTION OF LATE ITEMS		
3. APPROVAL OF AGENDA		
4. ADOPTION OF COUNCIL MINUTES		
(a) THAT the Regular Council Meeting Minutes of February 4, 2019 be adopted		**Item 4(a) Page 1**
(b) THAT the Special Council Meeting Minutes of February 14, 2019 be adopted		**Item 4(b) Page 7**
5. BUSINESS ARISING FROM THE MINUTES		
6. CONSENT AGENDA		
i. Bylaws	(a) Highway and Traffic Amendment Bylaw No. 1136, 2019	**Item 6.i(a) Page 11**
ii. Agreements		
iii. Committee/ Commission Minutes	(a) Draft Resort Development Committee Meeting Minutes of January 31, 2019	**Item 6.iii(a) Page 13**
iv. Correspondence		
7. DELEGATIONS/PETITIONS		
(a) Fraser Valley Health Care Foundation, Robert Beischer Re: Foundation work in the region		**Item 7(a) Page 15**
8. CORRESPONDENCE		
(a) Community Wildfire Protection Plan 2017		**Item 8(a) Page 17**
9. BUSINESS ARISING FROM CORRESPONDENCE		
10. REPORTS OF COUNCILLORS, COMMITTEES, COMMITTEE OF THE WHOLE AND COMMISSIONS		

11. REPORTS FROM MAYOR

12. REPORTS FROM STAFF

(a) Report of the Infrastructure Manager – January 23, 2019
Re: Fire Hall Seismic

Item 12(a)
Page 135

Recommendation

THAT the Fire Hall Seismic Report be received.

(b) Report of the Planning Consultant – February 4, 2019
Re: To start the Development Variance Permit process – 102 Rockwell Drive

Item 12(b)
Page 260

Recommendation

That staff be authorized to start work on application 3090-20-DVP11/18 for land legally described as: DL 5031, Group 1, New Westminster District.

(c) Report of the Planning Consultant – February 4, 2019
Re: To start the Development Variance Permit process – 875 Hot Springs Road

Item 12(c)
Page 264

Recommendation

That staff be authorized to start work on application 3090-20-DVP01/19 for land legally described as: Lot G, Sec 12, Twp 4, Rg 29, W6M, New Westminster District Plan 16245.

(d) Report of the Financial Officer – February 15, 2019
Re: Inter-Municipal Business Licence Program

Item 12(d)
Page 268

Recommendation

THAT Council authorize staff to pursue registering the Village of Harrison Hot Springs as a participant in the Fraser Valley Inter-Municipal Business Licence program starting in the year 2020.

13. BYLAWS

(a) Report of the Financial Officer - February 12, 2019
Re: 2019-2023 Financial Plan Bylaw No. 1134, 2019

Item 13(a)
Page 270

Recommendation

THAT the 2019-2023 Financial Plan Bylaw No. 1134, 2019 be given second reading as amended;

FURTHER THAT the 2019-2023 Financial Plan Bylaw No. 1134, 2019 be given third reading.

(b) Report of the Planning Consultant – February 19, 2019
Re: Business Licence Bylaw No. 1128, 2018

Item 13(b)
Page 286

Recommendation

THAT Bylaw 1128, 2018 be given the first two readings; and

THAT staff be authorized to set up a community notification process as per the requirements of the Community Charter. This will include the posting of the Notice of Intent advertisement and the setting up of a community session to collect any written and/or any verbal comments on the bylaw.

14. QUESTIONS FROM THE PUBLIC (pertaining to agenda items only)

15. ADJOURNMENT

4(a)

VILLAGE OF HARRISON HOT SPRINGS
MINUTES OF THE REGULAR MEETING OF COUNCIL

DATE: Monday, February 4, 2019
TIME: 7:00 p.m.
PLACE: Council Chambers
495 Hot Springs Road, Harrison Hot Springs, BC

IN ATTENDANCE: Mayor Leo Facio
Councillor Ray Hooper
Councillor Gerry Palmer
Councillor Samantha Piper
Councillor Michie Vidal

Deputy Administrative Officer/Corporate Officer, Debra Key
Tracey Jones, Financial Officer
Troy Davis, Infrastructure Manager
Rhonda Schell, Community Services Coordinator

ABSENT:
Chief Administrative Officer, Madeline McDonald
Ken Cossey, Planning Consultant

Recording Secretary: Nicole Sather

DRAFT

1. CALL TO ORDER

Mayor Facio called the meeting to order at 7:00 p.m.

2. INTRODUCTION OF LATE ITEMS

Items 12 (c) and 12 (d), Reports of the Planning Consultant, be removed from the Agenda and deferred to the next Regular Council Meeting of February 19, 2019 as the Planning Consultant is unable to attend.

3. APPROVAL OF AGENDA

Moved by Councillor Piper
Seconded by Councillor Vidal

THAT the agenda be approved, as amended.

CARRIED
UNANIMOUSLY
RC-2019-02-01

4. ADOPTION OF COUNCIL MINUTES

Moved by Councillor Piper
Seconded by Councillor Hooper

THAT the Regular Council Meeting Minutes of January 21, 2019 be adopted, as amended.

Errors & Omissions:

- Page 4, under Councillor Hooper's Report, bullet 3, sentence should read "*...held on January 15, 16 and 17...*"

CARRIED UNANIMOUSLY
RC-2019-02-02

Moved by Councillor Piper
Seconded by Councillor Vidal

THAT the Committee of the Whole Meeting Minutes of January 30, 2019 be adopted.

CARRIED UNANIMOUSLY
RC-2019-02-03

5. BUSINESS ARISING FROM THE MINUTES

None

6. CONSENT AGENDA

i. (a) Sewer Fee Regulation Amendment Bylaw No. 1133, 2019

iii. (a) Resort Development Committee Minutes of December 12, 2018

Moved by Councillor Palmer
Seconded by Councillor Hooper

THAT Sewer Fee Regulation Amendment Bylaw No. 1133, 2019 be adopted; and

THAT the Minutes of the Resort Development Strategy Committee meeting be received.

CARRIED UNANIMOUSLY
RC-2019-02-04

7. DELEGATIONS/PETITIONS

None

8. CORRESPONDENCE

None

9. BUSINESS ARISING FROM CORRESPONDENCE

None

10. REPORTS OF COUNCILLORS, COMMITTEES, COMMITTEE OF THE WHOLE AND COMMISSIONS

Councillor Vidal

- Attended the Sts'ailes First Nation Council to Council meeting held on January 22, 2019
- Attended the Harrison Hot Springs Fire Department evening practice held on January 22, 2019
- Attended the Regular Council meeting held on January 21, 2019
- Attended the Royal Canadian Mounted Police Strategic Planning meeting held on January 23, 2019
- Attended the Community to Community Forum hosted by Cheam First Nation held on January 23, 2019
- On behalf of the Mayor, attended the Fraser Valley Regional District Regional Directors Board meeting held on January 23, 2019
- Attended the Committee of the Whole Regular and In Camera meetings held on January 30, 2019
- Attended the In Camera Regular Council held on February 4, 2019

Councillor Hooper

- Attended the Sts'ailes First Nation Community to Community meeting held on January 22, 2019
- Attended the Royal Canadian Mounted Police Strategic Planning meeting held on January 23, 2019
- Attended the Community to Community Forum hosted by Cheam First Nation held on January 22, 2019
- Attended a meeting with the Port Moody Mayor and Councillors held on January 27, 2019
- Attended the 60s Scope First Nation Workshop held on January 29, 2019
- Attended the Committee of the Whole Regular and In Camera meetings held on January 30, 2019

Councillor Palmer

- Attended the Fraser Valley Regional Library Board meeting

Councillor Piper

- Attended the Sts'ailes First Nation Community to Community meeting held on January 22, 2019
- Attended the Royal Canadian Mounted Police Strategic Planning meeting held on January 23, 2019
- Attended the Community to Community Forum at Cheam held on January 22, 2019
- Attended the Tourism Harrison Board of Directors meeting held on January 23, 2019
- Attended the Committee of the Whole meeting held on January 30, 2019
- Chaired the Resort Development Strategic Committee Meeting held on January 31, 2019

11. **MAYOR'S REPORT**
- Reported that the Shoulder Enhancement Project signage is under discussion to promote multiuse
- Attended a meeting with the Port Moody Mayor and Councillors held on January 27, 2019
- Attended the Community to Community Forum hosted by Cheam held on January 22, 2019
- Attended the Royal Canadian Mounted Police Strategic Planning meeting held on January 23, 2019

12. REPORTS FROM STAFF

(a) Report of the Deputy Chief Administrative Officer – February 4, 2019 (verbal)
Re: Bylaw Services Agreement and Legal Services Award of Contract.

Deputy Chief Administrative Officer reported out from an In Camera Council meeting held on February 4, 2019 regarding the approval of a new Five-Year Bylaw Enforcement Services Agreement and the award of a Five-Year Legal Services Contract to Lidstone and Company.

(b) Report of the Community Services Coordinator – February 1, 2019
Re: Resort Development Strategy Committee

Mayor Facio thanked the Resort Development Committee for their efforts on researching and providing their input and recommendation on the Resort Development Strategy for Council's consideration.

Moved by Councillor Piper
Seconded by Councillor Hooper

THAT Council authorize staff to prepare a draft Resort Development Strategy based on the identified priority capital projects in this report.

OPPOSED BY MAYOR FACIO/
OPPOSED BY COUNCILLOR HOOPER/
OPPOSED BY COUNCILLOR VIDAL
MOTION FAILED

Moved by Councillor Hooper
Seconded by Councillor Vidal

THAT the draft Resort Development Strategy be referred to staff for further information; and

THAT a Special Council meeting be held on Thursday, February 14, 2019 at 2:00 p.m. to finalize the Resort Development Strategy.

CARRIED
UNANIMOUSLY
RC-2019-02-05

13. BYLAWS

(a) Report of the Financial Officer – January 30, 2019
Re: 2019-2023 Financial Plan Bylaw No. 1134, 2019

Moved by Councillor Piper
Seconded by Councillor Vidal

THAT the 2019-2023 Financial Plan Bylaw No. 1134, 2019 be introduced and be given first reading; and

THAT the 2019-2023 Financial Plan be forwarded for public consultation at an Open House to be held on February 15, 2019.

CARRIED
UNANIMOUSLY
RC-2019-02-06

(b) Report of the Deputy Chief Administrative Officer/CO – February 1, 2019
Re: Amendment to Highway and Traffic Bylaw No. 974, 2011

Moved by Councillor Palmer
Seconded by Councillor Vidal

THAT Highway and Traffic Amendment Bylaw No. 1136, 2019 be given first, second and third reading.

CARRIED
UNANIMOUSLY
RC-2019-02-07

14. QUESTIONS FROM THE PUBLIC (pertaining to agenda items only)

Questions from the public were entertained.

15. ADJOURNMENT

Moved by Councillor Palmer
Seconded by Councillor Vidal

THAT the meeting be adjourned at 8:12 p.m.

CARRIED
UNANIMOUSLY
RC-2019-02-08

Leo Facio Mayor	Debra Key Corporate Officer

4(b)

VILLAGE OF HARRISON HOT SPRINGS
MINUTES OF THE SPECIAL MEETING OF COUNCIL

DATE: Thursday, February 14, 2019
TIME: 2:00 p.m.
PLACE: Council Chambers
495 Hot Springs Road, Harrison Hot Springs, BC

IN ATTENDANCE: Mayor Leo Facio
Councillor Ray Hooper
Councillor Gerry Palmer
Councillor Samantha Piper
Councillor Michie Vidal

Chief Administrative Officer, Madeline McDonald
Deputy Administrative Officer/Corporate Officer, Debra Key
Rhonda Schell, Community Services Coordinator

ABSENT:

Recording Secretary: Nicole Sather

1. CALL TO ORDER

Mayor Facio called the meeting to order at 2:00 p.m.

2. INTRODUCTION OF LATE ITEMS

None

3. APPROVAL OF AGENDA

Moved by Councillor Piper
Seconded by Councillor Vidal

THAT the agenda be approved.

CARRIED
UNANIMOUSLY
SC-2019-02-01

4. DELEGATIONS/PETITIONS

None

5. REPORTS FROM STAFF

The Chief Administrative Officer presented an overview of the Resort Municipality Initiatives (RMI) highlighting the objectives of increasing tourist activity throughout the year and increasing overnight stays.

(a) Report of Community Services Coordinator – February 11, 2019
Re: Resort Development Strategy Projects (2019-2021)

The Community Service Coordinator reported that RMI communities must complete and submit a draft multi-year Resort Development Strategy (RDS) to the Province by March 15, 2019. A Resort Development Strategy (RDS) identifies projects and guides how RMI funds are spent. The projects identified in the RDS must be based on tourism infrastructure.

The Community Services Coordinator presented Council with the Resort Development Committee recommendations of projects listed below.

- Public Art on Lagoon
- Village Centre WiFi
- Synthetic Outdoor Rink
- Boat Launch Upgrades
- Solar Charging/ Conversation Station
- Water Bottle Refill
- Sidewalk to Ranger Station
- Misting Station
- Lagoon Bridge or Lookout
- Splash Park
- Lillooet West

Discussion ensued regarding the proposed Resort Development Strategy projects, priority, cost, funding requirements, tourism and accessibility.

Moved by Councillor Hooper
Seconded by Councillor Palmer

THAT the following projects are the priority of Council for the Resort Development Strategy:

- Synthetic outdoor rink which includes improvements to the adjacent building, washrooms and the preparation of surface to support the rink;
- Lagoon and beach area improvements including accessibility upgrades; and
- Public art on the lagoon or beach front area.

CARRIED
UNANIMOUSLY
SC-2019-02-02

6. BYLAWS

None

7. QUESTIONS FROM THE PUBLIC (pertaining to agenda items only)

Questions from the public were entertained.

8. ADJOURNMENT

Moved by Councillor Vidal
Seconded by Councillor Palmer

THAT the meeting be adjourned at 3:06 p.m.

CARRIED UNANIMOUSLY
SC-2019-02-03

Leo Facio
Mayor

Debra Key
Corporate Officer

6i(a)

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS
BYLAW NO. 1136

A bylaw to amend Highway and Traffic Bylaw No. 974, 2011

WHEREAS the Village of Harrison Hot Springs has deemed it advisable to amend Highway and Traffic Bylaw No. 974, 2011 to reflect an increase in pay parking fees under the pay parking program;

NOW THEREFORE in open meeting assembled, the Mayor and Council of the Village of Harrison Hot Springs enacts as follows:

1. This Bylaw may be cited for all purposes as Village of Harrison Hot Springs "Highway and Traffic Amendment Bylaw No. 1136, 2019".
2. Highway and Traffic Bylaw No. 974, 2011 hereby amended by deleting Schedule "A" in its entirety and substituting it with Schedule "A" attached hereto and forming part of this bylaw.

READINGS AND ADOPTION

READ A FIRST TIME THIS 4th DAY OF FEBRUARY, 2019

READ A SECOND THIS 4th DAY OF FEBRUARY, 2019

READ A THIRD TIME THIS 4th DAY OF FEBRUARY, 2019

ADOPTED THIS DAY OF DAY OF FEBRUARY, 2019

Leo Facio Mayor	Debra Key Corporate Officer

DRAFT

Highway and Traffic Amendment Bylaw No. 1136

Schedule "A"

The following highways are designated as pay parking areas for the purposes of pay parking and will be subject to the following pay parking fees, and as amended from time to time:

- Esplanade Avenue
- St. Alice Street
- Hot Springs Road north of Lillooet Avenue
- Maple Street
- Chehalis Street
- Spruce Street

Time	Rate
Any hour	*$3.00 per hour*
6:00 a.m. to 7:00 p.m.	*up to a daily maximum of $12.00*

6iii(a)

VILLAGE OF HARRISON HOT SPRINGS
RESORT DEVELOPMENT STRATEGY
COMMITTEE MEETING

DATE:	January 31, 2018
TIME:	4:00 p.m.
PLACE:	Harrison Beach Hotel 160 Esplanade Avenue Harrison Hot Springs, BC
IN ATTENDANCE:	Councillor Samantha Piper, Chair Community Services Coordinator, Rhonda Schell Tourism Harrison Board of Directors Chair, Tara Ryder Tourism Harrison Executive Director, Robert Reyerse
ABSENT:	Chief Administrative Officer, Madeline McDonald

Recording Secretary: Nicole Sather

1. CALL TO ORDER

The Chair called the meeting to order at 4:03 p.m.

2. INTRODUCTION OF LATE ITEMS

None

3. APPROVAL OF AGENDA

Moved by Tara Ryder
Seconded by Robert Reyerse

THAT the agenda be approved.

CARRIED
UNANIMOUSLY
RDS-2019-01-01

4. ADOPTION OF MINUTES

Moved by Rhonda Schell
Seconded by Tara Ryder

THAT the Minutes of December 12, 2018 Resort Development Strategy Committee Meeting be adopted as presented.

CARRIED
UNANIMOUSLY
RDS-2019-01-02

5. ITEMS FOR DISCUSSION

(a) Email dated January 25, 2019 from Robert Reyerse, Executive Director of Tourism Harrison
Re: Tourism Projects

Correspondence received and filed.

(b) Potential Capital Projects for RMI Funding 2019-2022

Annual budget projected to be $350,000.00 per annum after the following expenditures:

- $90,000 per annum to events (Tourism Harrison)
- $10,00 per annum to administrative costs

Discussion ensued on the priority projects to recommend to Council regarding the Resort Development Strategy for the Regular Council Meeting scheduled for Tuesday, February 19, 2019.

The Community Services Coordinator will prepare a report to Council including a PowerPoint Presentation recommending the following projects and associated costs:

- Public Art on Lagoon
- Village Centre WiFi
- Synthetic Outdoor Rink
- Boat Launch Washroom/ Lighting Upgrade
- Solar Charging/ Conversation Station
- Water Bottle Refill
- Sidewalk to Ranger Station
- Misting Station

Resort Development Strategy to be drafted for Council's approval prior to March 15, 2019.

(c) Further Public Consultation

A webpage will be created to for public consultation. Page content will include a visual demonstration of the synthetic ice rink.

7. ADJOURNMENT

Moved by Tara Ryder
Seconded by Robert Reyerse

THAT the meeting be adjourned at 4:25 p.m.

CARRIED
UNANIMOUSLY
RDS-2019-01-03

Councillor Samantha Piper Chair	Debra Key Corporate Officer

7(a)

RECEIVED

JAN 29 2019

VILLAGE OF HARRISON HOT SPRINGS

HARRISON HOT SPRINGS

Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS

Request to Appear as a Delegation

In order to make a presentation to Council at a Council Meeting, you are required to submit a written request to the Corporate Administration Department no later than 12:00 p.m. on the Wednesday before the regular meeting. The request can either be a copy of this completed form or a separate letter that you have written which contains the information requested on this form. All requests must be accompanied with background information which will be included in the agenda package. You can submit your request in person, by mail at PO Box 160 Harrison Hot Springs, BC V0M 1K0, fax at 604-796-2192 or e-mail at admin@harrisonhotsprings.ca.

The Corporate Administration Department will advise you when you are scheduled to appear before Council. Council meetings commence at 7:00 p.m. in the Village Council Chambers at 495 Hot Springs Road, Harrison Hot Springs, BC.

You are limited to a maximum of 10 minutes to present your material, regardless of the number of presenters in your delegation.

Date: Jan 07/2019 Requested Meeting Date: Feb 19/2019

Organization Name (if applicable): Fraser Valley Health Care Foundation

Name of Presenter: Liz Harris

Name of Applicant if Other than Above: Rob Beischer

Contact Phone Number & E-Mail: 6048514890 robert.beischer@fraserhealth.ca

Mailing Address with Postal Code: 32900 Marshall rd Abbotsford BC V2S0C2

Audio/Visual requirements: Power Point

Topic: Foundations Work in the Region

Action you wish Council to take: For information only

8(a)

Village of Harrison Hot Springs Community Wildfire Protection Plan 2017

Submitted by:

B.A. Blackwell & Associates Ltd.
270 – 18 Gostick Place
North Vancouver, BC, V7M 3G3
Ph: 604-986-8346
Email: bablackwell@bablackwell.com

B.A. Blackwell & Associates Ltd.

Submitted to:
Gerald Basten, CFO, Deputy Fire Chief,
Emergency Program Coordinator
Village of Harrison Hot Springs
495 Hot Springs Rd, Harrison Hot Springs, BC V0M 1K0
Ph: 604-819-5570
Email: basten@agassizfire.com

HARRISON HOT SPRINGS
Naturally Refreshed

ACKNOWLEDGEMENTS

The authors would like to thank the following Village of Harrison Hot Springs and District of Kent staff: Gerald Basten (Emergency Program Coordinator); Derek Dubiellak (Deputy Emergency Program Coordinator); Madeline McDonald (Chief Administrative Officer); Troy Davis (Infrastructure Manager); Nicole Sethe (Clerk). The authors would also like to express their appreciation to David Whittaker (Fire Chief – Village of Harrison Hot Springs Fire Department). These individuals invested substantial time in meetings, answering questions, reviewing and commenting on the contents of this document.

In addition, the authors would like to thank staff from the BC Wildfire Service, including: Tony Botica (Fuel Management Specialist, Coastal Fire Centre); Orin Caddy (Forest Protection Technician, Fraser Fire Zone - Cultus/Haig Fire Base); as well as Reg Dyck (Manager of Electoral Area Emergency Services, Fraser Valley Regional District); Stacey Barker (Deputy Director of Regional Programs, Fraser Valley Regional District); and Sam Stickney (Area Supervisor – North Fraser, BC Parks).

This report would not be possible without the Strategic Wildfire Prevention Initiative (SWPI) Program and funding from the Union of British Columbia Municipalities (UBCM).

REGISTERED PROFESSIONAL SIGN AND SEAL

To be completed following draft review

EXECUTIVE SUMMARY/ SUMMARY OF CWPP RECOMMENDATIONS

The Community Wildfire Protection Plan (CWPP) process was created in British Columbia (BC) as a response to the devastating 2003 wildfire in Kelowna. As an integral part of the Strategic Wildfire Prevention Initiative (SWPI), managed and funded through the Strategic Wildfire Prevention Working Group, CWPPs aim to develop strategic recommendations to assist in improving safety and to reduce the risk of damage to property from wildfires.

This CWPP will provide the Village of Harrison Hot Springs (the Village) with a framework that can be used to review and assess areas of identified high fire risk within the Village. Additionally, the information contained in this report should help to guide the improvement and/or development of emergency plans, emergency response, evacuation plans, communication and education programs (including FireSmart), bylaw development in areas of fire risk, and the management of potentially hazardous forest lands adjacent to the community.

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of 23 strategic recommendations are summarized in Table 1 below. In addition, these recommendations are more thoroughly discussed in their appropriate sections within the document. As emergency services are currently managed jointly between the District of Kent and the Village of Harrison Hot Springs, efficiencies may be gained by both parties if some of the recommendations contained in this CWPP are implemented cooperatively. As such, it is suggested that the Village partner with the District wherever appropriate and feasible, as determined by Village and District staff. Furthermore, because the area of interest extends onto private land and therefore outside the Village jurisdiction, the Village's role may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the Village. Ultimately, the recommendations within this strategy should be considered a toolbox of options to help reduce the wildfire threat to the community. There is not one combination or course of action which is the answer; the Village will have to further prioritize based on resources, strengths, constraints, and availability of funding and regularly update the prioritization and course of action as variables change through time.

Table 1. Summary of CWPP recommendations by document section.

Document Section 2: Local Area Description (2.5.3: Local Government/First Nations Policies and Recommendations)				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Objective: Review and amend the current Village regulatory framework to incorporate wildfire mitigation and preparedness considerations				
1	10	High	Consider reviewing Section 3.5 of the OCP and incorporating a Wildfire Development Permit Area where wildfire interface guidelines based on FireSmart principles apply. (See Section **Error! Reference source not found.** for further details and recommendations regarding a new development permit).	UBCM CRI Funding/ ~25-50 in-house hours (local government funding)
2	11	Moderate	Consider applying to the Community Resiliency Investment (CRI) Program[1] for funding to conduct FireSmart home and property assessments within the Village, to develop a FireSmart rebate program for residents, and for the removal of debris accumulated from FireSmart activities conducted on private land.[2]	~25-30 in-house hours (local government funding)
3	12	Moderate	Review the OCP and consider parks acquisition and maintenance through a wildfire risk lens, including consideration for long-term maintenance costs and access. Consider amendments where needed, including the following: 1) require the use of a Qualified Professional (QP) in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that bylaws provide the Village authority to request modification (either fuels, access, or siting) based upon QP recommendation and prior to acceptance to ensure that the park is received in, and able to be maintained in, an acceptable range of risk. (See Section 6.1.3 for related recommendations specific to access).	UBCM CRI Funding/ ~15-20 in-house hours (local government funding)

[1] Note that the UBCM SWPI funding stream has very recently transitioned into a new Community Resiliency Investment (CRI) Program. Refer to Section **Error! Reference source not found.** and the Union of BC Municipality's website (https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html) for further information.

[2] 2019 Community Resiliency Investment Program FireSmart Community Funding & Supports Program & Application Guide, 2018.

Document Section 2: Local Area Description (2.5.3: Local Government/First Nations Policies and Recommendations)				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
4	12	High	Develop a Parks and Trails Master Plan and include consideration for the placement, type, width, and objective of trails. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to Wildfire Act and Regulations). The Master Plan could also include an emergency response plan to deal with the risks of fire within parks.	Approximately $50,000-$100,000
5	13	Moderate	Review Village Tree Management and Preservation Bylaw No. 1015, 2012 and revise to allow for homeowners to address wildfire hazards on their property associated with trees immediately adjacent to homes, as determined by a QP.	UBCM CRI Funding/ ~20-50 in-house hours (local government funding)

Document Section 3: Values at Risk				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Objective: Protect human life and safety				
6	20	Moderate	Consider lobbying the Provincial government or local Medical Health Officer(s) to develop a strategy for communities to draw upon when they are exposed to smoke from wildfire for extended periods of time. This strategy may include smoke exposure risk assessments, exposure reduction measures, and a decision-key for when to evacuate the community due to wildfire smoke.	~10-15 in-house hours (local government funding)
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
7	20	Moderate	The use of fire resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	Negligible in-house cost

Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Objective: Reduce Wildfire Threat through Fuel Management				
8	59	High	Proceed with detailed assessment, prescription development and treatment of hazardous fuel units identified and prioritized in this CWPP.	UBCM CRI Funding/ local government funding
9	63	Moderate	If and when operational fuel treatments are conducted within the Village AOI, treatment monitoring should be completed by a Qualified Professional in order to schedule the next set of maintenance activities (5 – 10 years out). This can be completed with a CWPP update or as a stand-alone exercise.	UBCM CRI Funding/ local government funding
Objective: Reduce Wildfire Hazard on Private Land				

10	70	High	10.1 - Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area. A recommended development permit area (DPA) for the Village would include all areas within the municipality that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. It is also recommended that the Village consider incorporating QP reports and sign-off as part of the wildfire interface guidelines and that DP applications are provided to the Village of Harrison Hot Springs Fire Department (VHHSFD) for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between the VHHSFD and the Village will increase. The Village should also consider engaging the development/ building community (may include developers, builders, landscapers, and architects) in DPA development process. It is recommended that this be done in partnership with the District of Kent, if appropriate. 10.2 - To complement the DPA, it is recommended that the Village develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. See *Section* ***Error! Reference source not found.*** *Planning and Development* for more information on DPA recommendations.	UBCM CRI Funding/ local government funding

Document Section 5: Risk Management and Mitigation Factors Recommendations

Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Objective: Increase Public Wildfire Awareness				
11	74	High	Make this report and associated maps publicly available through webpage, social media, and public FireSmart meetings. In addition, this CWPP should be shared with local industry partners; in particular industrial forest companies who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP document.	3-6 in-house hours depending on method of distribution

12	74	Moderate	Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the Village's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.	UBCM CRI funding/ local government funding
13	75	High	Consider promoting FireSmart approaches for wildfire risk reduction to Village residents through Town Hall meetings, workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior to and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.	~10 hours. May be eligible for UBCM CRI grant
14	75	Moderate	Work towards FireSmart community recognition, at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.	FireSmart grant (when funding is available)
15	75	Moderate	Facilitate the FSCCRP uptake within the Village and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.	$5,000/ neighbourhood and an additional 40 hours / initiative UBCM CRI grant(s) available

Document Section 5: Risk Management and Mitigation Factors Recommendations

Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
16	75	Moderate	Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.	~1.5 hours/ assessment

Document Section 6: Wildfire Response Resources Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
Objective: Improve Access/Egress to Enhance Emergency Preparedness				
17	79	High	In cooperation with the District of Kent, continue to work with relevant Provincial ministries and stakeholders including BC Parks, Emergency Management BC, Ministry of Transportation and Infrastructure, MFLNRORD, Seabird Island Indian Band (holders of a woodlot license adjacent to Sasquatch Provincial Park), BC Hydro, Fraser Valley Regional District, Enbridge (operating a line station at Ruby Creek) and Canadian Pacific Railway, to complete a secondary egress route through Sasquatch Park and provide an alternate evacuation route for residents and visitors along Rockwell Drive.	~40-50 in-house hours, dependent on task sharing with the District of Kent
18	79	Moderate	When the evacuation plan is finalized, complete and participate in regular testing of, and updates to, the evacuation plan.	~30-40 hours to plan and stage; 8 hours to complete testing
19	79	Moderate	Consider developing a community wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest.	~10,000- $15,000 to complete (contractor estimate)
Objective: Include Wildfire Considerations when Trail Planning				
20	79	Moderate	Develop a Total Access Plan for the Village to create, map and inventory trail and road network in natural areas for suppression planning, identification of areas with insufficient access and to aid in strategic planning. Georeferenced maps with ground-truthed locations of potential optimal firebreaks should be developed as part of the Total Access Plan and shared with fire suppression personnel and BCWS to support emergency response in the event of a wildfire. The plan should be updated every five years, or more regularly, as needed to incorporate additions and / or changes.	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)
Objective: Enhance Wildfire Equipment and Training				
21	80	Moderate	Fire Departments should engage in regular cadence of communication with the BCWS Fraser Fire Zone, Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.	~4 hours/ year

Document Section 6: Wildfire Response Resources Recommendations				
Item	Page No.	Priority	Recommendation / Next Steps	Estimated Cost ($) or Person hours
22	80	High	Ensure all VHHSFD continue to have SPP-WFF 1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. The Office of the Fire Commissioner (OFC) offers SPP-115 (formerly S-115) to train structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). The OFC is currently developing additional wildfire-specific Officer-level training courses (i.e., Engine Operations in the Wildland Urban Interface); the fire department should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources / budgets allow.	Current training budget plus additional 8 hour training session/firefighter for SPP-115
Objective: Enhance Protection of Municipal Infrastructure from Wildfire				
23	82	High	Complete a vulnerability assessment of all critical infrastructure, secondary power sources, and fuel availability. Review current capability of secondary power sources, identify vulnerabilities, and prioritize needs, in the case of prolonged or extensive power outages. Upgrade or realign resources, as prioritized.	~20 hours to complete vulnerability assessment and upgrading dependent on project(s) chosen

TABLE OF CONTENTS

List of Tables

List of Maps

List of Figures

COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CFFDRS	Canadian Forest Fire Danger Rating System
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DP	Development Permit
EOC	Emergency Operations Centre
FBP	Fire Behaviour Prediction System
FDU	Forest Development Unit
FESBC	Forest Enhancement Society of British Columbia
FMP	Fire Management Plan
FRS	Fire Rescue Services
FSCCRP	FireSmart Canada Community Recognition Program
FSP	Forest Stewardship Plan
GAR	Government Actions Regulation
HIZ	Home Ignition Zone
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
NFPA	National Fire Protection Agency
OCP	Official Community Plan
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
QP	Qualified Professional
SPU	Structural Protection Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
VHHSFD	Village of Harrison Hot Springs Fire Department
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

In 2017, B.A. Blackwell and Associates Ltd. was retained to assist the Village of Harrison Hot Spring (the Village) in developing a Community Wildfire Protection Plan (CWPP); hereinafter referred to as the CWPP. This CWPP document will focus on integrating the updated Provincial Strategic Threat Analysis (PSTA), updated BC Wildfire Service (BCWS) fuel type mapping, and the updated and improved wildfire threat analysis methodology. Furthermore, Village staff have recognized that wildfire mitigation and planning is an important component of emergency planning and preparedness for the community.

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2004, 2009, 2010, 2015 and 2017 wildfire seasons resulted in significant economic, social and environmental losses in BC. The 2018 fire season was the most extensive in terms of area burned, surpassing the 2017 fire season. While final suppression costs for the 2018 season are yet to be calculated, the 2017 fire season costs were estimated at over $568 million. Recent wildfire disasters like those experienced in Slave Lake, Alberta (2011), Washington State (2014 and 2015), Fort McMurray, Alberta (2016) and BC and California (2017 and 2018) all display the vulnerability of communities and the potential toll of wildfires on families, neighbourhoods and the economy of entire regions. These events, along with critical lessons learned and important advances in knowledge and loss prevention programs have spurred the need for greater consideration and due diligence with respect to fire risk in the wildland urban interface[3] (WUI).

1.1 PURPOSE

The purpose of this CWPP is to identify the wildfire risks within and surrounding the Village of Harrison Hot Springs, to describe the potential consequences if a wildfire was to impact the community, and to examine options and strategies to reduce the wildfire risks. Each community has a unique risk profile. This CWPP provides an assessment of the level of risk with respect to changes in the area that have occurred recently and gives the Village a current and accurate understanding of the threats to human life, property, and critical infrastructure faced by their communities from wildfires. The goal of this CWPP, in addition to defining the threats, is to identify measures necessary to mitigate these threats, and outline a plan of action for implementing these measures. Specifically, this CWPP is intended to serve as a framework to inform the implementation of specific actions and strategies that will serve to: 1) reduce the likelihood of wildfire entering the community, 2) reduce the impacts and losses to property and critical infrastructure if wildfire were to occur, and 3) reduce the negative economic and social impacts of wildfire to the community.

[3] Wildland/urban interface is defined as the presence of structures in locations in which conditions result in the potential for their ignition from flames and firebrands/embers of a wildland fire (National Fire Protection Association). See Appendix D for a more detailed discussion.

1.2 CWPP PLANNING PROCESS

This CWPP is a review and synthesis of the background information and current data related to the Area of Interest (AOI) which represents the municipal boundary of the Village of Harrison Hot Springs. The CWPP consists of four general phases:

1) **Consultation involving key local government representatives, structural and wildfire specialists, First Nations, and stakeholders**. Consultation and information sharing at various stages of the CWPP development and ensuring linkages with relevant existing land use plans, legislation, and policy currently in place.
2) **Identification of the values at risk and assessment of the local wildfire threat.** Wildfire threat assessment takes into consideration natural fire regime and ecology, Provincial Strategic Threat Analysis (2017), and field work, fuel type verification, completion of WUI Threat Forms and Geographic Information Systems (GIS) wildfire threat analyses.
3) **Developing a risk mitigation strategy**. A guide for the Village to implement mitigation and risk reduction activities. The risk mitigation strategy accounts for prioritization of fuel treatments, FireSmart activities, and wildfire response recommendations that will reduce wildfire threat locally.
4) **Building a community engagement and education strategy**. This phase includes presentation of the CWPP to the Board or Council, the formation of a Wildfire Working Group as well as comprehensive outside consultation with First Nations, government and non-governmental agencies. This CWPP provides recommendations for ongoing community education and engagement to support successful implementation of the CWPP.

1.2.1 Consultation

Broad engagement with local government, Provincial government landowner representatives, stakeholders and First Nations played a key role in developing this CWPP.

The first step in the consultation process was to assemble the key players in the 'Wildfire Working Group'. This group was composed of key internal Village staff, which included: Chief Administrative Officer, Infrastructure Manager, Chief Financial Officer, and Emergency Program Manager and Deputy Emergency Program Coordinator. Non-Village staff included in the Working Group were: Fire Chief for the Village of Harrison Hot Springs Fire Department. At the initial meeting of the Wildfire Working Group, the objective was to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, areas of concern, and Village vulnerabilities; and to determine priorities and potential mitigation strategies. Members of the Working Group were consulted on an ongoing basis throughout CWPP development and were integral in providing plan review and approval. The Wildfire Working Group was integral in the review of the draft of this CWPP and provided ongoing support throughout the CWPP process.

BCWS representatives (Wildfire Threat Specialist and Forest Protection Technician) were consulted as follows: 1) at the onset of the project planning phase and 2) throughout the CWPP development process, both via the submission of Fuel Type Change Rationales and a questionnaire regarding the concerns and priorities of BCWS with respect to wildfire and emergency planning in the Village; and 3) revision of the draft document upon Plan completion.

Information sharing took place with the Seabird Island Band, the Sts'ailes First Nation, the Stó:lō Tribal Council (Stó:lō Nation, Soowahlie First Nation, Shxw'ow'hamel First Nation, Skawahlook First Nation, Leq'a:mel First Nation, Scowlitz First Nation, Kwaw-kwaw-apilt First Nation, Skwah First Nation, Chawathil First Nation), Siska Indian Band, Cook's Ferry Indian Band, Coldwater Indian Band, Nlaka'pamux Nation Tribal Council (Oregon Jack Creek Indian Band, Lytton First Nation, Boothroyd Indian Band, Spuzzum First Nation, Skuppah Indian Band), and Lower Nicola Indian Band, as identified through the Consultative Areas Database and in consultation with Ministry of Forests, Lands, Natural Resources, and Rural Development (MFLNRORD) and the Village of Harrison Hot Springs, regarding the CWPP and locations of potential cultural values at risk requiring protection consideration. Information sharing consisted of an initial phone call, and subsequent distribution of a referral letter and information package (maps, explanation of CWPP, and CWPP draft).

Additional stakeholders were consulted to identify synergies, opportunities for collaboration, and ensure linkages with adjacent and overlapping planning. Combined, these various consultation and engagement opportunities have generated a shared understanding of the CWPP objectives and expected outcomes among local government, stakeholders, residents, and land managers.

1.2.2 Identification of Values at Risk and Local Wildfire Threat Assessment

The risks associated with wildfire must be clearly identified and understood before a CWPP can define strategies or actions to mitigate risks. The identified values at risk are described in Section 3. The wildfire threat in the Village of Harrison Hot Springs AOI was assessed through a combination of the following approaches:

- Natural fire regime and ecology (Section 4.1);
- Provincial Strategic Threat Analysis (Section 4.2); and
- Local wildfire threat analysis (Section 4.3).

The relationship between wildfire hazard, threat and risk can be demonstrated in the following example. If a fire (the hazard) ignites and spreads towards a community, the wildfire can become a threat to life and property, with an associated risk of loss, where:

$$\textbf{\textit{Wildfire risk}} = \textbf{\textit{Probability x Consequence}}$$

And where:

- Wildfire risk is defined as the potential losses incurred to human life, property and critical infrastructure within a community in the event of a wildfire;

- Probability is the likelihood of fire occurring in an area and is related to the susceptibility of an area to fire (fuel type, climate, probability of ignition etc.); and
- Consequences refer to the repercussions associated with fire occurrence in a given area (higher consequences are associated with densely populated areas, or areas of high biodiversity etc.).

1.2.3 Development of a Risk Management Strategy

An effective risk management strategy was developed considering a full range of activities relating to the following:

- Fuel management;
- FireSmart planning and activities;
- Community outreach through communication and education;
- Other prevention measures;
- Structure protection and planning (i.e., FireSmart activities);
- Emergency response and preparedness;
- Evacuation and access; and
- Planning and development.

1.2.4 Building Community Engagement and Education Strategy

Engaging the entire community, from local government staff and officials, to key stakeholders and residents, in wildfire protection planning activities is key to ensuring successful implementation of the plan recommendations. A community engagement and education strategy is described in Section 5.3.

A presentation to the Village Council will aim to ensure high level approval and support for this CWPP.

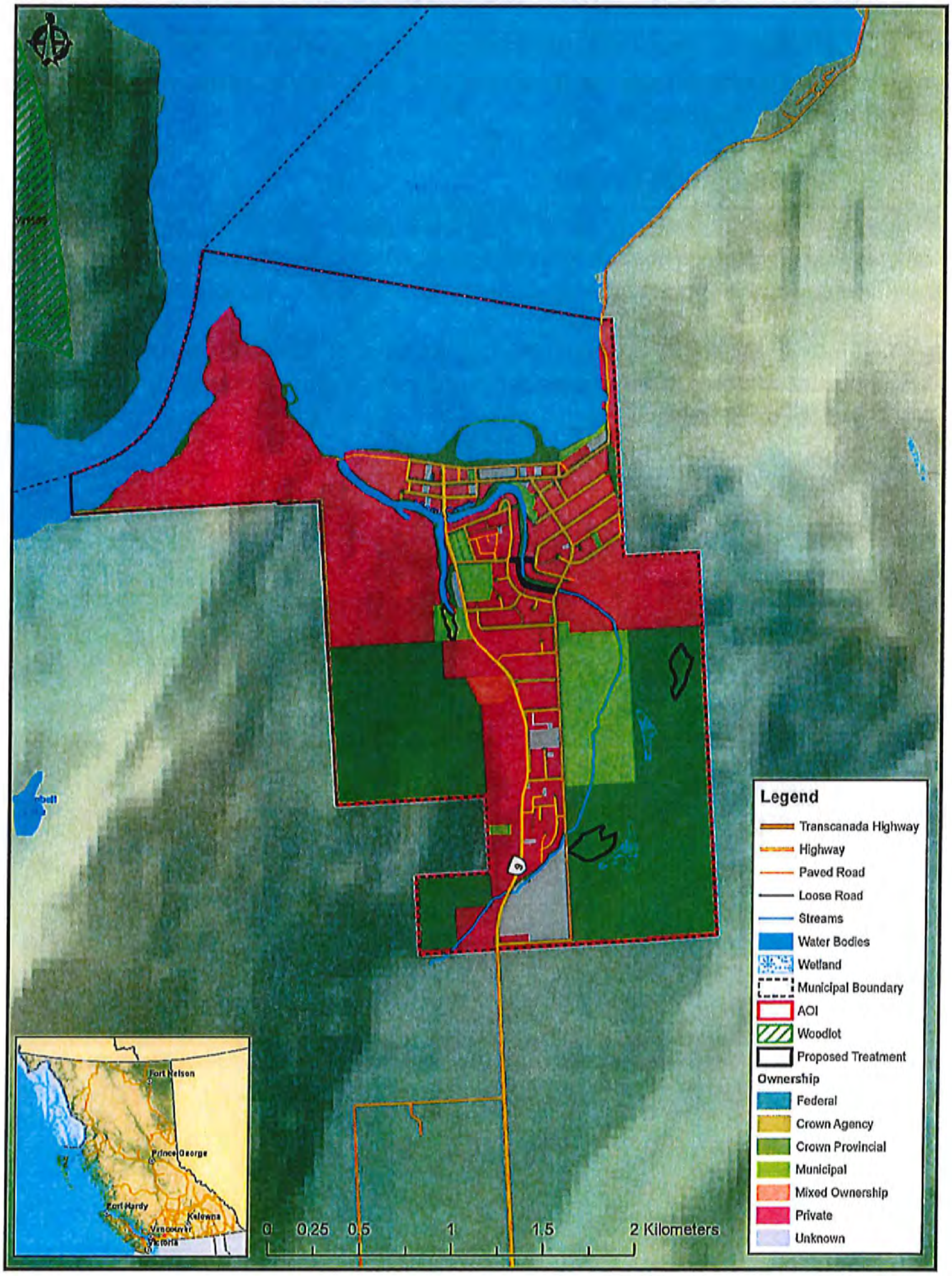
SECTION 2: LOCAL AREA DESCRIPTION

This section describes the extent of the Village of Harrison AOI, summarizes the current community engagement initiatives in wildfire prevention and mitigation, and identifies linkages to other plans and policies with relevance to wildfire planning.

2.1 AREA OF INTEREST

The Village of Harrison Hot Springs is located in the South Coast region of BC, approximately 100km east of Vancouver in the Fraser Valley. The Village is bordered by the District of Kent on its south, east and west sides, and Harrison Lake on its north side.

The AOI for the CWPP is illustrated below in Map 1. It represents the municipal boundary of the Village of Harrison Hot Springs. The AOI encompasses 709 ha of land in total. A breakdown of the AOI's land ownership is provided in Table 2.



Map 1. Area of Interest (AOI).

Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
Private	410
Municipal	0
Provincial Crown	3
Crown Agency	43
Federal Crown	234
Unknown	19
Total	709

2.2 COMMUNITY DESCRIPTION

The Village of Harrison Hot Springs is a small resort community located at the southern tip of Harrison Lake in the Fraser Valley. The Village has a population of approximately 1,500 residents and is a popular tourist destination.[4] Services to residents of the Village are provided both at the municipal and regional level through the Village of Harrison and the Fraser Valley Regional District. The regional government provides environmental services, building services, strategic planning, emergency management services, and regional parks planning. At the municipal level, services provided include the enforcement of select bylaws, fire protection services, license and permitting services, public works and utilities, and planning and development.[5]

The South Coast region has been inhabited by the Coast Salish Aboriginal Peoples since before recorded time. The Sts'ailes First Nation, the Seabird Island Band, and the Stó:lō Nation Bands are among the Coast Salish nations that historically occupied land (a complete list of First Nations with interest in the area is provided in Section 1.2.1 and 3.3.2). What is now the Village of Harrison Hot Springs became known to miners for its hot springs in the 1850s and a hotel was built in 1886 to draw visitors to the area. Harrison Lake was and continues to be actively logged for timber and many logging camps have existed in the area throughout the past century. The townsite plan was first registered in 1889 but the Village was not officially incorporated until 1949.

Despite its small size, the Village AOI is topographically diverse, with low lying ecologically productive lands and mountainous terrain. The elevation varies from less than 200m to over 500m. Harrison Lake is the largest freshwater body within and adjacent to the AOI, with an area of over 20,000 ha. Several streams are present within the Village, including Hotsprings Slough and Miami Creek.

[4] Harrison Hot Springs, 2017. Our Community. Retrieved online from: https://www.harrisonhotsprings.ca/our-community/

[5] Harrison Hot Springs, 2017. Departments. Retrieved online from: https://www.harrisonhotsprings.ca/village-office/#

The Village of Harrison Hot Springs economy was historically driven by forestry and mining.[6] Although these industries remain important to the community and surrounding areas, the economic focus has shifted in recent decades to tourism.

Fire protection within the AOI is the responsibility of the Village of Harrison Hot Springs Fire Department (FD). Mutual aid agreements exist between this department and the Agassiz Fire Department. BCWS is responsible for responding to fires that are beyond the boundaries of the department Fire Service Areas. In the event of a wildfire, the Village of Harrison Hot Springs has limited emergency egress routes. Hot Springs Road (Highway 9) is the arterial route connecting the Village with Lougheed Highway (Highway 7), which runs north and south from the AOI. It is the only reliable, paved access route. Additionally, the Rockwell Drive corridor is an area of particular concern with respect to limited emergency egress and lack of an alternate evacuation route (see Section 6.1.3 for further discussion). This limits the ability of fire crews to respond to fires and safely evacuate residents.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

BCWS Fraser Fire Zone staff communicated that the majority of past wildfire activity within the AOI was human-caused and ignitions due to abandoned campfires and poor recreation practices. BCWS staff reported that slash accumulations following industrial logging can be an issue, particularly next to forest service roads.

Based on the BCWS historical wildfire dataset, the largest fires to burn within and adjacent to the Village AOI occurred in 1938, with an estimated area of over 1,700 ha. No significant fires have occurred in the AOI in recent years. In 2018, a 427-ha fire burned less than 6 km east of the AOI on Mt. Hicks in the District of Kent. This fire burned for several weeks and resulted in the closure of the Lougheed Highway, which connects many Fraser Valley communities. The Mt. Hicks wildfire, in combination with the 2016 Fort McMurray and 2017 and 2018 BC province-wide wildfires, have alerted BCWS to the potential for large, catastrophic wildfires occurring within and surrounding the present AOI.

The BC Wildfire Service historical ignition dataset demonstrates that the proportion of human-caused fires within the Village AOI is substantially greater than that of the province as a whole.[7] This ignition data shows that within the Village AOI, approximately 92% of ignitions since 1972 have been human-caused (a conservative estimate not including miscellaneous/undetermined causes), versus 40% in the province of BC.[8] This statistic may be explained by the lower proportion and occurrence of lightning strikes in the Fraser Valley relative to other areas in the province. Additionally, high recreational use and the prevalence of forestry activities within the AOI may also contribute to this statistic.

[6] Harrison Hot Springs, 2017. Our History. Retrieved online from: https://www.harrisonhotsprings.ca/our-community/our-history/

[7] BC Wildfire Service: Fire Incident Locations - Historical

[8] BCWS, 2018

2.4 CURRENT COMMUNITY ENGAGEMENT

There is recognition and awareness, from both Village staff and the community, of the threat posed to the community by wildfire. There has been some community engagement in FireSmart initiatives in the Village to this point. FireSmart presentations and workshops are provided by the fire department during fire prevention week and FireSmart materials have been distributed door to door prior to the fire season in previous years. Furthermore, the fire department is consulted during community development planning. However, there is currently no established wildfire development permit area within the Village of Harrison Hot Springs, which can set standards based upon FireSmart principles for building material use, landscaping and appropriate setbacks from forested areas. Future initiatives should focus efforts during times of high public uptake (post wildfire season) in order to maximize the resources available for community engagement.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

Following is a summary of Village policies and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed jointly by the District of Kent and the Village of Harrison Hot Springs, and they have created a comprehensive Emergency Management Plan to serve the two communities.[9] The plan was developed to optimize the response, resources and planning for major emergencies that may occur within the Village and District. The plan outlines the Emergency Operations Centre (EOC) functions and activation, Incident Command Post (ICP) functions, guidelines for emergency response (communications, personnel identification, documentation, etc.), and hazard-specific roles and procedures. The hazard-specific roles and procedures for wildland interface fires lists the possible major effects of such an event, the potential actions that may be required to address these effects, the associated actions of the EOC, and any resources that could aid in response. Emergency response is coordinated using the BC Emergency Management System (BCEMS) Site and Site Support Standard, with designated EOC locations and Incident Command (IC) for site level response. A Provincial Emergency Operations Centre (PREOC) and a Provincial Emergency Coordination Centre (PECC) may also be established if the emergency is large in scale.

2.5.2 Affiliated CWPPs

CWPPs have been developed for the City of Abbotsford (2009), the District of Mission (2005), and the District of Maple Ridge (2005). A CWPP for Seabird Island is currently being developed by Firefly Integrated Resources Enterprises Inc. These documents, when available, were reviewed for relevance (i.e., synergistic project opportunities, as well as to confirm that there are no contradicting recommendations). Furthermore, a CWPP Update for the District of Kent is being developed

[9] Emergency Response and Recovery Plan - Kent/Harrison Joint Emergency Program, 2015.

concurrently with this CWPP by the same consultant, ensuring consistency in recommendations and synergies within proposed future fuel treatment works.

2.5.3 Local Government/First Nation Policies and Recommendations

The intent of this section is to review all relevant local government plans, policies and bylaws and identify sections within that are relevant to the CWPP. Fraser Valley Regional District (FVRD) plans and policies were reviewed and incorporated where applicable. However, recommendations to revise or update these bylaws were not included as this is considered outside of the scope of this plan. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

Bylaw No. 864, 2007: Village of Harrison Hot Springs Official Community Plan

OCP Section 3.2: Growth Management Strategy

Section 3.2 of the OCP acknowledges the small land base of the Village of Harrison Hot Springs, provides estimates of projected growth, options for accommodating growth within the municipality, and outlines the financial implications of development. The specific growth management policies include increasing density in the Village Centre, developing Pine Avenue for low density residential housing, and expanding medium density housing in the Lakeshore Residential Area. Subsection 3.2.4, which outlines the development of the Lakeshore Residential Area, recognizes the need for setbacks due to geotechnical hazards.

OCP Section 3.5: Development Permit Areas

Section 3.5 outlines the Village policy surrounding development permit areas (DPAs), the purpose of DPAs within the Village, and the situations under which DPAs are not required. DPAs within the Village include DPA 1 - Lakeshore (Section 4.4 of the OCP), DPA 2 - Tourist Commercial (Section 5.4), DPA 3 - Multi-family residential (Section 6.4), DPA 4 – Geotechnical Hazard (Section 9.4), and DPA 5 – Miami River (Section 14.4). These DPAs are together intended to reduce specific hazards, protect the environment, and guide development in the Village of Harrison Hot Springs. Refer to Section ***Error! Reference source not found.*** *Planning and Development* for detailed discussion and recommendations regarding a Wildfire Development Permit Area.

RECOMMENDATION #1: Consider reviewing Section 3.5 of the OCP and incorporating a Wildfire Development Permit Area where wildfire interface guidelines based on FireSmart principles apply. See *Section* ***Error! Reference source not found.*** *Planning and Development* for further details regarding a new development permit.

OCP Section 6: Residential Development

Section 6 of the OCP describes the current development trends in the Village, specifically the locations of multi-family versus single-family residential areas. Along with promoting high quality and sufficient supply of housing, one of the objectives included in this section is to allow for appropriate setbacks to protect environmentally sensitive areas, including riparian ecosystems.

OCP Section 7: East Sector Special Planning Area

The East Sector Special Planning Area is approximately 160 ha of land east of McCombs Drive, which encompasses multiple ownership types, including provincial, municipal, private, and Agricultural Land Reserve (ALR) land. Section 7 of the OCP outlines the importance of this area for the community due to the presence of species at risk, rare ecosystems, natural water drainage systems, and recreation trails. The issues that need to be resolved prior to any development occurring within the East Sector Special Planning Area include the completion of drainage studies, environmentally sensitive areas assessments, and a Parks and Trails Master Plan. Due to the importance of this area, a concerted effort should be made to protect the above values should the Village choose to conduct operational fuel treatments within the East Sector Special Planning Area.

OCP Section 8: Resource Lands

Section 8 of the OCP outlines the Village's commitment to maintaining the lands designated as Resource Lands in a natural state, thereby directing development to other parts of the municipality. It also emphasizes that ALR land within the Village is the jurisdiction of the Agricultural Land Commission, and despite this, the needs of private landowners still require consideration.

OCP Section 9.3.3: Areas Subject to Interface Fire Potential

This section of the OCP states that Council will encourage FireSmart activities on properties within the Village that are adjacent to forested land, including thinning trees and removing surface fuels, and will make upgrades to the Village water system in order to increase water availability for fire protection. These upgrades to the water system were completed in 2018 (see Section 6.1.2 for more details).

RECOMMENDATION #2: Consider applying to the Community Resiliency Investment (CRI) Program for funding to conduct FireSmart home and property assessments within the Village, to develop a FireSmart rebate program for residents, and for the removal of debris accumulated from FireSmart activities conducted on private land.[10]

OCP Section 10.3.4: Water Systems

Section 10.3.4 of the OCP outlines the community's goals for maintaining and upgrading the Village's water systems. These relate to storage capacity, expansion based on planned development, protection of well sites, and withdrawals from Harrison Lake.

OCP Section 10.3.5: Drainage

This section of the OCP proposes that the Village develop a Drainage Plan to address several aspects of the drainage system within the community, including reducing system deficiencies, utilizing groundwater infiltration and detention to control peak flows, and an assessment of the current drainage infrastructure in the Village. The section goes on to describe the environmental

[10] 2019 Community Resiliency Investment Program FireSmart Community Funding & Supports Program & Application Guide, 2018.

considerations that should be included in the development of the Drainage Plan and the potential financing for the plan and associated upgrades to the system.

OCP Section 13: Parks and Open Space

Section 13 of the OCP discusses the importance of parks, greenspace, and trees within the Village and outlines several objectives and policies to maintain and improve these areas. Policy 13.3.1 describes the plan to acquire Crown land for parks within the Village and Policy 13.3.2 outlines the intent to prepare a "Parks and Trails Master Plan", which will guide future acquisitions, development and restoration and maintenance projects.

RECOMMENDATION #3: Review the OCP and consider parks acquisition and maintenance through a wildfire risk lens, including consideration for long-term maintenance costs and access. Consider amendments where needed, including the following: 1) require the use of a Qualified Professional (QP) in review, assessment, and siting of parks and park access prior to acceptance; and 2) ensure that bylaws provide the Village authority to request modification (either fuels, access, or siting) based upon QP recommendation and prior to acceptance to ensure that the park is received in, and able to be maintained in, an acceptable range of risk. (See Section 6.1.3 for related recommendations specific to access).

RECOMMENDATION #4: Develop a Parks and Trails Master Plan and include consideration for the placement, type, width, and objective of trails. Consideration should also be given to trail building and maintenance as these activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (though proper placement, clean-up of combustible fuels trailside and work practices which adhere to Wildfire Act and Regulations). The Master Plan could also include an emergency response plan to deal with the risks of fire within parks.

Subdivision and Development Servicing Bylaw No. 578, 1993

The Subdivision and Development Servicing Bylaw dictates that all developments to occur within the Village must be connected to both the community water and sewage systems and defines other levels of service required for Village subdivisions and developments. Furthermore, the standards and specifications set out for this infrastructure are outlined in Schedule B of the bylaw.

Development Procedures Bylaw No. 1090, 2016

This bylaw describes the conditions under which development permits may be issued within the Village of Harrison Hot Springs, including the application process, fees, the potential requirement for public meetings, reporting requirements, security, approvals, and situations in which issued permits may be revoked.

Fire Department Regulation Bylaw No. 1031, 2013

This bylaw regulates aspects of the Village of Harrison Hot Springs Fire Department (VHHSFD), including the establishment of the VHHSFD and positions within the department, the appointment or election of officers, membership requirements, renumeration, the Fire Chief's authority, jurisdiction, mutual aid agreements, offence and penalty, and repeal. Section 8.1 (e) of bylaw 1031, which addresses the Fire Chief's authority, includes a clause which allows for the Chief to order a land owner to remove or reduce objects or conditions on their property that present a fire hazard.

Open Burning and Outdoor Fire Regulation Bylaw No. 1110, 2017

Bylaw No. 1110, 2017 outlines the conditions under which open burning and campfires are permitted within the Village, enforcement, penalties for non-compliance, and severability. Open burning is limited to very specific conditions and locations within the Village and all communal campfires require a permit from the Fire Department. The bylaw also allows for the Fire Chief to prohibit the use of campfires for a period of time if conditions are such that there will be higher risk of escape or significant smoke concerns.

Fireworks Regulation Bylaw No. 871

This bylaw regulates the use of fireworks within the Village of Harrison Hot Springs, as well as enforcement and severability should a person violate the bylaw. Permits for firework use are issued by the Fire Chief, who has the authority to not issue permits, revoke permits, and to impose restrictions on the permits issued.

Tree Management and Preservation Bylaw No. 1015, 2012

Bylaw No. 1015 is in place to ensure that trees are preserved within the Village by restricting the conditions under which trees can be cut, including the cutting of "Distinct Trees" of large diameters.

RECOMMENDATION #5: Review Village Tree Management and Preservation Bylaw No. 1015, 2012 and revise to allow for homeowners to address wildfire hazards on their property associated with trees immediately adjacent to homes, as determined by a QP.

Water Regulation and Fee Bylaw No. 967, 2011

The Water Regulation and Fee Bylaw outlines general provisions such as liability and restrictions, as well as the fees that apply to water service, water system connections, prohibited acts, inspection requirements and water metering.

Solid Fuel Burning Appliance Regulation No. 1124, 2018

Bylaw No. 1124, 2018 regulates the use of solid fuel burning appliances within the Village of Harrison Hot Springs by setting emissions standards for existing appliances and prohibiting the installation of new appliances. Exceptions include the use of barbeques and hibachis on private property.

Riparian Area Protection Bylaw No. 852

The Riparian Area Protection Bylaw dictates when and how riparian assessments are to be conducted prior to development and specifies that these assessments must be completed by a Qualified Environmental Professional (QEP).

Park Regulation Bylaw No. 915, 2009

The Park Regulation Bylaw regulates the use of public spaces such as parks, beaches, and boulevards in the Village. Restricted activities within these areas include campfires, and the use of barbeques, hibachis, and other wood, charcoal or briquette burning cooking devices. Furthermore, smoking of any kind is also restricted within all public spaces in the Village.

Property Maintenance Bylaw No. 1072, 2015

The Property Maintenance Bylaw prohibits the owner or occupant of any property within the Village from allowing rubbish, furniture, vehicle parts, wood (with some exceptions), construction materials when no construction activities are occurring, or standing water to accumulate on the property.

Regional Growth Strategy for the Fraser Valley Regional District[11]

Eight growth management goals are outlined relating to transportation, the agricultural sector, responsible management of urban land, sustainable communities, protection of the natural environment, protection and management of rural and recreational lands, sustainable economic growth and managing water, energy and waste responsibly. As a member municipality of the FVRD, the Village OCP is consistent with these goals. With respect to the goal of managing urban land responsibly, the Strategy supports contained development and OCPs that encourage compact development patterns. It also supports settlement patterns that minimize risk associated with hazards including wildfire. Rural and intermix areas are generally more vulnerable (at higher risk) for interface fires than contained development areas as there is often the potential to have inadequate or unreliable water supply for suppression, as well as longer emergency response times.

Fraser Valley Regional District Parks Regulation Bylaw No. 1273, 2014

This bylaw applies to the Harrison Boat Launch and East Sector Lands, which are the only FVRD managed parks within the Village AOI.[12] This bylaw contains several subsections that relate to fire prevention in Regional parks. It controls the use of fire and flame-producing cooking devices in Regional parks, unless in a designated place or facility and/or accompanied by a permit and sets the maximum allowable fire size. Additionally, authorized personnel may prohibit or extinguish any of the above for public safety. This bylaw also prohibits smoking when signs or notices are posted. Under section 13, the discharge of fireworks is prohibited without a valid permit, as outlined above in Bylaw No. 871.

With respect to potential fuel treatments in Regional parks, section 7 also addresses the preservation of natural features and lists prohibited activities (except as authorized by a permit) that may alter or damage trails, disturb wildlife, damage natural park features, introduce plant material or introduce contaminants. Section 8 outlines restoration requirements for park permit holders or contractors. As

[11] "Choices for our Future", Fraser Valley Regional District, 2004.

[12] Regional Parks Strategic Plan 2014-2024, Fraser Valley Regional District. Retrieved from https://www.fvrd.ca/assets/Parks~and~Recreation/Documents/2014%20-%202024%20Strategic%20Parks%20Plan.pdf

outlined in Section 10, any Regional park or park road or trail may be closed to public use for public safety. This has implications for park closures during periods of high wildfire danger.

2.5.4 Higher Level Plans and Relevant Legislation

Sustainable Resource Management Plan (SRMP) Biodiversity Chapter for East Harrison Landscape Unit[13]

The SRMP is the higher-level planning document for the East Harrison Landscape Unit (LU), which encompasses the Village of Harrison Hot Springs AOI. The plan describes the resource tenure holders in the LU, the resource values present, existing higher-level plans, First Nations, an analysis of the Old Growth Management Areas (OGMAs) and Wildlife Tree Retention within the LU, and a discussion regarding LU objectives.

Spotted Owl Management Plan[14]

The Spotted Owl Management Plan is a guidance document for spotted owl (*Strix occidentalis caurina*) management within the Chilliwack and Squamish Forest Districts. The goal of this plan is to stabilize, and ideally increase, spotted owl populations in the two districts over time while avoiding substantial impacts to forestry employment and timber supply. It includes a strategic management plan with objectives, policies, and operational guidelines for forest practices and creating operational plans in spotted owl management areas. Best management practices to manage forests within spotted owl habitat were subsequently updated as a component of the Spotted Owl Management Plan[15]. This document should be reviewed and used as a guidance during any fuel management activities that are proposed within areas of suitable spotted owl habitat such as late seral stage forests.

Relevant Legislation

Spatially explicit ministerial orders pertaining to Old Growth Management Areas (OGMA) were identified within the Village of Harrison AOI. These orders must be reviewed, considered, and addressed during the fuel management prescription-level phase. Fuel management within these areas should aim to enhance these values within the AOI, whenever possible, and the land manager and/or stewardship forester (Chilliwack Natural Resource District) must be consulted regarding any overlapping values at risk, spatially explicit ministerial orders, or other notable values on the land base, during prescription development.

2.5.5 Ministry or Industry Plans

Reviewing and incorporating other important forest management planning initiatives into the CWPP planning process is a critical step in ensuring a proactive and effective wildfire mitigation approach in the AOI.

---

[13] The Province of BC, Ministry of Sustainable Resource Management, 2005.

[14] The Province of BC, 1997.

[15] Spotted Owl Best Management Practices Working Group, 2009. https://www.for.gov.bc.ca/ftp/DCK/external/!publish/LOCAL_DATA/Spotted_Owl_Management_Plan/DOCUMENTS/SPOWBestManagementPractiesJul2009.pdf

The South Coast Response Fire Management Plan (FMP)[16] was developed for the Sea to Sky Natural Resource District (NRD), the Sunshine Coast NRD, and the Chilliwack NRD. The FMP was reviewed to identify any regional fire management planning objectives and their interpretation in the context of management considerations for the Village AOI. The 2018 South Coast FMP identifies values at risk and prioritizes broad categories of values as 'themes' for response planning through the Resource Strategic Wildfire Allocation Protocol (RSWAP). The South Coast FMP briefly speaks to the concept of wildfire prevention engineering within the region, which includes fuel management such as locally identified fuel breaks, proposed treatment areas, or demonstration and operational treatment areas. In order to reduce local fire threat and to build defensible space around critical infrastructure and/or residential neighbourhoods, this CWPP identifies various fuel treatment opportunities (Section **Error! Reference source not found.**).

Due to the fact that the Village of Harrison Hot Springs has limited access and egress options, improving access and increasing public safety in the event of an emergency evacuation should be a priority. There may be funding opportunities for fuel breaks on Crown land along the Agassiz-Rosedale Highway (Highway 9/Hot Springs Road) and Rockwell Drive through the Forest Enhancement Society of British Columbia (FESBC). Communication with the Natural Resource District and Ministry of Transportation and Infrastructure can be initiated to explore potential fuel treatments.

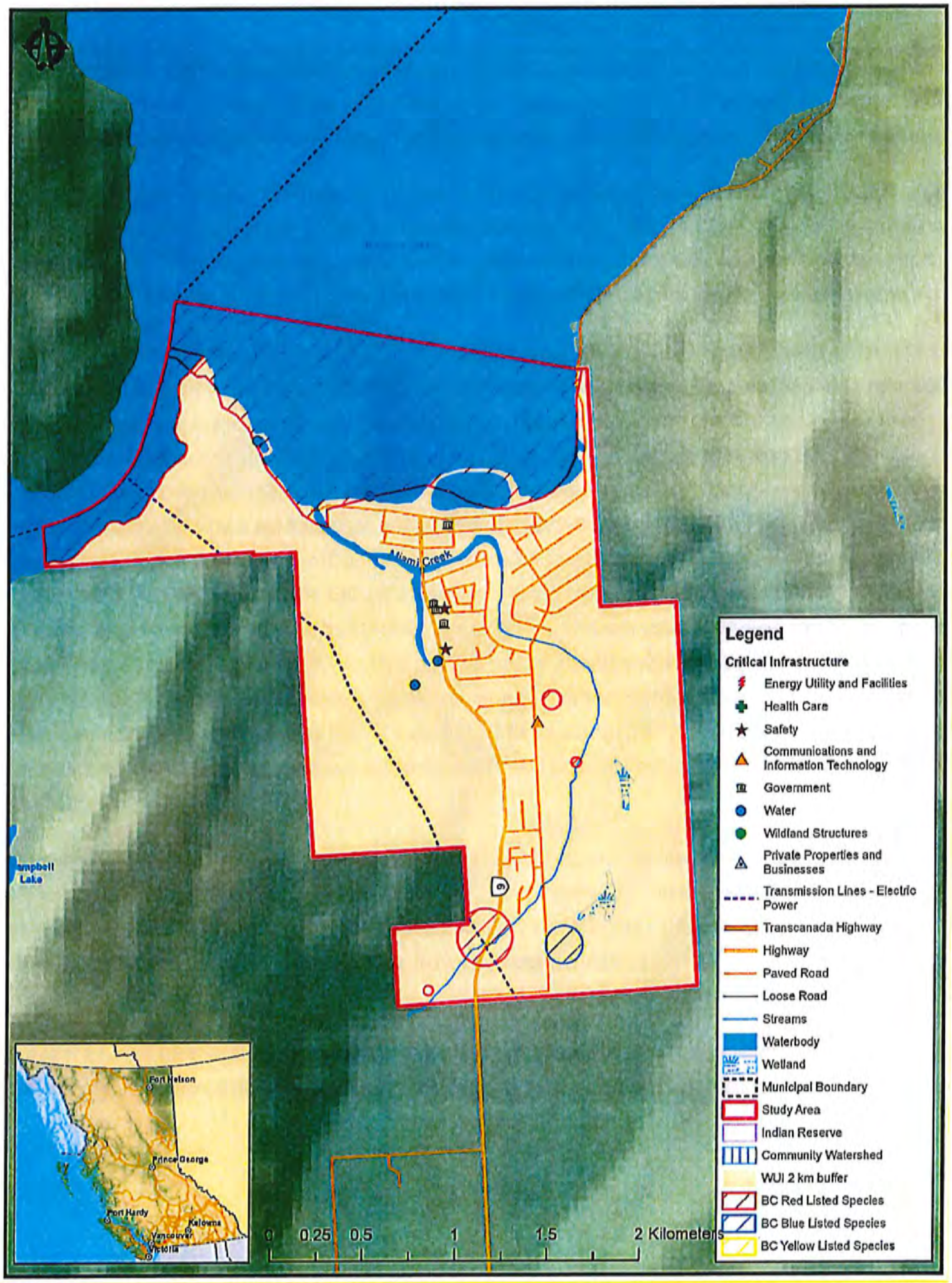
Six approved Forest Development Units (FDUs) are located within and adjacent to the AOI with associated Forest Stewardship Plans which set specific forest practices obligations applicable to specific forest licensees.

Forest health management and associated initiatives within the Fraser TSA are guided by the Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview[17]. This plan must be reviewed, considered, and addressed during the prescription-level phase. Fuel management and prescriptions aimed at reducing wildfire hazard within the AOI should aim to incorporate the guiding principles and best management practices (BMPs) presented within this aforementioned plan.

SECTION 3: VALUES AT RISK

Following is a description of the extent to which wildfire has the potential to impact the values at risk (VAR) within the Village of Harrison Hot Springs AOI. VAR, or the human and natural resources that may be impacted by wildfire, include human life and property, critical infrastructure, high environmental and cultural values, and other resource values. VAR also include hazardous values that pose a safety hazard. Key identified VAR are illustrated below in Map 2.

[16] South Coast Fire Management Plan. 2018.
[17] Ministry of Forests, Lands and Natural Resource Operations. 2015



Map 2. Values at risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

One of the primary goals of the BCWS is to support emergency response and provide efficient wildfire management on behalf of the BC government. BCWS aims to protect life and values at risk, while ensuring the maintenance and enhancing the sustainability, health and resilience of BC ecosystems.[18]

Human life and safety is the first priority in the event of a wildfire. A key consideration is the evacuation of at-risk areas and safe egress. Evacuation can be complicated by the unpredictable and dynamic nature of wildfire, which can move quickly. Evacuation takes time and safe egress routes can be compromised by wildfire, limited visibility, or by traffic congestion and/or accidents.

The population distribution (both people and structures) within the AOI is important in determining the wildfire risk and identifying mitigation activities. The population of the Village of Harrison Hot Springs remained stable in recent years. It was last measured at approximately 1,468 persons in 2016 and 2011, the last two census years.[19] This compares to 6.6% growth in the Fraser Valley Regional District as a whole during the same years. According to the 2016 Census, there are 928 private dwellings in the Village AOI, approximately 209 of which are occupied on a part-time basis. The future population growth in the Village is expected to be determined by the availability of development opportunities and was estimated to reach 2545 residents by 2021 in the 2007 OCP.[20] The Village of Harrison Hot Springs also attracts visitors for camping, hiking, canoeing, summer camps, and other recreational endeavors, particularly during the fire season (May – October). Several parks throughout the AOI are highly used during the summer months, including Rendall Park, Spring Park, East Sector, and Greenspace. Furthermore, Hot Springs Road (Highway 9) is frequently used as an access corridor for Sasquatch Provincial Park, which increases the number of people to evacuate in the event of a wildfire.

Knowledge of and access to updated structure locations within an area is a critical step in efficient and successful emergency response planning and the development of mitigation strategies and recommendations. Field visits to the Village AOI and access to recent orthophotography and spatial data from the Village has enabled the development of a spatial layer with structure locations that accounts for the most recent development.

Smoke exposure is another important consideration when assessing the risks of wildfire to human life and safety. Wildfire smoke contains many substances that can be harmful to human health, including

[18] BC Provincial Coordination Plan for Wildland Urban Interface Fires. 2016. https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc-provincial-coord-plan-for-wuifire_revised_july_2016.pdf

[19] Statistics Canada. 2016 Census.

[20] Village of Harrison Hot Springs Official Community Plan Bylaw No. 864.

particulate matter, carbon monoxide, volatile organic compounds, and toxic gases.[21] Those with pre-existing health conditions and firefighters are particularly at risk.

RECOMMENDATION #6: Consider lobbying the Provincial government or local Medical Health Officer(s) to develop a strategy for communities to draw upon when they are exposed to smoke from wildfire for extended periods of time. This strategy may include smoke exposure risk assessments, exposure reduction measures, and a decision-key for when to evacuate a community due to wildfire smoke.

3.2 CRITICAL INFRASTRUCTURE

Protection of critical infrastructure (CI) during a wildfire event is an important consideration for emergency response effectiveness, ensuring that coordinated evacuation can occur if necessary, and that essential services in the study area can be maintained and/or restored quickly in the case of an emergency. Critical infrastructure includes emergency and medical services, electrical and gas services, transportation, water, social services, and communications infrastructure. Table 3 details an inventory of critical infrastructure identified by the Village staff and during field visits and Map 2 provides a visual depiction of this critical infrastructure within the AOI.

Protection of critical infrastructure has shown itself to be an essential wildfire preparedness function. Survival and continued functionality of these facilities not only support the community during an emergency but also determine, to a great degree, the extent and cost of wildfire recovery and economic and public disruption during post wildfire reconstruction. Critical infrastructure provides important services that may be required during a wildfire event or may require additional considerations or protection. As outlined in Section 5.2, FireSmart principles are important when reducing wildfire risk to both classes of structure and are reflected in the outlined recommendations. During field visits, it was observed that the Village's critical infrastructure (i.e., fire halls, water infrastructure, etc.) is in various levels of compliance with FireSmart principles.

RECOMMENDATION #7: The use of fire resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure. Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines. Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.

3.2.1 Electrical Power

Electrical service for most of the Village of Harrison Hot Springs is received through a network of wood pole transmission and underground distribution infrastructure supplied by BC Hydro. Neighbourhoods with small, street-side wooden poles to connect homes are particularly vulnerable to fire. It is

[21] Wildfire Smoke and Your Health. US Forest Service. Retrieved from https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5318238.pdf

recommended that utility right-of-way BMPs such as, regular brushing and clearing of woody debris and shrubs be employed to help reduce fire risk, utility pole damage and subsequent outages.

One major transmission line bisects the Village AOI, connecting the Bridge River substation to the Rosedale substation. This system is well-mapped and BC Hydro states that staff will work with local fire departments and BCWS to mitigate impacts to this infrastructure in the event of a wildfire.[22]

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect means. For example, heat from flames or fallen trees associated with a fire event may cause power outages. Consideration must be given to protecting this critical service and providing power back up at key facilities to ensure that the emergency response functions are reliable.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks. Secondary power is available for some critical infrastructure such as the fire hall, emergency operations centre, and most water pumping stations via backup generators. Vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale outage occur, and fuel shortage in the event of very long outages. Refer to Section 6.1.2 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

The Village of Harrison Hot Springs does not contain any hospitals or airports, as residents are serviced by Chilliwack General Hospital, Abbotsford International Airport, and Vancouver International Airport. There is a FortisBC gas line that supplies the Village. A map of the FortisBC natural gas distribution system is not available to external companies. As such, it is not possible to identify specific areas that may be vulnerable to wildfire. A publicly available service area map[23] indicates that a Spectra Energy (now Enbridge Inc.) natural gas pipeline transects the Zone. A full inventory of critical infrastructure for communications, pipelines and Village buildings with updated locations is presented in Table 3, below.

Table 3. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Canadian Broadcasting Corporation Telecommunication Tower	McCombs Drive between Pine Avenue and Alder Avenue
Village of Harrison Hot Springs Municipal Administration Office	495 Hot Springs Road
Village of Harrison Hot Springs Fire Department	555 Hot Springs Road
Alternative* Emergency Operations Centre (EOC) 1 – the Village of Harrison Hot Springs Office	495 Hot Springs Road

[22] https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html
[23] https://www.fortisbc.com/About/ServiceAreas/Pages/default.aspx

Critical Infrastructure Type	Location
Harrison Hot Springs Elementary	501 Hot Springs Road
Water Treatment Plant	East of Hot Springs Road (Highway 9) at Balsam Avenue
Water Reservoir	East of Hot Springs Road (Highway 9) at Balsam Avenue

**Primary EOC is the Agassiz Fire Hall, located outside of the AOI*

3.2.3 Water and Sewage

The Village of Harrison Hot Spring's water is supplied through surface water sources from Harrison Lake. It is a duel system which relies on both pump and gravity fed mechanisms. The system includes a water treatment plant, a water reservoir, three pumps along Harrison Lake, and gravity fed distribution pipes which provide water to all residences within the Village. The province of BC tracks the water levels in Harrison Lake and levels are closely monitored during high water events. The Village operates and maintains a sewer system and has both a water treatment plant and a wastewater treatment plan within the AOI. In 2015, the Village commissioned a Water Master Plan Report to assess the water infrastructure and develop a planning strategy for the municipality. The report found multiple deficiencies in the system, and according to the Wildfire Working Ground, many of these have been resolved since the report was submitted.

In 2017, the Village was awarded $2.29 million for its Water Infrastructure Renewal Program. This work is now complete and involved upgrading water lines and water mains, and extending the system to incorporate 102 additional properties. These updates to the system within the Village, specifically the water main upgrade along Hot Springs Road, have increased the water capacity for fire suppression efforts. A detailed account of water availability for wildfire suppression is provided in Section 6.1.2.

Locations for water and sewage infrastructure (current as of 2018) within the Village AOI are detailed below in Table 4.

Table 4. Critical Water and Sewer Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Water supply	• The water treatment plant is located east of Hot Springs Road at Balsam Avenue • The water reservoir is located uphill of the water treatment plant • The water intake for the water system is located west of Harrison Beach
Sanitary sewer system	• The wastewater treatment plant is located on Whippoorwill Point.

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

The following section identifies high environmental and cultural values and where they are located. Environmental, cultural and recreational values are high throughout the AOI. A more detailed account of environmental and biodiversity aspects of this region is presented in Section 3.3.3.

3.3.1 Drinking Water Supply Area and Community Watersheds

The Village of Harrison Hot Springs draws its domestic water from Harrison Lake. There are no Community Watersheds which intersect Village AOI, however, effects from wildfire still have the potential to impact the community's primary water supply, which draws from Harrison Lake. It should also be noted that the potential impacts of wildfire extend past the time a fire is extinguished. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[24] Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, or flooding. This may directly impact the community (i.e., structure loss, risk to public safety) or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the watershed affecting water quality.

3.3.2 Cultural Values

The Coast Salish are the main First Nations group whose territory falls within the Fraser Valley. Within this group, a total of 37 First Nations with aboriginal interests in the AOI were identified in the BC Consultative Areas Database. These include the following mainland-based First Nations: Stó:lō Nation and Stó:lō Tribal Council, Soowahlie First Nation, Shxw'ow'hamel First Nation, Skawahlook First Nation, Leq'a:mel First Nation, Scowlitz First Nation, Kwaw-kwaw-apilt First Nation, Skwah First Nation, Chawathil First Nation, Seabird Island Band, Sts'ailes, Peters First Nation, Siska Indian Band, Cook's Ferry Indian Band, Coldwater Indian Band, Oregon Jack Creek Indian Band, Nlaka'pamux Nation Tribal Council, Nicola Tribal Association, Lower Nicola Indian Band, Lytton First Nation, Boothroyd Indian Band, Ashcroft Indian Band, Shackan Indian Band, Spuzzum First Nation, Skuppah Indian Band, Popkum First Nation, Cheam First Nation, Union Bar First Nations, Yale First Nation, Nooaitch Indian Band, and the following Vancouver Island based First Nations: Halalt First Nation, Stz'uminus First Nation, Cowichan Tribes, Lake Cowichan First Nation, Lyackson First Nation, and Penelakut Tribe.

Archaeological sites in BC that pre-date 1846 are protected by the *Heritage Conservation Act* (HCA), which applies on both private and public lands. Archaeological remains in BC are protected from disturbance, intentional and inadvertent, by the HCA. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (e.g., lithic scatters) as well as Aboriginal pictographs, petroglyphs, and burials (which are likely not as old but are still considered to have historical or archaeological value) are also protected. Under the HCA, protected sites may not be damaged, altered or moved in any way without a permit. It is a best practice that cultural heritage resources such as

[24] Jordan, P., K. Turner, D. Nicol, D. Boyer. 2006. Developing a Risk Analysis Procedure for Post-Wildfire Mass Movement and Flooding in British Columbia. Part of the 1st Specialty Conference on Disaster Mitigation. Calgary, AB May 23 -26, 2006.

culturally modified tree (CMT) sites be inventoried and considered in both operational and strategic planning.

Due to site sensitivity, the locations of archaeological sites may not be made publicly available, however, data provided by the MFLNRORD Archaeology Branch confirms that multiple sites do exist. The Village should ensure that they have direct access to Remote Access to Archaeological Data (RAAD), which allows users to look up or track any archeological sites in the area.[25] Prior to stand modification for fire hazard reduction, and depending on treatment location, preliminary reconnaissance surveys may be undertaken to ensure that cultural heritage features are not inadvertently damaged or destroyed. Pile burning and the use of machinery have the potential to damage artifacts that may be buried in the upper soil horizons. Above ground archaeological resources may include features such as CMTs, which could be damaged or accidentally harvested during fire hazard reduction activities. Fuel treatment activities should include consultation with all identified First Nations at the site level and should ensure sufficient time for review and input regarding their rights and interests prior to prescription finalization or implementation.

3.3.3 High Environmental Values

The AOI overlaps with multiple legal Old Growth Management Areas (OGMAs). Any proposed fuel treatment that may overlap these areas requires MFLNRORD oversight at the prescription development phase, and works can only occur following MFLNRORD consultation and approval.

The Conservation Data Centre (CDC), which is part of the Environmental Stewardship Division of the Ministry of Environment and Climate Change Strategy, is the repository for information related to plants, animals and ecosystems at risk in BC. To identify species and ecosystems at risk within the study area, the CDC database was referenced. Two classes of data are kept by the CDC: non-sensitive occurrences for which all information is available (species or ecosystems at risk and location); and masked, or sensitive, occurrences where only generalized location information is available.

There are four occurrences of Red-listed species, one occurrence of Blue-listed species within the AOI (Table 5), and one overlap with a masked occurrence. Through consultation with the CDC and a biologist or QP, all site level operational plans must determine if these occurrences will be impacted by fuel management or other wildfire mitigation activities. All future fuel treatment activities or those associated with recommendations made in this plan should consider the presence of, and impact upon, potentially affected species. Additionally, all site level operational plans should consult the most recent data available to ensure that any new occurrences or relevant masked occurrences are known and considered in the operational plan to mitigate any potential impacts on species at risk. The BC Species & Ecosystems Explorer, which allows combined searches for species and ecological communities, should also be consulted at the prescription phase. Due to potential limitations of existing databases, consultation with a QP with local knowledge may also be recommended at the prescription phase.

[25] https://www.for.gov.bc.ca/archaeology/accessing_archaeological_data/obtaining_access.htm

Table 5. Publicly available occurrences of Red and Blue-listed species recorded within the AOI.

Common Name	Scientific Name	Category	BC List	Habitat Type
Salish Sucker	*Catostomus sp. 4*	Vertebrate Animal	Red	Riverine: Creek
Pacific Water Shrew	*Sorex bendirii*	Vertebrate Animal	Red	Terrestrial: Forest Mixed, Swamp
Pygmy Longfin Smelt	*Spirinchus sp. 1*	Vertebrate Animal	Red	Lacustrine; Deep Water
White Sturgeon, (Lower Fraser River population)	*Acipenser transmontanus pop. 4*	Vertebrate Animal	Red	Riverine: Big River; High Gradient; Low Gradient; Moderate Gradient; Estuarine: River Mouth; Tidal Flat
Northern Red-legged Frog	*Rana aurora*	Vertebrate Animal	Blue	Lacustrine: Shallow Water; Palustrine: Pond; Terrestrial: Marsh, Forest Needleleaf, Forest Mixed

3.4 OTHER RESOURCE VALUES

There are multiple resources values associated with the land base, including recreation and tourism, wildlife habitat, drinking water supplies, timber supply and many others.

The AOI is located in the Fraser Timber Supply Area (TSA), which encompasses approximately 1.4 million hectares of land and is administered by the Chilliwack Natural Resource District.[26] The last Timber Supply Review (TSR) was completed in 2015 and the Allowable Annual Cut (AAC) determination was completed in February of 2016.[27,28] However; effective August, 2016 the current AAC is 1,241,602 cubic metres (as a result of the surrender of a Tree Farm License).[26] The AAC is not applicable to

[26] Government of BC, Fraser Timber Supply Area. Accessed at: https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/fraser-tsa

[27] Ministry of Forests, Lands and Natural Resource Operations, Fraser TSA Timber Supply Analysis Discussion Paper. Accessed at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/fraser_tsa_discussion_paper.pdf

[28] Fraser Timber Supply Area Rationale for AAC Determination. Accessed at: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/stewardship/forest-analysis-inventory/tsr-annual-allowable-cut/fraser_tsa_rationale.pdf

private managed forest land. The effective timber harvesting land base in the TSA, based on the last TSR, is 250,405 ha or approximately 17.6% of the total land area.[27]

Fuel reduction treatments on Crown land within the AOI are not anticipated to have a measurable effect on the timber harvesting land base. Typically, forest stands identified for fuels treatments are highly constrained for conventional logging and are often in undesirable or uneconomic stand types. No forest tenures currently exist on crown land within the AOI, however, the opportunity still exists to work with local licensees on commercial thinning projects that meet fuel management objectives on forested tenure lands immediately adjacent to the AOI.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. The Village of Harrison Hot Springs wastewater treatment plant is the only industrial site or facility that can be considered a hazardous value. The management and treatment of fuels in proximity to hazardous infrastructure is critical in order to reduce the risks associated with both structural fire and wildfire. Specifically, best management practices recommended for management of hazardous values include: 1) incorporating FireSmart planning and setback requirements for all infrastructure in this category; and 2) maintaining emergency fuel/propane emergency shut off procedures to be enacted immediately and efficiently in the event of an approaching wildfire or ember shower.

Table 6. Hazardous Infrastructure Identified in CWPP field visits.

Critical/Hazardous Infrastructure Name	2018 Location
Wastewater treatment plant	Whippoorwill Point

SECTION 4: WILDFIRE THREAT AND RISK

This section summarizes the factors that contribute to and were assessed in the determination of wildfire threat around the community. These factors include the natural fire regime and ecology, the Provincial Strategic Threat Analysis, and the local wildfire risk analysis completed for the AOI.

4.1 FIRE REGIME, FIRE DANGER DAYS AND CLIMATE CHANGE

The ecological context of wildfire and the role of fire in the local ecosystem under historical conditions is an important basis for understanding the current conditions and the potential implications of future conditions on wildfire threat to the community. Historical conditions may be altered by the interruption of the natural fire cycle (i.e., due to fire exclusion, forest health issues, human development) and/or climate change.

4.1.1 Fire Regime

Ecological Context and Forest Structure

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils, and climate. Map 3 outlines the BEC zones found within the AOI. Regional subzones are derived from relative precipitation and temperature. Subzones may be further divided into variants based upon climatic variation and the resulting changes in the vegetative communities; variants are generally slightly drier, wetter, snowier, warmer, or colder than the climate of the regional subzone.[29] The following section is synthesized from information found on MFLRNORD's Research Branch BECWeb.[29]

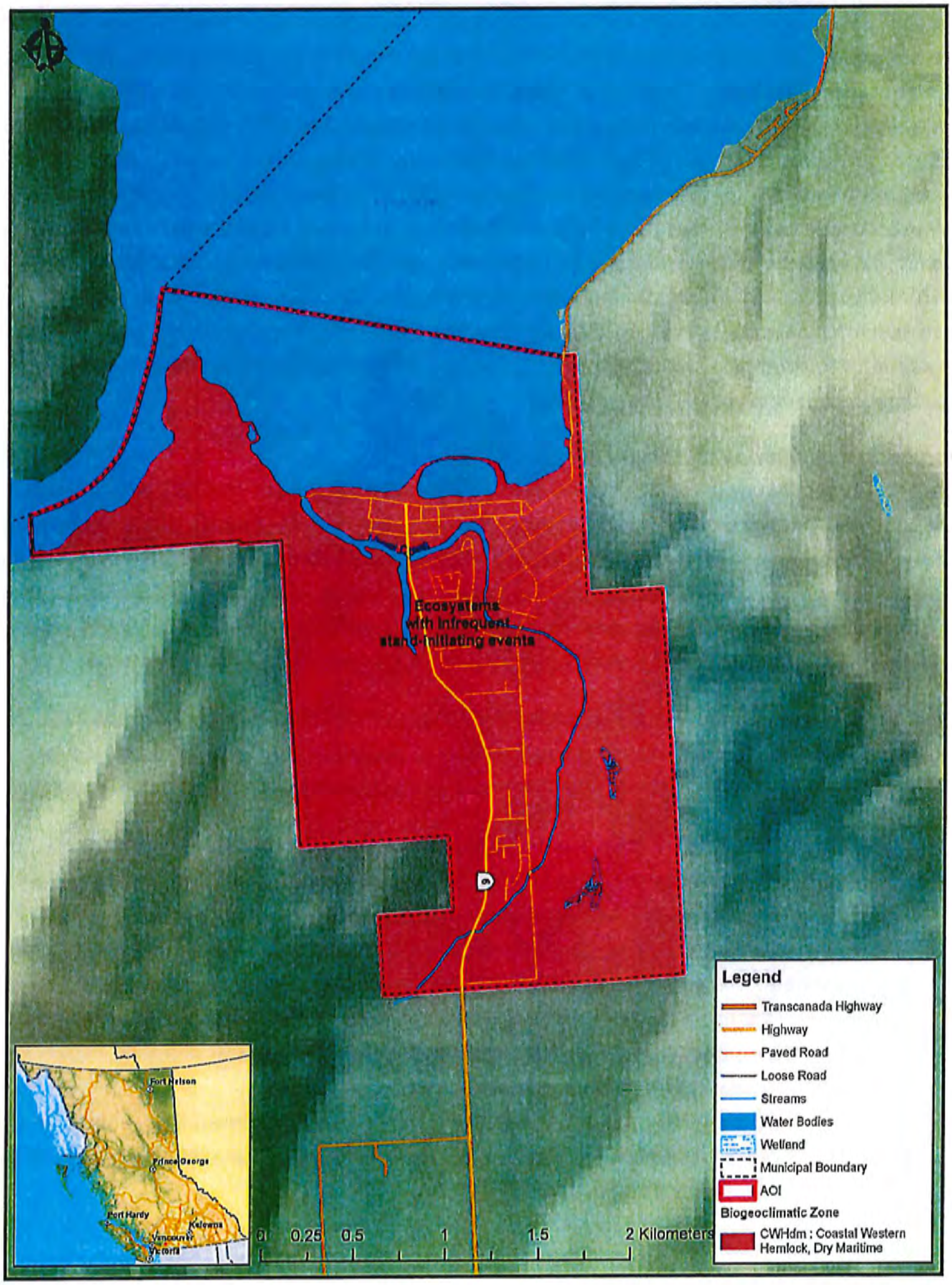
BEC zones have been used to classify the Province into five Natural Disturbance Types (NDTs). NDTs have influenced the vegetation dynamics and ecological functions and pathways that determine many of the characteristics of our natural systems. The physical and temporal patterns, structural complexity, vegetation communities, and other resultant attributes should be used to help design fuel treatments, and where possible, to help ensure that treatments are ecologically and socially acceptable.[30]

The Village of Harrison Hot Springs AOI is characterized by Coastal Western Hemlock, Dry Maritime (CWHdm) BEC subzone. The CWHdm makes up 100% of the Village AOI. The CWHdm supports forests on zonal sites that are dominated by Douglas-fir (*Pseudotsuga menziesii*), accompanied by western redcedar (*Thuja plicata*) and western hemlock (*Tsuga heterophylla*). It is normally found at elevations between sea level and 650m.[31] The CWHdm is characterized by warm, dry summers and moist, mild winters where snowfall is uncommon. The CWHdm is classified as a Natural Disturbance Type 2 – forest ecosystems with infrequent stand initiating events where fires are often of moderate size (20 to 1000 ha) with a mean return interval of fire of approximately 200 years.[30] Many of these fires occur after periods of extended drought and produce a forested landscape characterized by extensive areas of mature forest with intermixed patches of younger forests.[30] Although the fire frequency is not high and fires are generally not large, pre-planning and preparation are essential to reduce the negative impacts of a wildfire.

[29] https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

[30] Province of British Columbia, 1995. Biodiversity Guidebook, s.l.: s.n.

[31] Green & Klinka, 1994



Map 3. Biogeoclimatic Zones within the AOI.

Forest Health Issues

The Coast Forest Health Overview outlines forest health issues present within the Fraser TSA.[32] This overview and forest health strategy (2015-2017) outlines several forest health issues that are most prevalent within the Fraser Timber Supply Area. Of particular concern, due to the severity or extent of outbreaks, are the Douglas-fir beetle, Swiss needle cast and Douglas-fir needle cast, mountain pine beetle, root diseases (primarily laminated root disease and armillaria spp.), drought, and windthrow. Outbreaks of western hemlock looper and western spruce budworm were a concern in the past, however, occurrences of these pests have declined in recent years. Spatial data available through DataBC[33] indicates no historic outbreaks of forest pests within the Village AOI. However, these forest health factors may still be present within the AOI and have implications for the level of surface fuel accumulation in affected stands, as well as access and working conditions for firefighters in the event of wildfire. Both laminated and armillaria root rot can result in high levels of windthrow due to the destabilization of infected trees' root systems.

Human Development and Natural Events

Most land cover change in the AOI can be described as residential and commercial development. This process entails land clearing and road building. Forest harvesting is also common on provincial Crown land as well as on private land within the AOI. Abiotic and biotic natural events occur at small geographic scales. The overall implication of human development is an increase in human ignition potential with a decrease in hazardous fuels cover as land clearing for human development generally increases the non-fuel and O1-a/b fuel types (see Section 4.3.1 for a description of fuel types).

Since the establishment of communities within the Village of Harrison Hot Springs, there have been numerous anthropogenic and natural changes that have occurred on the landscape. The following is a list of notable changes observed within the AOI and a description of associated implications regarding wildfire behaviour.

- Residential land development has occurred across the AOI since the mid-19th century following wide-spread settlement by early pioneers engaging in resource-based activities. This has generally resulted in an increased wildland-urban interface in particular areas (Section 5.2.3) and an increase in fire suppression in an ecosystem that had a historic fire interval of 200 years. Population growth is expected to continue and the Village's proximity to larger Fraser Valley communities, favourable climate and high recreational and landscape values make it a desirable place to live and work or retire.
- Forest industry activities – forest harvesting occurs on provincial crown land within the AOI. Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.

[32] 2015-17 Coastal Timber Supply Areas Forest Health Overview. 2015.

[33] https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons (current as of September, 2017)

4.1.2 Fire Weather Rating

The Canadian Forestry Service developed the Canadian Forest Fire Danger Rating System (CFFDRS) to assess fire danger and potential fire behaviour. Fire Danger Classes provide a relative index of the ease of ignition and the difficulty of suppression. A network of fire weather stations is maintained during the fire season by MFLNRORD and the recorded data are used to determine fire danger, represented by Fire Danger Classes, on forestlands within a community. The information can be obtained from the BCWS and is most commonly utilized by municipalities and regional districts to monitor fire weather, restrict high risk activities when appropriate, and to determine hazard ratings associated with bans and closures.

The BC *Wildfire Act* [BC 2004] and *Wildfire Regulation* [BC Reg. 38/2005], which specify responsibilities and obligations with respect to fire use, prevention, control and rehabilitation, and restrict high risk activities based on these classes. Fire Danger Classes are defined as follows:

- **Class 1 (Very Low):** Fires are likely to be self-extinguishing and new ignitions are unlikely. Any existing fires are limited to smoldering in deep, drier layers.
- **Class 2 (Low):** Creeping or gentle surface fires. Ground crews easily contain fires with pumps and hand tools.
- **Class 3 (Moderate):** Moderate to vigorous surface fires with intermittent crown involvement. They are challenging for ground crews to handle; heavy equipment (bulldozers, tanker trucks, and aircraft) are often required to contain these fires.
- **Class 4 (High):** High-intensity fires with partial to full crown involvement. Head fire conditions are beyond the ability of ground crews; air attack with retardant is required to effectively attack the fire's head.
- **Class 5 (Extreme):** Fires with fast spreading, high-intensity crown fire. These fires are very difficult to control. Suppression actions are limited to flanks, with only indirect actions possible against the fire's head.

It is important for the development of appropriate prevention programs that the average exposure to periods of high fire danger is determined. 'High fire danger' encompasses Danger Class ratings of 4 (High) and 5 (Extreme). Danger class days were summarized to provide an indication of the fire weather in the AOI. Considering that fire danger varies from year to year, historical weather data can provide information on the number and distribution of days when the AOI is typically subject to high fire danger conditions, which is useful information in assessing fire risk.

Figure 1 displays the average frequency of Fire Danger Class days between the months of April and October. The data summarized comes from the Haig Camp weather station (daily data for the years 2002 – 2018). According to Figure 1, the months with the highest average number of 'high' and 'extreme' fire danger class days are July and August. Historically, 'high' fire danger days also occur in June and even extend into May and October. 'Extreme' fire danger class days extend only into June and September. August historically has the highest number of days in the 'extreme' and 'high' classes when compared to June, July, and September.

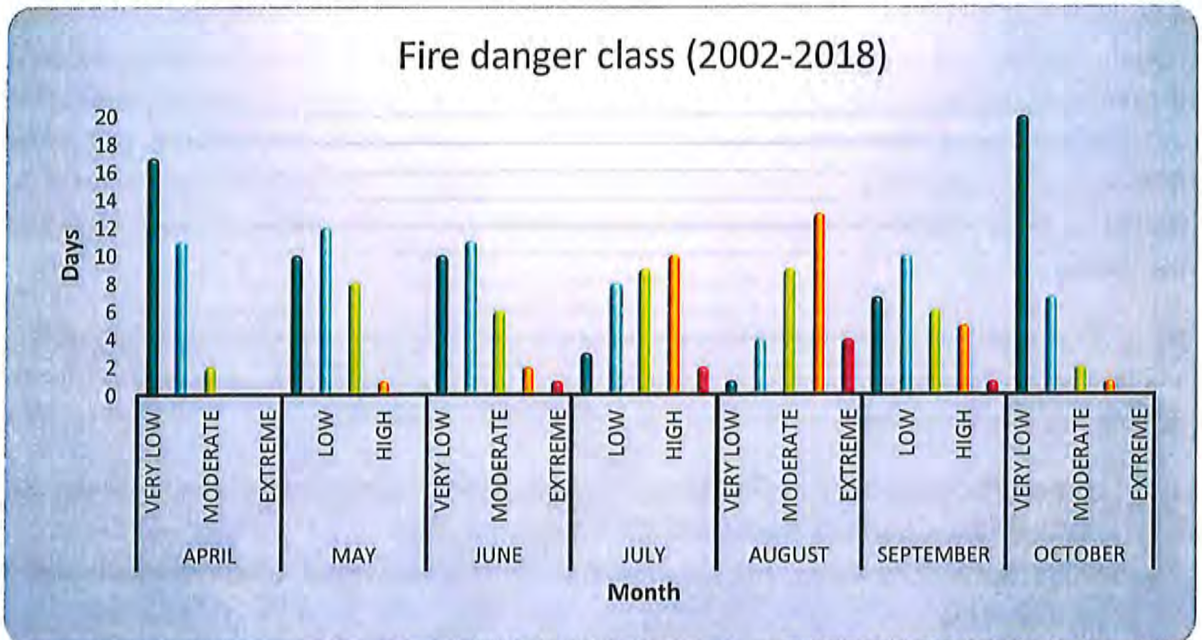


Figure 1. Average number of danger class days for the Haig Camp weather station. Summary of fire weather data for the years 2002 - 2018.

4.1.3 Climate Change

Climate change is a serious and complex consideration for wildfire management planning. Warming of the climate system is unequivocal, and since the 1950s, each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850. The period from 1983 to 2012 was likely the warmest 30-year period of the last 1400 years in the Northern Hemisphere.[34]

Numerous studies outline the nature of these impacts on wildland fire across Canada, and globally. Although there are uncertainties regarding the extent of the impacts of climate change on wildfire, it is clear that the frequency, intensity, severity, duration and timing of wildfire and other natural disturbances is expected to be altered significantly with the changing climate.[35] Despite the uncertainties, trends within the data are visible. As outlined in the *BC Agriculture Climate Change Adaptation Risk & Opportunity Assessment Series Fraser Valley and Metro Vancouver Snapshot Report*[36], the following climate projections for the Fraser Valley are made:

[34] International Panel on Climate Change. (2014) Climate change 2014: Synthesis report, summary for policymakers. 32p.

[35] Dale, V., L. Joyce. S. McNulty, R. Neilson, M. Ayres, M. Flannigan, P. Hanson, L. Irland, A. Lugo. C. Peterson, D. Simberloff, F. Swanson, B. Stocks, B. Wotton. *Climate Change and Forest Disturbances*. BioScience 2001 51 (9), 723-734.

[36] British Columbia Agriculture & Food Climate Action Initiative, 2012. https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf

- Increases in average annual temperature consistent with temperature increases for the province of BC (approximately 1.8°C increase from 1961-1990 baseline by 2050);
- Decline in summer precipitation (up to 14% decrease by 2050) leading to drier fuels and soils, thereby increasing fire behaviour potential;
- Increase in winter precipitation (6% by 2050) in the form of rain and significant decreases in snowfall (-25% in the winter and -56% in the spring);
- Annual runoff from the Fraser River is expected to increase by approximately 14%, with increasing spring flow and decreasing summer flow;
- In the province as a whole, as average winter temperatures increase, more intense winter precipitation is expected to fall as rain during extreme events, and less falling as snow; potentially influencing watershed and groundwater storage ability, timing and amount of run-off, and soil and fuel moisture during early fire season.

An increased frequency of natural disturbance events is expected to occur as a result of climate change with coincident impacts to ecosystems. These include:

- Storm events, including catastrophic blowdown and damage to trees from snow and ice;
- Wildfire events and drought;
- Increased winter precipitation may result in slope instability, mass wasting, increased peak flows (loss of forest cover from fire or other disturbance may increase the chance of mass wasting); and
- Insects and disease occurrence of spruce beetle and Swiss needle cast may increase; outbreaks of western hemlock looper may increase.[37]

Other research regarding the intricacies of climate change and potential impacts on wildfire threats to Canadian forests has found that:

- Fuel moisture is highly sensitive to temperature change and projected precipitation increases will be insufficient to counteract the impacts of the projected increase in temperature. Results conclude that future conditions will include drier fuels and a higher frequency of extreme fire weather days.[38]
- The future daily fire severity rating (a seasonally cumulative value) is expected to have higher peak levels and head fire intensity is expected to increase significantly in western Canada. A bi-modal (spring-late summer) pattern of peak values may evolve to replace the historical late summer peak which is the current norm.[39] The length of fire seasons is expected to increase

[37] MFLNRO, 2016. BC Provincial Government extension note '*Adapting natural resource management to climate change in the West and South Coast Regions*'. Accessed online at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/coasten160222.pdf

[38] Flannigan, M.D., B.M. Wotton, G.A. Marshall, W.J. deGroot, J. Johnston, N. Jurko, A.S. Cantin. 2016. *Fuel moisture sensitivity to temperature and precipitation: climate change implications*. Climatic Change (2016) 134: 59 -71. Accessed online at https://link.springer.com/content/pdf/10.1007%2Fs10584-015-1521-0.pdf.

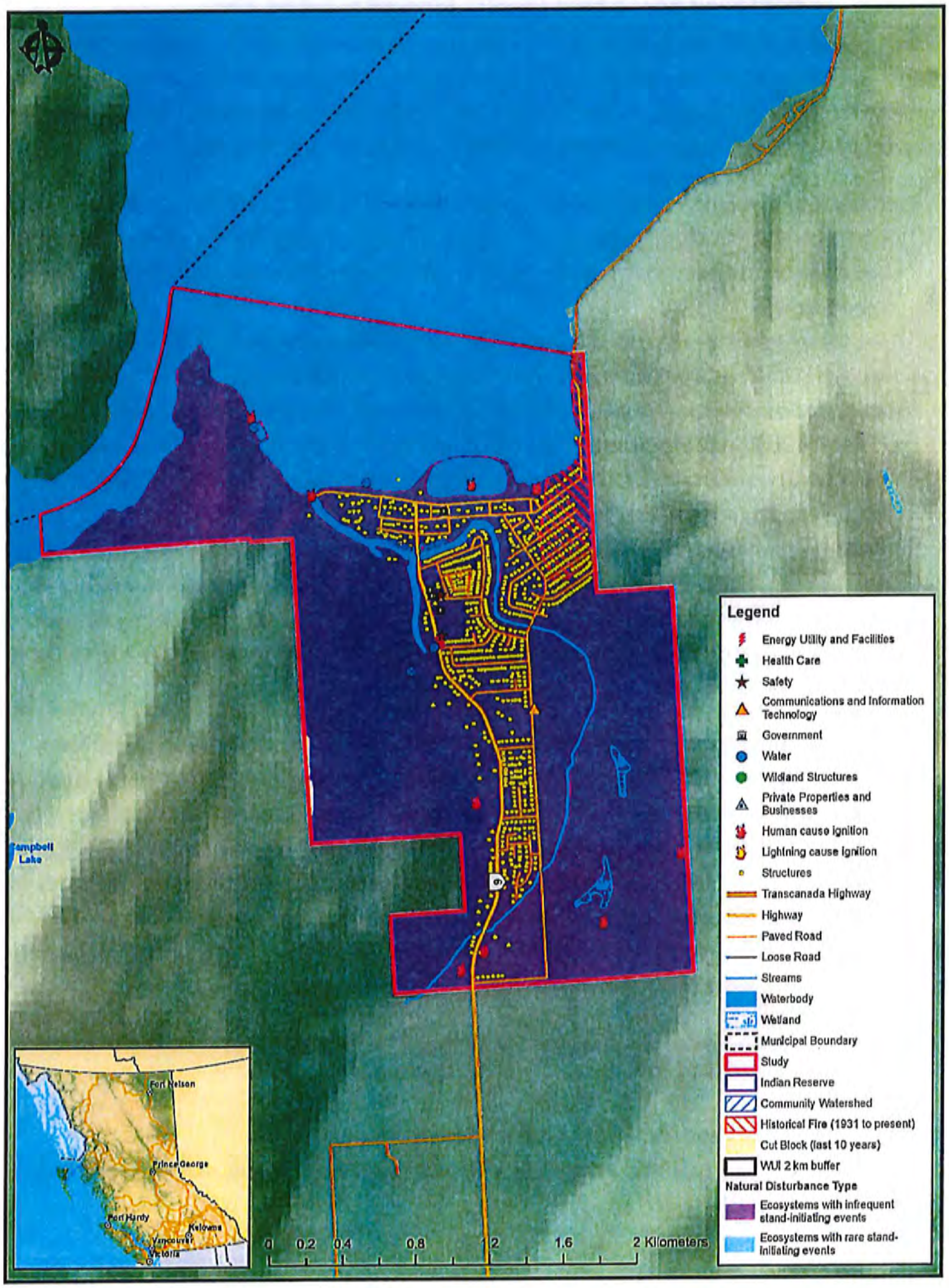
[39] deGroot, W. J., M. D. Flannigan, A.S. Cantin. 2013. *Climate change impacts on future boreal fire regimes*. Forest Ecology and Management. 294: 35 -44.

and the increase will be most pronounced in the northern hemisphere, specifically at higher latitude northern regions. Fire season severity seems to be sensitive to increasing global temperatures; larger and more intense fires are expected and fire management will become more challenging.[40, 41]

- More extreme precipitation events (increased intensity and magnitude of extreme rainfall) are expected, particularly in April, May and June, along with dry periods between major events (increased summer drought periods). Annual runoff is also expected to increase and the timing of peak flows are anticipated to occur earlier in the spring. [42]
- Future climatic conditions may be more suitable for, or give competitive advantage to, new species of plants, including invasive species.[43]

In summary, climate scientists expect that the warming global climate will trend towards wildfires that are increasingly larger, more intense and difficult to control. Furthermore, it is likely that these fires will be more threatening to WUI communities due to increased potential fire behaviour, fire season length, and fire severity. This trend is expected to be disproportionately felt in northern latitudes.[44]

[40] Flannigan, M.D., A.S. Cantin, W.J. de Groot, M. Wotton, A. Newbery, L.M. Gowman. 2013. *Global wildland fire season severity in the 21st century*. Forest Ecology and Management (2013) 294: 54 - 61.
[41] Jandt, R. 2013. Alaska Fire Science Consortium Research Brief 2013-3.
[42] British Columbia Agriculture & Food Climate Action Initiative, 2012.
https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf
[43] British Columbia Agriculture & Food Climate Action Initiative, 2012.
https://pics.uvic.ca/sites/default/files/uploads/publications/Adapt-FraserMetroVan%20Crawford.pdf
[44] All research noted was completed for Canada or globally, not for the study area. Direct application of trends may not be appropriate, although general expectations for Canada were noted to be consistent across multiple studies.



Map 4. Fire Regime, Ecology and Climate Change.

4.2 PROVINCIAL STRATEGIC THREAT ANALYSIS

The Provincial Strategic Threat Analysis (PSTA) evaluates multiple data sets to provide a coarse (high-level) spatial representation of wildfire threats across BC. The information in this section is a synthesis of the BCWS' Provincial Strategic Threat Analysis 2017 Wildfire Threat Analysis Component.[45] Three inputs are combined to create the PSTA Wildfire Threat Analysis (WTA) Component:

1) **Historic fire density**: represents the ignition and fire spread potential based upon historic patterns and fire density weighted by fire size (larger fire perimeters were given a higher weight in order to reflect the greater cost and damage usually associated with larger fires) (see Map 5 below).
2) **Spotting impact:** represents the ability of embers or firebrands from a burning fire to be sent aloft and start new fires in advance of the firefront, or outside of the fire perimeter. Spotting is most associated with high intensity crown fires in coniferous fuels and structure losses. For the WTA, the spotting analysis is based on estimating the threat to a given point on the landscape from the fuels surrounding it, up to a distance of 2 km. Spotting distances greater than 2 km are rare and unpredictable.
3) **Head fire intensity (HFI)**: represents the intensity (kW/m) of the fire front, a measure of the energy output of the flaming front. HFI is directly related to flame length, fire spread rate and fuel consumption and a fire's leading edge. There is a strong correlation between HFI, suppression effort required, and danger posed to suppression personnel. The HFI used in the WTA was developed using the 90th percentile fire weather index value.

The final wildfire threat analysis value was developed through an average weighting process of the aforementioned three layers: fire density 30%; HFI 60%; and spotting impact 10%. Water bodies were automatically given a value of 'no threat' (-1). The values were then separated into 10 classes (1 – 10) which represent increasing levels of overall fire threat (the higher the number, the greater the fire threat); threat class 7 is considered the threshold. Threat classes of 7 and higher are locations where the threat is severe enough to potentially cause catastrophic losses in any given fire season, when overlapping with values at risk. Classes were grouped into the following general threat class descriptions: low (1 – 3); moderate (4 – 6); high (7 – 8); and, extreme (9 – 10).

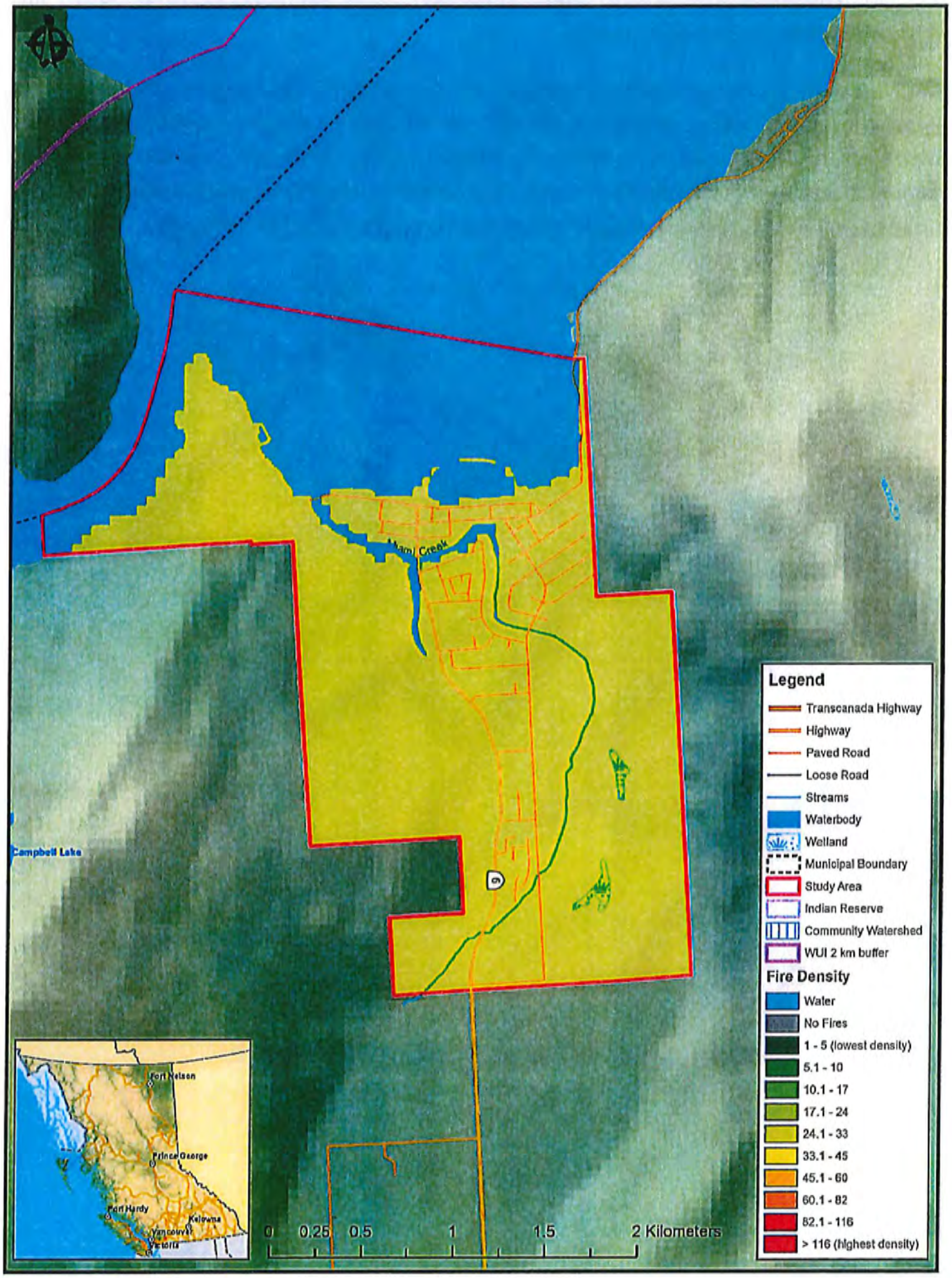
There are considerable limitations associated with the WTA component based upon the accuracy of the source data and the modeling tools, the most notable being:

- Limited accuracy and variability of the fire history point data;
- Sensitivity to fuel type and the associated limitations of using fuel type approximations for fire behaviour modelling; and,

[45] BC Wildfire Service. 2015. *Provincial Strategic Threat Analysis 2015 Wildfire Threat Analysis Component.* Retrieved from: https://www.for.gov.bc.ca/ftp/!Project/WildfireNews/PSTA/Provincial_Strategic_Threat_Analysis_PSTA_2015_REPORT.pdf. Accessed January 9, 2018.

- 90th percentile rating for HFI, which represents a near worst-case scenario which may be artificial in some circumstances.

The WTA serves to provide a provincial-level threat assessment for resource and land managers and local governments in order to complete landscape fire management planning and strategically plan efficient and effective wildfire risk reduction initiatives (e.g. placement or prioritization of fuel treatment areas, identification of values at risk, FireSmart planning, etc.). The WTA is then validated at the stand level in order to produce a finer, more accurate assessment of local threat.



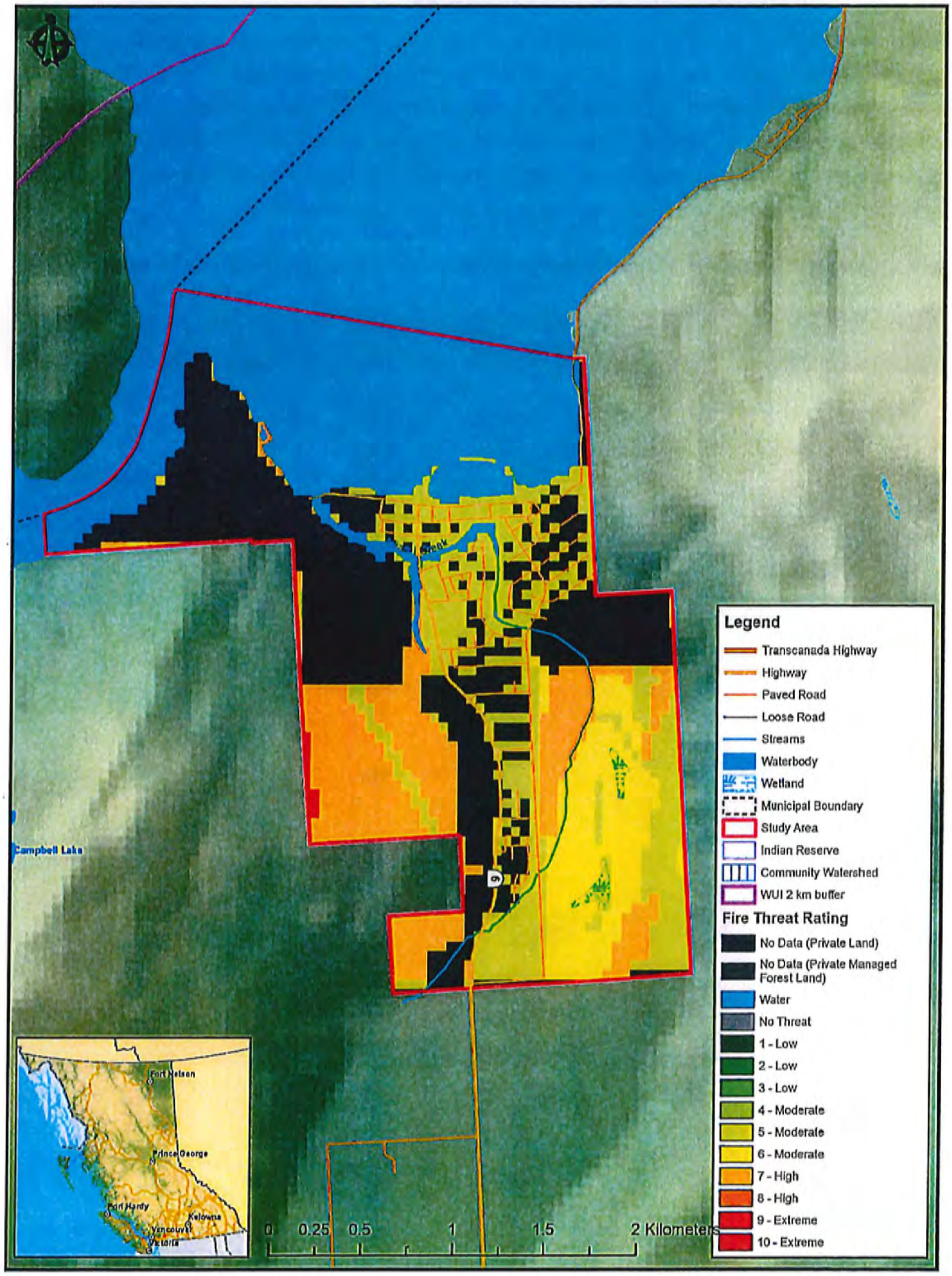
Map 5. Historical Fire Density.

4.2.1 PSTA Final Wildfire Threat Rating

Approximately 28% of the AOI is categorized as having a moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 7). High threat ratings cover less than 15% of the study area, with the most notable high-threat areas being concentrated on the western side of the AOI on Mount Woodside, and portions of the East Sector Lands (Map 6). 31% of the AOI is categorized as private land and has no data for wildfire threat in the Provincial Wildfire Threat Analysis dataset (PSTA), and water covers 27%. There are no low or extreme threat areas within the Village AOI.

Table 7. Overall PSTA Wildfire Threat Analysis for the study area (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	217	No Data (Private Land)	31
-2	0	No Data (Private Managed Forest Land)	0
-1	192	Water	27
0	0	No Threat	0
1	0	Low	0
2	0		
3	0		
4	0		
5	133	Moderate	28
6	62		
7	102	High	14
8	0		
9	0	Extreme	0
10	2		
Total	708	-	**100**



Map 6. Provincial Strategic Threat Rating.

4.2.2 Spotting Impact

Spotting impact is modeled by fuel type and distance class from a given fuel type. The layer estimates the threat of embers impacting a given point on the landscape from the fuel types surrounding it.

It has been found that, during extreme wildfire events, most home destruction has been a result of low-intensity surface fire flame exposures, usually ignited by embers in advance of the fire front. Firebrands can be transported long distances ahead of the wildfire, across fire guards and fuel breaks, and accumulate in densities that can exceed 600 embers per square meter. Combustible materials found adjacent or near to values at risk can provide fire pathways allowing spot surface fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

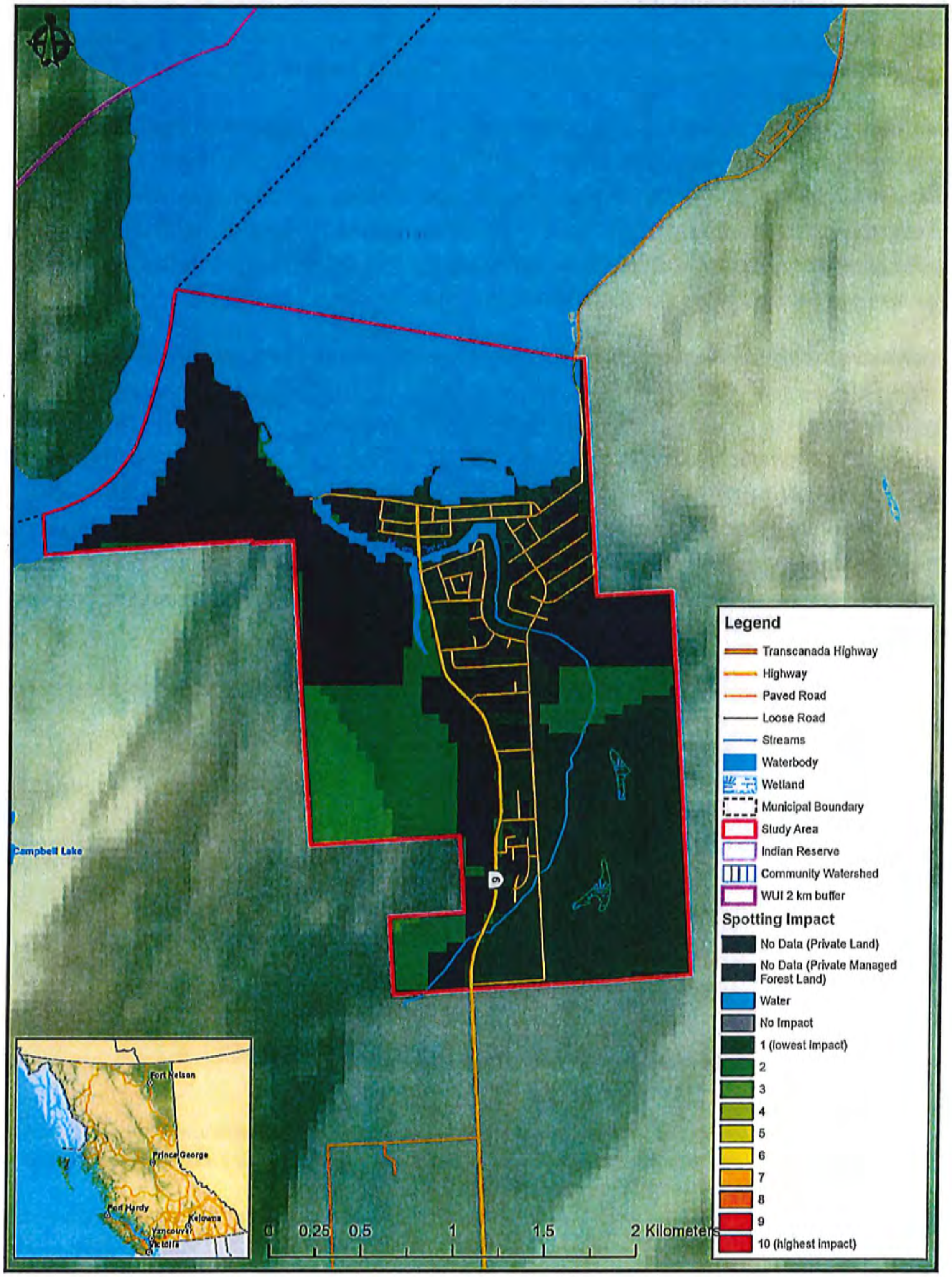
For example, an investigation of home destruction from the 2016 Fort McMurray, Alberta fire found that the vast majority of home ignitions in the interface (outer edges of urban neighbourhoods) were attributable to embers alighting on combustible material (home or adjacent areas).[46] Similarly, reports from the 2010 Fourmile Canyon fire outside Boulder, Colorado, found that only 17% of the 162 homes destroyed were attributed to crown fire.[47,48] Instead of high intensity flames or radiant heat, the majority of homes ignited as a result of firebrands (or embers), which ignited lower-intensity surface fires adjacent to structures or the home directly.[48] Post-fire studies have shown that it is uncommon for homes to be partially damaged by wildfire; survivability is based upon whether or not the structure, or area adjacent to the structure, ignites.

The AOI appears to generally be low in terms of spotting impact with the highest impact areas being in the western part of the AOI on Mount Woodside (Map 7).

[46] Westhaver, A. 2017. *Why some homes survived. Learning from the Fort McMurray wildland/urban interface fire disaster.* A report published by the Institute for Catastrophic Loss Reduction – ICLR research paper series – number 56. https://www.iclr.org/images/Westhaver_Fort_McMurray_Final_2017.pdf

[47] Calkin, D., J. Cohen, M. Finney, M. Thompson. 2014. *How risk management can prevent future wildfire disasters in the wildland-urban interface.* Proc Natl Acad Sci U.S.A. Jan 14; 111(2): 746-751. Accessed online 1 June, 2016 at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/.

[48] Graham, R., M. Finney, C. McHugh, J. Cohen. D. Calkin, R. Stratton, L. Bradshaw, N. Nikolov. 2012. Fourmile Canyon Fire Findings. Gen. Tech. Rep. RMRS-GTR-289. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 110 p.



Map 7. Spotting Impact within the AOI.

4.2.3 Head Fire Intensity

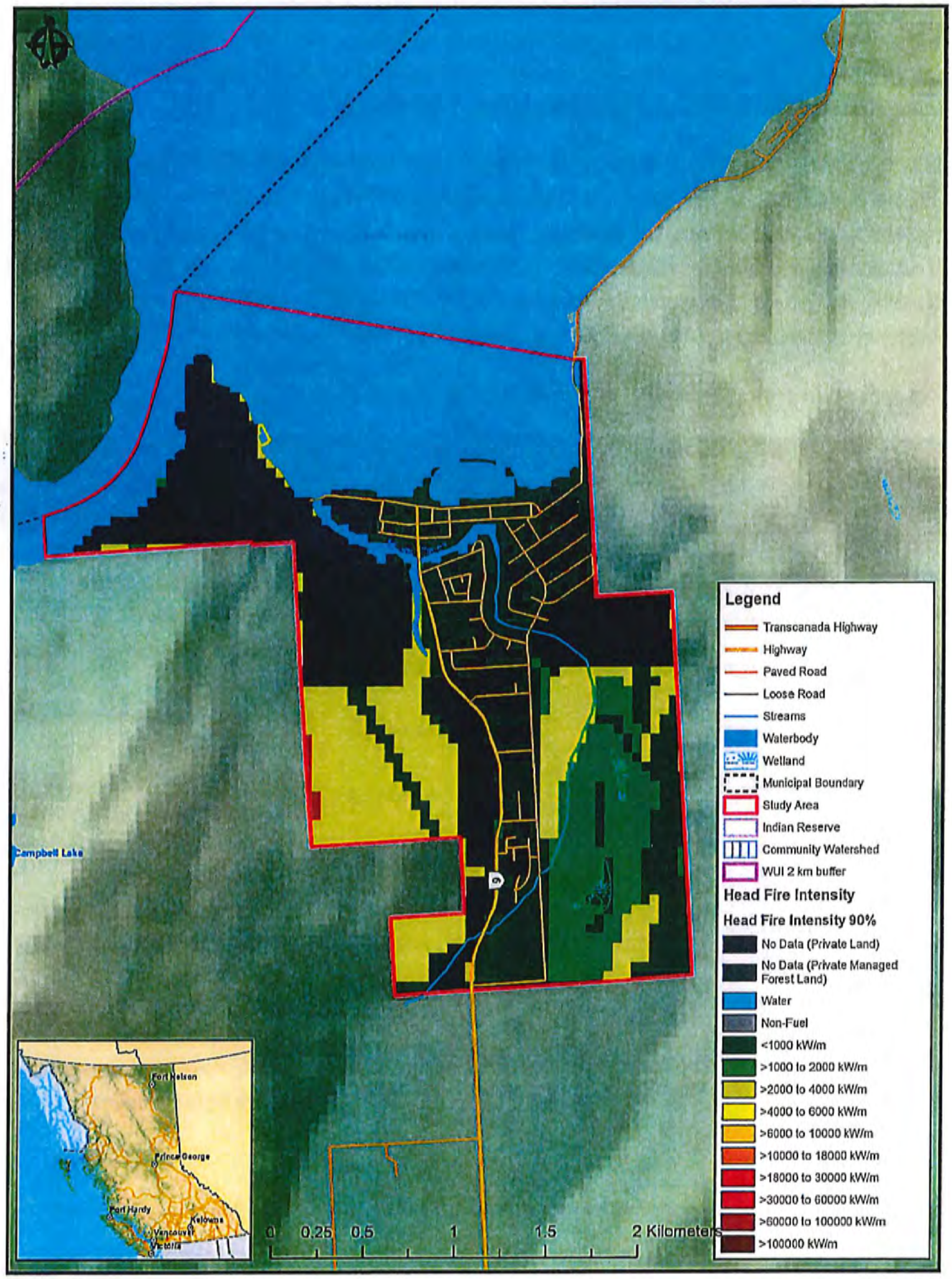
HFI is correlated with flame length and fire behaviour. The greater the fire intensity (or HFI), as measured in kW/m, and fire intensity class, the more extreme the fire behaviour is likely to be and the more difficult the fire will likely be to suppress (Table 8 and Map 8).

In the AOI, generally speaking, classes 1 and 3 are the most common in the AOI (approximately 19 and 14% of the area, respectively), and class 2 makes up the third most area (Table 8, Map 8). Class 3 is described as vigorous surface fire and classes 2 and 1 are described as moderate vigour surface fire and smoldering surface fire, respectively. The highest fire intensity class within the AOI is 9, which represents extreme and aggressive fire behaviour with blowups and conflagration. This small area of intensity class 9 is limited to the western edge of the AOI on Mount Woodside.

Table 8. Head Fire Intensity classes and associated fire behaviour.

PSTA - HFI Class	Fire Intensity kW/m	Fire Intensity Class[49]	Percent of AOI	Flame Length (meters)[50]	Likely Fire Behaviour[51]
1	0.01 – 1,000	2	19	< 1.8	Smouldering surface fire
2	1,000.01 – 2,000	3	9	1.8 to 2.5	Moderate vigour surface fire
3	2,000.01 – 4.000	4	14	2.5-3.5	Vigorous surface fire
4	4,000.01 – 6,000	5	0	3.5 to 4.2	Vigorous surface fire with occasional torching
5	6,000.01 – 10,000	5	0	4.2 to 5.3	Vigorous surface fire with intermittent crowning
6	10,000.01 – 18,000	6	0	12.3 to 18.2	Highly vigorous surface fire with torching and/or continuous crown fire
7	18,000.01 – 30,000	6	0	18.2 to 25.6	Extremely vigorous surface fire and continuous crown fire
8	30,000.01 – 60,000	6	0	>25.6[52]	Extremely vigorous surface fire and continuous crown fire, and aggressive fire behaviour
9	60,000.01 – 100,000	6	<1	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour
10	≥ 100,000	6	0	>25.6	Blowup or conflagration, extreme and aggressive fire behaviour

[49] Head fire intensity should be classified by intensity class not fire rank. Fire rank is a visual description of conifer fires for air operations.
[50] For calculating Flame Length, Bryam (1959) was used for surface fire (<10 000 kW/m) and Thomas (1963) was used for crown fire situations (>10 000 kW/m).
[51] These characteristics will be different in open and closed forest fuel.
[52] With HFI over 30 000 kW/m the function of the equation are stretched beyond the expectation of the equation, fire is under the influence too many other factors.



Map 8. Head Fire Intensity within the AOI.

4.2.4 Fire History

Fire ignition and perimeter data are depicted in Map 4. It was reported from BCWS (personal communication) that most fire activity in the Village AOI has occurred due to recreationalists leaving abandoned campfires, and using cut blocks for target practice. Locally, BCWS prevention activity is focused on patrolling popular areas to enforce fire bans during the fire season.

As shown in Map 4; one recorded historical wildfire has burned within the AOI. Fire ignition data for the area is available for 1950-2017 and fire perimeter data from 1928-2016. Based on the fire ignition data, from the year 1950 to 2016, there have been 8 fire incidents within the AOI; 7 of these ignitions were human-caused and one was of miscellaneous/undetermined cause. Based on the fire perimeter data from 1928-2017, the fire that burned within the AOI was estimated to be over 1,700 ha, and burned along the east side of Harrison Lake. It was also defined as human-caused.

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

WUI Threat Assessments were completed over three field days in June and August of 2018, in conjunction with verification of fuel types. WUI Threat Assessments were completed in interface (i.e., abrupt change from forest to urban development) and intermix (i.e., where forest and structures are intermingled) areas of the study area. This process was used to support the development of priority treatment areas, and in order to confidently ascribe threat to polygons which may not have been visited or plotted, but which have similar fuel, topographic, and proximity to structure characteristics, to those that were.

Field assessment locations were prioritized based upon:

- PSTA WTA class - Field assessments were clustered in those areas with WTA classes of 6 or higher.
- Proximity to values at risk – Field assessments were clustered in the intermix and interface, as well as around critical infrastructure.
- Prevailing fire season winds – More field time was spent assessing areas upwind of values at risk.
- Slope position in relation to value – More field time was spent assessing areas downslope of values at risk. Similarly, values at top of slope or upper third of the slope were identified as particularly vulnerable.
- Land ownership – Crown and municipal land was the main focus of field assessments.
- Local knowledge – Areas identified as hazardous, potentially hazardous, with limited access / egress, or otherwise of particular concern as vulnerable to wildfire, as communicated by local fire officials and BCWS zone staff.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 13 WUI threat plots were completed and over 40 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix E for WUI threat plot locations).

4.3.1 Fuel Type Verification

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions.[53] Fuel typing is recognized as a blend of art and science. Although a subjective process, the most appropriate fuel type was assigned based on research, experience, and practical knowledge; this system has been used within BC, with continual improvement and refinement, for 20 years.[54] It should be noted that there are significant limitations with the fuel typing system which should be recognized. Major limitations include: a fuel typing system designed to describe fuels which do not occur within the study area, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[54] Details regarding fuel typing methodology and limitations are found in Appendix F. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 9 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel types considered hazardous in terms of fire behaviour and spotting potential are C-3 and C-4. C-3 and C-7 can sometimes represent hazardous fuels, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. C-5 fuel types have a moderate potential for active crown fire when wind-driven.[54] An M-1/2 fuel type, a mix of deciduous and coniferous trees, can sometimes be considered hazardous, depending on the proportion of conifers within the forest stand; conifer fuels include those in the overstory as well as those in the understory. An O-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.[55] These fuel types were used to guide the threat assessment.

Forested ecosystems are dynamic and change over time: fuels accumulate, stands fill in with regeneration, and forest health outbreaks occur. Regular monitoring of fuel types and wildfire threat assessment should occur every 5 – 10 years to determine the need for threat assessment updates and the timing for their implementation.

[53] Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.

[54] Perrakis, D. and G. Eade. 2015. BC Wildfire Service. Ministry of Forests, Lands, and Natural Resource Operations. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2015 Version.

[55] Ibid.

Table 9. Fuel Type Categories and Crown Fire Spot Potential. *

Fuel Type	FBP / CFDDRS Description	Study Area Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
C-3	Mature jack or lodgepole pine	Fully stocked, late young forest (western red cedar, hemlock, and/or Douglas-fir), with crowns separated from the ground	Surface and crown fire, low to very high fire intensity and rate of spread	High**
C-5	Red and white pine	Well-stocked mature forest, crowns separated from ground. Moderate understory herbs and shrubs. Often accompanied by dead woody fuel accumulations.	Moderate potential for active crown fire in wind-driven conditions. Under drought conditions, fuel consumption and fire intensity can be higher due to dead woody fuels	Low
M-1/2	Boreal mixedwood (leafless and green)	Moderately well-stocked mixed stand of conifers and deciduous species, low to moderate dead, down woody fuels.	Surface fire spread, torching of individual trees and intermittent crowning, (depending on slope and percent conifer)	<26% conifer (Very Low); 26-49% Conifer (Low); >50% Conifer (Moderate)
D-1/2	Aspen (leafless and green)	Deciduous stands	Always a surface fire, low to moderate rate of spread and fire intensity	Low
W	N/A	Water	N/A	N/A
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation.	N/A	N/A

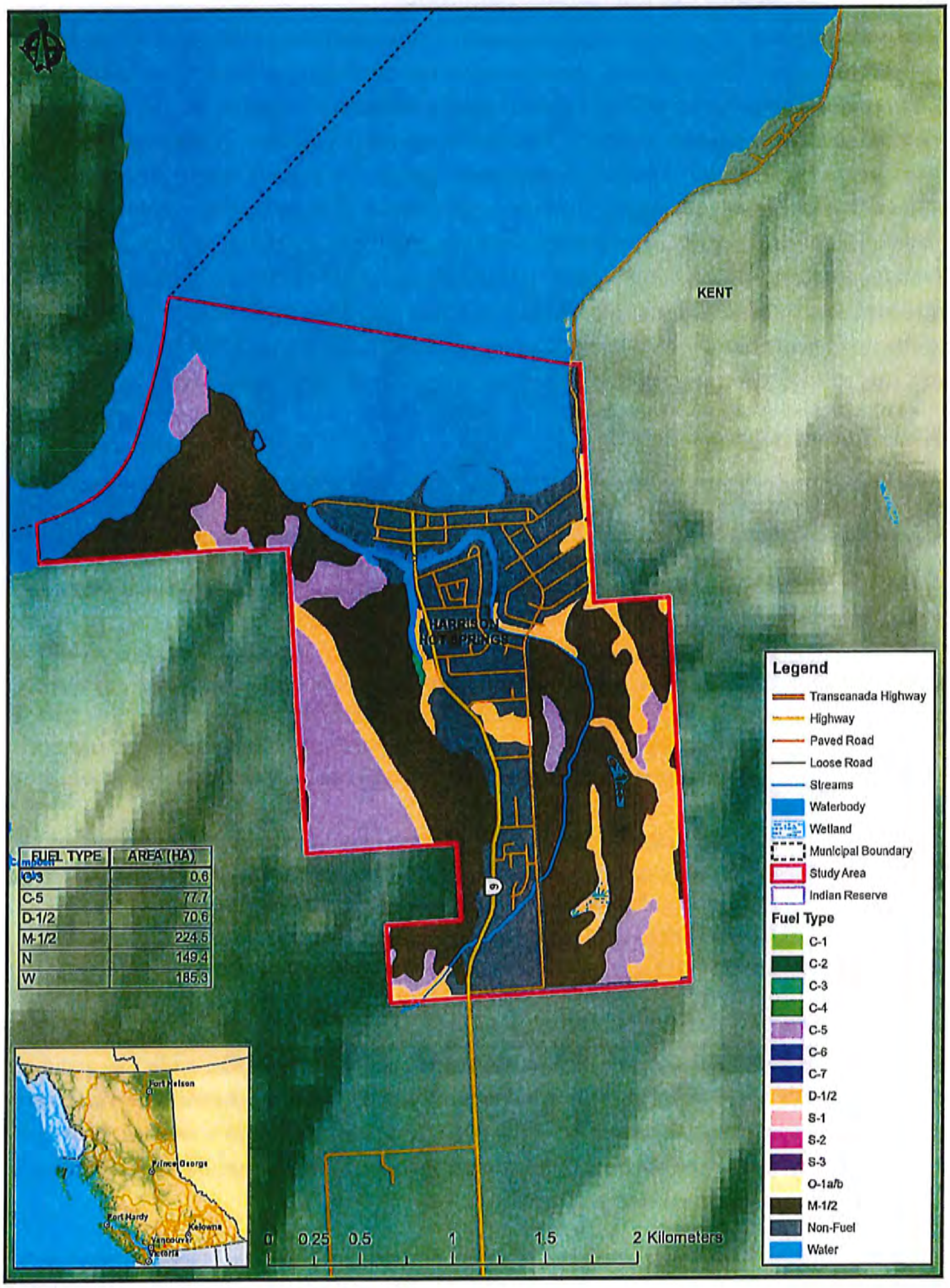
** Only summaries of fuel types encountered within the AOI are provided (as such, other fuel types, i.e., C-1, C-2, C-4, C-6 C-7, O-1a/b, S-1, S-2, and S-3 are not summarized below).*

***C-3 fuel type is considered to have a high crown fire and spotting potential within the study area due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels (i.e., western redcedar, Cw, and/or Douglas-fir, Fd).*

During field visits, two recurring patterns of fuel type errors were found in the provincial dataset. They were:

- M-1/2 fuel types being incorrectly identified by the PSTA as C-5, and
- M-1/2 fuel types identified as D-1/2.

All fuel type updates were approved by BCWS, using stand and fuel descriptions and photo documentation for the review process (see Appendix A for submitted fuel type change rationales).



Map 9. Updated fuel types.

4.3.2 Proximity of Fuel to the Community

Fire hazard classification in the WUI is partly dictated by the proximity of the fuel to developed areas within a community. More specifically, fuels closest to the community are considered to pose a higher hazard in comparison to fuels that are located at greater distances from values at risk. As a result, it is recommended that the implementation of fuel treatments prioritizes fuels closest to structures and / or developed areas, in order to reduce hazard level adjacent to the community. Continuity of fuel treatment is an important consideration, which can be ensured by reducing fuels from the edge of the community outward. Special consideration must be allocated to treatment locations to ensure continuity, as discontinuous fuel treatments in the WUI can allow wildfire to intensify, resulting in a heightened risk to values. In order to classify fuel threat levels and prioritize fuel treatments, fuels immediately adjacent to the community are rated higher than those located further from developed areas. Table 10 describes the classes associated with proximity of fuels to the interface.

Table 10. Proximity to the Interface.

Proximity to the Interface	Descriptor*	Explanation
WUI 100	(0-100 m)	This zone is always located adjacent to the value at risk. Treatment would modify the wildfire behaviour near or adjacent to the value. Treatment effectiveness would be increased when the value uses FireSmart practices.
WUI 500	(101-500m)	Treatment would affect wildfire behaviour approaching a value, as well as the wildfire's ability to impact the value with short- to medium- range spotting; should also provide suppression opportunities near a value.
WUI 2000	(501-2000 m)	Treatment would be effective in limiting long - range spotting but short- range spotting may fall short of the value and cause a new ignition that could affect a value.
	>2 000 m	This should form part of a landscape assessment and is generally not part of the zoning process. Treatment is relatively ineffective for threat mitigation to a value, unless used to form a part of a larger fuel break / treatment.

**Distances are based on spotting distances of high and moderate fuel type spotting potential and threshold to break crown fire potential (100m). These distances can be varied with appropriate rationale, to address areas with low or extreme fuel hazards.*

4.3.3 Fire Spread Patterns

Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread. Wind plays a predominant role in fire behaviour and direction of fire spread and is summarized in the Initial Spread Index (ISI) rose(s) from the local representative BCWS weather station – Haig Camp.[56] The ISI rose data is compiled hourly and provides an estimate of prevailing wind directions and wind speed in the area of the weather station.

During the fire season (April – October) winds from the northwest dominate in the afternoon (12-6pm) with the highest ISI values (related to wind speed) in the 18-24 range occurring in April and the highest

[56] MFLNRORD, 2018. Retrieved online: https://www.for.gov.bc.ca/ftp/HPR/external/!publish/Website/ISI%20Roses/

frequency of high ISI values (12-18) occurring in July and August (based on hourly data for date ranges as indicated in Figure 2). Winds predominantly blow from the northwest and east overnight (between 6pm and 6am) and continue from these directions between 6 am and noon. Figure 3 illustrates a windrose showing average daily wind readings during the fire season. The highest ISI values and frequency of winds generally occur from the northwest throughout the fire season (Figure 3). This has implications for potential fire spread patterns within the AOI, thereby allowing for strategic planning of fuel reduction treatments within the Village and providing important information to responders in the event of a wildfire. Potential treatment areas were identified and prioritized with the predominant wind direction in mind; wildfire that occurs upwind of a value poses a more significant threat to that value than one which occurs downwind.

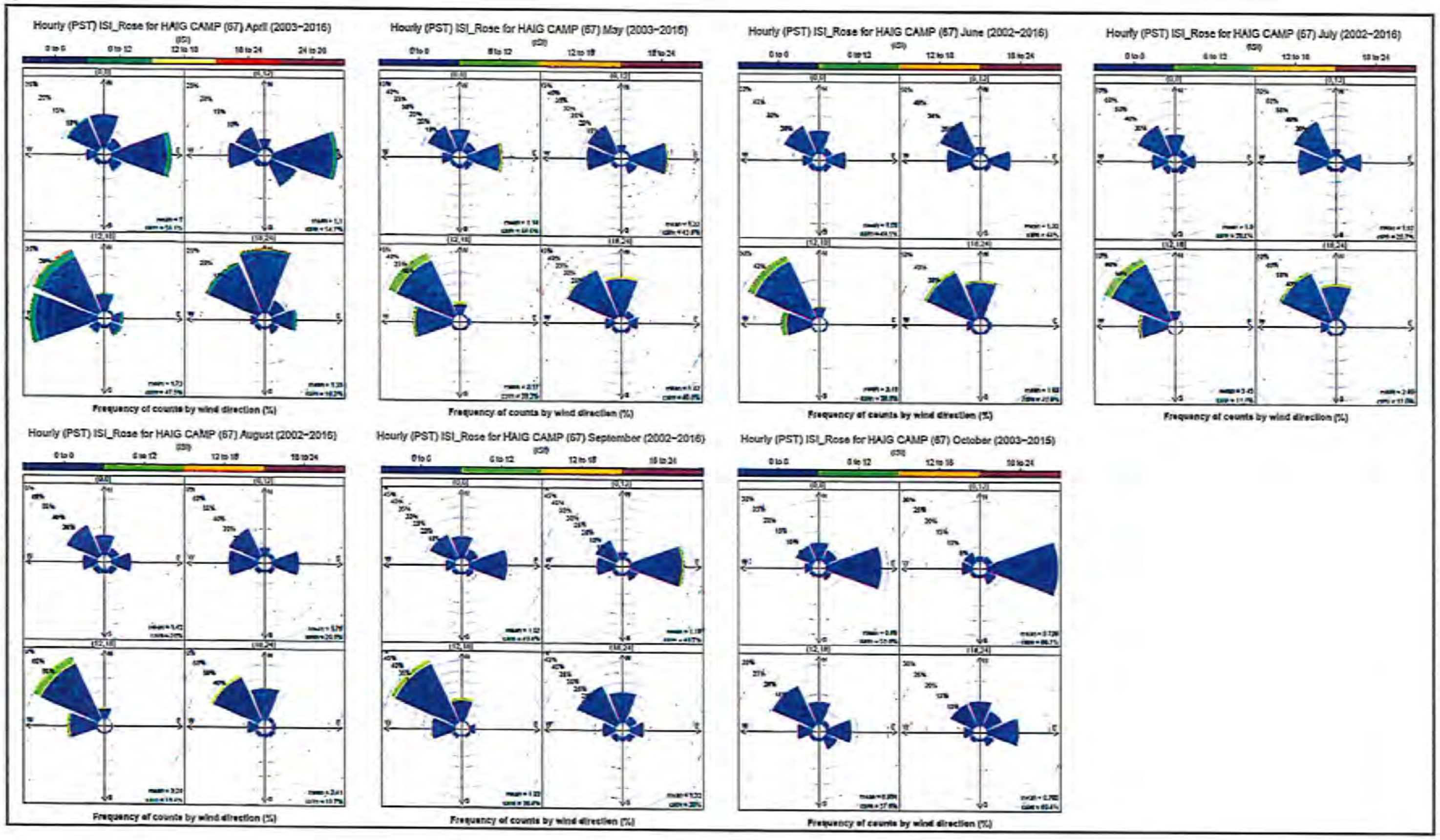


Figure 2. ISI roses depicting average hourly Initial Spread Index values (indicative of windspeed) for the fire season April – October. Data was sourced from the BCWS Haig Camp weather station for date ranges as indicated in each graphic. The ISI roses in each month are depicted for four daily time periods: (000 – 600 hrs (0, 6), 600 -1200 hrs (6, 12), 1200 -1800 hrs (12, 18) and 1800 -2400 hrs (18, 24). The length of each bar represents the frequency of readings in % and bar colour indicates the ISI value range from lowest (purple) to highest (red). The mean ISI value and the percent frequency of 'no wind events' (calm) are provided in each graphic.[57]

[57] Source BCWS, 2018. Tools for Fuel Management. Initial Spread Index Roses. Retrieved online: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/fire-fuel-management/fuel-management.

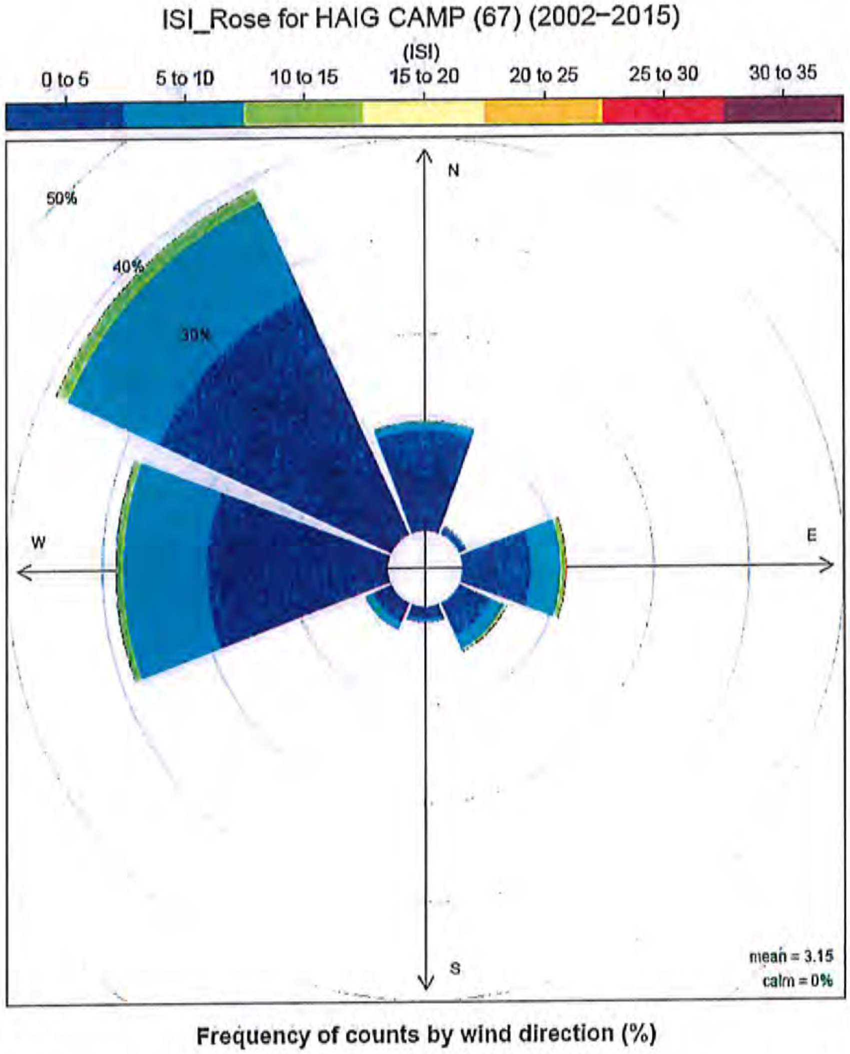


Figure 3. Windrose showing average daily wind readings during the fire season (April 1 – October 31) 2002 – 2015. Data taken from the Haig Camp weather station. The length of each bar represents the frequency of readings in % and bar colour indicates the ISI value range from lowest (purple) to highest (red). The mean ISI value and the percent frequency of 'no wind events' (calm) is provided in bottom right hand corner of the graphic.

4.3.4 Topography

Topography is an important environmental component that influences fire behaviour. Considerations include slope percentage (steepness) and slope position. Slope steepness influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill. Other factors of topography that influence fire behaviour include aspect, elevation and land configuration.

Slope Class and Position

Slope steepness affects solar radiation intensity, fuel moisture (influenced by radiation intensity) and influences flame length and rate of spread of surface fires. Table 11 summarizes the fire behaviour implications for slope percentage (the steeper the slope the faster the spread). In addition, slope position affects temperature and relative humidity as summarized in Table 12. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 11). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 12). The majority of the AOI (69%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Approximately 31% percent of the study area is likely to experience an increased or high rate of spread. On the larger topographic scale, the Village of Harrison Hot Springs and its commercial, recreational and residential developments would be considered bottom of the slope or valley bottom.

Table 11. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	69	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	3	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	5	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	9	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	14	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 12. Slope Position of Value and Fire Behaviour Implications.

Slope Position of Value	Fire Behaviour Implications
Bottom of Slope/ Valley Bottom	Impacted by normal rates of spread.
Mid Slope - Bench	Impacted by increased rates of spread. Position on a bench may reduce the preheating near the value. (Value is offset from the slope).
Mid slope – continuous	Impacted by fast rates of spread. No break in terrain features affected by preheating and flames bathing into the fuel ahead of the fire.
Upper 1/3 of slope	Impacted by extreme rates of spread. At risk to large continuous fire run, preheating and flames bathing into the fuel.

4.3.5 Local Wildfire Threat Classification

Using the verified and updated fuel types combined with field wildfire threat assessments, local wildfire threat for the study area was updated. Using the 2016 methodology, there are two main components of the threat rating system: the wildfire behaviour threat class (fuels, weather and topography sub-components) and the WUI threat class (structural sub-component).

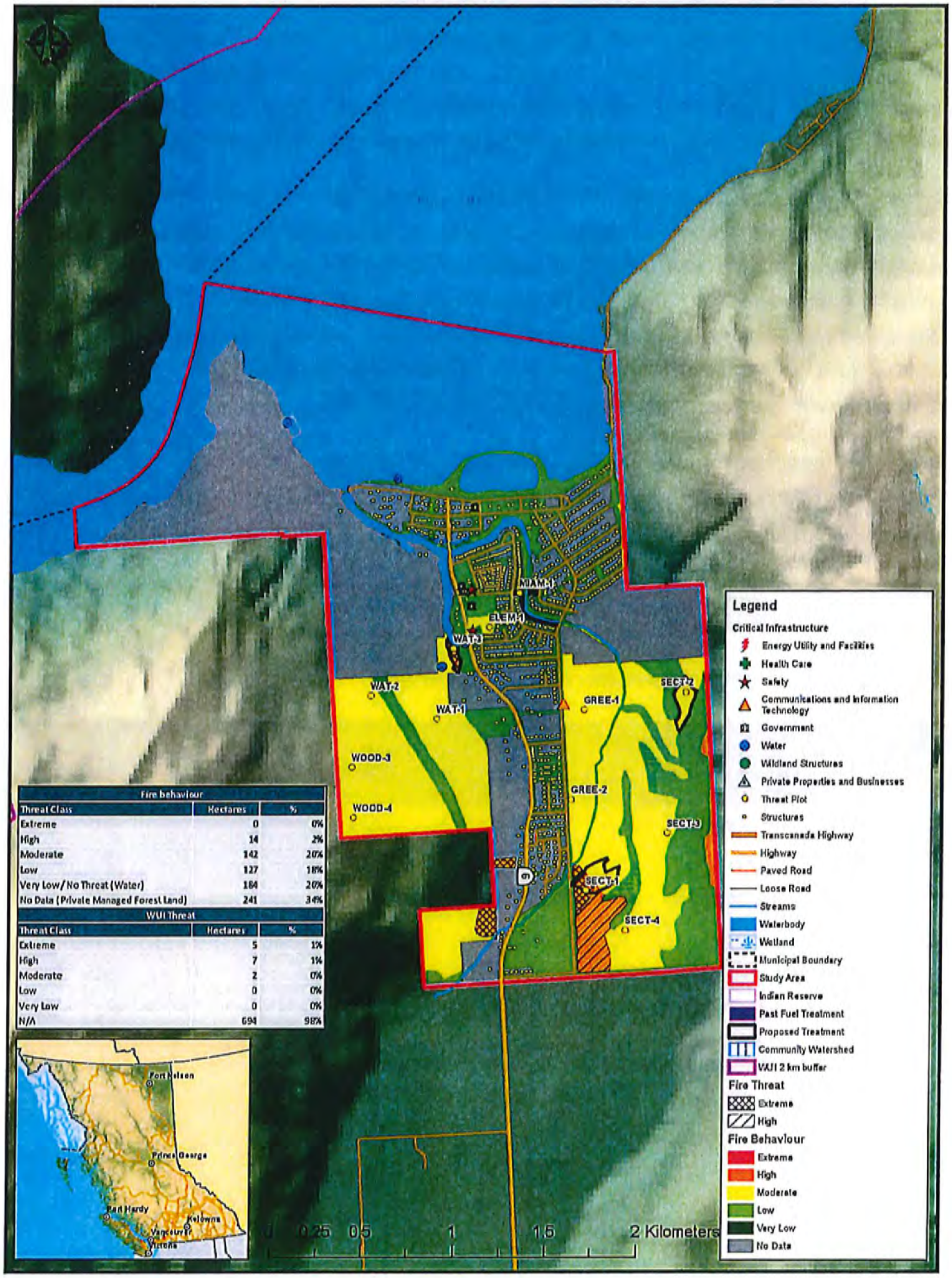
The result of the analysis shows that the study area is composed of a mosaic of low, moderate and high threat class stands; the variability in wildfire threat is dictated primarily by the stand types that occur within the Village of Harrison Hot Springs and the level of the development within the municipal boundary. A comparison of the wildfire behaviour threat class data from the original 2017 PSTA Data and this CWPP's corrected data can be found below (Table 13). 34% of the AOI is classified as private land and as such has not been allocated fire threat data. Assessment of fire threat on private land is not funded by SWPI and is therefore outside the scope of this CWPP.

The areas that represent the highest wildfire behavior potential and greatest risk to values within the Village AOI are areas of high threat class in the southwestern portion of the East Sector Lands and across Highway 9, east of the BC Hydro transmission line.

For detailed methodology on the local threat assessment and classification, please see Appendix G – WUI Threat Assessment Methodology.

Table 13. Fire behaviour threat summary for the study area.

Wildfire Behaviour Threat Class	2017 PSTA Data	2017 CWPP
	Percent of AOI	Percent of AOI
Extreme	0	0
High	14	2
Moderate	28	20
Low	0	18
Very Low/ No Threat (Water)	27	26
No Data (Private Land and Private Managed Forest Land)	31	34



Fire behaviour		
Threat Class	Hectares	%
Extreme	0	0%
High	14	2%
Moderate	142	20%
Low	127	18%
Very Low/No Threat (Water)	184	20%
No Data (Private Managed Forest Land)	241	34%

WUI Threat		
Threat Class	Hectares	%
Extreme	5	1%
High	7	1%
Moderate	2	0%
Low	0	0%
Very Low	0	0%
N/A	694	98%

Map 10. Local Fire Behaviour Threat Rating and WUI Threat Rating.

SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

This section outlines a wildfire risk management and mitigation strategy that accounts for fuel types present within the community, local ecology, hazard, terrain factors, land ownership, and capacity of local government and First Nations. Wildfire risk mitigation is a complex approach that requires cooperation from applicable land managers/owners, which includes all level of governments (local, provincial, federal and First nations), and private landowners. The cooperative effort of the aforementioned parties is crucial in order to develop and proactively implement a wildfire risk mitigation program. Development of a successful wildfire risk mitigation strategy is dependent on hazard identification within the community, which accounts for forest fuels, high risk activities, frequency and type of human use, and other important environmental factors. The resulting wildfire risk management and mitigation strategy aims to build more resilient communities and produces strategic recommendations or actionable items that can be categorized as follows:

1. Fuel management opportunities to reduce fire behaviour potential in the WUI;
2. Applications of FireSmart approaches to reduce fire risk and impacts within the community; and,
3. Implementation of communication and education programs to inform and remind the public of the important role it plays in reducing fire occurrence and impacts within its community.

5.1 FUEL MANAGEMENT

Fuel management, also referred to as vegetation management or fuel treatment, is a key element of wildfire risk reduction. For the purpose of this discussion, fuel management generally refers to native vegetation/fuel modifications in forested areas greater than 30 m from homes and structures (priority Zone 3 and beyond, see Section 5.2 for details on FireSmart priority zones). The principles of fuel management are outlined in detail in Appendix H. No fuel treatments have been completed within the Village AOI to date. Proposed treatments will begin the process of reducing the wildfire risk in the AOI, where the objectives for fuel management are to:

- Reduce wildfire threat on private and public lands nearest to values at risk; and,
- Reduce fire intensity, rate of spread, and ember/spot fire activity such that the probability of fire containment increases and the impacts on the forested landscape and the watershed are reduced (create more fire resilient landscapes).

Ideally, these objectives will enhance protection to homes and critical infrastructure. Caveats associated with the statement include: 1) wildfire behaviour will only be reduced if the fire burns in the same location as treatments occurred, and 2) protection of homes and critical infrastructure is highly dependent upon the vulnerability to ignition by embers (ignition potential) directly around the value at risk. In summary, fuel treatments alone should not be expected to protect a community from the effects of wildfire, namely structure loss.

Fuel treatments are designed to reduce the possibility of uncontrollable crown fire through the reduction of surface fuels, ladder fuels and crown fuels. However, the degree of fire behaviour reduction achieved by fuel management varies by ecosystem type, current fuel type, fire weather, slope and other variables and it is important to note that it does not stop wildfire.

Historically, funds from public sources, such as the Forest Enhancement Society of BC (FESBC) and the Union of British Columbia Municipalities (UBCM), were only eligible to be used on Crown lands and could not be used to treat private land. While this is still the case for the FESBC program, the new Community Resiliency Investment (CRI) Program (formerly SWPI) provides funding for selected FireSmart activities and planning on private land (subject to program requirements and limits).[58] It is important to recognize that the majority of the AOI (58%) is located on private land, which increases some of the challenges encountered in mitigation of fuels on private lands. Some of the best approaches to mitigate fuels on private land are to establish wildfire development permit areas to increase the resiliency of homes and to urge private landowners to comply with FireSmart guidelines (as described below in Section 5.2) and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available). In general, when considering fuel management to reduce fire risk, the following steps should be followed:

- Carefully anticipate the likely wildfire scenarios to properly locate fuel modification areas;
- Acquire an understanding of local ecological, archaeological, and societal values of the site;
- Prescriptions should be developed by a Registered Professional Forester working within their field of competence;
- Public consultation should be conducted during the process to ensure community support;
- Potential treatment areas and draft prescriptions should be referred to First Nations with sufficient time for meaningful review and input;
- Treatment implementation should weigh the most financially and ecologically beneficial methods of fulfilling the prescriptions goals;
- Pre- and post-treatment plots should be established to monitor treatment effectiveness; and
- A long-term maintenance program should be in place or developed to ensure that the fuel treatment is maintained in a functional state.

The fuel treatment opportunities identified in this document include the use of interface fuel breaks and primary fuel breaks as defined in Section 5.1.1, to reduce the wildfire potential around the AOI. Potential treatment activities include fuel removal, thinning, stand conversion, pruning, and chipping, or a combination of two or more of these activities. Stand conversion has been shown to be effective at reducing wildfire potential in mixed-wood or conifer dominated stands and is recommended as a BMP to encourage a higher deciduous component. This approach generally involves a thin-from-below to reduce ladder fuels and crown fuels continuity, targeting the removal of conifer species and the

[58] 2019 CRI FireSmart Community Funding & Supports – Program & Application Guide. Retrieved online on Sept 20, 2018. https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

retention of broadleaf species. Stand conversion fuel treatments are intricately linked to the establishment and enactment of fire management stocking standards within the WUI 2km buffer. The implementation of modified stocking standards plays a pivotal role in ensuring the success and effectiveness of stand conversion fuel treatments and associated reduction of fire hazard.[59]

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the SWPI Program have historically been limited to Crown Provincial, Regional District, or Municipal land. The UBCM SWPI funding stream (in place at the time this CWPP was developed) has transitioned, as of September 2018, into a new provincial program, the Community Resiliency Investment (CRI) Program, that will consider fire prevention activities on provincial Crown land and private land, in addition to local government and reserve land.[60] Fire prevention activities on private land that may be funded under this program are related to FireSmart activities (including FireSmart planning and assessments, local rebate programs for completion of eligible FireSmart activities, and provision of off-site disposal of vegetation management debris), subject to program requirements. This does not preclude other current and future funding opportunities or potential industrial partnerships and changes to existing programs.

The potential treatment areas represent moderate or high fire hazard areas which are close to values at risk (structures or infrastructure) and are located on Crown Provincial or municipal land. Recommendation for treatment in areas of moderate fire hazard areas were limited to areas which would increase efficacy of, and / or create continuity between areas of low threat / no fuel areas). All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, estimated project cost, type and number of values at risk, common fire weather (wind direction), and expected efficacy of treatment. Although potential treatment areas have been ground-truthed during field work, additional refinement of the polygons will be required at the time of prescription development. Polygons will require detailed site-level assessment to stratify treatment areas (and areas of no treatment), identify values and constraints, and identify and engage all appropriate Provincial agencies, First Nations, and stakeholders.

Recommended potential treatment areas within the AOI are outlined in Table 14 and displayed in Map 11. These fuel treatment opportunities include the use of interface fuel treatments (the treatment of both patches of fuels and linear interface fuel breaks) and trailside treatments as defined below.

[59] Forest Practices Board. (2006). Managing Forest Fuels. Special Report. Available online at: https://www.bcfpb.ca/wp-content/uploads/2016/04/SR29-Managing-Forest-Fuels.pdf

[60] This new funding program (up to $50 million over three years) was initiated as per recommendations from the 2017 BC Flood and Wildfire Review Report by Abbott and Chapman (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bc-flood-and-wildfire-review-addressing-the-new-normal-21st-century-disaster-management-in-bc-web.pdf). Program details are available on the UBCM's website: https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html

Fuel Treatment Types

The intent of establishing a fuel break (and associated treated patches) is to modify fire behaviour and create a fire suppression option that is part of a multi-barrier approach to reduce the risk to values (*e.g.*, structures). A fuel break, in and of itself, is unlikely to stop a fire under most conditions. The application of appropriate suppression tactics in a timely manner with sufficient resources, is essential for a fuel break to be effective. Lofting of embers (*i.e.*, "spotting") over and across a fuel break is a possibility (increasing with more volatile fuel types and fire weather) and has the potential to create spot fires beyond the fuel break that can expand in size and threaten values at risk, or land directly on or near structures and ignite them. To address spotting, fuels between the fuel break and the values at risk should be evaluated and treated to create conditions where extinguishment of spot fires is possible and FireSmart Standards should be applied to structures and associated vegetation and other fuel to reduce the risk of structures igniting. A multi-barrier approach that reduces the risk to values can include: establishing multiple fuel breaks (Interface Fuel Break), addressing fuels between the fuel break and structures (Interface Fuel Treatments), and applying FireSmart Standards to structures and the surrounding vegetation. Fuel breaks require periodic maintenance to retain their effectiveness.

Interface Fuel Breaks

Fuel breaks on Crown Land immediately adjacent to private land and in close proximity to the wildland urban interface and/or intermix areas, are termed 'interface fuel breaks'. These are designed to modify fire behaviour, create fire suppression options, and improve suppression outcomes. Interface fuel treatments are relatively small (approximately 100 meters wide) and when treated with appropriate fuel reduction measures, can break the crown fire threshold and reduce the risk of a crown fire reaching values at risk. Treatment widths can be varied to allow for alignment and to take advantage of natural and man-made fire resilient features that enhance effectiveness. Surface fire spread across the fuel treatment and spotting across the fuel treatment are both concerns and rely on suppression actions to be effective. In order to reduce potential fire intensity and spotting, fuel on private land between the interface fuel treatment and structures should be treated according to FireSmart vegetation management standards. Structures in interface areas should be constructed or retrofitted to FireSmart design standards.

Trailside Treatments

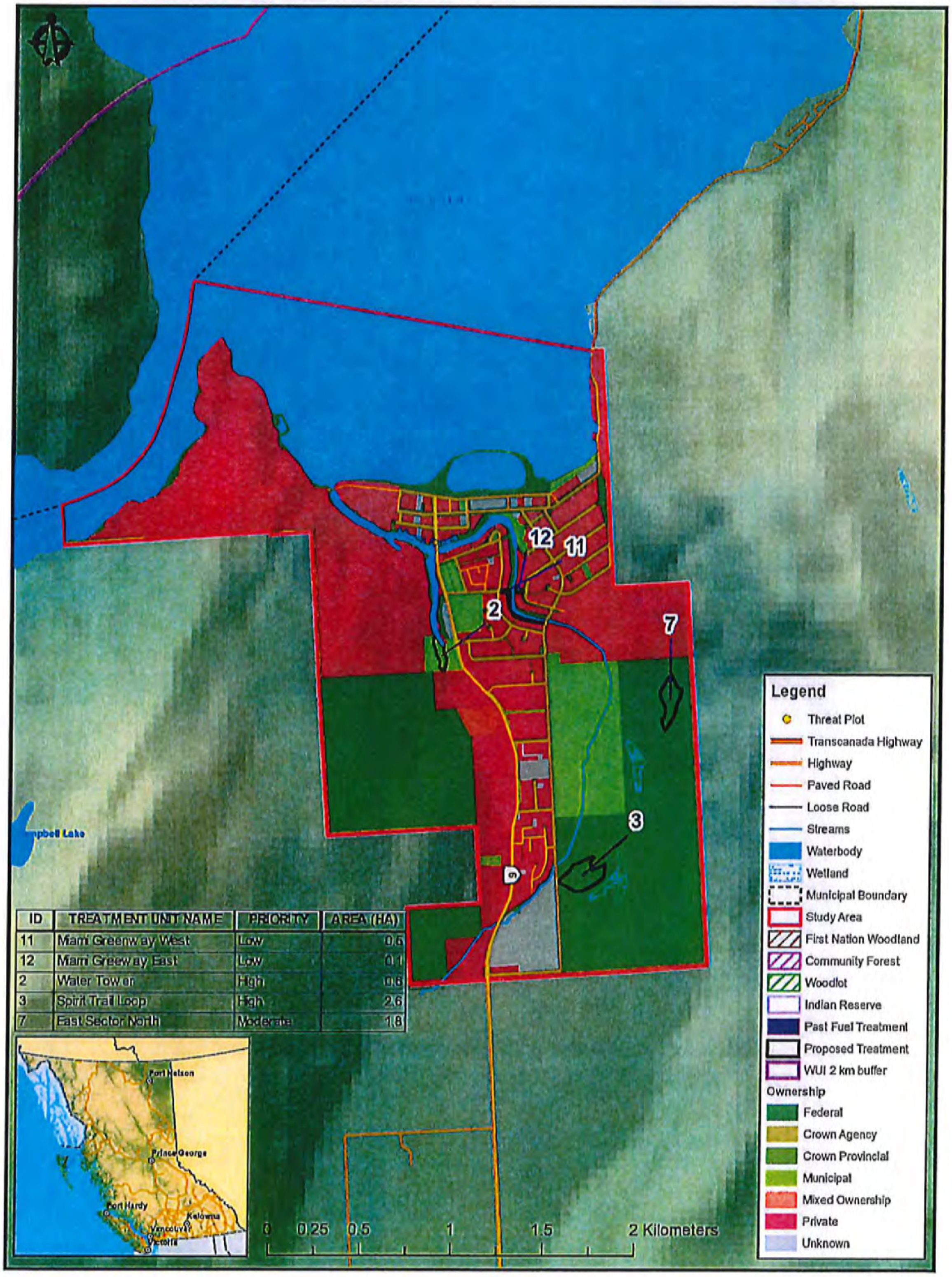
Trailside treatments are implemented to address hazardous fuels adjacent to publicly used trails, where ignition potential may be higher due to increased recreational use by hikers and both motorized and non-motorized off-road vehicles. The primary objective of these treatments is to reduce potential fire intensity and the probability of ignition, which is achieved through the creation of a defensible space surrounding these features. Potential strategies include reducing ladder and surface fuels, increasing crown base height of trees, and retaining fire-resistant tree species. Trailside treatments vary in size and are typically in the form of linear features which follow trail systems.

RECOMMENDATION #8: Proceed with detailed assessment, prescription development and treatment of hazardous fuel units identified and prioritized in this CWPP.

Table 14. Proposed Treatment Area Summary Table.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme/ High	Mod	Low		
2	Water Tower	High	0.6	Interface Fuel Break	0.6	0.0	0.0	This proposed treatment unit (PTU) is located adjacent to one arm of the Miami River. Multiple Forest Development Units (FDUs) overlap the Water Tower PTU: TFLP, Northwest Hardwoods Fraser, BCTS TCH Chilliwack District, Sta'ailes, Teal Cedar Products Ltd., the Dorman Group (Seabird Island First Nation), and Chawathil First Nation. Consultation with the licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU is located immediately adjacent (<200m) to private residences and the Village's water reservoir. This area has been recommended for treatment due to its high recreational use and the presence of hazardous fuels. The stands characteristic of this PTU are primarily typed as C-3 fuel types with moderate to high stand densities, moderate to high fine and medium woody fuel loading, low crown base heights, and interlocking crowns. The combination of these factors results in an increased potential for crown fire behavior. Recommended treatments include removal of understorey conifers and pruning to increase crown base heights, thereby reducing laddering potential and potential surface fire intensity.
3	Spirit Trail Loop	High	2.6	Interface Fuel Break	0.9	1.7	0.0	This PTU lies entirely within East Sector Lands, a Regional nature park with high ecological and cultural value. Presence of Conservation Data Centre (CDC) red-listed Salish Sucker (*Catostomus sp. 4*) has been recorded within East Sector riparian areas. As such, consultation with a biologist and the Fraser Valley Regional District must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed. Multiple Forest Development Units (FDUs) overlap this PTU: TFLP, Northwest Hardwoods Fraser, BCTS TCH Chilliwack District, Sta'ailes, Teal Cedar Products Ltd., the Dorman Group (Seabird Island First Nation), and Chawathil First Nation. Consultation with the licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The Spirit Trail Loop PTU is located in the southwestern part of the East Sector Lands, adjacent to residences along McCombs Drive. The stands characteristic of this area are mixed conifer and deciduous stands typed as M-1/2, with high understorey conifer densities and low crown base heights. This type of stand is likely to exhibit potential for crown fire behavior during periods of high or extreme fire danger. Recommended treatments include removal of understorey conifers and pruning to increase crown base heights, thereby reducing laddering potential and potential surface fire intensity.

FTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)			Overlapping Values / Treatment Constraints*	Treatment Rationale
					Extreme/ High	Mod	Low		
7	East Sector North	Moderate	1.8	Interface Fuel Break	0.0	1.8	0.0	This PTU lies entirely within East Sector Lands, a Regional nature park with high ecological and cultural value. Presence of Conservation Data Centre (CDC) red-listed Salish Sucker (*Catostomus sp. 4*) has been recorded within East Sector riparian areas. As such, consultation with a biologist and the Fraser Valley Regional District must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed. Multiple Forest Development Units (FDUs) overlap the East Sector North PTU: TFLP, Northwest Hardwoods Fraser, BCTS TCH Chilliwack District, Sta'ailes, Teal Cedar Products Ltd., the Dorman Group (Seabird Island First Nation), and Chawathil First Nation. Consultation with the licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU is located in the northeastern part of the East Sector Lands, approximately 650m from private residences on McCombs Drive. The stands characteristic of this area are classified as a C-5 fuel type with a minor component of deciduous (<10%). High fine and medium fuel levels are present throughout, and ladder fuels are sparse. Recommended treatments include surface fuel removal, pruning trees to increase crown base heights, and removing understorey conifers.
11	Miami Greenway West	Low	0.5	Trailside Treatment	0.0	0.5	0.0	Multiple Forest Development Units (FDUs) overlap this PTU: TFLP, Northwest Hardwoods Fraser, BCTS TCH Chilliwack District, Sta'ailes, Teal Cedar Products Ltd., the Dorman Group (Seabird Island First Nation), and Chawathil First Nation. Consultation with the licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The Miami Greenway West PTU is a proposed trailside treatment located along the Miami River bridges public trail. The stands characteristic of this area are classified as an M-1/2 fuel type with a moderate deciduous component (approximately 30%). A light treatment which involves removing surface fuels, pruning trees to increase crown base heights, and removing understorey conifers is recommended.
12	Miami Greenway East	Low	0.1	Trailside Treatment	0.0	0.0	0.1	Multiple Forest Development Units (FDUs) overlap this PTU: TFLP, Northwest Hardwoods Fraser, BCTS TCH Chilliwack District, Sta'ailes, Teal Cedar Products Ltd., the Dorman Group (Seabird Island First Nation), and Chawathil First Nation. Consultation with the licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The Miami Greenway East PTU is a proposed trailside treatment located along the Miami River bridges public trail. The stands characteristic of this area are classified as an M-1/2 fuel type with a moderate deciduous component (approximately 30%). A light treatment which involves removing surface fuels, pruning trees to increase crown base heights, and removing understorey conifers is recommended.



ID	TREATMENT UNIT NAME	PRIORITY	AREA (HA)
11	Miami Greenway West	Low	0.5
12	Miami Greeway East	Low	0.1
2	Water Tower	High	0.6
3	Spirit Trail Loop	High	2.6
7	East Sector North	Moderate	1.8

Map 11. Proposed and Past Fuel Treatments.

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the Village AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are to occur in the Village in the future, maintenance activities such as removing standing dead, reducing surface fuels, or additional thinning (overstorey reduction and thinning suppressed conifers or conifer regeneration) should occur as needed to maintain the effectiveness of these treatments. The return interval for maintenance activities depends upon site productivity and the type and intensity of treatment. Less productive areas can likely withstand a longer frequency between maintenance activities, while more productive areas would require treatments more often.

RECOMMENDATION #9: If and when operational fuel treatments are conducted within the Village AOI, treatment monitoring should be completed by a Qualified Professional in order to schedule the next set of maintenance activities (5 – 10 years out). This can be completed with a CWPP update or as a stand-alone exercise.

5.2 FIRESMART PLANNING AND ACTIVITIES

This section provides detail on: 1) the current level of FireSmart implementation and uptake within the community; 2) identified FireSmart subdivisions and/or acceptance into the FireSmart Canada Community Recognition Program (FSCCRP); and 3) recommended potential FireSmart activities that can be applied within the AOI at a future date.

5.2.1 FireSmart Goals and Objectives

FireSmart® is the comprehensive nationally accepted set of principles, practices and programs for reducing losses from wildfire.[61] FireSmart spans the disciplines of hazard/threat assessment; regional planning and collaboration; policy and regulations; public communication and education; vegetation/fuel management; training and equipment; and, emergency preparedness and response. FireSmart concepts provide a sound framework for advancing the goal of wildfire loss reduction, as it is a common goal shared with CWPPs.

The FireSmart approach and concepts, including recommended FireSmart guidelines[62], have been formally adopted by almost all Canadian provinces and territories, including British Columbia in 2000; FireSmart has become the de facto Canadian standard. FireSmart is founded in standards published by the National Fire Protection Association (NFPA). The objective of FireSmart is to help homeowners, neighbourhoods, whole communities and agencies with fire protection and public safety mandates to work together to prepare for the threat of wildfire in the WUI. Coordinated efforts between all levels of planning and action are integral to effectively and efficiently reducing the risk to communities.

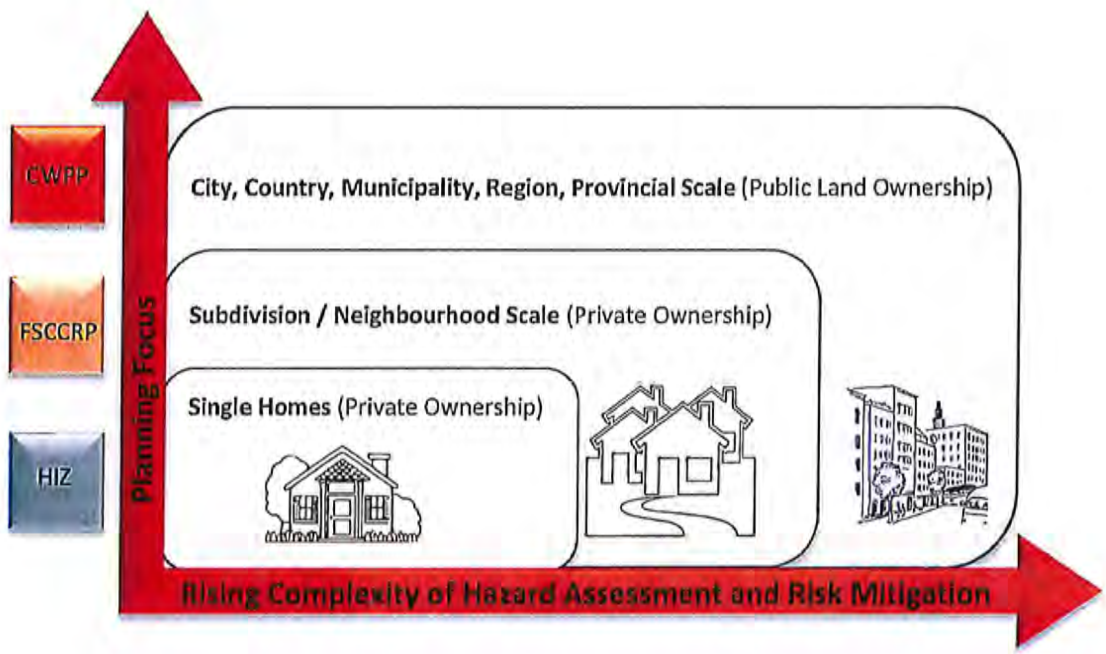
The following are key principles of FireSmart:

[61] FireSmart is the registered trademark held by the Partners in Protection Association.

[62] FireSmart guidelines first published in the 1999 manual "*FireSmart: Protecting Your Community from Wildfire*", with a second edition published in 2003.

- Wildland fires are a natural process and critical to the health of Canadian ecosystems.
- Mitigation and response efforts must be carefully coordinated through all stages of planning and implementation.
- Threats and losses due to wildfires can be reduced by working together. Responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments.[63]
- There are seven broad disciplines to help address the threat of wildfire: education, vegetation management, legislation and planning, development considerations, interagency cooperation, emergency planning, and cross training.[63]
- Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 4).
- The ultimate root of the WUI interface problem is the vulnerability of structures and homes to ignition during wildfire events, in particular vulnerability to embers. This leads to an emphasis on risk mitigations on private properties.

The highest level of planning within the FireSmart program is strategic direction, such as that provided in CWPPs.



[63] https://www.firesmartcanada.ca

Figure 4. Diagram of the various, coordinated levels of the FireSmart program.[64] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

Home Ignition Zone

Multiple studies have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings; the area that determines the ignition potential is referred to as the Home Ignition Zone (HIZ).[65,66] The HIZ includes the structure itself and three concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 – 10 m (Priority Zone 1), 10 – 30 m (Priority Zone 2), and 30 – 100 m (Priority Zone 3). These zones help to guide risk reduction activities, with recommended FireSmart guidelines being most stringent closest to the structure. The likelihood of home ignition is mostly determined by the area within 30 m of the structure (Priority Zones 1 and 2). Recommended FireSmart guidelines address a multitude of hazard factors within the HIZ: building materials and design; vegetation (native or landscaped materials); and the presence of flammable objects, debris, and vulnerable ignition sites. More detail on the FireSmart Priority Zones can be found in Appendix J.

It has been found that, during extreme wildfire events, most home destruction has been a result of low-intensity surface fire flame exposures, usually ignited by embers. Firebrands, also known as embers, can be transported long distances ahead of the wildfire, across fire guards and fuel breaks, and accumulate within the HIZ in densities that can exceed 600 embers per square meter. Combustible materials found within the HIZ combine to provide fire pathways allowing spot surface fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

Because ignitability of the HIZ is the main factor driving structure loss, the intensity and rate of spread of wildland fires beyond the community has not been found to necessarily correspond to loss potential. For example, FireSmart homes with low ignitability may survive high-intensity fires, whereas highly ignitable homes may be destroyed during lower intensity surface fire events.[66, 67] It is for this reason that the key to reducing WUI fire structure loss is to reduce home ignitability; mitigation responsibility must be centered on homeowners. Risk communication, education on the range of available activities, and prioritization of activities should help homeowners to feel empowered to complete simple risk reduction activities on their property.

---

[64] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.

[65] Reinhardt, E., R. Keane, D. Calkin, J. Cohen. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. Forest Ecology and Management 256:1997 - 2006.

[66] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.

[67] Calkin, D., J. Cohen, M. Finney, M. Thompson. 2014. *How risk management can prevent future wildfire disasters in the wildland-urban interface*. Proc Natl Acad Sci U.S.A. Jan 14; 111(2): 746-751. Accessed online 1 June, 2016 at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/.

FireSmart Canada Community Recognition Program

In the case of adjacent homes with overlapping HIZs, a neighbourhood (or subdivision) approach can be an effective method of reducing ignition potential for all homes within the neighbourhood. The FireSmart Canada Community Recognition Program (FSCCR Program) is an 8-step resident-led program facilitated by trained Local FireSmart Representatives designed for this purpose. It provides groups of residents with critical information and a means of organizing themselves to progressively alter hazardous conditions within their neighbourhood. The program also facilitates FireSmart knowledge and practices to quickly filter downwards onto the property of individual residents to further mitigate wildfire hazards at the single-home scale within the HIZ.

WUI Disaster Sequence

Calkin et al (2014) coined the 'WUI disaster sequence', a six-step sequence which has been used to describe the situation in which the firefighting capacity of a community is overwhelmed by wildland / interface fires in highly ignitable communities: 1) extreme wildfire behaviour weather combined with, 2) a fire start, which 3) exposes numerous homes with high ignition potential, and results in numerous structures burning, 4) overwhelms suppression efforts and capabilities, and 5) leads to unprotected homes, and therefore 6) considerable structure loss (Figure 5).

Once multiple homes are ignited in an urban area, there is increasing potential for fire to spread from structure to structure, independently of the wildland vegetation. This is known as an urban conflagration. Effective fire protection depends on ignition resistant homes and properties during extreme wildfire events.[68] More than two simultaneous structure fires could overwhelm the resources and capacity of a fire department.

Overall, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover following wildfires by sustaining fewer losses and disruption, and safer places to live and recreate. Action by homeowners is the number one priority for reducing structure loss in the event of a WUI fire, but the overall adaptation of the community to wildfire is multi-pronged and the landscape should not be ignored.[68]

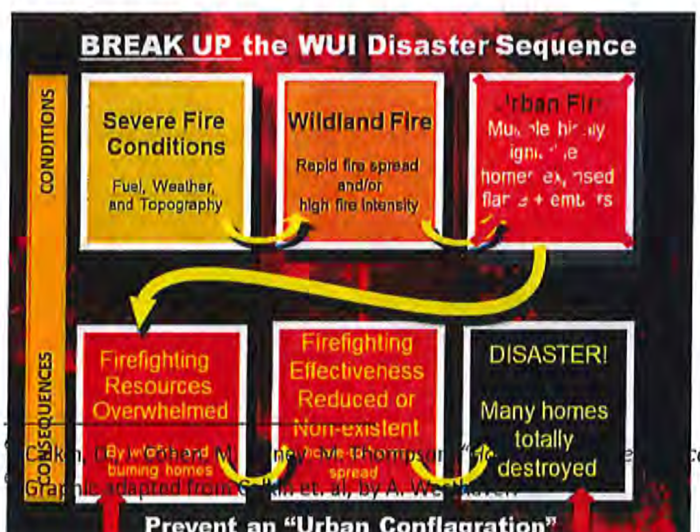


Figure 5. Wildland/urban interface disaster sequence.[69] It is possible to break up the disaster sequence by decreasing the number of highly ignitable homes exposed to embers, therefore reducing the number of homes ignited and

Calkin, ... Cohen, ... Thompson ... can prevent future wildfire"
Graphic adapted from C... et. al, by A. We...

removing the consequences of multiple structures lost.

5.2.2 Key Aspects of FireSmart for Local Governments

Reducing the fire risk profile of a community through FireSmart implementation requires coordinated action from elected officials, local government planners, developers, private land owners and industrial managers. This section presents various options of FireSmart practices, which when enacted, provide avenues for reducing fire risk within the community. An evaluation of the current level of FireSmart implementation within the Village is also presented in this section.

Communication, Education and Partnerships

Communicating effectively is a key aspect of any education strategy. Communication materials must be audience specific and delivered in a format and through mediums that reach the target audience. Audiences should include home and landowners, students, local businesses, elected officials, Village staff, and local utilities providers. Education and communication messages should be simple yet comprehensive. A basic level of background information is required to enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

FireSmart information material is readily available and simple for municipalities to disseminate. It provides concise and easy-to-use guidance that allows homeowners to evaluate their homes and take measures to reduce fire risk. However, the information needs to be supported by locally relevant information that illustrates the vulnerability of individual houses to wildfire.

The Village of Harrison Hot Springs has undertaken some public education outreach in the community to date, including FireSmart concepts being included in the local newsletter, community vegetation management days, delivery of FireSmart materials, and FireSmart presentations during the VHHSFD open house. This can be expanded upon and/or adapted to further enhance wildfire preparedness and education. Programming could include volunteer/advocacy work from professional foresters, wildland firefighters or prevention officers, and Village staff. The Village should consider holding a wildland specific Fire Prevention Day, or similarly formatted event, in the spring prior to the wildfire season. Timely educational materials to increase preparedness would be most effective immediately prior to the fire season.

A full list of recommendations pertaining to the Communication, Education and Partnerships strategy is presented in Section 5.3.

FireSmart Vegetation Management

Some examples of actionable items for the Village with regards to vegetation or fuel management and the FireSmart approach include: 1) policy development and implementation of FireSmart maintenance for community parks and open spaces; 2) implementing fire resistive landscaping requirements as part of the development permitting process; and 3) provision of collection services for private landowners with a focus on pruning, yard and thinning debris.

The Village does not currently enforce FireSmart landscaping requirements within development permits. More detailed recommendations regarding municipal policies and bylaws are provided below in Planning and Development.

Planning and Development

Municipal policies and bylaws are tools available to mitigate wildfire risk to a community. It is recognized that, to be successful, all levels of government (municipal, provincial, and federal) and individual landowners need to work together to successfully reduce their risk. To that end, local government can use a range of policy tools to help the community to incrementally increase FireSmart compliance over the mid-term (5 – 20 years) and therefore play a role in reducing the chance of structure loss from wildfire.

The planning and development objectives for the Village of Harrison Hot Springs are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas; and
- To utilize regulatory and administrative tools to reduce wildfire hazard on private land and increase number of homes compliant with FireSmart guidelines (with low ignition potential).

The OCP does not explicitly consider the establishment of a development permit (DP) area to address wildfire risk mitigation. It is recommended that the Village review the OCP, with consideration towards establishing a wildfire development permit area that addresses new constructions, exterior renovations, and changes in building footprints. Other jurisdictions' wildfire development permit areas can serve as models for various components. [70] The first step should be to establish DP area objectives (for example, minimize risk to property and people from wildland fires; minimize risk to forested area surrounding communities and development in the AOI; conserve the visual and ecological assets of the forest surrounding these areas; reduce the risk of post-fire landslides, debris flows and erosion, etc.). The following components should be considered during the OCP review and DP area development process in order to help meet the established objectives:

- Use of fire resistant exterior construction materials within the established development permit area, based on recognized standards such as NFPA 1144 or FireSmart;
- Inclusion of minimum setbacks from forested edge and top of slope based on FireSmart principles;
- Use of FireSmart landscaping (low flammability plants, appropriate spacing and low flammability surface materials / ground cover based on FireSmart principles).
- Underground servicing;

[70] The District of North Vancouver and the District of Maple Ridge have robust and well-documented Wildfire Hazard Development Permit processes.

- Mitigation of fire hazard through fuel management activities based upon Qualified Professional recommendations (prescriptions and oversight). This is generally most applicable in the subdivision phase;
- Prompt removal of combustible construction materials, thinning/ fuel management debris, or clearing debris during the fire season;
- Coordinating QPs to ensure that requirements for overlapping, and potentially conflicting hazards are met;
- Review and approval process for submitted applications;
- Post-development inspections and sign-offs;
- Outline of responsibilities for staff and applicants; and
- Enforcement and regulation (consequences of non-compliance).

It is advised to engage the development community in the DP process to educate, inform, and allow for input. This can be accomplished in a variety of formats, including, but not limited to, workshops, informational sessions, or open-houses.

In 2015, the province passed the *Building Act* as the new legislation to guide building and construction in the province (Spring 2015). This Act establishes the province as the sole authority to set building requirements and limits local government authority to set building requirements in their bylaws. Section 5 of the *Building Act* provides an exception to the above limitation to local governments by giving them the authority to set local building bylaws for unrestricted and temporarily unrestricted matters, such as exterior design and finish of buildings in relation to wildfire hazard and within a development permit area. The British Columbia Building Code does not have any wildfire-specific fire-resistant design components. Until revisions of the Building Code to include requirements specific to prevention of wildfire spread are completed, local governments can set exterior requirements within an established development permit area for wildfire risk mitigation.[71]

RECOMMENDATION #10:
10.1 - Review the Official Community Plan (OCP); consider including wildfire as a natural hazard development permit area. A recommended development permit area for the Village would include all areas within the municipality that are located within 200 m of moderate, high or extreme wildfire behaviour threat class areas. This is a suggested distance which should be validated and defined through a more comprehensive GIS analysis of hazardous fuels and their proximity to the interface.

It is suggested that the Village review similar DPAs established in other jurisdictions and use as models for various aspects of the DPA process. The following aspects should be considered in the OCP review and wildfire DP development:

- Establish DP objectives (e.g. minimize risk to property and people from wildland fires; minimize risk to forested area surrounding the AOI; and conserve the visual and ecological assets of the forests surrounding communities; and
- Where possible, it is recommended to mandate FireSmart construction materials, some of which may be beyond the BC Building Code within the established wildfire hazard development

[71] Building and Safety Standards Branch. 2016. Bulletin No. BA 16-01 Building Act Information Bulletin: Update for Local Governments.

permit area.

In order to meet objectives, consider including the following elements:

1) Minimum setbacks from forested edge based on FireSmart guidelines,
2) Fuel management based upon Qualified Professional (QP) recommendations,
3) Landscaping to FireSmart guidelines,
4) Building materials and design based on NFPA 1144 or FireSmart standards,
5) Underground servicing, and
6) Prompt removal of combustible construction materials or thinning/ fuel management waste.

It is also recommended that the Village consider incorporating QP reports and sign-off as part of the wildfire interface guidelines and that DP applications are provided to the VHHSFD for opportunity for input prior to approval. As more wildfire DP applications are received, the importance of communication and integration between the VHHSFD and the Village will increase.

The Village should also consider engaging the development/ building community (may include developers, builders, landscapers, and architects) in DP development process. This can be accomplished through a series of workshops/ informational sessions to: 1) increase awareness of wildfire risk, 2) demonstrate that there are a variety of actions which can be undertaken to immediately and measurably reduce the risk to the homeowner and community, 3) discuss various strategies and actions which could be implemented to meet DP objectives, 4) educate and inform regarding the DP process and expectations. It is recommended that this be done in partnership with the District of Kent, if appropriate.

10.2 - To complement the DPA, it is recommended that the Village develop a landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce maintenance, watering requirements, avoid wildlife attractants, and reduce wildfire hazard. Consider including the landscaping standard as a requirement of the development permit within the applicable area, as well as making it publicly available for residents and homeowners outside of the DPA (can be provided at issue of building permit and made available at Municipal Office or other strategic locations). It is recommended that this be done in partnership with the District of Kent, if appropriate.

Additional recommendations for amendments to policies and bylaws were discussed in Section 2.5.3.

Subdivision Design

Subdivision design should include consideration to decrease the overall threat of wildfire. Aspects of subdivision design that influence wildfire risk are access, water pressure and hydrant locations. The number of access points and the width of streets and cul-de-sacs determine the safety and efficiency of evacuation and emergency response. In the communities and/or developed areas within the Village, on-street parking can contribute hazards on narrow or dead-end roads, which are already unlikely to have a high capacity under heavy smoke conditions.[72] When the time for evacuation is limited, poor access has

[72] Cova, T. J. 2005. Public safety in the wildland-urban interface: Should fire-prone communities have a maximum occupancy? Natural Hazards Review. 6:99-109.

contributed to deaths associated with entrapments and vehicle collisions during wildfires.[73] Methodologies for access design at the subdivision level can provide tools that help manage the volume of cars that need to egress an area within a given period of time.[72]

For new development in rural settings where hydrants are limited or unavailable (or it is otherwise determined by the Village that adequate or reliable water supply systems may not exist), the NFPA 1142 can be used to help determine minimum requirements for alternative water supply (natural or artificial). Alternative water sources, such as dry hydrant systems, water usage agreements for accessing water on private land, cisterns or other underground storage, etc., should be reviewed by the Village and the VHHSFD prior to development approval.

Increasing Local Capacity

Local capacity for emergency management and efficient response to wildland urban interface fires can be enhanced by addressing the following steps:

- Provision of sprinkler kits to community residents (at a cost); and
- Engagement in annual cross-training exercises with adjacent fire departments and/or BCWS in order to increase both local and regional emergency preparedness with regards to structural fire and wildfire training.

A detailed account of current local capacity for Village and recommendations to address gaps is provided in SECTION 6:.

FireSmart Compliance within the Area of Interest

There is a wide range of FireSmart compliance on private properties in the Village AOI. There are large differences in the degree to which FireSmart best practices are visible within individual HIZs, and in neighbourhoods throughout Village. Generally speaking, many homes in areas such as the Rockwell Corridor, McCombs Drive, and homes backing onto forested land on the eastern and western edges of the Village do not maintain 10 m defensible space. The main concern in the aforementioned areas is the ubiquity of flammable landscaping options (i.e., cedar hedging or trees overhanging homes) in proximity to residences, as well as the lack of defensible space between property footprints and adjacent forested areas. Accumulations of conifer foliage in roof corners and gutters was not uncommon. Storage of combustible items under decks, carports, and other horizontal surfaces was also noted. On the other hand, many residences are surrounded by lawn, 10 m defensible space, and/or hardscaping (rocks), all of which are FireSmart compliant. The Lakeshore area generally displays the highest FireSmart compliance rate.

Aside from differing levels of awareness, understanding and acceptance of recommended FireSmart guidelines by residential and commercial property owners, there are a number of other factors that add variability to the level of FireSmart compliance within the AOI. Ultimately, these also impact the

[73] De Ronde, C. 2002. Wildland fire-related fatalities in South Africa – A 1994 case study and looking back at the year 2001. Forest Fire Research & Wildland Fire Safety, Viegas (ed.), http://www.fire.uni-freiburg.de/GlobalNetworks/Africa/Wildland.cdr.pdf

vulnerability of structures and the amount of effort required to achieve a FireSmart rating for individual homes, neighbourhoods or the community as a whole. These factors include but are not limited to: the age of homes or subdivision; prevailing design features and favored building materials of the era; proximity to forested area (both on private land and adjacent Crown or Village-owned land); density, lot size and lay-out of the subdivision; positioning of the home or neighbourhood in relation to slope, aspect and prevailing winds; and the stage and maturity of landscaping.

Neighbourhoods in the Village AOI were unofficially surveyed during field work. The following observations were made:

- Wildfire hazard levels range from low to high across neighbourhoods within the AOI;
- The bulk of hazards are associated with conditions of natural and landscaped vegetation immediately surrounding residential properties;
- For new development, where landscaping is not yet completed, educational approaches may aid in promoting fire resistant landscaping options and achieving defensible space in the HIZ; and
- All neighbourhoods have good opportunities to mitigate risk through individual and collective action.

5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart planning and activities.

These priorities are based on general field observations and input from the Village and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially the same for each neighbourhood or area; however, it is recommended that the Village prioritize the neighbourhoods in Table 15. In addition, every neighbourhood within the AOI should continue and improve upon existing FireSmart activities and equally participate in the Village's FireSmart program.

Table 15. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Rockwell Drive	N	N	The following is a non-extensive list of FireSmart activities for which the Village can engage suggested neighbourhood residents: 1) Provide guidance to ensure landscaping is to an established FireSmart standard; 2) Incentivise private landowners to engage in retrofitting homes with building materials and design based on NFPA 1144 or FireSmart standards;
Echo Avenue	N	N	
Naismith Avenue	N	N	
Residences west of Hot Springs Road (Highway 9)	N	N	
McCombs Drive	N	N	

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
			3) Encourage prompt removal of combustible construction materials or yard waste from private properties; and 4) Coordinate monthly or bi-monthly yard waste removal days prior to and during the fire season to reduce WUI fire hazard.
Critical infrastructure	Y (partially)	N/A	Based on field observations, most critical infrastructure has had some level of FireSmart setback from forested areas. Consider conducting frequent (2-3 years) maintenance treatments to ensure the wildfire risk remains moderate. It is recommended that fuel treatments be considered for areas adjacent to critical infrastructure in order to bolster the effect of previous FireSmart treatments. FireSmart treatments may include thinning from below to reduce ladder fuels and crown fire potential, pruning of retained trees to 3 m, and reducing surface fuels. Additionally, consider adding regular brushing activities to the maintenance treatment schedule to control weeds and grasses around critical infrastructure.

5.3 COMMUNICATION AND EDUCATION

Establishing effective communications and actively engaging key stakeholders in risk reduction activities are keystones to building a FireSmart community. Without the support and involvement of residents, businesses, public officials, industry, and other forest tenure holders, the efforts of public officials, fire departments, and others to reduce wildfire losses will be hindered. In many communities, there is a general lack of understanding about interface fire, the relationship between ignition potential and loss of homes, and the simple steps that can be taken to minimize risk on private land. In addition, public perceptions regarding responsibility for risk reduction and the ability of firefighters to safely intervene to protect homes during a wildfire are often limited or inaccurate.

Based on the consultation completed during the development of this Plan, it is evident that Village staff and some residents have a good level of awareness of interface fire risk and a strong level of commitment to continue to improve their awareness and understanding. However, field observations highlighted the need to further educate the community at large on what private land owners can do to build a FireSmart community and take personal responsibility for the ignition potential of their homes, businesses, lands, and neighbourhoods. Often, the risk of wildfire is at the forefront of public awareness during or after major wildfire events, whether close to home or further afield. The challenge is to retain this level of awareness outside these times. The Communication and Education objectives for the AOI are:

- To improve public understanding of fire risk and personal responsibility by increasing resident and property owner awareness of the wildfire threat in their community, to establish a sense of responsibility for risk mitigation among property owners, and to empower them to act;
- To enhance the awareness of, and participation by, elected officials and all WUI stakeholders regarding proactive WUI risk mitigation activities; and
- To reduce or avoid ignitions from industrial sources.

Bringing organizations together to address wildfire issues that overlap physical, jurisdictional or organizational boundaries is a good way to help develop interagency structures and mechanisms to reduce wildfire risk. Engagement of various stakeholders can help with identifying valuable information about the landscape and help provide unique and local solutions to reducing wildfire risk. The Village should consider creating/formalizing a joint Interface Steering Committee with the District of Kent to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as Village and District staff, BCWS, BC Parks, recreational groups/representatives, industrial operators, and forest tenure license holders.

Moving from the CWPP to implementation of specific activities requires that the community is well informed of the reasons for, and the benefits of specific mitigation activities. In order to have successful implementation, the following communication and public education recommendations are made:

RECOMMENDATION #11: Make this report and associated maps publicly available through webpage, social media, and public FireSmart meetings. In addition, this CWPP should be shared with local industry partners; in particular industrial forest companies who may be interested in collaborating on direct fuel management treatments or with other sections of this CWPP document.

RECOMMENDATION #12: Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, stand structure or changes to infrastructure in the interface. The frequency of updates is highly dependent upon major changes which would impact the Village's wildfire threat assessment or the rate at which wildfire risk reduction efforts are implemented. An evaluation of major changes (including funding program changes that may lead to new opportunities) and the potential need for a CWPP update should be initiated every 5 - 7 years.

RECOMMENDATION #13: Consider promoting FireSmart approaches for wildfire risk reduction to Village residents through Town Hall meetings, workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior to and during the fire season. Consider supplying FireSmart materials to homeowners in the interface during these engagement campaigns.

RECOMMENDATION #14: Work towards FireSmart community recognition at the neighbourhood level and facilitate uptake into the FireSmart Canada Community Recognition Program (FSCCRP). This will help reduce fire risk and aid in further funding applications.

RECOMMENDATION #15: Facilitate the FSCCRP uptake within the Village and enhance its applications by including the following: 1) inviting BCWS crews to participate in and support the annual FireSmart events set up by participating neighbourhoods. 2) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool. 3) Include within the FireSmart Canada Community Assessment Report the standard recommendation that participating neighbourhoods hold a home hazard assessment workshop as one of their FireSmart events.

RECOMMENDATION #16: Promote the use of the FireSmart Home Partners Program offered by the Partners in Protection Association, which facilitates voluntary FireSmart assessments on private property. Use the opportunity to educate the home or business owner about the hazards which exist on their property and provide easy improvements to reduce their risk.

5.4 OTHER PREVENTION MEASURES

In addition to fuel treatment and community communication and education, fire prevention in the AOI is also addressed via the following avenues: 1) public display of danger class rating signs throughout the AOI; 2) fire ban alignment with provincial fire bans; 3) potential enforcement of restricted access to back country areas similar to provincial requirements; and 4) enforcement of local bylaws such as Property Maintenance Bylaw No. 1072, 2015; Fire Department Regulation Bylaw No. 1031, 2013; Fireworks Regulation Bylaw No. 871; and the Park Regulation Bylaw No. 915, 2009. The aforementioned activities are either currently being applied or have potential to be applied in order to reduce the potential and / or threat of wildfire ignitions within the AOI.

Risk of human-caused ignition within the study area is not limited to private property owners and individual residents. Powerlines and industrial activities pose a risk of ignition, particularly in areas where cured fuels or fuel accumulations exist. Tree failures adjacent to power lines (transmission and distribution) are common occurrences and represent significant risks to ignition within the study area. A cooperative approach for addressing the industrial area concerns must be undertaken by the Village and pertinent industrial partners.

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources accessible for emergency response and preparedness use. Accordingly, in emergency situations when multiple fires are burning in different areas of the Province, resource availability may be scarce. Therefore, local government preparedness and resource availability are critical components of efficient wildfire prevention and planning. Deployment of provincial resources occurs as per the process detailed in the *Provincial Coordination Plan for Wildland Urban Interface Fires* document[74]. The aforementioned document

[74] Provincial Coordination Plan for Wildland Urban Interface Fires. 2016. Available online at: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/provincial-emergency-planning/bc-provincial-coord-plan-for-wuifire_revised_july_2016.pdf

establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 LOCAL GOVERNMENT AND FIRST NATION FIREFIGHTING RESOURCES

Firefighting efforts and effectiveness can be affected by access to secondary power sources, water pressure and supply, and existing local government contingency plans. In the event of a wildfire emergency situation and loss of power, the Village has access to mobile diesel generators to power critical infrastructure such as the Fire Halls and the Emergency Operation Centre (EOC). In consultation with the Wildfire Working Group, it was also noted that water infrastructure, such as pumps and water treatment, have dedicated backup power. However, should a wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. The local government has not identified any issues with water pressure within areas that have fire hydrant service. Specific limitations of the Village water system with regards to wildfire suppression are detailed in Section 6.1.2.

Formal mutual aid agreements are in effect between the Village of Harrison Hot Springs Fire Department (VHHSFD) and the District of Kent (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the Village is activated, as required, and may also lead to aid requests from BCWS.

6.1.1 Fire Department and Equipment

Fire protection with the AOI is the responsibility of the VHHSFD.

Table 16 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment.

The greatest personnel deficiency reported by the VHHSFD is attrition. In consultation with the VHHSFD, it was determined that there are no structural or wildland firefighting equipment deficiencies.

Table 16. Fire department capacity and equipment within the AOI.

Fire Department	Number of Stations	Number of Members	Apparatus type and number
Village of Harrison Hot Springs FD	1	17 (paid, on-call)	2 engines, 1 rescue, 1 utility truck

The VHHSFD has a formal mutual aid agreement with the District of Kent and can provide mutual aid within relatively short response times. These mutual aid agreements may be utilized several times a year for structure or vehicle fires. In consultation with the Wildfire Working Group, it was noted that the

VHHSFD relies on mutual aid from the District of Kent for some daytime responses and for large or complex fires that require more resources. Members of the VHHSFD undergo significant training focused on structural firefighting and some training related to wildfire, including Structure Protection Program Wildland Firefighter Level 1 (SPP-WFF1). The VHHSFD has two in-house SPP-WFF1 train-the-trainers. The VHHSFD has had no exposure to practical cross-training with MFLNRORD's BCWS. Cross-training with the BCWS would enable the local fire department to prepare its responders with the technical and practical firefighting experience in order to action both structural and wildland fires. It is recommended that all VHHSFD members have at a minimum S100 and/or SPP-WFF1 (or equivalent), and that the fire department members engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of SPUs. The aforementioned cross-training opportunity could include, for example, a joint wildfire simulation exercise. This level of training would improve the local fire departments' commitment to wildfire preparedness.

Over the previous 7 years (2011-2017), the VHHSFD responded to two significant wildland fire calls, in 2013 and 2015.

6.1.2 Water Availability for Wildfire Suppression

Water is the single most important suppression resource. In an emergency response scenario, it is critical that a sufficient water supply be available. The Fire Underwriters Survey summarizes their recommendations regarding water works systems fire protection requirements, in *Water Supply for Public Fire Protection* (1999).[75] Some key points from this document include the need for:

- Duplication of system parts in case of breakdowns during an emergency;
- Adequate water storage facilities;
- Distributed hydrants, including hydrants at the ends of dead-end streets; and
- Piping that is correctly installed and in good condition.

Water works planning should always take worst-case-scenarios into consideration. The water system should be able to serve more than one major fire simultaneously, especially in larger urban centers.

Water service within the Village is an important component of emergency response for a wildland urban interface fire in the event of a large-scale emergency, and in particular for structural fires. As previously noted in Sections 3.2.3 and 3.3.1, water service is provided by a Village-operated system which relies on surface water from Harrison Lake. For suppression within the AOI, hydrant service is provided in all areas within the municipal boundary. In consultation with the VHHSFD, it was noted that water availability for fire suppression is most challenging in interface areas with steep slopes. In 2017, the

[75] http://www.scm-rms.ca/docs/Fire%20Underwriters%20Survey%20-%201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf

Village was awarded provincial funding to upgrade and expand the water system to increase fire protection capacity. This project was completed in 2018.

The Village fire department can draft from natural water sources such as Harrison Lake, and as a last resort, streams such as Miami Creek. These natural water sources are known and mapped. Harrison Lake in particular provides a large capacity freshwater reservoir that is not assumed to be immediately vulnerable to drought conditions or climate change.

6.1.3 Access and Evacuation

Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. In the event of a wildfire emergency, the Hot Springs Road (Highway 9) is the only access route to and from the AOI. Evacuation would be conducted by First Responders, RCMP, and the Search and Rescue team (tactical). If a wildfire were to block Hot Springs Road, evacuation from the AOI would be difficult. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

Many developments within the Village are located on single access roads which branch off of the Hot Springs Road, which also limits the ability of fire crews to respond to fires and safely evacuate residents. The Rockwell Drive corridor was identified by the Wildfire Working Group as the development of greatest concern for access and egress within the Village AOI. Within the AOI, some of the critical infrastructure is reached via narrow and/or private, forested roads, which may impede suppression efforts and response times.

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The District of Kent and Village of Harrison have developed a Kent-Harrison Joint Emergency Response and Recovery Plan (2018) which includes basic contingencies in the event of a wildland / interface fire (i.e., contacts and roles of local government personnel). However, the plan does not specify evacuation routes to be used during an emergency situation. In the event of a wildfire emergency within the AOI, the Agassiz Fire Hall (outside of the AOI) can be designated as the EOC and the Village municipal administration office can be designated as the back-up EOC. It is recommended that the Village develop a detailed evacuation plan that includes the following provisions:

- Mapping and identification of safe zones, marshaling points and aerial evacuation locations;
- Planning of traffic control and accident management;
- Identification of volunteers that can assist during and/or after evacuation;
- Development of an education/communication strategy to deliver emergency evacuation procedures to residents.

Recreation trails built to support ATVs can provide access for ground crews and act as fuel breaks for ground fires, particularly in natural areas. Strategic recreational trail development to a standard that supports ATVs, and further to install gates or other barriers to minimize access by unauthorized users, can be used as tools that increase the ability of local fire departments to access interface areas.

The creation of a map book or spatial file that displays the trail network available for fire departments to access during an emergency or for fire suppression planning must accompany any fire access trail building activities. In order to effectively use the trails as crew access or as fuel breaks during suppression efforts, it is recommended that a Parks Access Plan, or Total Access Plan, is developed. This plan should be made available to the VHHSFD and the BCWS in the event that they are aiding suppression efforts on an interface fire in the AOI. The plan should include georeferenced maps with associated spatial data and ground-truthed locations of potential optimal firebreaks, identify the type of access available for each access route, identify those trails that are gated or have barriers, and provide information as to how to unlock / remove barriers. The plan should also identify those natural areas where access is insufficient. Access assessment should consider land ownership, proximity of values at risk, wildfire threat, opportunities for use as fuel break / control lines, trail / road network linkages where fuel-free areas or burn off locations can be created or used as potential sprinkler locations, and requirements for future maintenance activities such as operational access for fuel treatments and other hazard reduction activities.

In addition to providing the safest, quickest, and easiest access routes for emergency crews, a Total Access Plan would minimize the need for using machinery or motorized access in an otherwise undisturbed area. This would reduce the risk of soil disturbance and other environmental damage, and would therefore decrease rehabilitation costs.

RECOMMENDATION #17: In cooperation with the District of Kent, continue to work with relevant Provincial ministries and stakeholders including BC Parks, Emergency Management BC, Ministry of Transportation and Infrastructure, MFLNRORD, Seabird Island Indian Band (holders of a woodlot license adjacent to Sasquatch Provincial Park), BC Hydro, Fraser Valley Regional District, Enbridge (operating a line station at Ruby Creek) and Canadian Pacific Railway, to complete a second-means egress route through Sasquatch Park and provide an alternate evacuation route for residents and visitors along Rockwell Drive.

RECOMMENDATION #18: When the evacuation plan is finalized, complete and participate in regular testing of, and updates to, the evacuation plan.

RECOMMENDATION #19: Consider developing a community wildfire pre-planning brochure that addresses the following: 1) locations of staging areas; 2) identifies water reservoirs, communications requirements (i.e., radio frequencies), minimum resource requirements for structure protection in the event of an interface fire, and values at risk; and 3) maps of the area of interest.

RECOMMENDATION #20: Develop a Total Access Plan for the Village to create, map and inventory trail and road network in natural areas for suppression planning, identification of areas with insufficient access and to aid in strategic planning. Georeferenced maps with ground-truthed locations of potential optimal firebreaks should be developed as part of the Total Access Plan and shared with fire suppression personnel and BCWS to support emergency response in the event of a wildfire. The plan should be updated every five years, or more regularly, as needed to incorporate additions and / or changes.

6.1.4 Training

The VHHSFD maintains a current level of structural protection training as described in Section 6.1.1. Additionally, all members have yearly refreshers and / or certification in SPP-WFF1. According to the Office of Fire Commissioner, a new course on Engine Operations in the Wildland Urban Interface is currently being developed and expected to be released in 2018, which is a 1-day course that combines the SPP-WWF-1, the S115 and S215 (personal communication with Tom Boechler, Structure Protection Specialist). It is recommended that the VHHSFD considers providing members with this course upon release, to ensure currency with techniques, applications and procedures for wildland urban interface fire suppression. Provision of training opportunities for structural firefighters in the realm of wildland firefighting is critical to building capacity for suppression and emergency management at the local level. Until these course developments are complete, it is recommended that all fire department members at minimum have S100 and/or SPP-WFF1 (or equivalent), and that the fire departments engage in yearly practical wildland fire training with BCWS.

The current level of communication between the VHHSFD and BCWS occurs as required by the fire season demands. It is recommended that the VHHSFD work cooperatively with the BCWS (Fraser Fire Zone, Cultus/Haig Fire Base) to conduct yearly mock exercises, where information and technical/practical knowledge are shared, such as: fireline construction, Mark 3 pump operations, sprinkler protection, skid pack operations, portable water tank deployment, and wildland hose operations. These practices could also provide training to wildland crews on hydrant hookup methods, as well as provide an avenue to discuss working together on inter-agency fires. Additional training options could include engaging adjacent Fire Departments outside the AOI (i.e., Agassiz Fire Department) to conduct joint training so as to further strengthen regional emergency response and firefighting training.

RECOMMENDATION #21: Fire Departments should engage in regular cadence of communication with the BCWS Fraser Fire Zone, Cultus/Haig Fire Base to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities.

RECOMMENDATION #22: Ensure that the VHHSFD maintains the capability to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all VHHSFD continue to have SPP-WFF 1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. The Office of the Fire Commissioner (OFC) offers

SPP 115 (formerly S-115) to train structural firefighters on the use of wildfire pumps and hose, and fire service hose and hydrants in the application of structural protection units (SPUs). The OFC is currently developing additional wildfire-specific Officer-level training courses (i.e., Engine Operations in the Wildland Urban Interface); the fire department should continue the practice of staying up to date on wildfire training opportunities, and to train members in this capacity, as training resources / budgets allow.

6.2 STRUCTURE PROTECTION

The VHHSFD is relatively well-resourced in both structural and wildland fire suppression equipment. The fire departments maintain a current level of training in both wildfire and structural firefighting (see Section 6.1.1 for additional detail). The VHHSFD is not equipped with a Structural Protection Unit (SPU) The UBCM owns four complete SPUs, each equipped to protect 30 – 35 structures. The kits are deployed by the MFLNRORD / BCWS incident command structure and are placed strategically across the province during the fire season based on fire weather conditions and fire potential. When the kits are not in use, they may be utilized by fire departments for training exercises. SPUs can be useful tools in the protection of rural/ interface homes in the event of a wildfire. An important consideration in protecting the WUI zone from fire is ensuring that homes can withstand an interface fire event. Structure protection is focused on ensuring that building materials and construction standards are appropriate to protect individual homes from interface fire. Materials and construction standards used in roofing, exterior siding, window and door glazing, eaves, vents, openings, balconies, decks, and porches are primary considerations in developing FireSmart neighbourhoods. Housing built using appropriate construction techniques and materials in combination with fire resistant landscaping are less likely to be impacted by interface fires.

While many BC communities established to date were built without significant consideration with regard to interface fire, there are still ways to reduce home vulnerability. Changes to roofing materials, siding, and decking can be achieved over the long-term through voluntary upgrades, as well as changes in bylaws and building codes. The FireSmart approach has been adopted by a wide range of governments and is a recognized process for reducing and managing fire risk in the wildland urban interface. More details on FireSmart construction can be found in Appendix J.

It is recommended that homeowners take a building envelope-out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: http://www.youtube.com/watch?v= Vh4cQdH26g.

The structure protection objectives for the Village are to:

- Encourage private homeowners to voluntarily adopt FireSmart principles on their properties and to reduce existing barriers to action;
- Enhance protection of critical infrastructure from wildfire (and post-wildfire impacts); and,
- Enhance protection of residential / commercial structures from wildfire.

RECOMMENTATION #23: Complete a vulnerability assessment of all critical infrastructure, secondary power sources, and fuel availability. Review current capability of secondary power sources, identify vulnerabilities, and prioritize needs, in the case of prolonged or extensive power outages. Upgrade or realign resources, as prioritized.

REFERENCES

BCWS. 2018. Wildfire Causes. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes

Dale, V., L. Joyce. S. McNulty, R. Neilson, M. Ayres, M. Flannigan, P. Hanson, L. Irland, A. Lugo. C. Peterson, D. Simberloff, F. Swanson, B. Stocks, B. Wotton. 2001. *Climate Change and Forest Disturbances*. BioScience 2001 51 (9), 723-734.

Flannigan, M.D., B.M. Wotton, G.A. Marshall, W.J. deGroot, J. Johnston, N. Jurko, A.S. Cantin. 2016. Fuel moisture sensitivity to temperature and precipitation: climate change implications. Climatic Change (2016) 134: 59 -71. Accessed online at https://link.springer.com/content/pdf/10.1007%2Fs10584-015-1521-0.pdf.

Green, R. N., and K. Klinka. 1994. A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. Land Management Handbook Number 28. Retrieved from: https://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh28.pdf

Ministry of Forests, Lands and Natural Resource Operations. 2015. Coast Area 2015-17 Coastal Timber Supply Area Forest Health Overview. Retrieved from: https://www.for.gov.bc.ca/ftp/HFP/external/!publish/Forest_Health/TSA_FH_Strategies/2015-Coast%20FH%20Strategy.pdf

Ministry of Forests, Lands, and Natural Resource Operations. 2016. BC Provincial Government extension note 'Adapting natural resource management to climate change in the West and South Coast Regions'. Accessed online at: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/nrs-climate-change/regional-extension-notes/coasten160222.pdf

The Province of British Columbia. 1995. Biodiversity Guidebook. Retrieved from: https://www.for.gov.bc.ca/hfd/library/documents/bib19715.pdf

The Province of British Columbia. 1997. Spotted Owl Management Plan for Chilliwack and Squamish Forest District. Ministry of Environment, Lands and Parks, Lower Mainland Region (Abstract). Retrieved from: http://www.env.gov.bc.ca/wld/documents/ce09blackburn.pdf.

The Province of British Columbia. 2005. Sustainable Resource Management Plan Biodiversity Chapter for East Harrison Landscape Unit. Ministry of Sustainable Resource management, Coast Region – Chilliwack Office. Retrieved from: https://www.for.gov.bc.ca/tasb/slrp/srmp/coast/chilliwack/reports/East_Harrison/East_Harrison_LU_Plan_May2005.pdf

Spotted Owl Best Management Practices Working Group, 2009. Best Management Practices for Managing Spotted Owl Habitat. Retrieved from: https://www.for.gov.bc.ca/ftp/DCK/external/!publish/LOCAL_DATA/Spotted_Owl_Management_Plan/DOCUMENTS/SPOWBestManagementPractiesJul2009.pdf

APPENDIX A – WILDFIRE THREAT ASSESSMENT – FBP FUEL TYPE CHANGE RATIONALE

Provided separately as PDF package.

APPENDIX B – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS

Provided separately as PDF package.

APPENDIX C – MAPS

Provided separately as PDF package.

APPENDIX D – WILDLAND URBAN INTERFACE DEFINED

The traditional and most simple definition for the wildland/urban interface (WUI) is "the place where the forest meets the community". However, this definition can be misleading. Incorrectly, it implies that neighbourhoods and structures well within the perimeter of a larger community are not at risk from wildfire. As well, it fails to recognize that developments adjacent to grassland and bush are also vulnerable.

A more accurate and helpful definition of the WUI is based on a set of conditions, rather than a geographical location: "the presence of structures in locations in which conditions result in the potential for ignition of structures from the flames, radiant heat or embers of a wildland fire." This definition was developed by the National Fire Protection Association and is used by the US Firewise program.[76] It recognizes that all types of wildland fuel/fire can lead to structural ignition (i.e. forest, grassland, brush) and also identifies the three potential sources of structural ignition.

Two situations are differentiated. Locations where there is a clean/abrupt transition from urban development to forest lands are usually specified as the "interface" whereas locations where structures are embedded or mingled within a matrix of dense wildland vegetation are known as the "intermix". An example of interface and intermixed areas is illustrated in Figure 6.

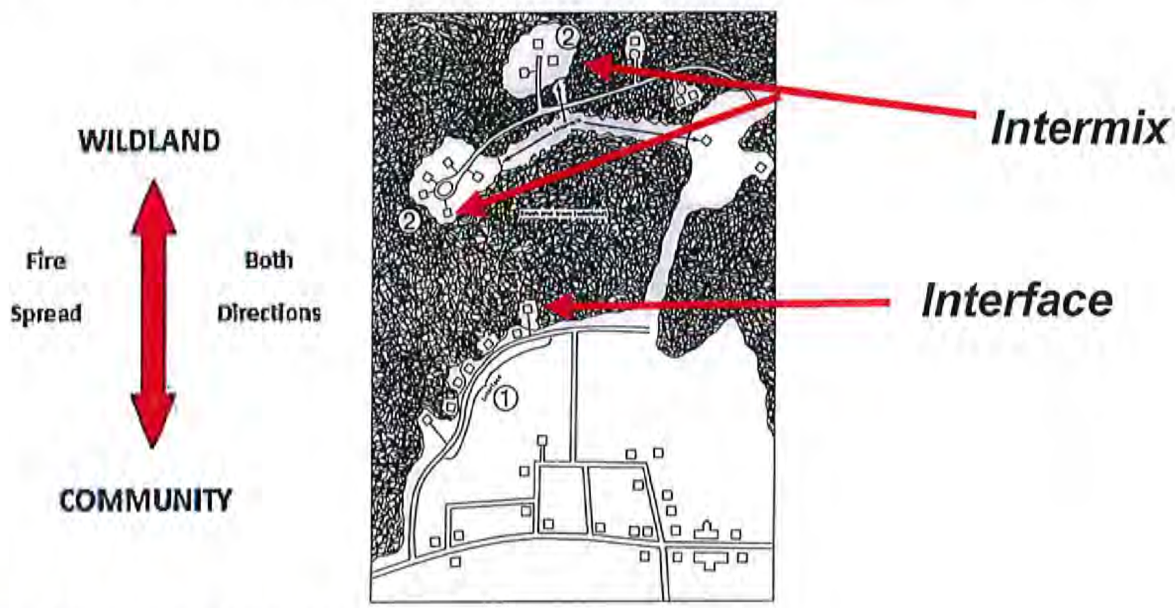


Figure 6. Illustration of intermix and interface situations.

Within the WUI, fire has the ability to spread from the forest into the community or from the community out into the forest. Although these two scenarios are quite different, they are of equal importance when considering interface fire risk. Regardless of which scenario occurs, there will be consequences for the community and this will have an impact on the way in which the community plans and prepares itself for interface fires.

[76] https://www.nfpa.org/Public-Education/By-topic/Wildfire/Firewise-USA

Fires spreading into the WUI from the forest can impact homes in two distinct ways:

1. From sparks or burning embers carried by the wind, or convection that starts new fires beyond the zone of direct ignition (main advancing fire front), that alight on vulnerable construction materials or adjacent flammable landscaping (roofing, siding, decks, cedar hedges, bark mulch, etc.) (Figure 7).

2. From direct flame contact, convective heating, conductive heating or radiant heating along the edge of a burning fire front (burning forest), or through structure-to-structure contact. Fire can ignite a vulnerable structure when the structure is in close proximity (within 10 meters of the flame) to either the forest edge or a burning house (Figure 8).

Figure 7. Firebrand caused ignitions: burning embers are carried ahead of the fire front and alight on vulnerable building surfaces.

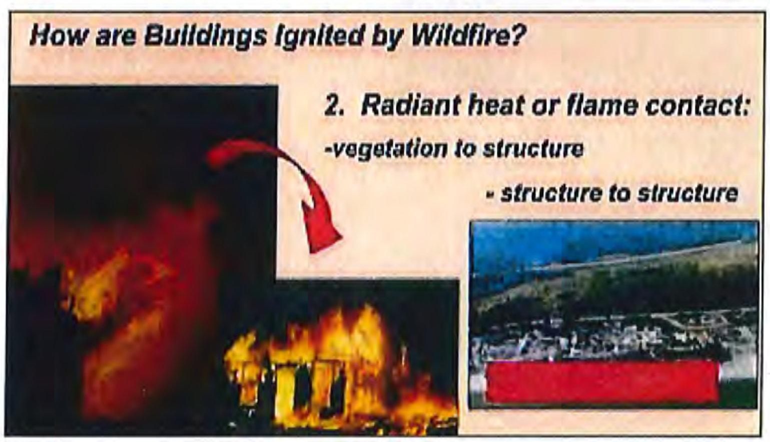


Figure 8. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

Current research confirms that the majority of homes ignited during major WUI events trace back to embers as their cause (e.g. 50% – 80^{+} %). Firebrands can be transported long distances ahead of the wildfire, across any practicable fire guards, and accumulate on horizontal surfaces within the home ignition zone in densities that can reach 600^{+} /m^2. Combustible materials found within the home ignition zone combine to provide fire pathways allowing spot fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

APPENDIX E – WUI THREAT PLOT LOCATIONS

Table 17 displays a summary of all WUI threat plots completed during CWPP field work. The original WUI threat plot forms and photos will be submitted as a separate document. The following ratings are applied to applicable point ranges:

- Wildfire Behaviour Threat Score – Low (0-40); Moderate (41 – 95); High (96 – 149); Extreme (>149); and,
- WUI Threat Score – Low (0 – 13); Moderate (14 – 26); High (27 – 39); Extreme (>39).

Table 17. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
ELEM-1	Park adjacent to Harrison Elementary	Moderate	N/A
GREE-1	Greenspace	Moderate	N/A
GREE-2	Greenspace	Moderate	N/A
MIAM-1	Miami River Greenway	Moderate	N/A
SECT-1	East Sector Lands	High	High
SECT-2	East Sector Lands	Moderate	N/A
SECT-3	East Sector Lands	Moderate	N/A
SECT-4	East Sector Lands	Moderate	N/A
WAT-1	Campbell Lake Trail	Moderate	N/A
WAT-2	Campbell Lake Trail	Moderate	N/A
WAT-3	Adjacent to water reservoir	High	Extreme
WOOD-3	Mount Woodside	Moderate	N/A
WOOD-4	Mount Woodside	Moderate	N/A

*Note that WUI threat scores are only collected for untreated polygons that rate high or extreme for Wildfire Behaviour Threat score.

APPENDIX F – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the study area was the 2015 provincial fuel typing layer provided by BCWS as part of the *2015 Provincial Strategic Threat Analysis* (PSTA) data package. This fuel type layer is based on the FBP fuel typing system. PSTA data is limited by the accuracy and availability of information within the Vegetation Resource Inventory (VRI) provincial data; confidence in provincial fuel type data is very low on private land. The PSTA threat class for all private land within the AOI was not available. Fuel types within the study area have been updated using ortho-imagery of the study area with representative fuel type calls confirmed by field fuel type verification. Polygons not field-verified were assigned fuel types based upon similarities visible in orthophotography to areas field verified. Where polygons were available from the provincial fuel typing layer, they were utilized and updated as necessary for recent harvesting, development, etc.

It should be noted that fuel typing is intended to represent a fire behaviour pattern; a locally observed fuel type may have no exact analog within the FBP system. The FBP system was almost entirely developed for boreal and sub-boreal forest types, which do not occur within the study area. As a result, the AOI fuel typing is a best approximation of the Canadian Forest Fire Danger Rating System (CFFDRS) classification, based on the fire behaviour potential of the fuel type during periods of high and extreme fire danger within the South Coast region. Additionally, provincial fuel typing depends heavily on Vegetation Resource Inventory (VRI) data, which is gathered and maintained in order to inform timber management objectives, not fire behaviour prediction. For this reason, VRI data often does not include important attributes which impact fuel type and hazard, but which are not integral to timber management objectives. Examples include: surface fuels and understory vegetation.

In some cases, fuel type polygons may not adequately describe the variation in the fuels present within a given polygon due to errors within the PSTA and VRI data, necessitating adjustments required to the PSTA data. In some areas, aerial imagery is not of sufficiently high resolution to make a fuel type call. Where fuel types could not be updated from imagery with a high level of confidence, the original PSTA fuel type polygon and call were retained.

For information on the provincial fuel typing process used for PSTA data as well as aiding in fuel type updates made in this document, please refer to Perrakis and Eade, 2015.[77]

[77] Ibid.

APPENDIX G – WUI THREAT ASSESSMENT METHODOLOGY

As part of the CWPP process, spatial data submissions are required to meet the defined standards in the Program and Application Guide. As part of the program, proponents completing a CWPP or CWPP update are provided with the Provincial Strategic Threat Analysis (PSTA) dataset. This dataset includes:

- Current Fire Points
- Current Fire Polygons
- Fuel Type
- Historical Fire Points
- Historical Fire Polygons
- Mountain pine beetle polygons (sometimes not included)
- PSTA Head Fire Intensity
- PSTA Historical Fire Density
- PSTA Spotting Impact
- PSTA Threat Rating
- Structure Density
- Structures (sometimes not included)
- Wildland Urban Interface Buffer Area

The required components for the spatial data submission are detailed in the Program and Application Guide Spatial Appendix – these include:

- AOI
- Fire Threat
- Fuel Type
- Photo Location
- Proposed Treatment
- Structures
- Threat Plot
- Wildland Urban Interface

The provided PSTA data does not necessarily transfer directly into the geodatabase for submission, and several PSTA feature classes require extensive updating or correction. In addition, the Fire Threat determined in the PSTA is fundamentally different than the Fire Threat feature class that must be submitted in the spatial data package. The Fire Threat in the PSTA is based on provincial scale inputs - fire density; spotting impact; and head fire intensity, while the spatial submission Fire Threat is based on the components of the Wildland Urban Interface Threat Assessment Worksheet. For the scope of this project, completion of WUI Threat Assessment plots on the entire AOI is not possible, and therefore an analytical model has been built to assume Fire Threat based on spatially explicit variables that correspond to the WUI Threat Assessment worksheet.

Field Data Collection

The primary goals of field data collection are to confirm or correct the provincial fuel type, complete WUI Threat Assessment Plots, and assess other features of interest to the development of the CWPP. This is accomplished by traversing as much of the study area as possible (within time, budget and access constraints). Threat Assessment plots are completed on the 2012 version form, and as per the Wildland Urban Interface Threat Assessment Guide.

For clarity, the final threat ratings for the study area were determined through the completion of the following methodological steps:

1. Update fuel-typing using orthophotography provided by the client and field verification.
2. Update structural data using critical infrastructure information provided by the client, field visits to confirm structure additions or deletions, and orthophotography
3. Complete field work to ground-truth fuel typing and threat ratings (completed 13 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 40+ field stops with qualitative notes, fuel type verification, and/or photographs)
4. Threat assessment analysis using field data collected and rating results of WUI threat plots – see next section.

Spatial Analysis

Not all attributes on the WUI Threat Assessment form can be determined using a GIS analysis on a landscape/polygon level. To emulate as closely as possible the threat categorization that would be determined using the Threat Assessment form, the variables in Table 18 were used as the basis for building the analytical model. The features chosen are those that are spatially explicit, available from existing and reliable spatial data or field data, and able to be confidently extrapolated to large polygons.

Table 18. Description of variables used in spatial analysis for WUI wildfire threat assessment.

WUI Threat Sheet Attribute	Used in Analysis?	Comment
FUEL SUBCOMPONENT		
Duff depth and Moisture Regime	No	Many of these attributes assumed by using 'fuel type' as a component of the Fire Threat analysis. Most of these components are not easily extrapolated to a landscape or polygon scale, or the data available to estimate over large areas (VRI) is unreliable.
Surface Fuel continuity	No	
Vegetation Fuel Composition	No	
Fine Woody Debris Continuity	No	
Large Woody Debris Continuity	No	
Live and Dead Coniferous Crown Closure	No	
Live and Dead Conifer Crown Base height	No	
Live and Dead suppressed and Understory Conifers	No	
Forest health	No	
Continuous forest/slash cover within 2 km	No	
WEATHER SUBCOMPONENT		
BEC zone	Yes	
Historical weather fire occurrence	Yes	
TOPOGRAPHY SUBCOMPONENT		
Aspect	Yes	

WUI Threat Sheet Attribute	Used in Analysis?	Comment
Slope	Yes	Elevation model was used to determine slope.
Terrain	No	
Landscape/ topographic limitations to wildfire spread	No	
STRUCTURAL SUBCOMPONENT		
Position of structure/ community on slope	No	
Type of development	No	
Position of assessment area relative to values	Yes	Distance to structure is used in analysis; position on slope relative to values at risk is too difficult to analyze spatially.

The field data is used to correct the fuel type polygon attributes provided in the PSTA. The corrected fuel type layer is then used as part of the initial spatial analysis process. The other components are developed using spatial data (BEC zone, fire history zone) or spatial analysis (aspect, slope). A scoring system was developed to categorize resultant polygons as having relatively low, moderate, high or extreme Fire Threat, or Low, Moderate, High or Extreme WUI Threat.

These attributes are combined to produce polygons with a final Fire Behaviour Threat Score. To determine the Wildland Urban Interface Score, only the distance to structures is used. Buffer distances are established as per the WUI Threat Assessment worksheet (<200, 200-500 and >500) for polygons that have a 'high' or 'extreme' Fire Behaviour Threat score. Polygons with structures within 200m are rated as 'extreme', within 500m are rated as 'high', within 2km are 'moderate', and distances over that are rated 'low'.

There are obvious limitations in this method, most notably that not all components of the threat assessment worksheet are scalable to a GIS model, generalizing the Fire Behaviour Threat score. The WUI Threat Score is greatly simplified, as determining the position of structures on a slope, the type of development and the relative position are difficult in an automated GIS process. This method uses the best available information to produce the initial threat assessment across the study area in a format which is required by the UBCM SWPI program.

Upon completion of the initial spatial threat assessment, individual polygon refinement was completed. In this process, the WUI threat plots completed on the ground were used in the following ways:

- fuel scores were reviewed and applied to the fuel type in which the threat plot was completed;
- conservative fuel scores were then applied to the polygons by fuel type to check the initial assessment;
- high Wildfire Behaviour Threat Class polygons were reviewed in google earth to confirm their position on slope relative to values at risk.

In this way, we were able to consider fuel attributes outside the fuel typing layer, as well as assessment area position on slope relative to structures, which are included in the WUI threat plot worksheet.

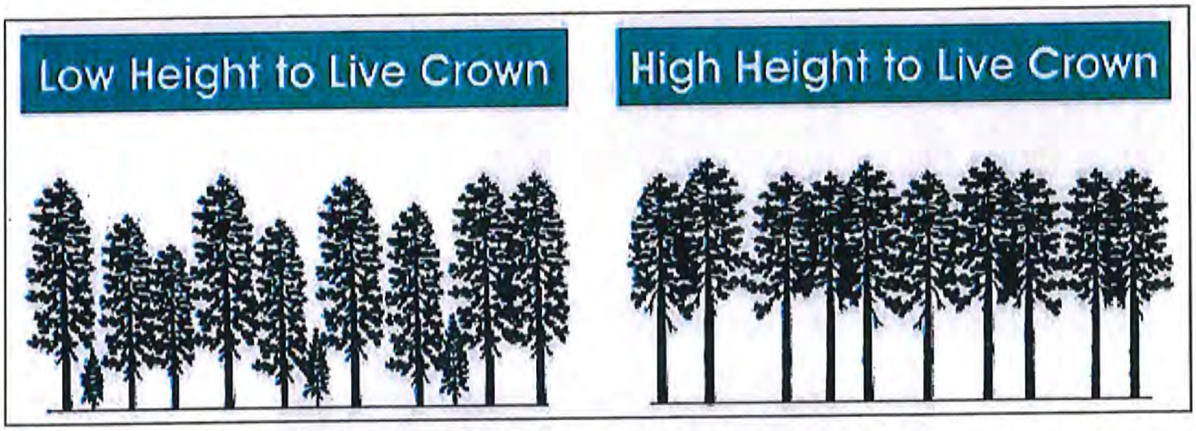


Figure 9. Comparison of stand level differences in height-to-live crown in an interior forest, where low height to live crown is more hazardous than high height to live crown.

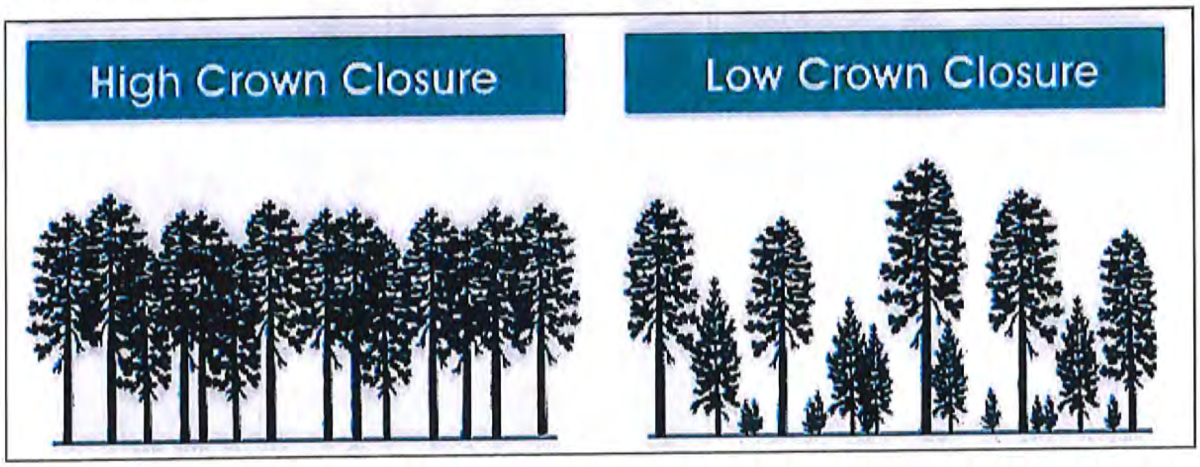


Figure 10. Comparison of stand level differences in crown closure, where high crown closure/continuity contributes to crown fire spread, while low crown closure reduces crown fire potential.

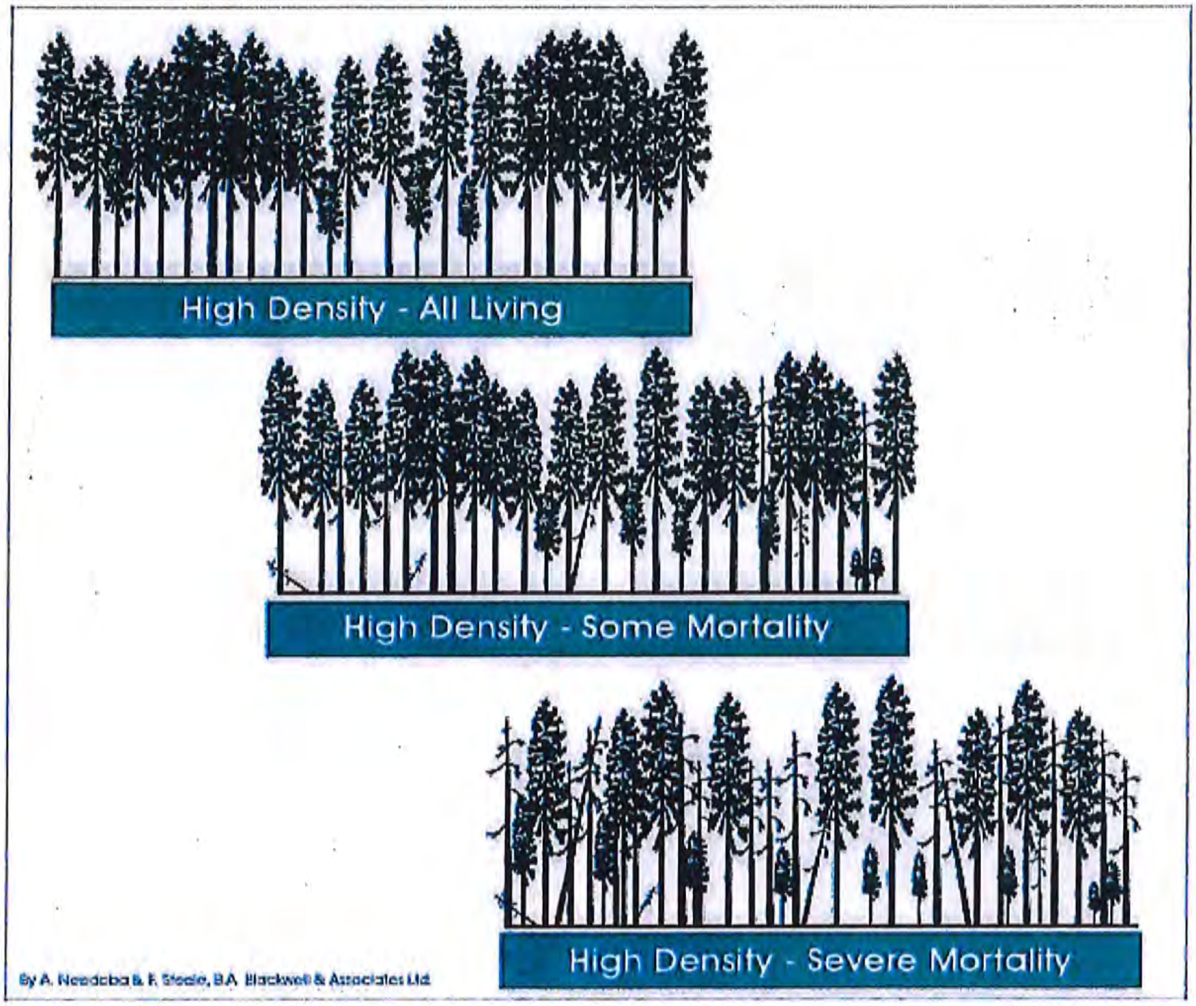


Figure 11. Comparison of stand level differences in density and mortality, and the distribution of live and dead fuels in these types of stands.

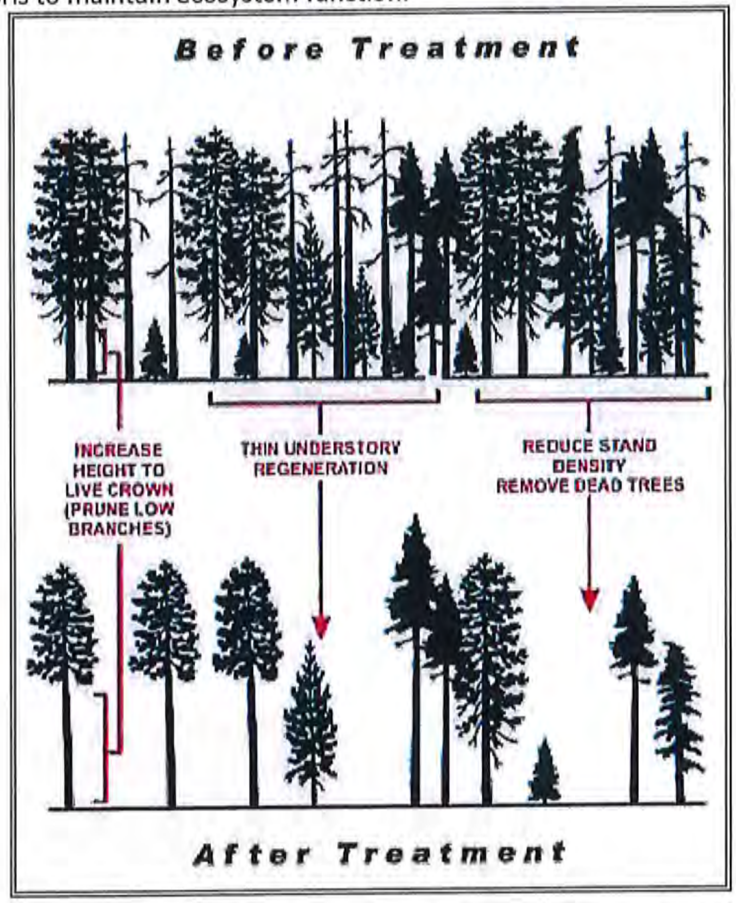
Thinning is a preferred approach to fuel treatment (Figure 12.) and offers several advantages compared to other methods:

- Thinning provides the most control over stand level attributes such as species composition, vertical structure, tree density, and spatial pattern, as well as the retention of snags and coarse woody debris for maintenance of wildlife habitat and biodiversity.
- Unlike prescribed fire treatments, thinning is comparatively low risk, and is less constrained by fire weather windows.
- Thinning may provide marketable materials that can be utilized by the local economy.
- Thinning can be carried out using sensitive methods that limit soil disturbance, minimize damage to leave trees, and provide benefits to other values such as wildlife.

The main wildfire objective of thinning is to shift stands from having a high crown fire potential to having a low surface fire potential. In general, the goals of thinning are to:

- Reduce stem density below a critical threshold to minimize the potential for crown fire spread;
- Prune to increase the height to live crown to reduce the potential of surface fire spreading into tree crowns; and
- Remove slash created by spacing and pruning to minimize surface fuel loadings while still maintaining adequate woody debris to maintain ecosystem function.

Figure 12. Illustration of the principles of thinning to reduce the stand level wildfire hazard.



Fuel type, weather and topography are all primary factors that influence the spread of fires. The three most important components of weather include wind, temperature and humidity. Fuel type and slope are primary concerns related to fire spread along the forested areas on the slopes surrounding the Village. The steepness of a slope can affect the rate and direction a fire spreads and generally fires move faster uphill than downhill, and fire will move faster on steeper slopes. This is attributed to (MFLNRO, 2014):

- *On the uphill side, the flames are closer to the fuel;*
- *The fuels become drier and ignite more quickly than if on level ground;*
- *Wind currents are normally uphill and this tends to push heat flames into new fuels;*
- *Convected heat rises along the slope causing a draft which further increases the rate of spread; and*
- *Burning embers and chunks of fuel may roll downhill into unburned fuels, increasing spread and starting new fires.*

APPENDIX I – FIRESMART FUEL TREATMENTS

The following information regarding fuel treatments is based on the FireSmart Manual (Partners in Protection 2002).

Priority Zone 1 is a 10 m fuel free zone around structures. This ensures that direct flame contact with the building cannot occur and reduces the potential for radiative or conductive heat to ignite the building. While creating this zone is not always possible, landscaping choices should reflect the use of less flammable vegetation such as deciduous shrubs, herbs and other species with low flammability. Coniferous vegetation such as juniper or cedar shrubs and hedges should be avoided, as these are highly flammable.

Priority Zone 2 extends from 10 to 30 m from the structure. In this zone, trees should be widely spaced 5 to 10 m apart, depending on size and species. Tree crowns should not touch or overlap. Deciduous trees have much lower volatility than coniferous trees, so where possible deciduous trees should be preferred for retention or planting. Trees in this area should be pruned as high as possible (without compromising tree health), especially where long limbs extend towards buildings. This helps to prevent a fire on the ground from moving up into the crown of the tree or spreading to a structure. Any downed wood or other flammable material should also be cleaned up in this zone to reduce fire moving along the ground.

Priority Zone 3 extends from 30 to 100 m from the home. The main threat posed by trees in this zone is spotting, the transmission of fire through embers carried aloft and deposited on the building or adjacent flammable vegetation. To reduce this threat, cleanup of surface fuels as well as pruning and spacing of trees should be completed in this zone (Partners in Protection 2002).

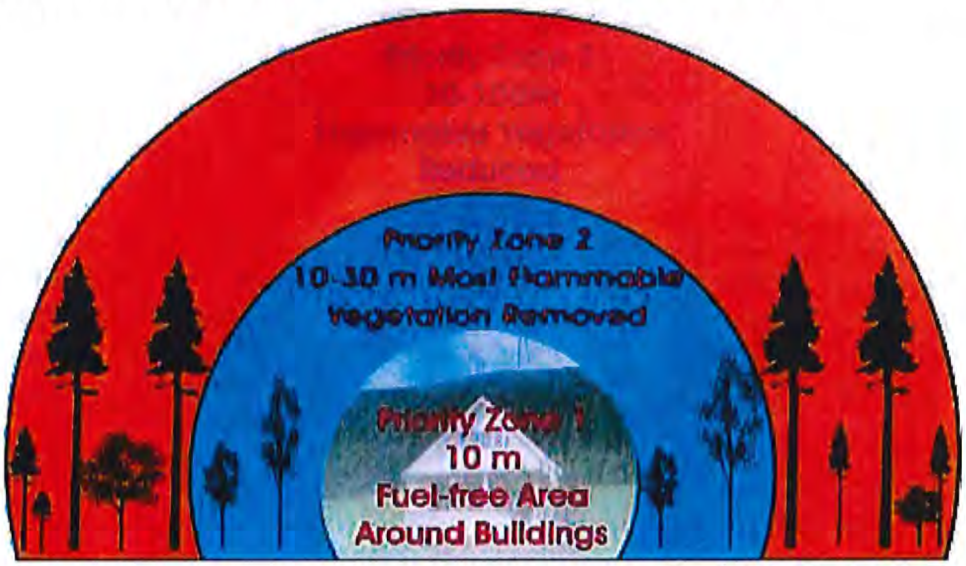


Figure 13. Illustration of FireSmart zones. (Figure adapted from FireSmart)

APPENDIX J – FIRESMART CONSTRUCTION AND LANDSCAPING

Two recent studies by Westhaver (2015, 2017) found that certain "fatal flaws", such as high-flammability landscaping like bulky ornamental junipers and large, easily ignited fuel sources (e.g. motorized vehicles, firewood, construction materials, *etc.*) were sufficiently influential to result in structure ignition of homes otherwise assessed as "Low" hazard by overwhelming the advantages provided by highly fire resistant structures[78].

In the 2017 Fort McMurray investigations (Westhaver) it was found that the most notable observed attributes of the surviving interface homes were: vegetation and fuels within the HIZ which were compliant with FireSmart practices, HIZs with relatively few combustible objects and ignition sites (examples of ignition sites include: combustible accumulations on roofs, gutters, *etc.*) , and Low to Moderate structural hazard ratings.[79,80] This investigation, and other similar investigations, indicate that the FireSmart principles can be effective at reducing structure loss, particularly in the urban perimeter where fire initially spreads from the forest to structures. .

The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: https://www.youtube.com/watch?v=IvbNOPSYyss.

FireSmart Construction

Roofing Material:

Roofing material is one of the most important characteristics influencing a home's vulnerability to fire. Roofing materials that can be ignited by burning embers increases the probability of fire related damage to a home during an interface fire event.

In many communities, there is no fire vulnerability standard for roofing material. Homes are often constructed with unrated materials that are considered a major hazard during a large fire event. In addition to the vulnerability of roofing materials, adjacent vegetation may be in contact with roofs, or roof surfaces may be covered with litter fall from adjacent trees. This increases the hazard by increasing the ignitable surfaces and potentially enabling direct flame contact between vegetation and structures.

Soffits and Eaves

Open soffits or eaves provide locations for embers to accumulate, igniting a structure. Soffits and eaves should be closed. Vents which open into insulated attic space are of particular concern, as they provide a clear path for embers to a highly flammable material inside the structure. Any exhaust or intake vents that open into attic spaces should resist ember intrusion with non-combustible wire mesh no larger than 3 mm.

Building Exterior - Siding Material:

Building exteriors constructed of vinyl or wood are considered the second highest contributor to structural hazard after roofing material. These materials are vulnerable to direct flame or may ignite when sufficiently heated by nearby burning fuels. The smoke column will transport burning embers, which may lodge against siding materials. Brick, stucco, or heavy timber materials offer much better

[78] Westhaver, A. 2017. *Why some homes survived. Learning from the Fort McMurray wildland/urban interface fire disaster.* A report published by the Institute for Catastrophic Loss Reduction – ICLR research paper series – number 56. https://www.iclr.org/images/Westhaver_Fort_McMurray_Final_2017.pdf

[79] Ibid.

[80] Using the FireSmart hazard assessment system.

resistance to fire. While wood may not be the best choice for use in the WUI, other values from economic and environmental perspectives must also be considered. It is significantly less expensive than many other materials, supplies a great deal of employment in BC, and is a renewable resource. New treatments and paints are now available for wood that increase its resistance to fire and they should be considered for use.

Balconies and Decking:

Open balconies and decks increase fire vulnerability through their ability to trap rising heat, by permitting the entry of sparks and embers, and by enabling fire access to these areas. Closing these structures off limits ember access to these areas and reduces fire vulnerability. Horizontal surfaces, such as decks, of flammable materials are vulnerable to ignition from embers. Fire resistant decking/ patio materials will reduce the ignitability of the home.

Combustible Materials:

Combustible materials stored within 10 m of residences are also considered a significant issue. Woodpiles, propane tanks, recreational motorized vehicles, and other flammable materials adjacent to the home provide fuel and ignitable surfaces. Locating these fuels away from structures helps to reduce structural fire hazards and makes it easier and safer for suppression crews to implement suppression activities adjacent to a house or multiple homes.

FireSmart Landscaping

Future landscaping choices should be limited to plant species with low flammability within 10 m of the building. Coniferous vegetation such as Juniper, Cypress, Yew or Cedar hedging or shrubs of any height should not be planted within this 10 m zone as these species are considered highly flammable under extreme fire hazard conditions.

Decorative bark mulch, often used in home landscapes is easily ignitable from wildfire embers or errant cigarettes and can convey fire to the home. Alternatives to bark mulch include gravel, decorative rock, or a combination of wood bark and decorative rock.[81]

Landscaping Alternatives

The landscaping challenges faced by many homeowners pertain to limited space, privacy and the desire to create visually explicit edge treatments to demarcate property ownership from adjacent lots with evergreen vegetation screens. Ornamental plant characteristics fulfilling these criteria have an upright branching habit, compact form, dense foliage, as well as a moderate growth rate. Dwarf and ornamental conifers such as Arborvitae hedging are popular choices, yet conifers such as these which have needle or scale-like foliage are highly flammable and not compliant with FireSmart principles and should be omitted from the 10 m Fire Priority Zone of the planned home footprint.

There are a number of broadleaved deciduous and evergreen plants with low flammability which can be used for landscaping within FireSmart PZ 1 (within 10 m of structures). Landscaping should be selected for the appropriate Canadian Plant Hardiness Zone (see www.planthardiness.gc.ca for the Hardiness Zone specific to the various study area). The majority of the areas would be within Zone 3b.

Plants that are fire resistant/ have low flammability generally have the following characteristics:

[81] *Fire Resistant Plants for Home Landscapes: Selecting plants that may reduce your risk from wildfire*. 2006. A Pacific Northwest Extension Publication (PNW 590).

- Foliage with high moisture content (moist and supple),
- Little dead wood and do not tend to accumulate dry and dead foliage or woody materials, and
- Sap that is water-like and without a strong odour.[3]

It is important to note that even fire resistant plants can burn if not maintained. Grass, shrubs, and herbs must be maintained in a state that reduces fire hazard by maintaining foliar moisture content. This can be accomplished by:

- Choosing plant species that are well-adapted to the site (microclimate and soil conditions of the parcel);
- Incorporating a landscape design where shrubs, herbs, and grasses are planted in discrete units manageable by hand watering;
- Removal of dead and dying foliage; and/or,
- Installing irrigation.

Depending solely on irrigation to maintain landscaping in a low flammability state can be limiting and may actually increase the fire hazard on the parcel, particularly in times of drought and watering restrictions. Lack of irrigation in times of watering restrictions may create a landscape which is unhealthy, unsightly, as well as dead, dry, and highly flammable.

There are a number of resources available to aid in development of FireSmart compliant landscaping curriculum or educational material; links can be found below.

The Canadian and U.S. systems for determining Plant Hardiness Zones differ.

- The USDA bases hardiness zones on minimum winter temperatures only: http://planthardiness.ars.usda.gov/PHZMWeb/Default.aspx,
- The Canadian system bases them on seven climatic factors including frost free days, and minimum and maximum temperature: http://www.planthardiness.gc.ca/

APPENDIX K – COMMUNICATION AND EDUCATION

Communicating effectively is the key aspect of education. Communication materials must be audience specific and delivered in a format and through a medium that will reach the target audience. Audiences should include home and landowners and occupiers, school students, local businesses, municipal officials and staff, community members, and other community groups. Education and communication messages should be engaging, empowering, simple yet comprehensive. A basic level of background information is required to enable a solid understanding of fire risk issues and the level of complexity and detail of the message should be specific to the target audience.

Websites and social media are some of the most cost-effective methods of communication available. Pew Research Center recently found that approximately 60% of Americans get their news from social media; 44% get their news from Facebook.[82] Twitter, LinkedIn, and Instagram are other social media platforms which can be used to provide real-time information to a large audience and are used, albeit to a lesser extent, by users as their primary news source.[83]

The challenge of all social media is to ensure that your message reaches the intended audience, accomplished by having users 'like' the page, engage with the posts, or re-share information to an even larger audience. There are communication experts who specialize in social media who can evaluate an organization's goals and offer tips to increase engagement and create compelling content to communicate the message. Likewise, it is important to be aware of the demographic of the community; a younger, more digitally connected community is more likely to use social media to get updates on 'newsworthy items'.[84]

[82] Pew Research Center Journalism and Media. Social media news use: Facebook leads the pack. May 25, 2016. Accessed December 17, 2017 from http://www.journalism.org/2016/05/26/news-use-across-social-media-platforms-2016/pj_2016-05-26_social-media-and-news_0-03/.

[83] Although the research cited in this document is of American social media users, it can be cautiously assumed that, while data and numbers are not likely exact to the Canadian demographic, similar trends in Canada likely occur.

[84] The Pew Research Center finds that 69% of Facebook users are 49 and younger. Only 8% of Facebook users are older than 65.

12(a)

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS

REPORT TO COUNCIL

TO:	**Mayor and Council**	**DATE: January 28, 2019**
FROM:	**Troy Davis** **Infrastructure Manager**	**FILE: 0810-20-01**
SUBJECT:	**Fire Hall Seismic Report**	

ISSUE: A seismic review of the Fire Hall indicates that work is required to meet fire hall seismic standards.

BACKGROUND:

During a Fire Service Review in 2017 it was recommended that the Fire Hall have a seismic review conducted. This followed an earlier recommendation for a seismic assessment arising from a 2011 Fire Services Review. The seismic assessment served two purposes. First, there was an additional Firewise recommendation that extra storage and office space be built. It was noted that building an addition onto the existing building would trigger building code upgrade requirements. The second reason was to ensure that the fire hall would be able to quickly recover from a disaster such as an earthquake, forest fire, or flood, so that personnel would be better able to help residents in overall post-disaster recovery.

Through a Provincial Infrastructure Planning Grant and competitive process the Village contracted Ausenco Engineering Canada, Inc. to perform a seismic review on the Fire Hall. The report indicates that the necessary retrofit to meet seismic standards would cost approximately $555,000, plus any necessary building code upgrades. It is expected that the construction period to implement the seismic upgrades would be 6-8 months. Building code upgrades would require additional time.

While the seismic retrofit work and building code upgrades are occurring, it may be prudent to also upgrade any building systems that will extend the overall useful life of the building (e.g. heating, electrical, plumbing, etc.).

Staff will continue to review costs associated with the recommended upgrades to the Fire Hall, including an office space and storage addition, and report back with further recommendations to Council for future capital expenditures to be included in the 2020-20205 Financial Plan.

RECOMMENDATION:

THAT the Fire Hall Seismic Report be received.

Respectfully submitted;

Troy Davis
Troy Davis
Infrastructure Manager

REVIEWED BY:

Tracey Jones
Tracey Jones
Financial Officer

REVIEWED BY:

Madeline McDonald
Madeline McDonald
Chief Administrative Officer

Seismic Project Identification Report

REPORT NO. SPIR-01-001

for

BLOCK #01 (1992)

Fire Hall Building

495 Hot Springs Road, Harrison Hot Springs, BC

V0M 1K0

Village of Harrison Hot Spring

Structural Engineering Guidelines for the Performance-based Seismic Assessment and Retrofit of Low-rise British Columbia School

The Seismic Project Identification Report (SPIR) is a new report format that documents the seismic retrofit concepts proposed for a high risk school block.

The Ministry of Education (Ministry) requires that a School District submit an SPIR for any school block as the first step in the District's request for seismic retrofit funding.

APEGBC, as the Ministry's technical advisor for the Seismic Mitigation Program, was requested by the Ministry to develop the format and technical requirements for the SPIR.

SPIRs are due diligence documents that are designed to present seismic upgrading options to assist seismic safety planning by both the School District and the Ministry. The expectation is that SPIR information will guide the seismic upgrading of school blocks in a safe and cost-effective manner.

Ongoing feedback from engineering practitioners is encouraged to advance future refinements in the format for the SPIR document.

No.	Technical Topic	Summary
1	Building Name and School District	• Fire Hall Building • Village of Harrison Hot Springs
2	Block No. / Name	• Block 1 • Fire Hall
3	Floor Area	• 241 m2
4	Year, Number of Storeys and Type of Construction	• 1992 • 1 storey at truck bays and partial second floor for training room. • Reinforced concrete masonry exterior walls • Wood floor and wood interior stud walls • Engineered wood roof trusses with plywood sheathing
5	Soil Type	• Site Class D
6	Liquefaction Potential	• Not assessed
7	Risk (H1/H2/H3/M/L)	• H1
8	Life Safety Retrofit Features	• Not Applicable
9	Phased Retrofit Features	• Not Applicable
10	Enhanced Performance Retrofit Features	• New reinforced concrete buttress walls at each side of the Truck Bays opening complete with new footings and soil anchors at the West end of the Block. A 12.7 mm thick steel plate drag strut is used to transfer the force from masonry wall to the new concrete wall. • Additional vertical steel reinforcing to be inserted to existing interior masonry wall to increase its capacity. • Upgrade connection from wood roof trusses to masonry walls by adding blocking complete with Simpson framing clips. • Upgrade floor ledger connections by adding simpson framing anchors and simpson

(Structural Engineer
Professional Seal and Signature)

No.	Technical Topic	Summary
		SDS screws. • Upgrade connections of roof trusses to existing masonry walls at tower with 6 mm bent plate and HILTI anchors
11	Schedule	• 6 - 8 months
12	Construction Risks	• Asbestos, Lead Paint.
13	Cost Estimates	• $ 412,800 ($ 1,715/m²)
14	PDR Requirements	• Geotechnical Testing for Site Class and Liquefaction Potential. • Hazardous material Testing

Date

Figure 1.1: West Elevation

Figure 1.2: East Elevation

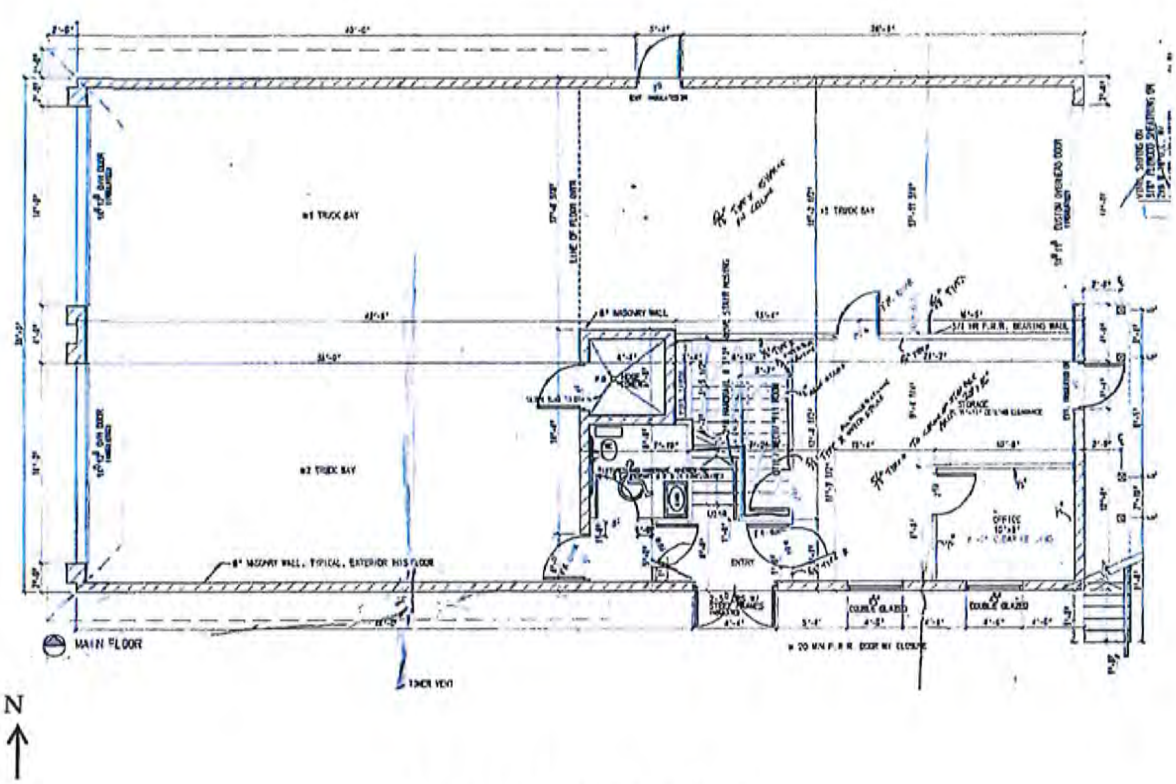


Figure 2.1: Key Plan for Block 1

Identification of Retrofit Block (Box #2-1)

Designed in 1992, Block 1 is a concrete masonry block (CMU) building with wood roof and floor. It serves as a fire hall that includes truck bays and training room. There is a hose tower located at the center of the building.

Adjacency (Box #2-2)

☒ No Significant Adjacency Issues

☐ Significant Adjacency Issues

Adjacency Comments (Box #2-3)

No adjacency as the block is a standalone building.

Municipality District (Box #3-1)

Village of Harrison Hot Springs

Block Name (Box #3-2)

Fire hall Building

Structural Firm (Box #3-3)

Ausenco

Engineer-of-Record (Box #3-4)

Ari Wibowo, P.Eng.

Years of Construction (Box #3-5)

1993

Floor Area (Box #3-6)

241 m2

Construction Type (Box #3-7)

#34

Site Classification (Box #3-8)

D

Comments on Construction Type (Box #3-9)

Reinforced concrete masonry wall

Number of Storeys (Box #3-10)

1

Clear Storey Heights (Box #3-11)

3960 mm (to second floor)
6400 mm (to underside of roof at truck bays)

Previous Seismic Upgrade (Box #3-12)

☒	No
☐	Yes

Previous Seismic Upgrade Details (Box #3-13)

NA

List of Testing Reports (Box #3-14)

Geotechnical Report by Golder Associates dated September 11, 1992

(1) Vertical Load-bearing Supports (VLS)

VLS Type (Box #4-1)

Reinforced Concrete Masonry Walls

VLS DDL (Box #4-2)

4%

Supports Description (Box #4-3)

Standard 8" (190 mm) partially grouted concrete masonry unit reinforced with 20M @ 48" (1200 mm) o.c. rebar, supporting timber roof trusses with plywood sheathing. Floor construction made from wood joists connected to CMU walls using wood ledger and anchor bolts.

(2) LDRSs

Number of LDRS Prototypes (Box #4-4)

1

LDRS Prototype Details (Box #4-5)

Shaking Direction	Prototype No.	LDRS Prototype Description	Max DDL	Capacity
N-S	M-3	Reinforced masonry wall	2%	<5%
E-W	M-3	Reinforced masonry wall	2%	>80%

Comments on LDRS Prototypes (Box #4-6)

In the N-S direction at the West end (truck bays doors), the opening for the large overhead doors created a frame effect on the masonry walls LDRS and reduces its capacity. The E-W direction on the other hand, has a good capacity as an LDRS due to its length.

(3) Out-of-Plane URM Walls

URM Walls (Box #4-7)

☒ No

☐ Yes

Out-of-Plane Prototype Details (Box #4-8)

Prototype No.	Prototype Description	Max. Height	Wall Thickness	Surcharge
OP-4	Cantilever masonry walls with vertical reinforcements and footing	6400	190	0% and 100%

Comments on Out-of-Plane Prototypes (Box #4-9)

Based on clause 6.4(1) of Volume 2 of SRG3, masonry walls are adequately reinforced against out-of-plane rocking. OP-4 applies if connection of wall to the roof diaphragm is considered insufficient.

(4) Roof Diaphragm

Roof Diaphragm Material (Box #4-10)

☒ Wood ☐ Concrete

☐ Steel Deck ☐ Braced Steel

Roof Diaphragm Prototype Details (Box #4-11)

Prototype No.	Roof Diaphragm Prototype Description	Span	Max. Movement	Capacity
D-2	Unblocked plywood sheathing – low roof	10 m	100 mm	18%
D-2	Unblocked plywood sheathing – high roof	10 m	100 mm	20%

Comments on Roof Diaphragm (Box #4-12)

Roof diaphragm is constructed from 12.7 mm (1/2") thick plywood sheathing. From the site investigation, there is no indication that the diaphragm is blocked for both high and low roof.

(5) Floor Diaphragm

Floor Diaphragm Material (Box #4-13)

☒ Wood ☐ Concrete

☐ Steel Deck with Concrete Topping

Floor Diaphragm Prototype Details (Box #4-14)

Prototype No.	Floor Diaphragm Prototype Description	Span	Max. Movement	Capacity
D-2	Unblocked plywood sheathing	10 m	100 mm	14%

Comments on Floor Diaphragm (Box #4-15)

At the training room, floor diaphragm is constructed from 19 mm (3/4") thick unblocked plywood sheathing.

(6) Connections

Connection Risk (Box #4-16)

Connection	C/D	Non-Brittle	Risk
VLS / Roof Diaphragm	1.0	☐ Yes ☒ No	M
VLS / Floor Diaphragm	>1.0	☒ Yes ☐ No	L
Roof Diaphragm / LDRS	<0.5	☐ Yes ☒ No	H
Floor Diaphragm / LDRS	>1.0	☒ Yes ☐ No	L
LDRS / Foundation	>1.0	☒ Yes ☐ No	L
Other (Specify)		☐ Yes ☐ No	

Note:

(1) Connections do not have an assigned RPR value (Chapter 5)

(2) Connection risk is determined as below:

- (a) H (High): brittle connections with C/D < 1.0
- (b) M (Medium): brittle connections with 1.0 ≤ C/D < 2.0
  non-brittle connections with 0.5 ≤ C/D > 1.0
- (c) L (Low): brittle connections with C/D ≥ 2.0
  non-brittle connections with C/D ≥ 1.0

(3) In Note (2) above, capacity (C) values are overstrength values.

Comments on Connections (Box #4-17)

Wood sill plate complete with anchor rods at the top bond beam is utilized to connect the wood roof to the CMU walls. No blocking between wood trusses to transfer shear. Wood ledger with anchor to CMU walls is utilized to connect the wood joist to the CMU walls. Wood joists are connected using joist hangers to the wood ledger.

(7) Liquefaction

Liquefaction Potential (Box #4-18)

Significant Risk of Liquefaction for Hazard Return Period of 2500 Years	☐ Yes ☐ No

Liquefaction Movement (Box #4-19)

Risk of Significant Vertical Differential Movement	☐ Yes ☐ No
Risk of Punching Failure	☐ Yes ☐ No
Risk of Significant Horizontal Differential Movement	☐ Yes ☐ No

Comments on Risk of Liquefaction (Box #4-20)

Based on the existing geotechnical report, liquefaction assessment was carried out using the 1:475 year event and the clean, compact sand was judged to be marginally liquefiable. Evaluation of the consequence is not within this SPIR assessment and should be determined in the next phase of the project after a proper liquefaction triggering analysis is carried out using current code.

Comments on Risk of Vertical Differential Movement (Box #4-21)

NA

Comments on Risk of Punching Failure (Box #4-22)

NA

Comments on Risk of Horizontal Differential Movement (Box #4-23)

NA

Risk Assessment Results (Box #5-1)

Principal Element	Prototype No.	Prototype Description	PDE	RPR(2)
LDRS	M-3	Reinforced Masonry Wall	>10%	H1
Diaphragm	D-2	Wood unblocked plywood	-	
		Maximum PDE / RPR	8.5%	H1
			Liquefaction Risk	Not in this scope of work
			Existing Block Retrofit Priority Ranking	**H1**

Note:

(1) RPR – Retrofit Priority Ranking

(2) Liquefaction is not assigned a PDE value. The RPR value is assigned for liquefaction on the following basis:
   (a) H (High): significant risk of structural failure due to liquefaction movement
   (b) L (Low): no significant risk of structural failure due to liquefaction movement

(3) Maximum assigned RPR for an out-of-plane element is H3 for non load-bearing walls and is not restricted for load-bearing walls.

(4) Diaphragms do not have an assigned RPR value (refer to Guidelines and Commentary).

Comments on Seismic Deficiencies, Recommended Testing and Risk Assessment Results (Box #5-2)

Seismic Deficiencies

A. Lateral Deformation Resisting Systems

1. Inadequate capacity of the LDRS. At the N-S direction, the truck bay overhead door openings created a frame action of the masonry walls which greatly reduces the capacity. Also, masonry walls at the location of the tower just barely have adequate reinforcing for the expected drift demand.

2. Connections from the roof diaphragm to the LDRS need to be upgraded to transfer sufficient shear. Wood roof truss is toe-nailed to sill plate and does not transfer enough shear to the CMU walls.

Testing/Site investigation

Further geotechnical investigation is needed to confirm the corresponding site class and the likelihood of soil liquefaction and its structural consequences.

Retrofit Options Documented (Box #6-1)

No.	Retrofit Performance Level	Chapter
1	Enhanced Retrofit (to match post-disaster)	9

Comments on Documented Retrofit Options (Box #6-2)

Only enhanced performance level retrofit design is carried out. See Chapter 9 for details.

Enhanced Performance

The target performance of the fire hall building is a 'post-disaster' level. Using the SRG guidelines, the enhanced performance retrofit is intended for a block that has a predefined post-event functional requirement. Using this target performance, the drift of the LDRS is set to be very small and the more than 50% of the LDRS that contributes to the resistance should be ductile. Similar to the requirement for the LDRS, the diaphragm should have a limited lateral movement and could only consist of ductile diaphragm. The target Enhanced Drift Limit for this building is calculated to be 0.25%, which is quite low.

The West end of the building consists of two large openings to accommodate the truck overhead doors, the concrete masonry frames built at this location as per assessment, do not have reinforcing that can be considered ductile moment frame. Also the drift at the East end of the building will exceed the stringent requirement of the enhanced performance level. Thus, the Reinforced Concrete Masonry (CMU) frames LDRS at this end need to be upgraded to be able to drift within allowable limit and increase their ductility.

At the middle of the building where the interface of the truck bay and the two storeys portion (walls that framed into the hose tower), the masonry wall LDRS is not adequately reinforced for the expected drift due to the demand from the truck bay side and the two storeys portion of the building.

Most of the connections between the wood and the masonry walls required to be upgraded to be able to withstand the drift limit and provide a certain ductility capacity. The connections upgrade will make the lateral load path more certain and predictable from the roof diaphragm to the foundation.

(1) Retrofit Concept

There is no Phased retrofit option for this block.

(1) Retrofit Concept

There is no Life Safety retrofit option for this block.

Figure 8.1: Life Safety Retrofit Concept

Comments on Figure 8.1 and Figure 8.2 (Box #8-1)

(2) Retrofit LDRSs

Number of Retrofit LDRS Prototypes (Box #8-2)

NA

Retrofit LDRS Prototype Details (Box #8-3)

Shaking Direction	Prototype No.	LDRS Prototype Description	Max PDE	Max DDL	R_m
NA					

Comments on Retrofit LDRS Prototypes (Box #8-4)

NA

(3) Liquefaction Retrofit

N.A

Figure 8.3: Typical Section for Liquefaction Retrofit

Comments on Figure 8.3 (Box #8-5)

(4) Reference SPIRs

Reference SPIRs (Box #8-6)

Reference SPIR No.	Reference SPIR Description	Retrofit Cost ($ / m^2)
Comments:		

(5) Scope of Retrofit

Refer to Appendix A for details on the scope of work for both the structural and non-structural retrofits.

(6) Retrofit Cost Estimate

Refer to Appendix B for details on the retrofit cost estimate for the life safety retrofit. A summary of the life safety retrofit is given on page (iii). Note that the retrofit cost estimate includes the liquefaction retrofit, where applicable.

(7) Schedule

Schedule (Box #8-7)

Duration of Construction Period	
Comments on Operational Disruption:	

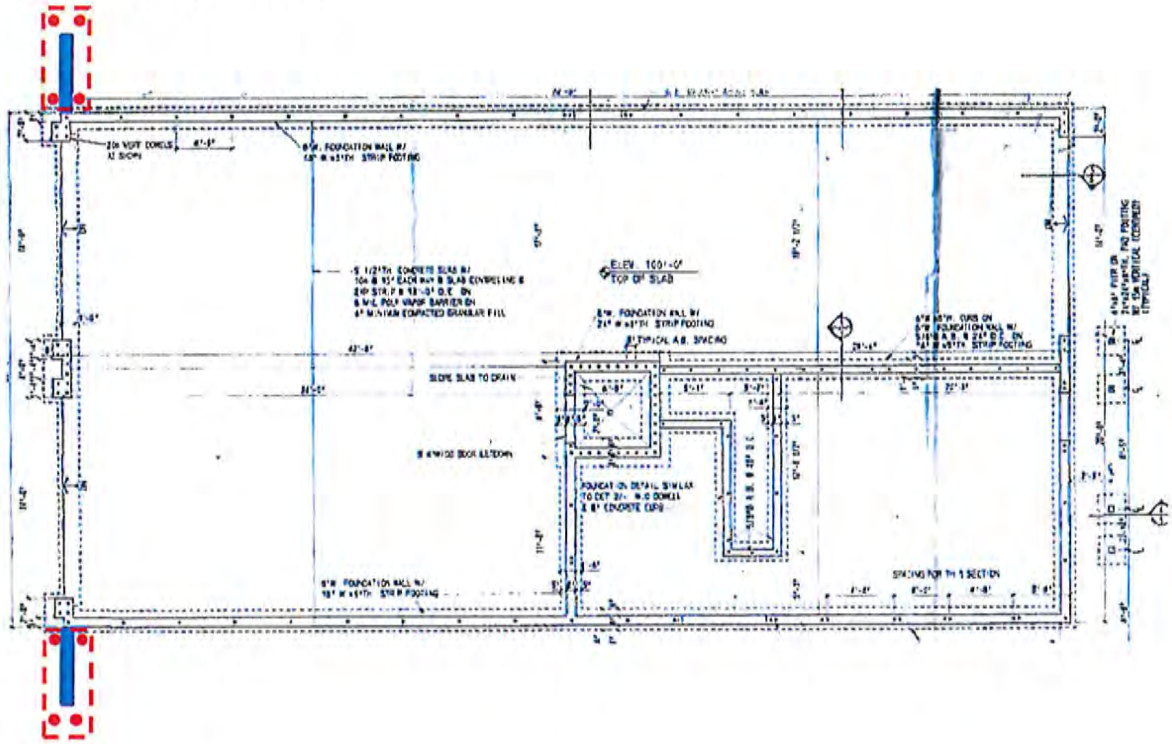
(8) Construction Risks

Risks (Box #8-8)

Risk Description	Significant Risk	
Asbestos	☐ Yes	☐ No
Vermiculite	☐ Yes	☐ No
Lead Paint	☐ Yes	☐ No

Risk Management Comments (Box #8-9)

(1) Retrofit Concept



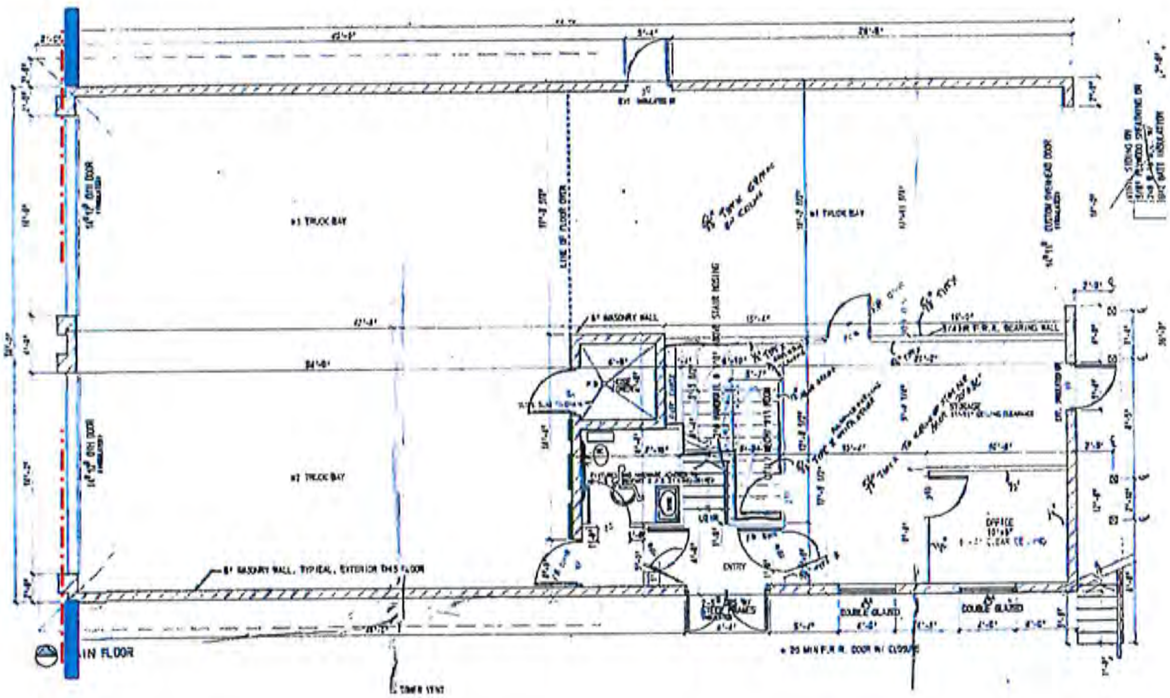
LEGEND

New Soil Anchors

New Footing (Outline)

New Reinforced Concrete Buttress Walls

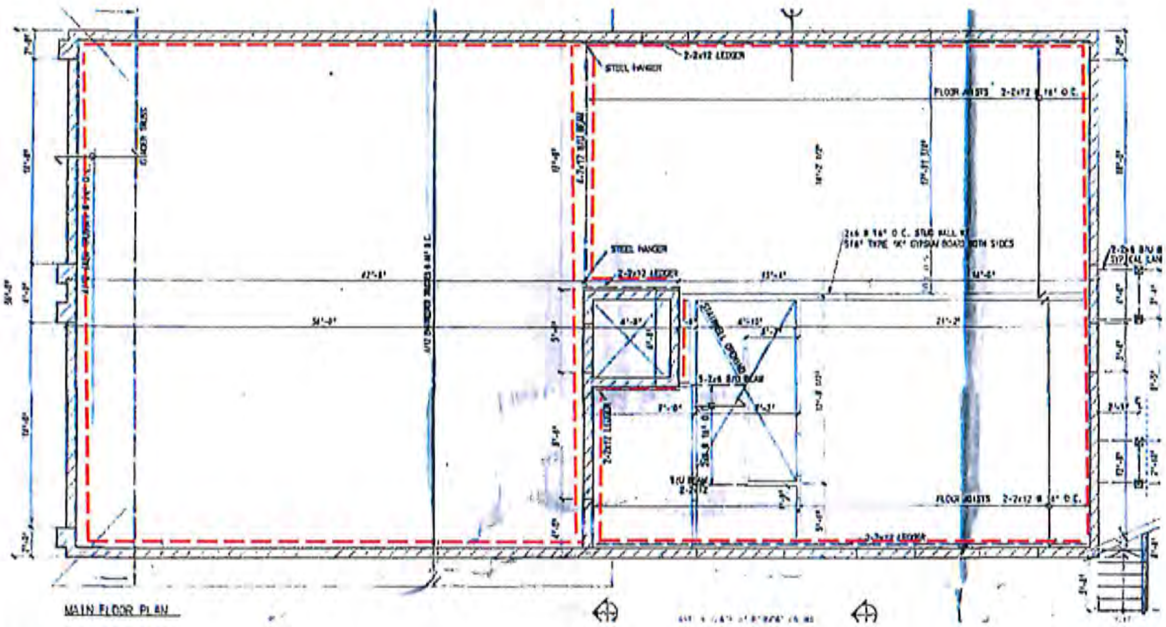
Figure 9.1: Foundation Plan



LEGEND

- New Reinforced Concrete Buttress Wall
- New Steel Drag Strut
- Install additional reinforcing to existing concrete masonry wall

Figure 9.2 Main Floor Plan



LEGEND

– – – Install new blocking as required and framing clips and/or anchors to upgrade connection between wood to masonry typ.

Figure 9.3 Roof plan (WEST)

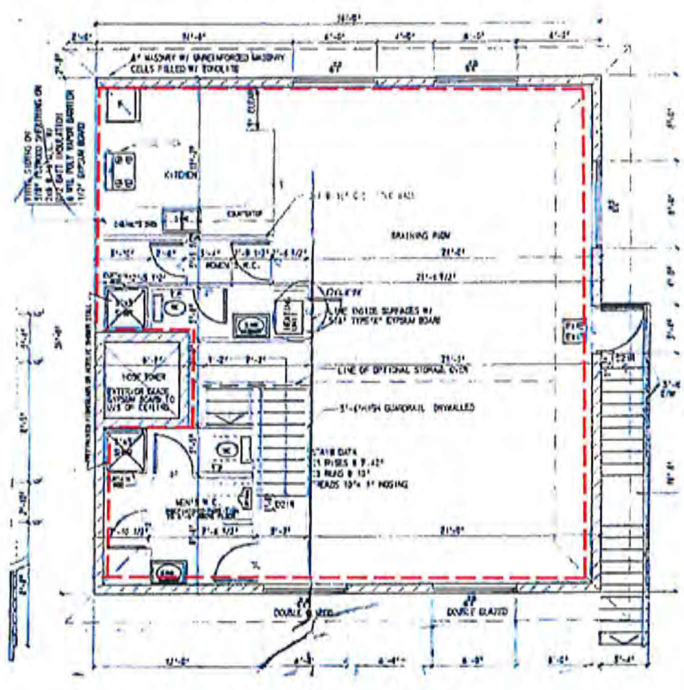


Figure 9.4 Roof Plan (2nd floor plan) (EAST)

Comments on Figure 9.1,Figure 9.2, Figure 9.3 and Figure 9.4 (Box #9-1)

1. Figure 9.1

   At the West end of the Building, new reinforced concrete buttress walls are added to the existing walls with the large overhead doors. The new concrete walls will act as the new LDRS for the N-S direction shaking. New foundations are required to support the concrete walls complete with soil anchors at each end. The soil anchors are used to restrain the walls from the overturning forces.

2. Figure 9.2

   New steel drag struts are required to carry the forces from the existing masonry walls at the East end to the new reinforced concrete buttress walls at each ends of the walls. The steel plate will be connected to the existing masonry walls bond beam using anchor bolts that will be installed using epoxy adhesives.

   Strengthening the reinforced masonry walls are also required at the middle for the N-S direction shaking, as the walls are the main LDRS at the interface of the two different levels of the Firehall roof.

   At the E-W direction, the existing reinforced masonry walls are adequate to provide the required force and drift demand, so no strengthening is required.

3. Figure 9.3 & Figure 9.4

   At the perimeter of the roof and floor plywood diaphragm, the connection is upgraded by adding a blocking between the trusses or joists and adding simpson framing clips and new anchor rods to the existing reinforced masonry walls. The upgraded connection will ensure the load path is clear and the connection itself is ductile and has adequate strength.

(2) Retrofit LDRSs

Number of Retrofit LDRS Prototypes (Box #9-2)

2

Retrofit LDRS Prototype Details (Box #9-3)

Shaking Direction	Prototype No.	LDRS Prototype Description	Max PDE	Max DDL	R_m
N-S	C-6	Moderately Ductile Shearwall (flexure)	2%	0.25%	57.7%
N-S	M-3	Reinforced masonry wall	2%	0.25%	40.2%

Comments on Retrofit LDRS Prototypes (Box #9-4)

The retrofit consists of adding two new concrete buttress walls (200 mm thick) to the existing reinforced masonry walls to achieve greater capacity to act as shearwalls at the West end of the fire hall building in the N-S directions shaking. Due to the large openings, the masonry walls at the end acted as frames and could not provide the resistance for the drift limit required.

At the interior masonry walls, strengthening the existing reinforced masonry wall is required for the N-S direction shaking, to be able to provide sufficient strength related to the drift limit required. The existing reinforcing will be augmented by new reinforcing installed and dowelled to the existing foundation. This interior wall served both side of the building where the roof level is not at the same level.

(3) Liquefaction Retrofit

NA

Figure 9.3: Typical Section for Liquefaction Retrofit

Comments on Figure 9.3 (Box #9-5)

Further geotechnical investigation is needed to confirm the likelihood of soil liquefaction and its structural consequences.

(4) Reference SPIRs

Reference SPIRs (Box #8-6)

Reference SPIR No.	Reference SPIR Description	Retrofit Cost ($ / m^2)
TBA		
Comments:		

(5) Scope of Retrofit

Refer to Appendix A for details on the scope of work for both the structural and non-structural retrofits.

(6) Retrofit Cost Estimate

Refer to Appendix B for details on the retrofit cost estimate for the life safety retrofit. A summary of the life safety retrofit is given on page (iii). Note that the retrofit cost estimate includes the liquefaction retrofit, where applicable.

(7) Schedule

Schedule (Box #8-7)

Duration of Construction Period	6 - 8 months
Comments on Operational Disruption: The construction works may be completed 6 to 8 months, unless the fire hall needs to be operational while it is under construction.	

(8) Construction Risks

Risks (Box #8-8)

Risk Description	Significant Risk	
Asbestos	☒ Yes	☐ No
Vermiculite	☒ Yes	☐ No
Lead Paint	☒ Yes	☐ No

Risk Management Comments (Box #8-9)

Hazmat survey should be conducted before proceeding to construction.

Summary of Enhanced Performance Retrofit (Box #9-1)

The fire hall building was constructed in 1992, it consists of truck bays and two storeys training room and offices, it also includes a hose tower. The block is made up of reinforced concrete masonry walls with roof trusses and plywood sheathing, the two storeys portion also constructed with wood joists and plywood sheathing. The governing drift limit is set to be 0.25% due to the post-disaster requirement.

At the West end of the block, the two large openings for the overhead doors at the truck bay location made the walls behave as masonry frame. The existing stiffness and strength of the frames could not accommodate the small drift with the associated forces required for the performance objective. Thus at this end, two new reinforced concrete buttress walls 200 mm thick approximately 2.2 m long are constructed at each end of the frame to provide the resistance for the required drift. The new reinforced concrete walls will be built with a raft foundation complete with soil anchors at the two end of the footing for tension resistance; this is due to the insufficient dead load that could be generated. Steel drag strut elements are used to transfer the forces from the concrete masonry walls to the new reinforced concrete buttress walls.

At the interior reinforced masonry walls at the N-S direction have to be upgraded as the main LDRS systems. New vertical reinforcing will be inserted to the existing walls to increase the stiffness and strength of the walls

Connections from the wood diaphragm to the reinforced masonry walls will be upgraded to create ductile connections and to make sure that the lateral loads load path is clear from roof to the foundation. The upgrades of the connections include adding additional blockings, framing clips and additional anchor

bolts to the existing masonry walls.

Architectural Scope of Work (Box #10-1)

To Be Confirmed

Mechanical Engineering Scope of Work (Box #10-2)

To Be Confirmed

Electrical Engineering Scope of Work (Box #10-3)

To Be Confirmed

Architectural, Mechanical and Electrical Engineering Construction Risks (Box #10-4)

To Be Confirmed

TRB PDR Requirements (Box #11-1)

No.	PDR Structural Details	TRB Requirement	
1	Additional Field Testing	☒ Yes	☐ No
2	Custom Site Response Analysis	☐ Yes	☐ No
3	Ambient Vibration Testing	☐ Yes	☐ No
4	Additional Figures	☐ Yes	☐ No
5	Additional Photographs	☐ Yes	☐ No
6	Class C Cost Estimate	☐ Yes	☐ No
7	Other	☐ Yes	☐ No
Note: PDR Requirements are agreed to by both the Engineer-of-Record and the TRB.			

Risk Management Comments (Box #11-2)

Hazardous material testing is required. Geotechnical testing needs to be performed for the current site to determine the Site Class and Liquefaction potential.

APPENDIX A

SCOPE OF RETROFIT DETAILS

for

BLOCK #01 (1992)
Fire Hall Building

Table A.1: Scope of Structural Phased Retrofit

No.	Construction Activity	Approx. Quantity
	NA	

Table A.2: Scope of Structural Life Safety Retrofit

No.	Construction Activity	Approx. Quantity
	NA	

Table A.3: Scope of Enhanced Performance Retrofit – Fire Hall Building

No.	Construction Activity	Approx. Quantity
1.	New reinforced concrete foundation for buttress walls – 2500 mm long x 700 mm wide and 700 mm deep (2 totals) for N-S direction	2.5 m3
2.	Vertical Soil anchor for N-S #11 approx. 12 m long	8 no.
3.	New steel plate drag strut – 12.7 mm thick x 200 mm wide. Fastened to existing CMU bond beam using HILTI Anchors 16 mm diameter with 200 mm spacing each side.	10 m
4.	New two reinforced concrete buttress walls at each side of the West end of Block for N-S direction. Wall thickness is 200 mm thick x 2.2 m long and 6 m high on two sides, reinforced with two layer of 15M @ 400 mm Horiz & Vert.	5.5 m3
5.	New additional vertical reinforcing installed at existing masonry wall complete with dowels to foundation and existing bond beam at interior walls for N-S direction.	18 m2
6.	New additional blocking between trusses complete with simpson strong tie framing clips and HILTI anchors to existing masonry walls at roof perimeter.	101 m
7.	New Simpson framing clips from underside of floor between sheathing and ledger and re-screws existing shear plates with simpson strong tie sds screws.	45 m

8.	New 6 mm thick bent plate x 100 mm long x 400 mm width complete with HILTI anchors to masonry walls and simpson SDS screws to wood truss install at underside of roof @ 600 mm spacing	90 kg or 26 m

APPENDIX B

SCOPE OF ARCHITECTURAL, MECHANICAL AND ELECTRICAL ENGINEERING WORK

for

BLOCK #01 (1992)
Fire Hall Building

Introduction

This appendix is comprised of stamped reports, one report for each discipline, for the scope of work for architectural, mechanical and electrical engineering work.

NOT APPLICABLE

APPENDIX C
RETROFIT COST ESTIMATE REPORT
for
BLOCK #01 (1992)
Fire Hall Building

Retrofit Cost Estimate Report

HARRISON HOT SPRINGS - FIRE HALL BUILDING December 17, 2018

495 Hot Springs Road, Harrison , Hot Springs, BC

Seismic Project Identification Report (SPIR)
for VILLAGE of HARRISON HOT SPRINGS
Seismic Assessment prepared by: AUSENCO ENGINEERING

SEISMIC RETROFIT ESTIMATE SUMMARY

		ENHANCED PERFORMANCE RETROFIT	
		1992 Fire Hall Building	
Building Construction Type		Reinforced Masonry, Wood Frame	
Seismic Risk		H1	
Site Class		D	
Number of Stories		2	
Gross Floor Area (m2)		241	
CONSTRUCTION COST ESTIMATE			
SEISMIC RETROFIT		$1,408.71	**$339,500**
Site Work		17,700	
Selective Demolition:		4,800	
Earthwork		11,400	
Concrete Work		31,600	
Soils Anchors		62,400	
URM Upgrade		8,200	
Dragstruts		8,400	
Plywood shear walls and Connections		0	
Diaphragm Upgrades & Connections		26,800	
Other		0	
Roofing		37,200	
Exterior Wall Cladding, Windows & Doors		2,900	
Partitions & Doors		800	
Finishes		4,800	
Millwork, Specialties		0	
Electrical Work		5,000	
Mechanical Work		10,000	
Asbestos & Lead Paint Remediation		10,000	
Contractor Site Overheads & Markup		53,200	
Design Contingency & Unspecified Risk	15%	44,300	
LIQUEFACTION RETROFIT			**$0**
Non-Structural SEISMIC (OFC's)		$304.15	**$73,300**
Restrain Architectural & Equipment Items		16,100	
Restrain Electrical Systems, fixtures, equipment		14,000	
Restrain Mechanical Systems, pipes, diffusers, equipment		12,000	
Restrain Building Contents		13,200	
Contractor Site Overheads & Markup		8,400	
Design Contingency & Unspecified Risk	15%	9,600	
Site Specific PHASING COSTS , Temporary Accomodation			**Not Included**
Building CODE Upgrades			**Not Included**
Building Systems and Beyond Useful Life Upgrades			**Not Included**
Total CONSTRUCTION (excl Taxes)		$1,712.86	**$412,800**
Project Soft Costs			**$101,000**
Design & Engineering	16.0%	66,000	
Building Permit & Inspections	1.0%	4,100	
Village Project Administration, Accounting, Legal	2.5%	10,300	
Construction Contingency - Change Orders/Unforeseen Existing Cond.	5.0%	20,600	
Payable GST	Assume Fully Refindable	0	
Construction Escalation	Assume 12mths	10%	**$41,300**
TOTAL PROJECT COST			**$555,100**

HARRISON HOT SPRINGS - FIRE HALL BUILDING

December 17, 2018

495 Hot Springs Road, Harrison , Hot Springs, BC

Seismic Project Identification Report (SPIR)
for VILLAGE of HARRISON HOT SPRINGS
Seismic Assessment prepared by: AUSENCO ENGINEERING

ENHANCED PERFORMANCE RETROFIT

SEISMIC RETROFIT ESTIMATE	1992 Fire Hall Building				
Building Construction Type	Seismic Risk H1	1992 1 Storey Truck Bay, 2 Storey Training - Wood Frame Structure, Reinforced Masonry Exterior			
Overview Description of Work	Site Class D	New exterior reinforced buttress walls with new foundation, additional vertical steel reinforcing to interior masonry wall, upgrade connections of roof structure to perimeter walls			
	GROSS FLOOR AREA				241 m2
Site Work					**17,700**
Remove existing pavement, site works for seismic foundations	20 m2	65.00	1,300		
Rework Footing Drains	15 m	300.00	4,500		
Reinstate all existing pavement	20 m2	175.00	3,500		
Relocate Gas Meter		Item	5,000		
New Bollards at Gas Meter	2 No.	450.00	900		
Miscellaneous site works, access, temp barricades etc		Allow	2,500		
Selective Demolition:					**4,800**
Interior Finishes, Specialties, Millwork Fittings etc.			0		
Remove Wall Finishes for corefill upgrade	18 m2	18.00	300		
Remove 2ft wide strip Ceiling Finishes at u/s floor for connection	45 m	78.00	3,500		
Demol at Washrooms			0		
Miscell demolition		Allow	1,000		
Earthwork					**11,400**
Excavation for exterior footing	17 m3	285.00	4,800		
Underpinning excavation under existing footings			0		
Clean off existing concrete foundations for new work	4 hrs	55.00	200		
Backfilling & compaction exterior foundations	14 m3	125.00	1,800		
Allowance for imported material	2 m3	Item	600		
Disposal and removal of excavated material, incl. trucking.	17 m3	90.00	1,500		
Erosion Sedimentation Control (ESC), wheel wash		Item	1,000		
Flagging, barricades, street/paving cleaning		Item	1,500		
Concrete Work- Foundations & shearwalls					**31,600**
Foundations	2.7 m3	2,486.09			
Formwork	2 Lcn	800.00	1,600		
Rebar	337 kg	3.50	1,200		
Drilled and epoxy starters to existing	16 No.	35.00	600		
Concrete supply	2.7 m3	280.00	800		
Concrete pumping		Item	600		
Labour concrete placing, pumping	24 Hrs	68.00	1,600		
Strip forms	6 Hrs	58.00	300		
Concrete walls - 300mm concrete shearwall	28 m2	902.17			
Formwork	55 m2	185.00	10,200		
Rebar	726 kg	3.30	2,400		
Drilled and epoxy starters 20m	80 No.	45.00	3,600		
Concrete supply	6 m3	280.00	1,600		
Concrete pumping	6 m3	Item	800		
Labour concrete placing, pumping	64 Hrs	68.00	4,400		
Strip forms	28 m2	40.00	1,100		
Finishing, ginding, patching	55 m2	15.00	800		

HARRISON HOT SPRINGS - FIRE HALL BUILDING

December 17, 2018

495 Hot Springs Road, Harrison , Hot Springs, BC

Seismic Project Identification Report (SPIR)

for VILLAGE of HARRISON HOT SPRINGS

Seismic Assessment prepared by: AUSENCO ENGINEERING

ENHANCED PERFORMANCE RETROFIT

SEISMIC RETROFIT ESTIMATE		1992 Fire Hall Building				
Soils Anchors						**62,400**
Soils Anchors #11, 12m long		8	No.	7,800.00	62,400	
URM Upgrade		18	m2			**8,200**
Corefill extg URM wall incl drilled starter to top/bottom (1.2m cs)		6	No.	1,200.00	7,500	
Drilled and epoxy grouted dowels into fndn/bond beam		13	No.	54.00	700	
Dragstruts						**8,400**
Exterior Drag Strut						
12.7PL x 200mm exterior drag strut - supply/fab/deliv, HD Galv	10m	208	kg	8.00	1,700	
Labour installation		32	hrs	85.00	2,700	
Coring/cutting thru pilaster for dragstrut, make good		2	Lcn	500.00	1,000	
Drilled and epoxy grouted SS anchors 16mm dia at 200c/s		50	No.	30.00	1,500	
Hoisting, manlifts					1,500	
Plywood shear walls and Connections						**0**
Diaphragm Upgrades & Connections						**26,800**
Floor Diaphragm Upgrade - Connections to Exterior walls						
Upgrade connection - new Simpson clips, screws, shear plates		45	m	65.00	2,900	
Additional blocking		45	m	15.00	700	
Roof Diaphragm Upgrade - Connections to Exterior walls		101	m			
New blocking between trusses		168	No.	45.00	7,600	
Upgrade connection - new Simpson clips, screws, shear plates		168	No.	65.00	10,900	
Drilled and epoxy grouted anchor (600mm c/s)		168	No.	28.00	4,700	
Other						**0**
Exterior Building Envelope Work					$166.39	**40,100**
Roofing						
Remove 4ft roofing at perimeter		121	m2	18.00	2,200	
Remove lower sheet of roofing sheathing		121	m2	31.00	3,800	
Reinstate roof sheating		36	m	200.00	7,200	
Reinstale Ice sheild/VB		55	m2	58.00	3,200	
Reinstate Asphalt shingle roofing (lower 4ft only)		121	m2	72.00	8,700	
Tie in new shingles to existing		101	m	21.00	2,100	
Temporary Weather protection				Item	5,000	
Mobile platforms, ladders, mobile scaffolding				Item	5,000	
Exterior Wall Cladding, Windows & Doors						
Exterior finish to new concrete		55	m2	35.00	1,900	
Caulking to existing structure		44	m	21.00	900	
Exterior finish - paint to exposed steel		3	m2	25.00	100	

HARRISON HOT SPRINGS - FIRE HALL BUILDING

December 17, 2018

495 Hot Springs Road, Harrison , Hot Springs, BC

Seismic Project Identification Report (SPIR)
for VILLAGE of HARRISON HOT SPRINGS
Seismic Assessment prepared by: AUSENCO ENGINEERING

ENHANCED PERFORMANCE RETROFIT

SEISMIC RETROFIT ESTIMATE	1992 Fire Hall Building			
Interior Work			$23.24	**5,600**
Partitions & Doors				
Patching/filling, painting URM upgraded walls	18 m2	45.00	800	
Drywall patching/repair where walls disturbed			0	
Reinstate, reinstall, refinish panelling/corridor dado			0	
Doors/Frames/Hardware - re/re, make good or replace (Avge)			0	
Finishes				
Reinstate Ceilings at perimeter connections 1.2m wide	45 m	95.00	4,300	
Wall Finish - paint, incl. remedial	18 m2	25.00	500	
Wall Finish - Make good, refinish existing adjacent surfaces		Item	0	
Wall Finish - ceramic tile - washrooms			0	
Millwork, Specialties				
Reinstall/Replace Millwork			0	
Reinstall/Replace Whiteboards			0	
Washroom Accessories			0	
Specialties etc.			0	
Electrical Work			Allowance	**5,000**
Nominal Elec work - re/re services on walls, lighting etc.				
Mechanical Work			Allowance	**10,000**
Plumbing - Fixtures (remove/replace existing in millwork)			0	
Sprinklers			0	
HVAC - re/re heating pipework, heaters, ducts etc.			0	
Asbestos & Lead Paint Remediation, Drywall Mud etc	241 m2		$40.00	**10,000**
Contractor Site Overheads & Markup		22%		**53,200**
Design Contingency & Unspecified Risk (incl. on site)		15%		**44,300**
SEISMIC RETROFIT CONSTRUCTION ESTIMATE			$1,408.71 /m2	**$339,500**

APPENDIX D
LIQUEFACTION STRUCTURAL DETAILS
for
BLOCK #01 (1992)
Fire Hall Building

Liquefaction Retrofit Structural Details

Not Applicable

APPENDIX E

REPRESENTATIVE STRUCTURAL DETAILS

for

BLOCK #01 (1992)
Fire Hall Building

Representative Structural Details

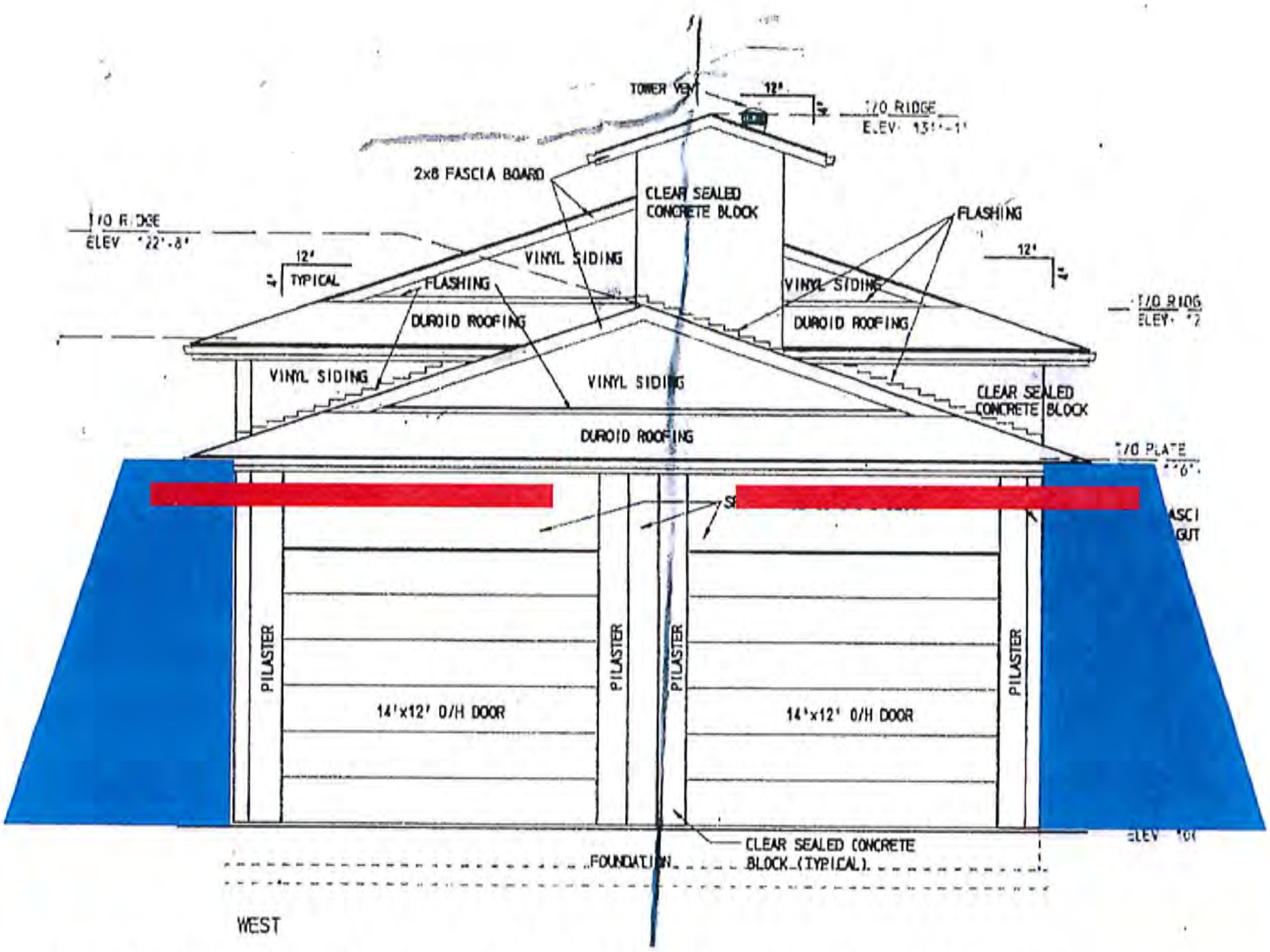
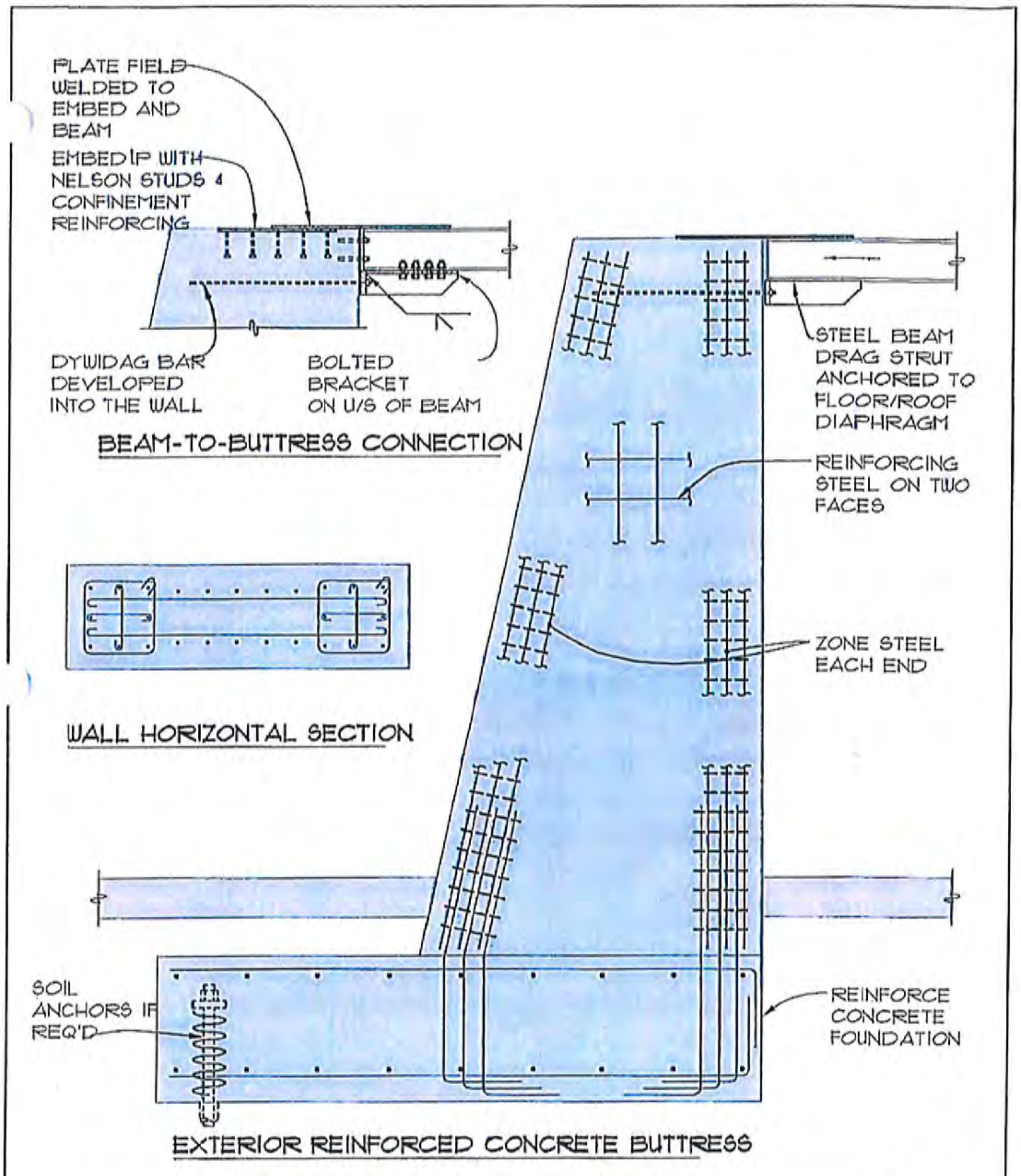


Figure 1. New Reinforced concrete buttress walls at each side of the truck bays door complete with steel drag strut elements



SEISMIC RETROFIT GUIDELINES SECOND EDITION LIBRARY OF RETROFIT DETAILS NOVEMBER, 2013	CONCRETE SHEARWALL #5 EXTERIOR BUTTRESS WALL	SCALE 1:20 SHEET No. CSW #5

Figure 2. Reinforced concrete exterior buttress wall detail complete with soil anchor

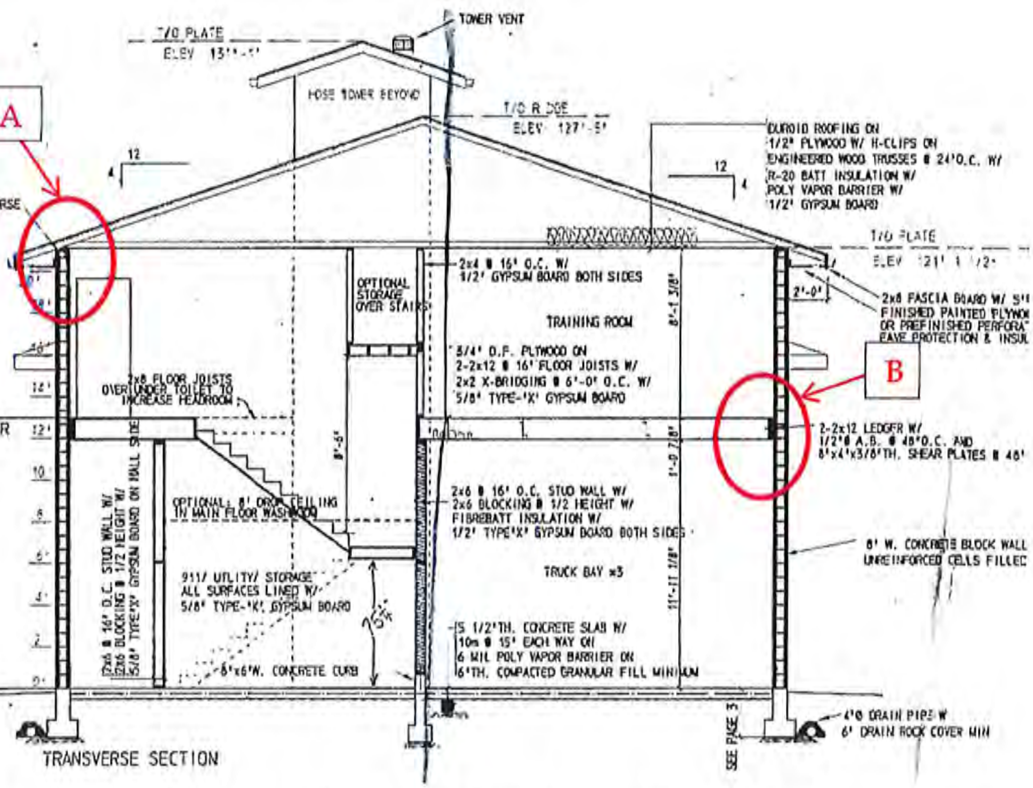


Figure 3. Cross section of Block showing connection upgrade

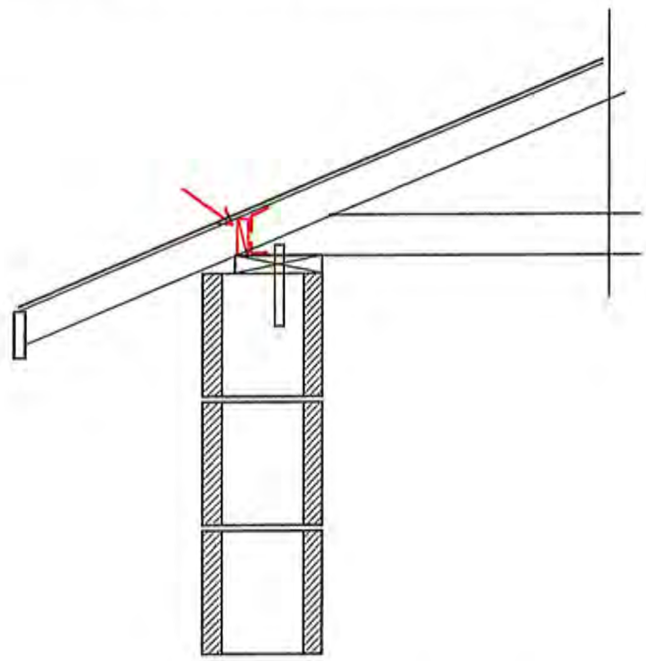


Figure 4. Detail A - New wood blocking with framing clips for shear transfer load path

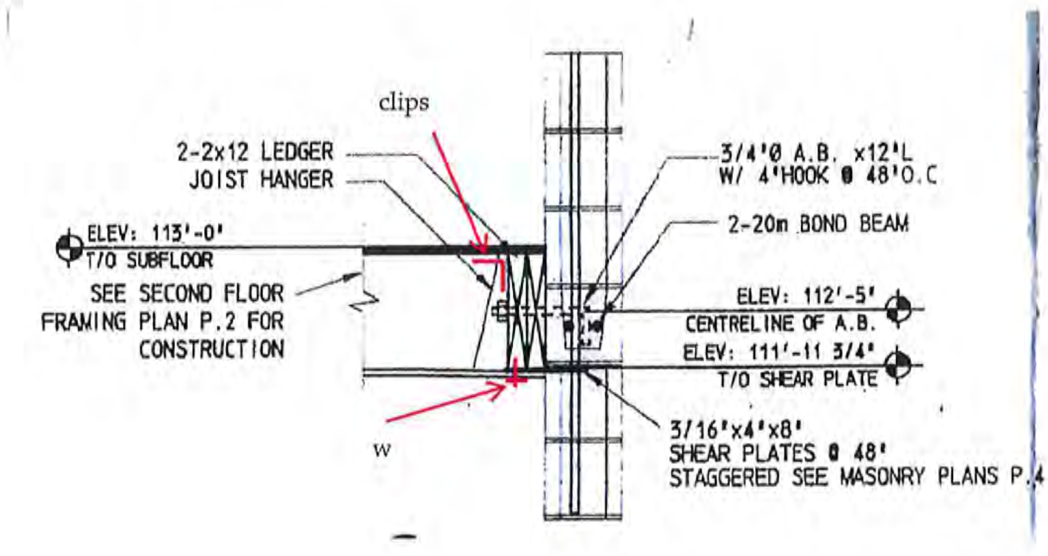


Figure 5.Connection upgrade at the floor ledger connections.

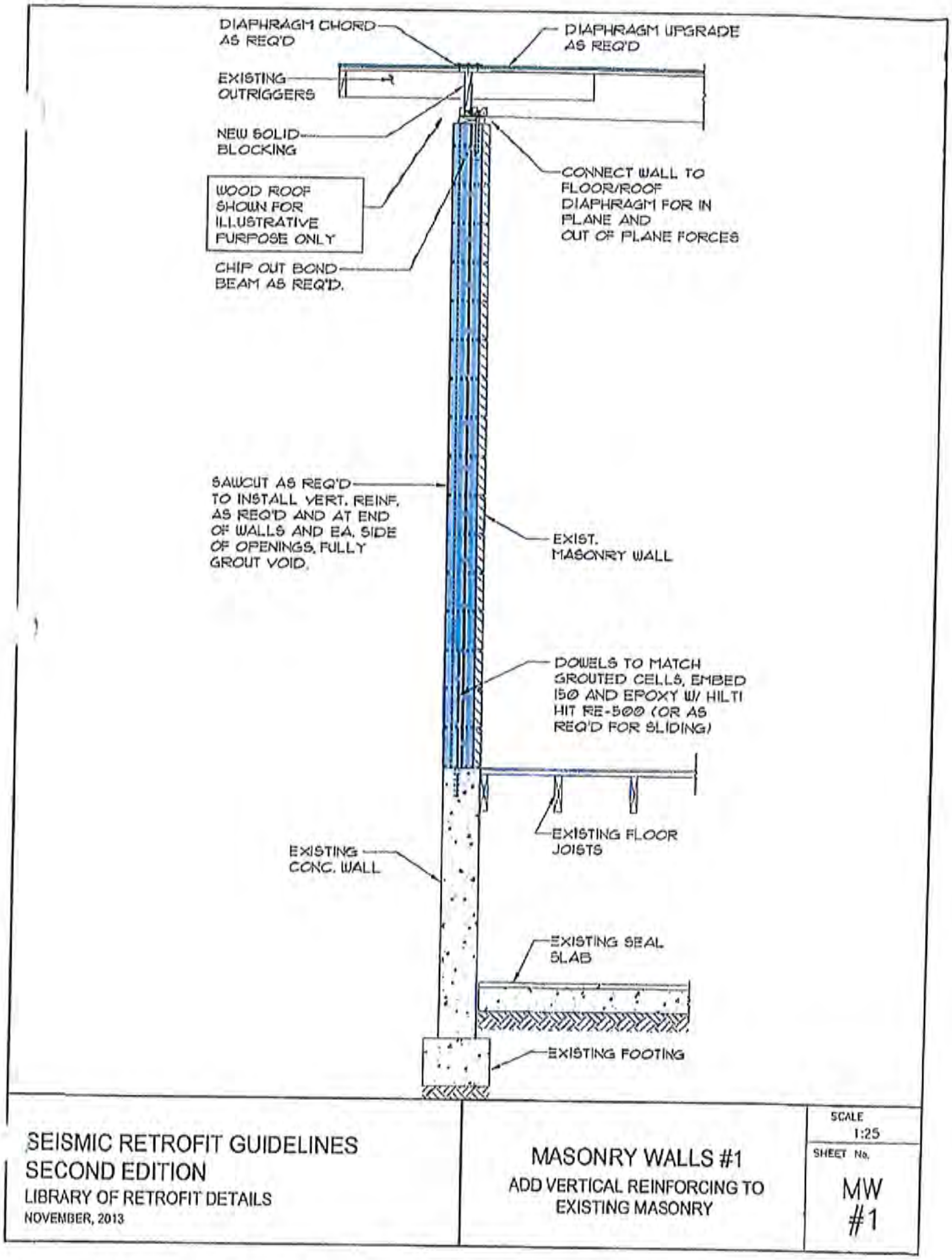


Figure 6. New additional vertical reinforcing at existing masonry wall

APPENDIX F
PHOTOGRAPHS
for
BLOCK #01 (1992)
Fire Hall Building

Figure F.1 Existing wood roof ledger connection to masonry walls (not properly connected for shear transfer)

Figure F.2 Roof trusses configuration showing existing plywood sheathing

Figure F.3 Existing roof trusses at end support to sill plate on top of masonry wall (not adequate shear transfer from plywood sheathing to sill plate).

Figure F.4 Plywood sheathing at gable end wall

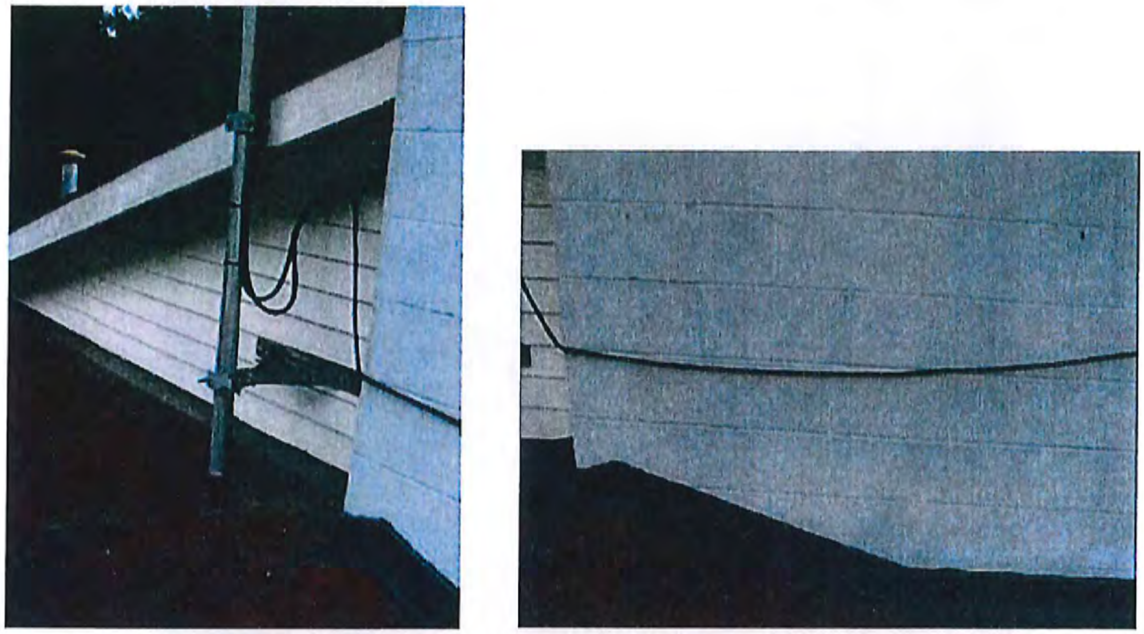


Figure F.5 Existing Roof Gable end wall and interface to masonry block

Figure F.6 Existing header at truck bay location built as concrete (shown as a wood beam on drawings)

Figure F.7 Bottom of existing header at truck bay location showing concrete (shown as a wood beam on existing drawings)

APPENDIX G
RELEVANT REFERENCE DOCUMENTS
for
BLOCK #01 (1992)
Fire Hall Building

Relevant Reference Documents

Golder Associates Ltd.

#108 - 2790 Gladwin Road
Abbotsford, B.C. Canada V2T 4S8
Telephone (604) 850-8786
(604) 857-1966
Facsimile (604) 850-8756

REPORT ON

GEOTECHNICAL INVESTIGATION
PROPOSED FIREHALL DEVELOPMENT
HOT SPRINGS ROAD
HARRISON HOT SPRINGS, BRITISH COLUMBIA

Submitted to:

The Corporation of the Village
of Harrison Hot Springs
P.O. Box 160, 495 Hot Springs Road
Harrison Hot Springs, British Columbia
V0M 1K0

DISTRIBUTION:

2 copies	-	The Corporation of the Village of Harrison Hot Springs Harrison Hot Springs, B.C.
2 copies	-	Golder Associates Ltd. Abbotsford, B.C.

September, 1992

922-5040

TABLE OF CONTENTS

Golder Associates Ltd.

#108 - 2790 Gladwin Road
Abbotsford, B.C. Canada V2T 4S8
Telephone (604) 850-8786
(604) 857-1966
Facsimile (604) 850-8756

Golder Associates

September 11, 1992 922-5040

The Corporation of the Village
of Harrison Hot Springs
P.O. Box 160, 495 Hot Springs Road
Harrison Hot Springs, British Columbia
V0M 1K0

ATTENTION: Mr. Eric McMurran, Clerk Treasurer

**RE: GEOTECHNICAL INVESTIGATION
PROPOSED FIRE HALL DEVELOPMENT
HOT SPRINGS ROAD
HARRISON HOT SPRINGS, BRITISH COLUMBIA**

Dear Sir:

As requested, Golder Associates has carried out a geotechnical investigation at the proposed fire hall development site located in the 500 block of Hot Springs Road in Harrison Hot Springs, B.C.

The purpose of the investigation was to determine the subsurface soil and groundwater conditions and to assess the influence of these conditions on the proposed development. The following report provides a summary of our understanding of the proposed development and assessment of the subsurface conditions, together with our engineering comments and recommendations relating to geotechnical aspects of the foundation design and construction of the proposed structure and ancillary facilities.

The scope of this investigation is limited to the determination of the foundation engineering properties of the site and does not include the investigation, chemical testing or assessment of potential soil or groundwater contamination of the site.

1.0 EXISTING SITE CONDITIONS

The site of the proposed development is Lot 344, located within the 500 block of Hot Springs Road in Harrison Hot Springs, B.C. as shown on Figures 1 and 2. The property is bounded to the north and east by dedicated parkland, to the south by undeveloped residential lots which front on Balsam Avenue, and to the east by Hot Springs Road.

As a result of recent fill placement activity the site is relatively flat-lying at an elevation approximately equal to that of Hot Springs Road. The present ground surface elevation, as indicated by survey marks adjacent to the sidewalk, is approximately 14.5 to 15 m. The fill placement has resulted in 1.5 to 2 m high embankments which border the site to the north, east and west. The ground surface beyond the embankment fills is also relatively flat-lying. However, it does exhibit localized relief of approximately 0.5 m.

Vegetation on the site consists of mature cedar, hemlock and maple trees, which generally border the site beyond the extent of fill. Some mature trees have been left standing within the fill area over the eastern portion of the site.

Indications of groundwater seepage or surface water flow were not evident on the site during the field investigation.

2.0 FIELD INVESTIGATION

2.1 General

The field work portion of the investigation was carried out on August 14 and 20, 1992, under the full-time inspection of a member of our engineering staff and included the following activities:

- five test pits; and
- one hollow stem borehole and associated dynamic cone penetration test (DCPT).

2.2 Test Pit Investigation

The test pit investigation at the site was carried out on August 14, 1992 using a rubber tired backhoe excavator supplied and operated by the Corporation of the Village of Harrison Hot Springs. A total of five test pits, designated as TP1 through TP5, were generally put down to depths of 4 to 4.3 m below the existing ground surface at the approximate locations shown in Figure 2. To minimize the disturbance of the subgrade soils test pit TP5, located within the building envelope, was terminated at a depth of 2 m. The soil and groundwater conditions were examined and logged as the test pit excavation progressed and representative, disturbed soil samples were collected. With the exception of test pit TP5 the depth of excavation was limited by the maximum downward reach of the excavator. The density and consistency of the subsurface soils was inferred from the resistance to penetration by the bucket of the backhoe. Upon completion of logging and soil sampling, the test pits were backfilled with the excavated material.

2.3 Drilling Investigation

The drilling investigation was carried out using a truck-mounted auger drill rig, supplied and operated by SDS Drilling Ltd. A single borehole designated BH-1 was put down at the approximate location shown on Figure 2. The borehole was advanced to a depth of 22.6 m below the existing ground surface. Disturbed soil samples were collected at about 1.5 m intervals using a standard 50 mm diameter split-spoon sampler.

In addition to the test boring, a continuous DCPT was carried out to the east of the borehole to determine the resistance of the soil to penetration using a hammer driven probe, from which the density of the subsurface soil has been inferred.

3.0 SUBSURFACE CONDITIONS

Detailed descriptions of the soils encountered in the borehole and test pits are presented in the Record of Borehole Logs and Record of Test Pits, in Appendix II and Appendix III, respectively. The following is a summary of the inferred subsurface conditions encountered at the site.

3.1 Fills

A surficial layer of fill material was encountered at all the test pit and borehole locations. The fill was observed to vary in thickness from 1.4 m in test pit TP1 to 2.3 m in test pit TP4, with an average depth of 1.8 m.

Two distinct fill materials were noted. The upper fill, present at the ground surface, consisted of 0.3 to 1.7 m of a heterogeneous mixture of silt, sand and gravel and contained a significant amount of construction debris including wood, asphalt, and concrete. Beneath the upper fill, test pits TP3, TP4, and TP5 and BH-1, encountered 0.4 to 1.5 m of loose, fine sand which contained a trace of clay pigeon fragments. It is understood that the upper fill came from numerous construction sites and was placed over the last few years. The lower fill, which contained the clay pigeon fragments, is understood to have come from the Harrison Hot Springs Hotel site and has been in-place for approximately 4 years.

Based on the resistance to penetration by the backhoe bucket and the results of the DCPT probe, the upper fill is inferred to be compact and the lower fill is inferred to be loose.

At all the test pit sites the fills were noted to overlie topsoil and organic debris as described below.

3.2 Topsoil

Native topsoil and organic debris were encountered beneath the fill in all of the test pits put down at the site. The topsoil varied from 0.1 to 0.3 m thick and comprised either loose amorphous peat or firm to soft organic silt which contained abundant roots and woody debris. In addition, large tree stumps were encountered in test pits TP1 and TP3. The layer of topsoil was noted to overlie a thin veneer of fine grained mineral soils as described below.

3.3 Silt

Test pits TP1, TP2, and TP5 and borehole BH-1 encountered 0.2 to 0.9 m of silt beneath the topsoil layer which, based on the resistance to penetration, is inferred to be loose. Test pits TP3 and TP4 encountered 0.9 and 0.6 m respectively, of stiff silt with some clay. At all test pits and the borehole, the silt and silt with some clay was noted to overlie an extensive, granular deposit as described below.

3.4 Granular Deposits

In general, beneath an average of 2.4 m of fills, topsoil and loose silt, the site is underlain by an extensive sequence of sand and gravelly sand with thin layers of silt. Exceptions to this were noted in test pits TP3 and TP4 where 0.6 to 0.9 m of stiff silt with some clay was noted between the topsoil and the granular deposits. Based on the observed resistance to penetration during excavation of the test pits and the DCPT results, the granular materials are inferred to be compact with layers of dense materials below 8.4 m. Borehole BH-1 was terminated within these compact layered sands at 14 m depth, while the DCPT probe indicates that these sandy stratas extend to depths in excess of 22 m.

3.5 Groundwater Conditions

With the exception of test pit TP4 groundwater seepage was encountered at the 4 m depth in all test pits and boreholes put down at the site. Test pit TP4 did not encounter seepage to the maximum 4.3 m depth of excavation. Given the relatively permeable nature of the granular soils underlying the site, the depth of seepage encountered in the test pits and borehole is believed to be representative of the static water level at the time of the investigation..

Groundwater levels are expected to fluctuate seasonally, in response to increased precipitation and infiltration, possibly rising to within 1 m of the original round surface.

4.0 PROPOSED DEVELOPMENT

Based on our telephone conversations, it is understood that a combination one and two storey structure approximately 11 by 22 m is being proposed for the site. The structure would house the volunteer fire department and would be situated at the approximate location shown on Figure 2.

Details of the proposed structure, including foundation loading are limited at this time, however it is understood that the structure may consist of concrete, masonry and/or wood-frame construction.

The finished floor elevation is expected to be at or slightly above that of Hot Springs Road which borders the site to the west.

5.0 SITE PREPARATION

5.1 General

The results of the test pitting and drilling investigation indicate that the site is underlain by random and loose fill materials, topsoil, and loose silt. The combined thickness of these materials varies from 2.1 to 2.6 m with an average thickness of 2.4 m. As the fill materials are not of suitable quality or density for structural fills, and overlie deleterious materials (stumps, roots and organic topsoil) the present site conditions are not considered to be suitable for shallow foundation support of the proposed structure or other settlement sensitive facilities.

The underlying compact, native granular deposit is considered to be a suitable bearing stratum for support of floor slabs and light to moderately loaded foundations, prepared in accordance to the following recommendations.

The choice of a suitable foundation type for the proposed structure will depend on both economic and structural design considerations. It is possible that foundations could be extended to bear directly on the compact and/or stiff native mineral soils. However, this alternative could require construction of foundation walls in excess of 2.5 m.. To limit the height of foundation walls, it may be desirable to replace the unsuitable fills and loose native soils with engineered structural fills. As an alternative to excavation and removal of the unsuitable fills and loose native soils, consideration may be given to the use of pile foundation support of the structure and floor slab.

5.2 Temporary Excavation and Subgrade Preparation

Unless pile support is provided, the surficial fill materials, topsoil, organics and loose mineral soils should be completely subexcavated from beneath the building area to expose either the compact sand or the stiff silt. The depth of excavation anticipated to remove these materials is 2.4 m. However, local overexcavation may be required to remove loosened or softened materials or large roots and tree stumps.

If the structure will be supported at shallow depth using select structural fills placed after removal of the existing poor quality fills and organics, the excavation should be extended beyond the edges of the proposed structure a distance at least equal to that of the thickness of the proposed fill.

Control of groundwater seepage is not expected to be a significant concern provided that construction is carried out during the dry summer period when the groundwater levels are similar to that indicated during the field investigation. It should be noted that groundwater levels may rise to or above the level of the unsuitable materials during periods of sustained wet weather.

Temporary excavation slopes within the surficial fill and the natural subgrade soils above the water table may be developed at slopes as steep as 1.5 horizontal to 1 vertical (1.5H:1V). However, if excavation is carried out below the groundwater table, flatter slopes may be required, together with dewatering or excavation support.

5.3 Fills and Final Site Grading

If building foundations are carried down to bear on the native soils it is recommended that 100 to 150 mm of crushed gravel and sand ("road mulch") be placed and compacted atop the native subgrade to create a high-strength working mat minimizing disturbance of the subgrade soils during construction. Structural fill placed within the excavation to reduce the height of the foundation walls may consist of the following:

- clean, well-graded, 75 mm minus pit run sand and gravel having less than 5 per cent passing the 0.075 mm (U.S.S. No. 200) sieve placed and compacted in lifts not exceeding 300 mm (loose thickness) with a large vibrating drum-roller (thinner lifts will be required if smaller compaction equipment is used); or

- clean, hard, well-graded 300 mm minus rockfill, placed and compacted in lifts not exceeding 300 mm, with a large vibrating drum-roller.

As described above, all fills which are intended to support structural foundations or settlement-sensitive facilities should extend outside the edge of these facilities a distance at least equal to the depth from the underside of the footings to the competent bearing stratum and shall be compacted to 100 percent of the standard Proctor maximum dry density.

Structural fills supporting lightly loaded but settlement sensitive pavements, concrete slab-on-grade and like facilities should also consist of the above noted granular materials, placed on prepared and approved subgrade soils, and compacted to 95 per cent of the standard Proctor maximum dry density.

5.4 Use of On-Site Materials

The random surficial fill material, topsoil and loose silt will not be suitable for use as structural or other high quality fill. These materials will likely become excessively softened and disturbed during excavation, particularly if construction is carried out during wet weather, and will be difficult to handle and compact.

Consideration may be given to stockpiling and use of this excavated material for landscaping or general fill in areas where significant post-construction settlements are acceptable. If stockpiling is carried out, the stockpiles should be developed a minimum of 5 m beyond the crest of the excavation cutslopes, to minimize the risk of slope instability.

The relatively clean sand fill that underlies the majority of the building site may be suitable for use as structural fill, provided the material is selectively excavated to avoid contamination from other fill materials present of the site. Prior to use of this material the stockpiles should be inspected and approved by a qualified geotechnical engineer.

6.0 GEOTECHNICAL ENGINEERING CONSIDERATIONS

6.1 Seismic Considerations

The site of the proposed development is located within Seismic Zone 4 of the current National and British Columbia Building Codes, which is one of the higher seismic risk categories. Based on the results of this investigation, it is recommended the structure be designed using a Foundation Factor, F, of 1.3 considering the thickness and compact nature of the subsurface soils. In addition, the effect of earthquake loading should be considered in the design of below grade walls and earth retention structures, as described below.

6.2 Liquefaction Assessment

An assessment was carried out of the potential for Liquefaction of the native subgrade soils present at the site. The penetration resistance values used in the comparison include both Standard Penetration Test (SPT) "N" values and DCPT results which can be correlated empirically with the SPT "N" values.

Based on the results of the investigation and analysis, the clean, compact sand encountered from 12 to 15 m was judged to be marginally liquefiable under the 1:475 year earthquake event. However, given the relatively limited thickness of the layer, the resulting settlements are expected to be in the order of 25 to 50 mm.

6.3 Foundations and Floor Slabs

The requirements for foundations and floor slabs will depend on which foundation option is used. If the existing fills are removed from the building area, Section 6.3.1 addresses the foundation and floor slab requirements. Requirements for the pile foundation option are discussed in Section 6.3.2.

6.3.1 Shallow Foundations

The compact sand and stiff silt subgrade, located approximately 2.4 m below the present grade, is considered to be suitable for support of light to moderately loaded foundations and/or structural fills, provided it is not loosened, softened or disturbed during construction.

For design purposes, foundations bearing on the stiff silt, compact sand, or well-compacted granular fills prepared as described above, may be designed using an allowable bearing capacity (including both dead and live loads) of 150 kPA (3,000 lbs. per sq.ft.) for conventional strip and rectangular footings.

If broken rock material is used for structural fill, the structure should be constructed on a suitably reinforced, thickened-edge slab on grade to minimize the effects of local "hard" points or voids. Regardless of bearing pressure conditions, it is recommended that strip and rectangular footings have minimum widths of 0.45 and 0.6 m, respectively. All perimeter foundations and those in unheated areas should be provided with a minimum of 0.6 m of soil cover for frost protection and embedment purposes.

Floor slabs may be grade supported on well-compacted granular fills placed in lifts and compacted up to the subslab level as described above. For conventional strip and spread footing foundations the floor slabs should be structurally separate from the walls and columns or should include suitable control joints to accommodate settlement.

Particular caution should be exercised if placement of granular fills over rockfill is considered. In such case, use of a geotextile separator layer may be required to minimize the potential for migration of the granular fill into voids within the rockfill.

6.3.2 Pile Foundation

Support of the proposed structure on piles driven into the underlying sands, allowing the existing fills to remain in place, has been assessed and is considered to be feasible. Based on the limited amount of subsurface data as well as the layered and variably compact nature of the underlying sand strata, variations in pile length may be encountered across the site.

Timber piles installed to support the proposed structure may be designed using an allowable vertical capacity of 180 kN (20 tons) for pressure-treated timber piles having a nominal 200 mm (8 inch) tip diameter.

Piles should be driven to a minimum depth of 11 m and/or a final set of at least 3 blows per 25 mm using a 14 kN (3,000 lbs.) drop hammer or equivalent delivering an energy of 24.4 kJ (18,000 ft.lbs.) per blow. For drop hammers, 75 per cent efficiency should be assumed unless calibration data can be provided to support a higher hammer efficiency. Timber piles should be driven at a center to center spacing not less than three pile diameters.

If significant amounts of post-construction settlement of the floor slab can be tolerated, consideration may be given to use of a grade support floor slab constructed in accordance with Section 6.3.1. However, if significant post-construction settlements are not fully acceptable then the floor slab should be pile supported.

Given the presence of debris such as concrete, asphalt and tree stumps in the fill materials, refusal to pile penetration at shallow depths may be encountered. Provisions should be made for either relocation of the piles or excavation and removal of the obstructions.

6.4 Wall Backfill and Buried Services

Backfill behind walls should consist of clean, well-graded, free-draining sand and gravel containing less than 5 per cent passing the 0.075 mm (U.S.S. No. 200) sieve. The backfill should be compacted using light hand-operated compaction equipment adjacent to building walls to minimize the risk of excessive loading or damage to the walls. A coefficient of lateral earth pressure of 0.45 should be used in design unless the wall is free to rotate at least 12 mm for each 3 m of height. If rotation is permitted, a lesser coefficient of active earth pressure of 0.3 may be used. In either case, it is recommended that the unit weight of the backfill should be considered to be a minimum of about 20 kN per cu.m. and all surcharge loads should be included. It is recommended that the resulting triangular earth pressure loading be re-distributed in equivalent rectangular fashion over the entire embedded wall height. The affects of hydrostatic water pressures should be included in the design unless positive control of water pressures is provided.

Unless a more rigorous analysis is considered warranted, an increase in the re-distributed rectangular earth pressure of 50 per cent should be used as a simplified method to evaluate the earth pressures acting on the walls below grade under seismic loading conditions.

Settlement-sensitive facilities, such as buried gravity-flow services, should be founded within well-compacted granular fills placed on suitably prepared subgrade soils. Where service trenches cross beneath proposed pavement areas or foundation elements, the trench backfill should be prepared in accordance with the recommendations for preparation of pavement and structural fills, respectively.

6.5 Permanent Cut and Fill Slopes

Where final site grading requires the construction of permanent fill slopes, such slopes should be constructed of granular materials free of deleterious matter. The fill may contain fines up to 10 per cent by weight, however, this fill should be placed and compacted to 95 per cent of the standard Proctor maximum dry density to minimize post construction settlements.

Permanent fill slopes should be constructed at slopes of 2.5H:1V, or flatter, and should be revegetated as soon as possible following construction to minimize the risk of erosion from rainfall and storm runoff. All accumulated surface flows should be collected and directed away from such slopes to assist in this regard.

6.6 Retaining Walls

Where retaining walls are required for final site grading, and where these structures support or contribute to stability of the embankment fill or retain settlement-sensitive structures, engineering design and/or review will be required. The retaining walls should be founded on the native compact sands, stiff silts or compacted structural fills, prepared as described above, and should be constructed using materials which will not deteriorate or decompose with time. Wall backfill and drainage requirements are the same as those recommended for the building foundation walls.

Landscaping retaining walls constructed of decomposable elements, such as timber ties or railroad ties, and walls constructed atop the existing fill materials, will require maintenance and possible future replacement. The use of landscaping retaining walls and non-engineered backfill material should be limited to areas where significant post-construction settlement and possible maintenance is considered to be acceptable and overall embankment stability and/or structural integrity is not a concern.

6.7 Drainage

Provided the finished floor grade is a minimum of 150 mm above the adjacent site grade and that of Hot Springs Road to the west, consideration may be given to deletion of perimeter foundation drains. If the floor grade is lower than that noted above then the installation of standard perimeter drains is recommended. These drains should be installed independent of all surface water collection systems (roof and floor drains should not be connected to the perimeter drains). The invert of the drains should be at or below the level of the underside of the building floor slab on grade or crawl space level. The drains should be suitably filtered and have a positive hydraulic connection to the subslab fill material. Such connection can be made by the installation of "weep holes" through the foundation walls. The holes should be located below the underside of the slab and above the level of the drain invert. Weep holes should be 50 to 75 mm diameter, covered with a layer of filter fabric and located at 2 to 3 m intervals along the length of the foundations.

Final site grading should be sloped to direct surface runoff away from the building, foundations and slopes that may be subjected to erosion during periods of heavy or prolonged precipitation.

6.8 Access Roads and Parking Areas

To provide a low maintenance pavement surface it would be necessary to subexcavate the existing fills, topsoil and loose silt material and replace them with clean, well-graded, granular fill compacted atop the prepared subgrade soils. However, it is understood that such extensive excavation and fill placement is not desirable at this time. Facilities, such as pavement structures, constructed atop the existing fills are expected to be subjected to the effects of both short and long term settlement.

To minimize the effect of post construction settlements and associated maintenance costs, it is recommended that consideration be given to delay of paving for about 2 years to permit some although not all of the consolidation/compression settlement to occur.

For driveways and parking areas which are subject to moderate to heavy-vehicle traffic, the following minimum pavement structure should be provided:

- 75 mm of asphalt pavement;
- 100 mm of clean, 20 mm minus crushed gravel and sand ("road mulch") compacted to a minimum of 100 per cent of the standard Proctor maximum dry density;
- 300 mm of clean, 75 mm minus, pit run sand and gravel, compacted as specified above.

Pavement areas which are subject to light passenger vehicle traffic only may be designed using a reduced 50 mm asphalt pavement layer. Consideration may also be given to reduction of the base and subbase course layers since some long-term maintenance of pavement structures atop the existing fills is expected to be required.

To provide proper drainage, it is recommended that the pavement subgrade be shaped and graded with a cross slope of at least 1 per cent. The completed pavement surface should also be sloped to promote runoff to a suitable storm drainage system and prevent ponding. Where possible, the pavement cross falls should be developed to greater than normal grades to minimize the impact of future settlements.

7.0 CONSTRUCTION INSPECTION AND DESIGN REVIEW

Golder Associates will be pleased to provide foundation design review and construction inspection services for the above development, as required by the Regional District of Fraser Cheam. These services may include, but not necessarily be limited to the following:

- geotechnical review of final foundation design;

- provision of Letters of Professional Assurance for geotechnical design and construction review, as required by the Regional District of Fraser Cheam;
- site inspection to confirm that the foundation excavations are carried down to suitable bearing strata and that all softened, loosened or disturbed soils are removed from beneath foundation and floor slab areas;
- assessment of temporary and permanent cutslopes;
- piling inspection during installation;
- periodic inspection and field density testing during placement and compaction of structural fill and backfill materials; and
- inspection of prepared foundation surfaces prior to pouring of footings.

If there are any changes, deletions or additions to the earthworks proposed or other facilities which could affect the stability of the site, structures or adjacent properties, Golder Associates should be notified so that a geotechnical review may be carried out to assess the impact of the such changes on the development prior to construction.

We trust that the above information is sufficient for your immediate needs. If you have any questions or comments with this report, or wish to discuss its contents, please do not hesitate to contact us.

Yours very truly,

GOLDER ASSOCIATES LTD.

Calvin D. VanBuskirk, P.Eng.

Richard C. Butler, P.Eng.
Principal

Attach.

VALLEY RENTALS

A DIVISION OF JOHNSON ENTERPRISES LTD.

• 20112 Logan Ave.
Langley, B.C.
534-5374

• 16098 Fraser Hwy.
Surrey, B.C. (Fleetwood)
597-2207

• 45506 Yale Rd.
Chilliwack, B.C.
792-0034

• ADMINISTRATION
20112 Logan Avenue
Langely, B.C. V3A 4L6
534-1733 - Fax 534-5848

• 12180 Vicker's Way
Richmond, B.C.
276-2829

• HEAVY RENTALS DIV.
20112 Logan Ave.
Langley, B.C.
533-7368

• 6786 King George Hwy.
Surrey, B.C. (Newton)
594-2421

• 1334 Johnston Rd.
White Rock, B.C.
531-1491

• 31790 South Fraser Way
Abbotsford, B.C.
852-9522

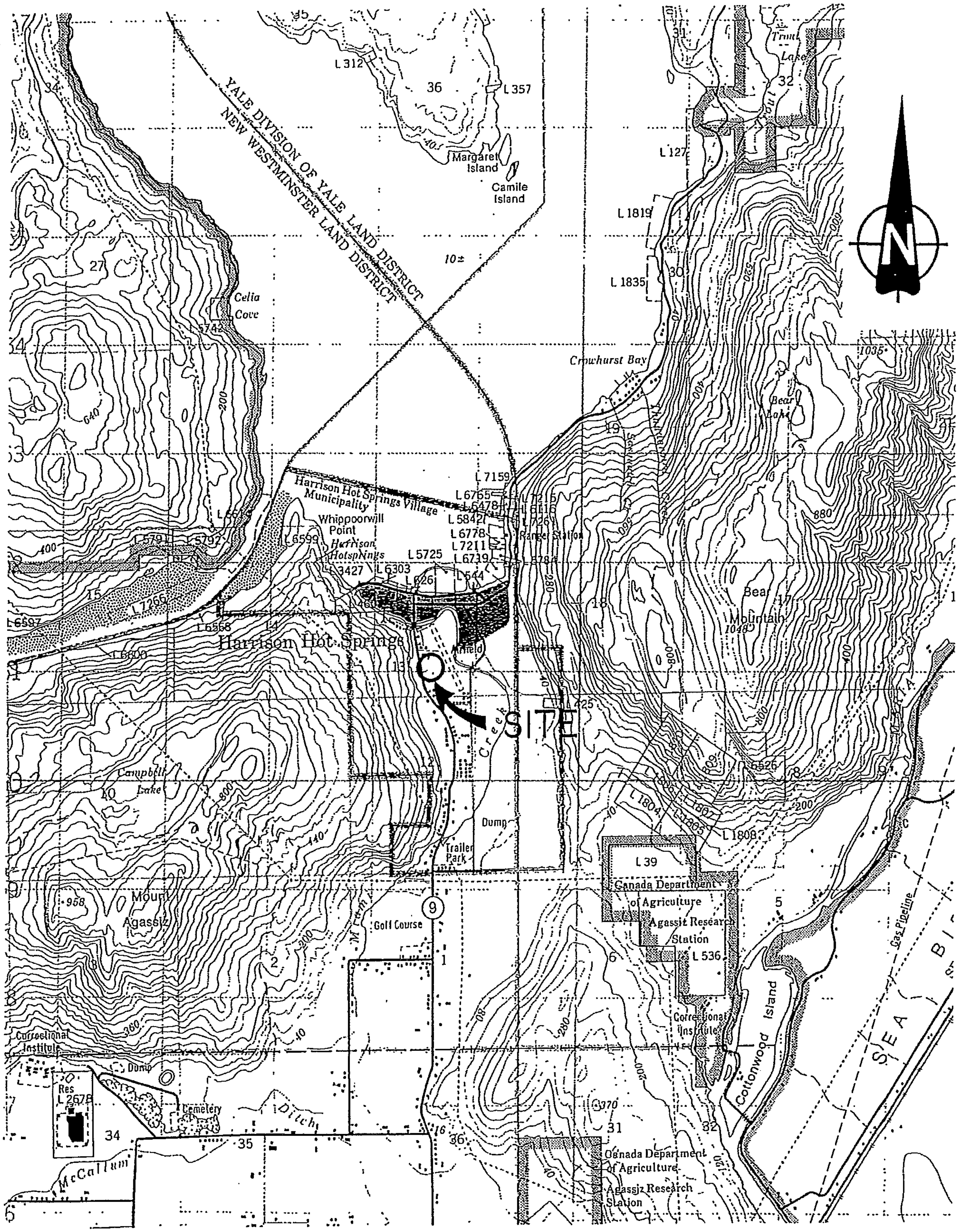
7:30
8:00 GRAVEL (PIT RUN) FROM
8:30 KENT MUNICIPAL PIT
9:00
9:30 DEC 8/92
10:00 GMC SINGLE AXLE 5 Yds X 14 = 70
10:30 INT. SINGLE AXLE 7 Yds X 14 = 98
11:00
11:30 DEC 9/92
12:00 GMC SINGLE AXLE 5 Yds X 11 = 55
12:30 INT SINGLE AXLE 7 Yds X 14 = 98
1:00 DAKA TANDEM 12 Yds X 7 = 84
1:30
2:00 DEC 10/92
2:30 GMC SINGLE AXLE 5 Yds X 15 = 75
3:00 INT SINGLE AXLE 7 Yds X 14 = 98
3:30
4:00 TOTAL Yds FOR 578 Yds
4:30 PO NUMBER 61810
5:00
5:30 [illegible signature]
6:00

APPENDIX I

FIGURES

KEY PLAN

Figure 1



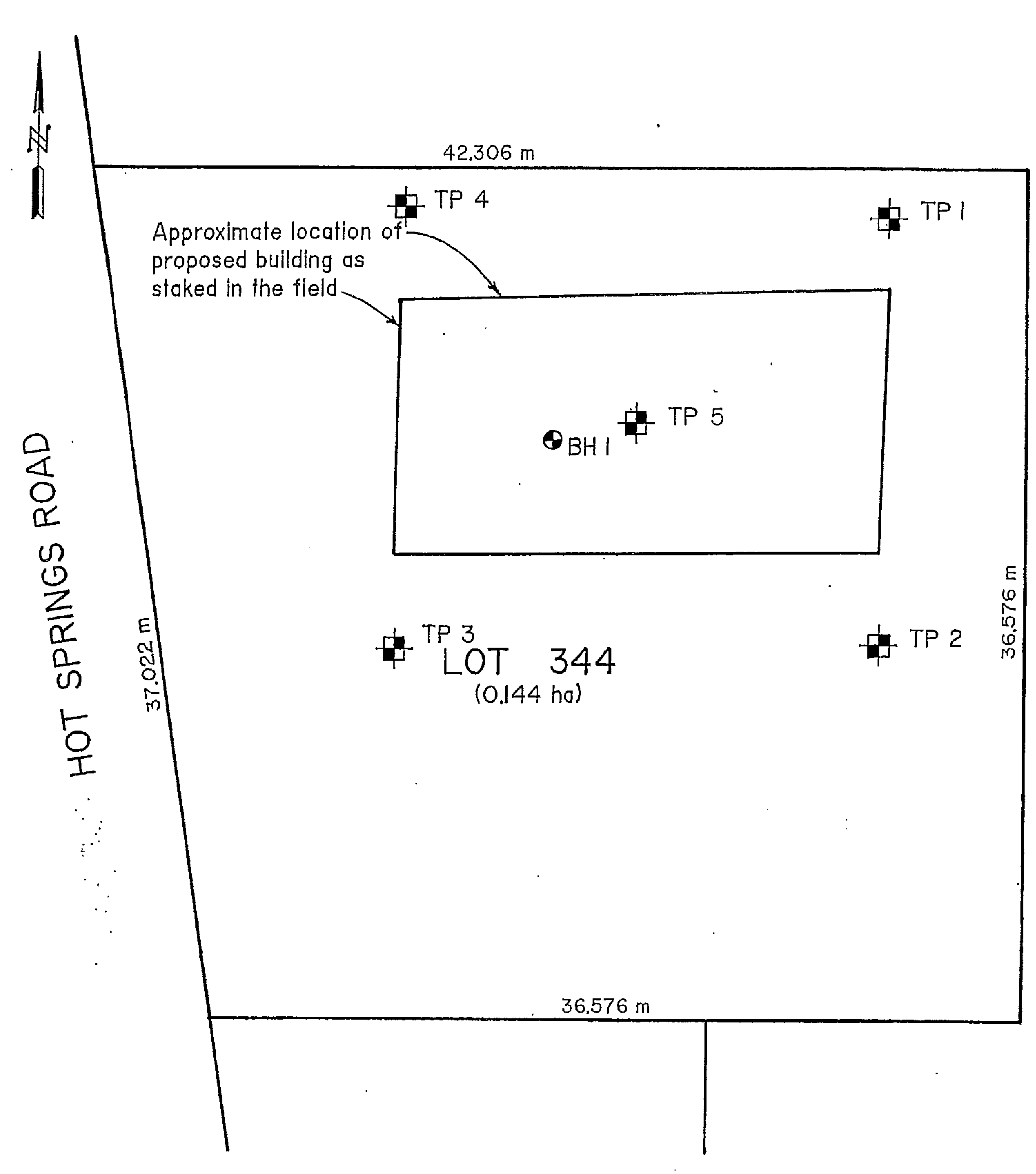
Scale 1:50,000

Golder Associates

PROJECT NO. 922-5040 DRAWN cvb REVIEWED CJB DATE August, 1992

SITE PLAN

Figure 2



LEGEND

Approximate test pit location

Approximate borehole location

Scale : 1 : 250

Note: Property boundaries and dimensions taken from undated unnumbered plan provided by the Village of Harrison Hot Springs

Golder Associates

PROJECT NO. 922-5040 DRAWN cvb REVIEWED [illegible] DATE August, 1992

APPENDIX II

RECORD OF BOREHOLES

Approximate borehole location is shown in Figure 2.

The abbreviation commonly employed on each "Record of Borehole," on the figures and in the text of the report, are as follows:

I. SAMPLE TYPES

AS auger sample
CS chunk sample
DO drive open
DS Denison type sample
FS foil sample
RC rock core
ST slotted tube
TO thin-walled, open
TP thin-walled, piston
WS wash sample

II. PENETRATION RESISTANCES

Dynamic Penetration Resistance:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) to drive uncased a 50 mm (2 in.) diameter, 60° cone attached to "A" size drill rods for a distance of 0.3 m (12 in.).

Standard Penetration Resistance, *N*:
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) drive open sampler for a distance of 0.3 m (12 in.).

WH sampler advanced by static weight—weight, hammer

PH sampler advanced by pressure—pressure, hydraulic

PM sampler advanced by pressure—pressure, manual

III. SOIL DESCRIPTION

(a) *Cohesionless Soils*

Relative Density	*'N'* Blows/0.30m or Blows/ft.
Very loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very dense	over 50

(b) *Cohesive Soils*

Consistency	*'Cu'* kPa	psf.
Very soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1000
Stiff	50 to 100	1000 to 2000
Very stiff	100 to 200	2000 to 4000
Hard	over 200	over 4000

IV. SOIL TESTS

C consolidation test
H hydrometer analysis
M sieve analysis
MH combined analysis, sieve and hydrometer[1]
Q undrained triaxial[2]
R consolidated undrained triaxial[2]
S drained triaxial
U unconfined compression
V field vane test

NOTES:
[1]Combined analyses when 5 to 95 per cent of the material passes the No. 200 sieve.
[2]Undrained triaxial tests in which pore pressures are measured are shown as $\bar{Q}$ or $\bar{R}$.

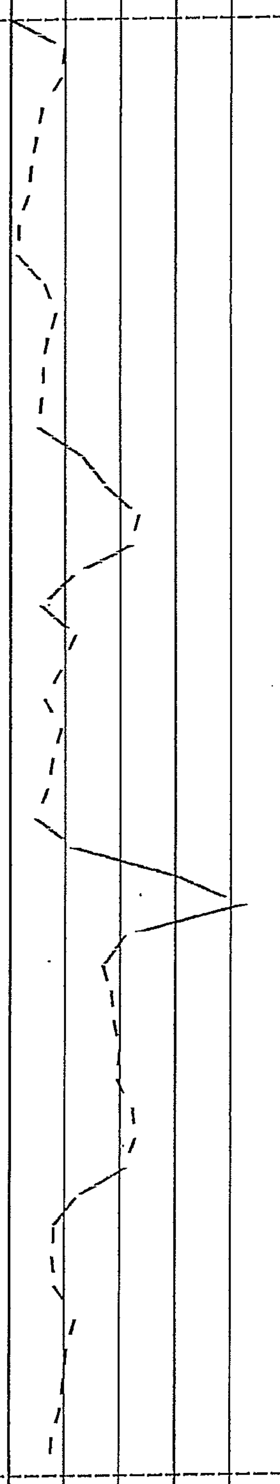
RECORD OF BOREHOLE BH-1

PROJECT: 922-5040
LOCATION: See Figure 2
SAMPLER HAMMER: 63.5kg; DROP: 760mm
BORING DATE: August 20, 1992
SHEET 1 OF 2
DATUM:
PENETRATION TEST HAMMER: 63.5kg; DROP: 760mm

BORING METHOD: SDS Truck-Mounted Solid Stem Auger; DCPT Cone: 60 mm dia, 150 mm sleeve

DEPTH SCALE METRES	SOIL PROFILE – DESCRIPTION	ELEV. DEPTH (m)	SAMPLE NUMBER	TYPE	BLOWS/0.3m
0	GROUND SURFACE				
	Compact, hetrogeneous, moist, brown, gravelly SAND and SILT (FILL).	0.00			
	Loose, moist, brown, fine SAND, trace fine gravel, trace clay pigeon fragments (FILL).	0.60	1	DO	6
			2	DO	2
	Loose, moist, light brown SILT, trace organics (rootlets).	1.80			
	Loose to compact, interlayered, moist, brown, fine SAND, and moist to wet, very fine SAND, with little to some silt.	2.40	3	DO	9
	Compact, wet, brown SAND and GRAVEL, trace silt.	4.30	4	DO	22
	Loose to compact, wet, grey, medium to coarse SAND, some gravel.	5.50	5	DO	25
			6	DO	
	Compact to dense, interlayered, wet, grey, medium to coarse SAND, little fine gravel and medium to fine SAND, little fine gravel.	8.40	7	DO	
			8	DO	
	Compact, wet, grey, fine SAND.	11.90	9	DO	
	END OF BOREHOLE.	14.00			
15	CONTINUED ON NEXT PAGE				

DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80)



SHEAR STRENGTH Cu, kPa (nat.V - + Q - ● rem.V - ⊕ U - O) 20 40 60 80

HYDRAULIC CONDUCTIVITY, k, cm/s

WATER CONTENT, PERCENT Wp —O W— Wl 20 40 60 80

ADDITIONAL LAB. TESTING

PIEZOMETER OR STANDPIPE INSTALLATION

15 ◆ 5 PERCENT AXIAL STRAIN AT FAILURE (0, 10)

DATA INPUT: gmt

DEPTH SCALE 1 to 75

Golder Associates

LOGGED: CVB
CHECKED: CVB

PROJECT: 922-5040

RECORD OF BOREHOLE BH-1

SHEET 2 OF 2

LOCATION: See Figure 2

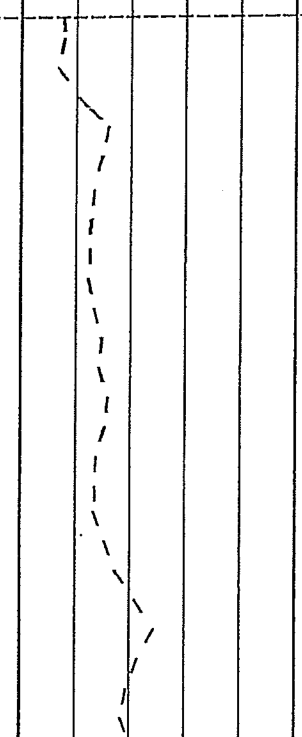
BORING DATE: August 20, 1992

DATUM:

SAMPLER HAMMER, 63.5kg; DROP, 760mm

PENETRATION TEST HAMMER, 63.5kg; DROP, 760mm

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE: DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: NUMBER	TYPE	BLOWS/0.3m	DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m (20 40 60 80); SHEAR STRENGTH Cu, kPa nat.V - + Q - ● rem.V - ⊕ U - O (20 40 60 80)	HYDRAULIC CONDUCTIVITY, k, cm/s; WATER CONTENT, PERCENT Wp —O W— Wl (20 40 60 80)	ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
15	SDS Truck-Mounted Solid Stem Auger; DCPT Cone: 60 mm dia, 150 mm sleeve	CONTINUED FROM PREVIOUS PAGE									
22.60				22.60				END OF PENETRATION TEST.			



15-◆-5 (0, 10) PERCENT AXIAL STRAIN AT FAILURE

DATA INPUT: gmt

DEPTH SCALE

1 to 75

Golder Associates

LOGGED: CVB

CHECKED: CVB

APPENDIX III

RECORD OF TEST PITS

Approximate test pit locations are shown in Figure 2.

RECORD OF TEST PITS

Test Pit No.	Depth (m)	Description
1	0.0-1.4	Loose, moist, light brown SILT, little clay, some pockets of fine to medium sand on west end of trench. Abundant wood debris, stumps, asphalt, plastic and pipe (FILL).
	1.4-1.5	Loose, amorphous, moist, dark brown to black PEAT (TOPSOIL), abundant roots.
	1.5-2.4	Loose, crumbly, moist, light brown, with some orange rust staining, SILT.
	2.4-4.3	Compact, interlayered, moist, brown with orange rust staining, fine SAND, trace silt, moist, grey, very fine micaceous SAND, wet, light grey with orange rust staining SILT, and wet, dark grey, medium to fine SAND.
	4.3	End of test pit. Minor groundwater seepage (5 to 10 litres/minute) observed at 4.1 m depth.
2	0.0-1.7	Compact to, loose, heterogeneous, light brown and light grey, SILT, gravelly SILT and SAND with little to some gravel, some construction debris, wood, steel wire and asphalt concrete (FILL).
	1.7-2.0	Soft, wet, dark grey, organic SILT, abundant roots (TOPSOIL).
	2.0-2.6	Loose, crumbly, moist, light brown SILT.
	2.6-2.9	Compact, moist, light brown, very fine SAND, trace silt.
	2.9-4.0	Compact, interlayered, moist, grey, fine siliceous SAND, trace of rounded gravel and wet, light brown SILT and fine SAND.
	4.0-4.3	Compact, wet, grey, fine micaceous SAND.
	4.3	End of test pit. Minor groundwater seepage (10 to 20 litres/minute) observed at 4 m depth.

RECORD OF TEST PITS

Test Pit No.	Depth (m)	Description
3	0.0-1.4	Compact and loose, heterogeneous, moist, silty GRAVEL, gravelly SILT, and SAND and GRAVEL, some asphalt and concrete slabs, large stump at 0.6 m at east end of trench (FILL).
	1.4-1.8	Loose, moist, light grey, fine SAND, with trace clay pigeon fragments (FILL).
	1.8-2.1	Loose, moist, grey and dark brown SILT and PEAT, abundant roots (TOPSOIL).
	2.1-3.0	Stiff, moist, mottled grey and light brown SILT with little to some clay.
	3.0-4.0	Compact, moist to wet, very fine, micaceous SAND.
	4.0	End of test pit. Minor groundwater seepage (10 to 20 litres/minute) observed at 4 m depth.
4	0.0-0.8	Loose, moist, brown SILT, little to some fine sand (FILL).
	0.8-2.3	Loose to compact, moist, light grey, fine SAND, trace of clay pigeon fragments (FILL).
	2.3-2.4	Firm to soft, moist, grey, organic SILT (TOPSOIL).
	2.4-3.2	Stiff, crumbly, moist, mottled light grey and brown SILT, little to some clay.
	3.2-4.3	Compact to dense, moist, dark grey with orange rust staining, fine SAND.
	4.3	End of test pit. No groundwater seepage observed.

RECORD OF TEST PITS

Test Pit No.	Depth (m)	Description
5	0.0-0.3	Very stiff to hard, moist, gravelly SILT (FILL).
	0.3-1.7	Loose, moist, light grey, fine SAND, trace of clay pigeon fragments (FILL).
	1.7-1.8	Loose, moist, brown, silty PEAT, abundant roots (TOPSOIL).
	1.8-2.0	Loose, crumbly, moist, light brown SILT, little to some roots.
	2.0	End of test pit. No groundwater seepage observed.

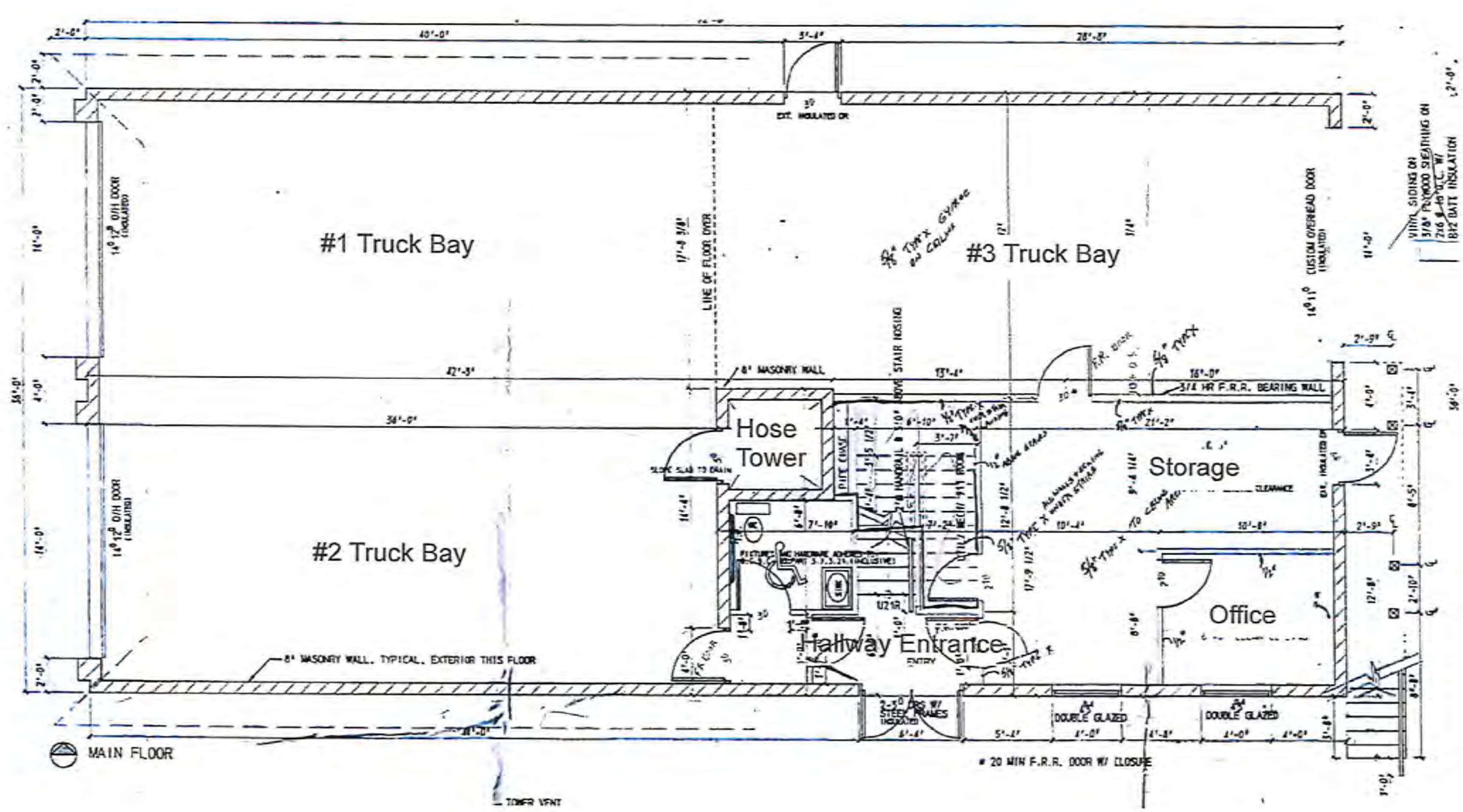
APPENDIX G

OPERATIONAL AND FUNCTIONAL COMPONENTS (OFC'S)

for

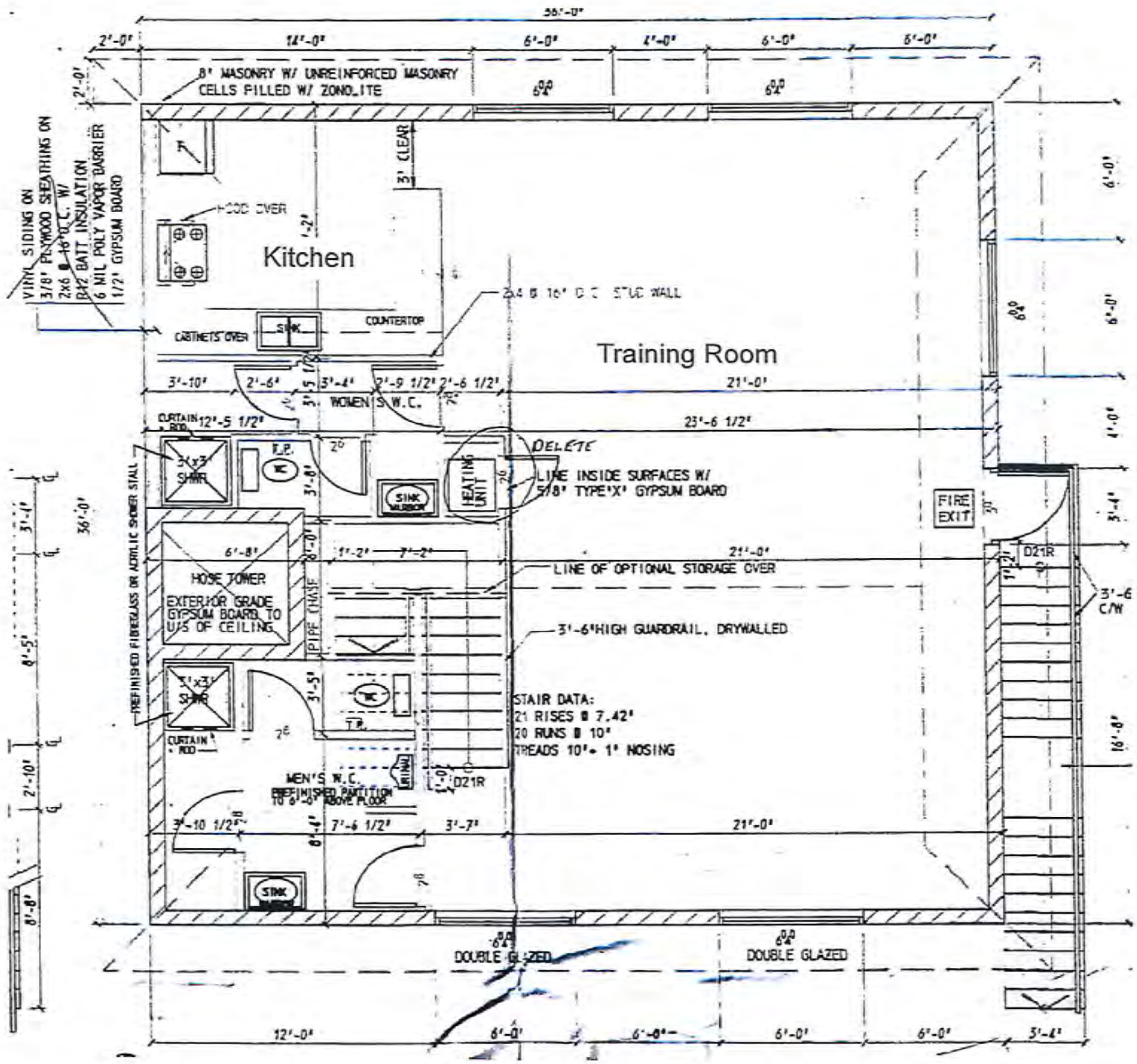
BLOCK #01 (1992)
Fire Hall Building

Harrison Hot Springs - Fire Hall Building



Ground Floor Plan

Harrison Hot Springs - Fire Hall Building



Second Floor Plan

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	9/03/18

Architectural Seismic Hazards — SPIR Phase

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Unbraced Suspended ceilings	Dropped acoustical tiles, perimeter separation of runners and cross-runners, swinging damage,	√		Hallway, Storage Area and Office at Ground Level	Provide fou-way diagonal wire bracing with a compression strut between the ceiling and supporting floor. For lay-in ceilings, stiffen splices and connections of T-bar sections with new metal clips and self-tapping screws. Discontinue ceiling across any seismic joint. This is not a problem with light weight panels (less than 10 kg/m2) Provide independent restraints to lighting fixtures Provide perimeter wires and strut stabilizers	High	
Plaster ceilings	Collapse, local spalling				Replace ceiling in egress routes and large assembly areas. Replace ceiling tiles housing fire suppression sprinkler's heads.		
Cladding	Falling, damaged panels and connections,				Replace or refasten veneer. Provide isolation to accommodate anticipated drift. Install additional anchorage to a structural component. Conduct maintenance to prevent moisture penetration from weather that could destroy the anchors.		
Ornamentation	Falling	√			Anchor the ornamentation to a structural wall, floor, or ceiling to prevent sliding and overturning.	Medium	
Plaster and gypsum board partition walls	Cracking, out of plane failure due to inadequate top support				Brace top of partitions to structural elements. Cross walls can act as lateral supports.		
Demountable partitions	Collapse				Provide isolation to accommodate anticipated drift. Use mechanical connetions that allow sliding with a slotted or oversize hole.		
Raised access floors	Collapse, separation between modules				Secure flooring pedestals to the structural floor with anchors. Add diagonal bracing to the pedestals.		
Recessed light fixtures & HVAC diffusers	Dropping out of suspended ceilings	√		Hallway Entance, Storage and Offices	Provide independent restraints to lighting fixtures & HVAC diffusers.	High	
Glazing, skylights, Glass elevator enclosures	Breakage, out of plane failure, falling glass, shattering glass				Provide isolation to accommodate anticipated drift. Large walls might need to be subdivided by additional structural supports into smaller areas to meet the force and drift criteria. Use laminated glazing and/or tempered glazing. Tempered glazing, when broken forms small cubes, which tend to act as ball bearings on hard surfaces. This produces a falling hazard on egress routes.		

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty structural engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	9/03/18

Architectural Seismic Hazards — SPIR Phase

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
					Apply adhesive security film to windows, preferably on the inside surface, to reduce UV degradation and hazards from broken glass (recommended when upgrading existing facilities where replacement of existing glazing is expensive and impractical).		
Doors	Jamming	√		Main entrance to the building and rooms	Provide isolation to door frames and guide rails. Provide training to fire service and ambulance crews and have equipment and tools readily available for dimantling the door.	High	
Other:	Description:						
				Total Estimated Cost			**$16,100.00**

Engineer's Seal Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty structural engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	09/03/2018

Mechanical and Pumbing Equipment Seismic Hazards — SPIR PHASE

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Ducts, diffusers, louvers	damage due to relative displacements, falling due to joint failure, stairwell ducts part of fire suppression systems	√		Truck Bay, Hallway and Storage Room	Install bracing (rigid or slack cable sway braces) to limit movement of the equipment. Add rod stiffeners to vertical hanger rods to prevent bucking resulting from compressive loads induced by the diagonal restraint components.	High	
Elevators (counterweights, drives and equipment	Dislodged counterweights, falling of drives and panels				Use resilient, fail-safe isolation grommets to anchor the guide rails to the structure. Anchor equipment to a structural floor, wall, or ceiling. Anchorage of drive with "overhung" systems should be based on total weight of drive, car, and counterweight. Anchorage of pulley beam with "side-traction" systems should be based on total weight of pulley, beam , car, and counterweight. Do not use slotted-equipment anchor points or friction-based hold downs. Use only anchors warranted by the manufacturer for seismic applications. Provide flexible connections for conduits/cables to accommodate displacements.		
Suspended Equipment (HVAC, fans)	Swinging and Falling	√		Truck Bay, Storage &Training Room	Install bracing (rigid or slack cable sway braces) to limit movement of the equipment. Add rod stiffeners to vertical hanger rods to prevent buckling resulting from compressive loads induced by the diagonal restraint components.	High	
Equipment on vibration isolators	adequate connections to prevents equipment from falling of isolators				Ensure that all components and conenctions in the "Critical load path" are capable of withstanding calculated and translated seismic forces. Replace existing isolators with thos that are seismically designed and tested or aument with a minimum of four seismically diesing and tested seismic snubbers. Use only anchors warranted ny the manufacturer for seismic applications.		
Floor-mounted, non-isolated equipment	displacement, breakage of connections, overturning, damage to adjacent equipment, explosion or rupture high pressure or high temperature vessels	√		Truck Bay, Storage	Anchor equimpent to a structural floor, wall, or ceiling using manufacturer designated and tested anchors. Equipement anchor points should not be slotted. Holes in equipment anchor points should not exceed 6 mm larger than the diameter of the anchors used.	High	

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.
(2) All these shall have seismic restraint in public spaces and in areas of egress

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	09/03/2018

Mechanical and Pumbing Equipment Seismic Hazards — SPIR PHASE

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
					Use only anchors that the manufacturer warrants to be used for seismic applications. Pay attention to heavy components located on the third floor or above, and on rooftops.		
Piping, (water, waste water, fire suppression, gas)(2)	Rupture, inoperation or emergency systems	√		Truck Bay, Stairs and Storage	Provide lateral and longitudinal sway braces (rigid or cable) with rod stiffeners acting as compression struts. Careful consideration of piping running across seis mic joints. Install flexible piping and/or connections t o accommodate relative movements. Test high-pressure piping. Provide vibration dampers for flexible piping system s, when appropriate. Use only anchors that the manufacturer warrants should be used for seismic applications at brace or cable connections to concrete structural component s. Install automatic gas shut-off valves.	High	
Other:	Description:						
				Total Estimated Cost			**$ 12,000.00**

Engineers Seal Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.
(2) All these shall have seismic restraint in public spaces and in areas of egress

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Electrical Equipment Seismic Hazards

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	SPIR PHASE Proposed Mitigation	Priority	Estimated Cost
Lighting fixtures, emergency lighting	Loss of vertical support, falling, swinging	√		Truck Bays, Storage & Office	Install cable or rigid bracing, independent of theceiling syst em, connecting the fixture to the structure above. Use only anchors that the manufacturer warrants should b e used for seismic applications at brace or cable connectio ns to concrete structural components. Install lens clips to restrain the fixture lens. Install safety hangers, independent of the ceilingssystem, connecting the fixture to the structure above. Locate fixtures in such a way that the light can swing 45° without impacting adjacent fixtures or structure; otherwise, provide a lateral restraint mechanism.	High	
Electrical bus ducts, cable trays	Failure due to relative displacements, damage to support framing				For attachments to steel beams, use beam clamps, and fit clamps to restraining device.		
Electrical Racks	Overturning, falling of rack contents	√		Strorage/Electrical Room	Anchor or tether the unit to a structural component. Install equipment on seismic isolation platform, providing flexible wiring connections to accommodate anticipated movements.	High	
Electrical generators, motors and transformers	Broken and damaged connections due to relative displacement, overturning of tall units	√		Storage/Electrical Room	Anchor equipment to a structural floor, wall, or ceiling. Provide flexible connections for conduits/cables to equipment to accommodate displacements. Use only anchors that the manufacturer warrants should be used for seismic applications. Use seismic isolation platforms under critical/highly fragile components. Emergency generators and power transformers are generally considered critical to building function. The restraint of emergency generators	High	
Rooftop tele-communication equipment	Falling, failure, sliding of large parabolic antennas, breakage of cables				Inspect guy wires to make sure they are in good condition, and replace whenever necessary. Check the capacity of the anchor connections. Make sure the connections are located in well-Check the capacity of the base plate connection. Install high-friction mat at the base of the antenna to increase resistance to sliding. Install guying system with adequate anchor connections to the roof. Provide adequate slack to all communication cables at interfaces.		
Other:	Description:						

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Electrical Equipment Seismic Hazards

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required (SPIR PHASE)	Proposed Mitigation	Priority	Estimated Cost
				Total Estimated Cost			$ 14,000.00

Engineers Seal Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specially engineer specific details.

Seismic Mitigation of OFCs

District	Village of Horrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Building Contents Seismic Hazards

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	SPIR PHASE Proposed Mitigation	Priority	Estimated Cost -
Shelving, bookcases, storage racks	Overturning, sliding, falling books and materials	√		Truck Bays, Storage & Office	Anchor the shelving and bookcase to a structural wall, floor , or ceiling to prevent sliding and overturning. Attach parallel adjacent shelving units and bookcases together at the top in their weak direction to create a system less prone to overturning and to reduce the risk of domino effect. Add metal cross bracing to the back of bookcase to improve its resistance to racking. Anchor rack to structure to provide lateral support. Locate heavy objects on lower levels of rack. Provide restraint to the stored materials to prevent falling hazards. Reinforce racks to resist lateral loads. Provide restraint to books and materials to prevent falling hazards. The seismic demand rotation and deflection of steel racks are higher than for steel frame structures. Therefore the ductility values mentioned in NBCC cannot be used for the steel racks. This is one of the areas need further discussion in both CSA S16 and the NBCC.	High	
Room decorations	Large potted plants, heavy sculptures, hanging art pieces etc. falling, sliding, overturning	√		Hose Tower & Training Room	Restrain decorations. Relocate decorations to less hazardous areas or place on the floor.	Medium	
Wheel-mounted equipment	Impact with other equipment, blocking egress	√		Truck Bay	Anchor or tether the unit to a structural Avoid placing unrestrained heavy equipment in hallways or near doorways	High	
Kitchen equipment	Failure can lead to flooding, gas leaks; spillage can cause severe injuries	√		Kitchen	Anchor the appliance to a structural wall, floor, or ceiling to prevent sliding and overturning. Restrain oven or coffee maker to the counter or table. Relocate oven or coffee maker to a lower shelf. Gas connections should be flexible.	High	
Desk- mounted equipment	Property damage and potential blocking of egress	√		Truck Bay, Storage, Office and Training Room	Anchor or tether the equipment; self-adhesive pads can provide sufficient restraint for lighter components; heavier components can require fixing to the desk with brackets and screws. Equipment such as monitors should be secured by proven tie-down systems Designed restraint details should be effective as restraints and at the same time not compromise the required flexibility of movement.	High	
Moveable partitions	Misalignment causing the wall to be inoperable, dislodge from track				Anchor equipment and partitions to a structural floor, wall, or ceiling.		
Hazardous materials	spills, ruptures, flamable or toxic substances	√		Truck Bay	Place toxic and hazardous substances in sealed containers. Restrain containers and gas cylinders.	High	

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Seismic Mitigation of OFCs

District	Village of Horrison Hot Springs	Block		Block 1			
Building	Fire Hall	Date		09/03/2018			
Building Contents Seismic Hazards				SPIR PHASE			
Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Other:	Description:						
							$ 13,200.00
				Engineers Seal	Date		

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Operational and Functional Components (OFCs)							
No	Photo	Qty	OFC Restraint	Room/Area	Floor	Name	Category
1		2	No Restraint	Truck Bay	Ground	Tube Heaters	Mechanical Components
2		1	No Restraint	Truck Bay	Ground	Hanging Tube Lights	Electrical Components
3		1	Restraint	Truck Bay	Ground	Ceiling Fan	Electrical Components
4		1	Partial Restraint	Truck Bay	Ground	High Pressure Air Control Unit	Mechanical Components
5		1	Restraint	Truck Bay	Ground	Air Cylinder	Building Contents
6		1	No Restraint	Truck Bay	Ground	Table Mounted Compressor and Controls	Building Contents
7		1	uestionable Restrai	Truck Bay	Ground	Workshop bench with drill equipment	Building Contents

8		1	No Restraint	Truck Bay	Ground	Wheel Mounted Storage Compartment	Building Contents
9		1	No Restraint	Truck Bay	Ground	Hazardous Material Cabinet	Building Contents
10		1	No Restraint	Truck Bay	Ground	Stereo Set on top of Cabinet	Building Contents
11		1	No Restraint/Shelves for Storage	Truck Bay	Ground	Portable air compressor and Vacuum cleaner	Building Contents
12		1	No Restraint/Proper Storage	Truck Bay	Ground	Barbecue	Building Contents
13		1	No Restraint	Truck Bay	Ground	Flammables Cabinet	Building Contents
14		1	No Proper Storage	Truck Bay	Ground	Portable compressor	Building Contents
15		1	Partial Restraint	Truck Bay	Ground	Dishwasher	Building Contents

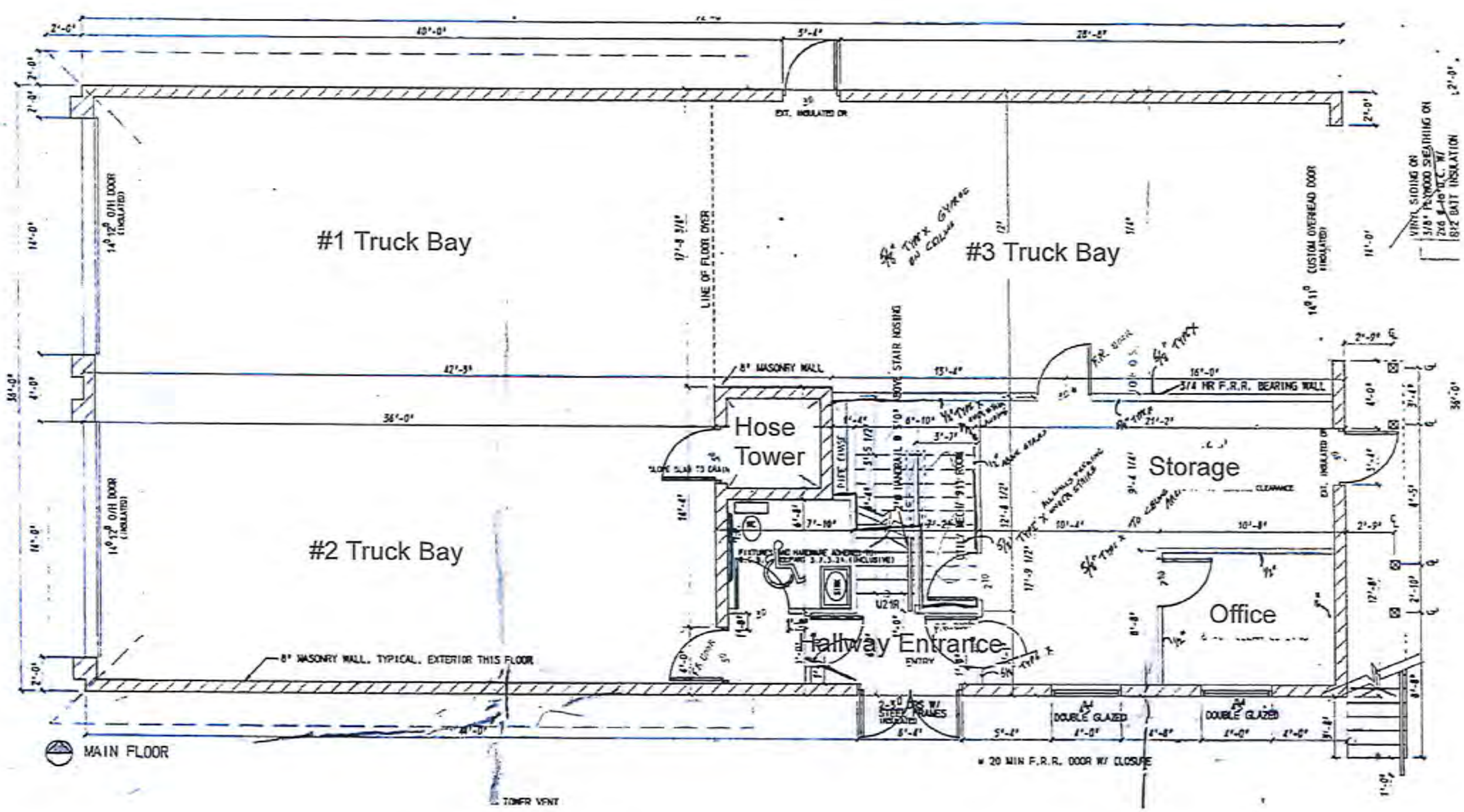
16		1	No Restraint	Truck Bay	Ground	Printer	Building Contents
17		1	No Restraint	Hose Tower	Ground	Hoses Shelves	Building Contents
18		1	No Restraint	Hallway Entry, Storage, Stairs & Office	Ground	Mechanical Ducts	Mechanical Components
19		2	Partial Restraint or Questionable Restraint	Truck Bay, Storage	Gound	Fire Extinguisher Wall Mounted	Building Contents
20		1	Partial Retraint or Questionable Restraint	Stairwell, etc.	Ground to Upper Floor	Pipings	Mechanical Components
21		1	No Restraint or Questionable Restraint	Truck Bay	Ground	Ladder - supported by Wall	Architectural Components
22		1	No Restraint	Hallway Entry, Storage & Office	Ground	Suspended Ceilings	Architectural Components
23		1	No Restraint	Office	Ground	Lighting Fixtures	Electrical Components

24		1	No Restraint	Storage	Ground	Water Heater Tank	Mechanical Components
25		1	No Restraint	Storage/Electrical Room	Ground	Electrical Panels - Wall Mounted	Electrical Components
26		1	No Restraint	Storage/Electrical Room	Ground	Electrical Motor	Electrical Components
27		1	No Restraint	Storage	Ground	Boiler Unit	Mechanical Components
28		1	No Restraint	Storage	Ground	Wood Shelves	Building Contents
29		1	No Restraint	Storage	Ground	Steel Shelves	Building Contents
30		1	No Restraint	Office - Chief Room	Ground	Filing Cabinet-Free Standing	Building Contents

31		2	No Restraint	Office	Ground	Desks	Building Contents
32		1	No Restraint	Training Room	2nd Floor	Desktop with Computer	Building Contents
33		2	No Restraint	Training Room	2md Floor	Storage Cabinets	Building Contents
34		1	No Restraint	Training Room	2nd Floor	Glass Plaque & Trophy holder	Architectural Components
35		1	No Restraint	Training Room	2nd Floor	Freestanding Heavy TV with cabinets	Building Contents
36		1	No Restraint	Training Room	2nd Floor	Bar style - Corner Storage Table Free standing	Building Contents
37		1	No Restraint/Proper Storage	Training Room	2nd Floor	Movable presentation desk	Building Contents

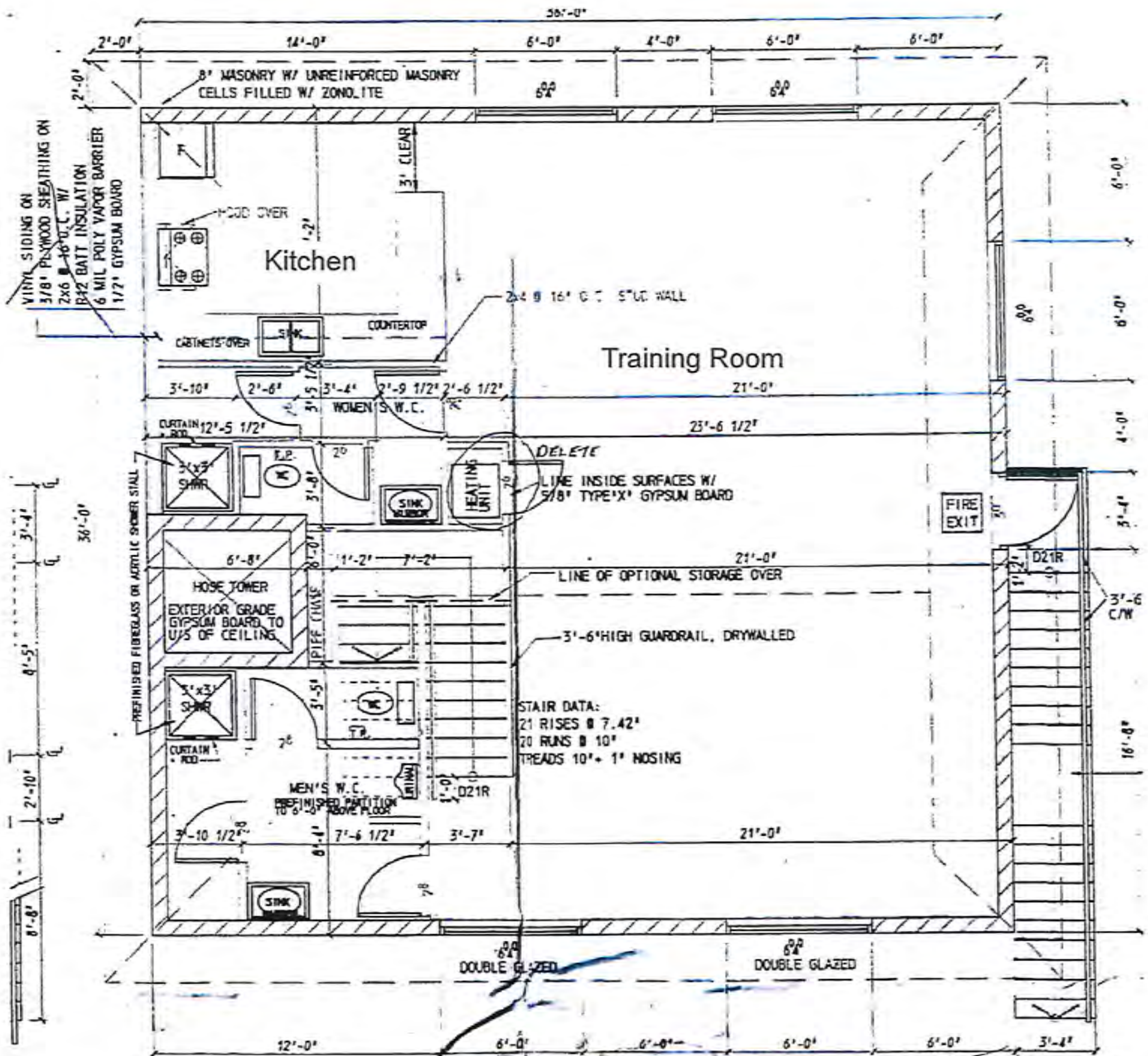
38		1	No Restraint	Kitchen	2nd Floor	Freestanding Fridge	Building Contents
39		1	No Restraint	Kitchen	2nd Floor	Kitchen Tabletop equipment	Building Contents
40		1	No Restraint	Stairs	Ground to 2nd Floor	Decorations	Architectural Components
41		1	No Restraint	Stairs	Ground to 2nd Floor	Emergency Lights	Electrical Components
42		1	Partial Restraint or Questionable Restraint	Training Room	2nd Floor	Ceiling Projector	Building Contents
43		Approx. 1	Jammed	Buildings	Ground & Second Floor	Doors	Architectural Components

Harrison Hot Springs - Fire Hall Building



Ground Floor Plan

Harrison Hot Springs - Fire Hall Building



Second Floor Plan

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	9/03/18

Architectural Seismic Hazards		SPIR Phase					
Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Unbraced Suspended ceilings	Dropped acoustical tiles, perimeter separation of runners and cross-runners, swinging damage,	√		Hallway, Storage Area and Office at Ground Level	Provide fou-way diagonal wire bracing with a compression strut between the ceiling and supporting floor. For lay-in ceilings, stiffen splices and connections of T-bar sections with new metal clips and self-tapping screws. Discontinue ceiling across any seismic joint. This is not a problem with light weight panels (less than 10 kg/m2) Provide independent restraints to lighting fixtures Provide perimeter wires and strut stabilizers	High	
Plaster ceilings	Collapse, local spalling				Replace ceiling in egress routes and large assembly areas. Replace ceiling tiles housing fire suppression sprinkler's heads.		
Cladding	Falling, damaged panels and connections,				Replace or refasten veneer. Provide isolation to accommodate anticipated drift. Install additional anchorage to a structural component. Conduct maintenance to prevent moisture penetration from weather that could destroy the anchors.		
Ornamentation	Falling	√			Anchor the ornamentation to a structural wall, floor, or ceiling to prevent sliding and overturning.	Medium	
Plaster and gypsum board partition walls	Cracking, out of plane failure due to inadequate top support				Brace top of partitions to structural elements. Cross walls can act as lateral supports.		
Demountable partitions	Collapse				Provide isolation to accommodate anticipated drift. Use mechanical connetions that allow sliding with a slotted or oversize hole.		
Raised access floors	Collapse, separation between modules				Secure flooring pedestals to the structural floor with anchors. Add diagonal bracing to the pedestals.		
Recessed light fixtures & HVAC diffusers	Dropping out of suspended ceilings	√		Hallway Entance, Storage and Offices	Provide independent restraints to lighting fixtures & HVAC diffusers.	High	
Glazing, skylights, Glass elevator enclosures	Breakage, out of plane failure, falling glass, shattering glass				Provide isolation to accommodate anticipated drift. Large walls might need to be subdivided by additional structural supports into smaller areas to meet the force and drift criteria. Use laminated glazing and/or tempered glazing. Tempered glazing, when broken forms small cubes, which tend to act as ball bearings on hard surfaces. This produces a falling hazard on egress routes.		

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty structural engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	9/03/18

Architectural Seismic Hazards — SPIR Phase

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
					Apply adhesive security film to windows, preferably on the inside surface, to reduce UV degradation and hazards from broken glass (recommended when upgrading existing facilities where replacement of existing glazing is expensive and impractical).		
Doors	Jamming	√		Main entrance to the building and rooms	Provide isolation to door frames and guide rails. Provide training to fire service and ambulance crews and have equipment and tools readily available for dimantling the door.	High	
Other:	Description:						
				Total Estimated Cost			$ -

Engineer's Seal   Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty structural engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	09/03/2018

Mechanical and Pumbing Equipment Seismic Hazards — SPIR PHASE

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Ducts, diffusers, louvers	damage due to relative displacements, falling due to joint failure, stairwell ducts part of fire suppression systems	√		Truck Bay, Hallway and Storage Room	Install bracing (rigid or slack cable sway braces) to limit movement of the equipment. Add rod stiffeners to vertical hanger rods to prevent bucking resulting from compressive loads induced by the diagonal restraint components.	High	
Elevators (counterweights, drives and equipment	Dislodged counterweights, falling of drives and panels				Use resilient, fail-safe isolation grommets to anchor the guide rails to the structure. Anchor equipment to a structural floor, wall, or ceiling. Anchorage of drive with "overhung" systems should be based on total weight of drive, car, and counterweight. Anchorage of pulley beam with "side-traction" systems should be based on total weight of pulley, beam , car, and counterweight. Do not use slotted-equipment anchor points or friction-based hold downs. Use only anchors warranted by the manufacturer for seismic applications. Provide flexible connections for conduits/cables to accommodate displacements.		
Suspended Equipment (HVAC, fans)	Swinging and Falling	√		Truck Bay, Storage &Training Room	Install bracing (rigid or slack cable sway braces) to limit movement of the equipment. Add rod stiffeners to vertical hanger rods to prevent buckling resulting from compressive loads induced by the diagonal restraint components.	High	
Equipment on vibration isolators	adequate connections to prevents equipment from falling of isolators				Ensure that all components and conenctions in the "Critical load path" are capable of withstanding calculated and translated seismic forces. Replace existing isolators with thos that are seismically designed and tested or aument with a minimum of four seismically diesing and tested seismic snubbers. Use only anchors warranted ny the manufacturer for seismic applications.		
Floor-mounted, non-isolated equipment	displacement, breakage of connections, overturning, damage to adjacent equipment, explosion or rupture high pressure or high temperature vessels	√		Truck Bay, Storage	Anchor equimpent to a structural floor, wall, or ceiling using manufacturer designated and tested anchors. Equipement anchor points should not be slotted. Holes in equipment anchor points should not exceed 6 mm larger than the diameter of the anchors used.	High	

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.
(2) All these shall have seismic restraint in public spaces and in areas of egress

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block:	Block 1
Building	Fire Hall	Date:	09/03/2018

Mechanical and Pumbing Equipment Seismic Hazards — SPIR PHASE

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
					Use only anchors that the manufacturer warrants to be used for seismic applications. Pay attention to heavy components located on the third floor or above, and on rooftops.		
Piping, (water, waste water, fire suppression, gas)(2)	Rupture, inoperation or emergency systems	√		Truck Bay, Stairs and Storage	Provide lateral and longitudinal sway braces (rigid or cable) with rod stiffeners acting as compression struts. Careful consideration of piping running across seis mic joints. Install flexible piping and/or connections t o accommodate relative movements. Test high-pressure piping. Provide vibration dampers for flexible piping system s, when appropriate. Use only anchors that the manufacturer warrants should be used for seismic applications at brace or cable connections to concrete structural component s. Install automatic gas shut-off valves.	High	
Other:	Description:						
				Total Estimated Cost			$ -

Engineers Seal Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.
(2) All these shall have seismic restraint in public spaces and in areas of egress

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Electrical Equipment Seismic Hazards

Component	Principal Concerns	Deficiency Yes	Deficiency No	SPIR PHASE Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Lighting fixtures, emergency lighting	Loss of vertical support, falling, swinging	√		Truck Bays, Storage & Office	Install cable or rigid bracing, independent of theceiling syst em, connecting the fixture to the structure above. Use only anchors that the manufacturer warrants should b e used for seismic applications at brace or cable connectio ns to concrete structural components. Install lens clips to restrain the fixture lens. Install safety hangers, independent of the ceilingssystem, connecting the fixture to the structure above. Locate fixtures in such a way that the light can swing 45° without impacting adjacent fixtures or structure; otherwise, provide a lateral restraint mechanism.	High	
Electrical bus ducts, cable trays	Failure due to relative displacements, damage to support framing				For attachments to steel beams, use beam clamps, and fit clamps to restraining device.		
Electrical Racks	Overturning, falling of rack contents	√		Strorage/Electrical Room	Anchor or tether the unit to a structural component. Install equipment on seismic isolation platform, providing flexible wiring connections to accommodate anticipated movements.	High	
Electrical generators, motors and transformers	Broken and damaged connections due to relative displacement, overturning of tall units	√		Storage/Electrical Room	Anchor equipment to a structural floor, wall, or ceiling. Provide flexible connections for conduits/cables to equipment to accommodate displacements. Use only anchors that the manufacturer warrants should be used for seismic applications. Use seismic isolation platforms under critical/highly fragile components. Emergency generators and power transformers are generally considered critical to building function. The restraint of emergency generators	High	
Rooftop tele-communication equipment	Falling, failure, sliding of large parabolic antennas, breakage of cables				Inspect guy wires to make sure they are in good condition, and replace whenever necessary. Check the capacity of the anchor connections. Make sure the connections are located in well- Check the capacity of the base plate connection. Install high-friction mat at the base of the antenna to increase resistance to sliding. Install guying system with adequate anchor connections to the roof. Provide adequate slack to all communication cables at interfaces.		
Other:	Description:						

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Seismic Mitigation of OFCs

District	Village of Harrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Electrical Equipment Seismic Hazards

				SPIR PHASE			
Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
				Total Estimated Cost			$ -

Engineers Seal Date

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Seismic Mitigation of OFCs

District	Village of Horrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Building Contents Seismic Hazards — SPIR PHASE

Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Shelving, bookcases, storage racks	Overturning, sliding, falling books and materials	√		Truck Bays, Storage & Office	Anchor the shelving and bookcase to a structural wall, floor , or ceiling to prevent sliding and overturning. Attach parallel adjacent shelving units and bookcases together at the top in their weak direction to create a system less prone to overturning and to reduce the risk of domino effect. Add metal cross bracing to the back of bookcase to improve its resistance to racking. Anchor rack to structure to provide lateral support. Locate heavy objects on lower levels of rack. Provide restraint to the stored materials to prevent falling hazards. Reinforce racks to resist lateral loads. Provide restraint to books and materials to prevent falling hazards. The seismic demand rotation and deflection of steel racks are higher than for steel frame structures. Therefore the ductility values mentioned in NBCC cannot be used for the steel racks. This is one of the areas need further discussion in both CSA S16 and the NBCC.	High	
Room decorations	Large potted plants, heavy sculptures, hanging art pieces etc. falling, sliding, overturning	√		Hose Tower & Training Room	Restrain decorations. Relocate decorations to less hazardous areas or place on the floor.	Medium	
Wheel-mounted equipment	Impact with other equipment, blocking egress	√		Truck Bay	Anchor or tether the unit to a structural Avoid placing unrestrained heavy equipment in hallways or near doorways	High	
Kitchen equipment	Failure can lead to flooding, gas leaks; spillage can cause severe injuries	√		Kitchen	Anchor the appliance to a structural wall, floor, or ceiling to prevent sliding and overturning. Restrain oven or coffee maker to the counter or table. Relocate oven or coffee maker to a lower shelf. Gas connections should be flexible.	High	
Desk- mounted equipment	Property damage and potential blocking of egress	√		Truck Bay, Storage, Office and Training Room	Anchor or tether the equipment; self-adhesive pads can provide sufficient restraint for lighter components; heavier components can require fixing to the desk with brackets and screws. Equipment such as monitors should be secured by proven tie-down systems Designed restraint details should be effective as restraints and at the same time not compromise the required flexibility of movement.	High	
Moveable partitions	Misalignment causing the wall to be inoperable, dislodge from track				Anchor equipment and partitions to a structural floor, wall, or ceiling.		
Hazardous materials	spills, ruptures, flamable or toxic substances	√		Truck Bay	Place toxic and hazardous substances in sealed containers. Restrain containers and gas cylinders.	High	

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specially engineer specific details.

Seismic Mitigation of OFCs

District	Village of Horrison Hot Springs	Block	Block 1
Building	Fire Hall	Date	09/03/2018

Building Contents Seismic Hazards

				SPIR PHASE			
Component	Principal Concerns	Deficiency Yes	Deficiency No	Deficient Area(s) and Further Comments as Required	Proposed Mitigation	Priority	Estimated Cost
Other:	Description:						
							$ -
				Engineers Seal Date			

(1) Mitigation may refer to tables in CSA-S832-06 (R2011) or to specialty engineer specific details.

Operational and Functional Components (OFCs)							
No	Photo	Qty	OFC Restraint	Room/Area	Floor	Name	Category
1		2	No Restraint	Truck Bay	Ground	Tube Heaters	Mechanical Components
2		1	No Restraint	Truck Bay	Ground	Hanging Tube Lights	Electrical Components
3		1	Restraint	Truck Bay	Ground	Ceiling Fan	Electrical Components
4		1	Partial Restraint	Truck Bay	Ground	High Pressure Air Control Unit	Mechanical Components
5		1	Restraint	Truck Bay	Ground	Air Cylinder	Building Contents
6		1	No Restraint	Truck Bay	Ground	Table Mounted Compressor and Controls	Building Contents
7		1	uestionable Restrai	Truck Bay	Ground	Workshop bench with drill equipment	Building Contents

8		1	No Restraint	Truck Bay	Ground	Wheel Mounted Storage Compartment	Building Contents
9		1	No Restraint	Truck Bay	Ground	Hazardous Material Cabinet	Building Contents
10		1	No Restraint	Truck Bay	Ground	Stereo Set on top of Cabinet	Building Contents
11		1	No Restraint/Shelves for Storage	Truck Bay	Ground	Portable air compressor and Vacuum cleaner	Building Contents
12		1	No Restraint/Proper Storage	Truck Bay	Ground	Barbecue	Building Contents
13		1	No Restraint	Truck Bay	Ground	Flammables Cabinet	Building Contents
14		1	No Proper Storage	Truck Bay	Ground	Portable compressor	Building Contents
15		1	Partial Restraint	Truck Bay	Ground	Dishwasher	Building Contents

16		1	No Restraint	Truck Bay	Ground	Printer	Building Contents
17		1	No Restraint	Hose Tower	Ground	Hoses Shelves	Building Contents
18		1	No Restraint	Hallway Entry, Storage, Stairs & Office	Ground	Mechanical Ducts	Mechanical Components
19		2	Partial Restraint or Questionable Restraint	Truck Bay, Storage	Gound	Fire Extinguisher - Wall Mounted	Building Contents
20		1	Partial Retraint or Questionable Restraint	Stairwell, etc.	Ground to Upper Floor	Pipings	Mechanical Components
21		1	No Restraint or Questionable Restraint	Truck Bay	Ground	Ladder - supported by Wall	Architectural Components
22		1	No Restraint	Hallway Entry, Storage & Office	Ground	Suspended Ceilings	Architectural Components
23		1	No Restraint	Office	Ground	Lighting Fixtures	Electrical Components

24		1	No Restraint	Storage	Ground	Water Heater Tank	Mechanical Components
25		1	No Restraint	Storage/Electrical Room	Ground	Electrical Panels - Wall Mounted	Electrical Components
26		1	No Restraint	Storage/Electrical Room	Ground	Electrical Motor	Electrical Components
27		1	No Restraint	Storage	Ground	Boiler Unit	Mechanical Components
28		1	No Restraint	Storage	Ground	Wood Shelves	Building Contents
29		1	No Restraint	Storage	Ground	Steel Shelves	Building Contents
30		1	No Restraint	Office - Chief Room	Ground	Filing Cabinet-Free Standing	Building Contents

31		2	No Restraint	Office	Ground	Desks	Building Contents
32		1	No Restraint	Training Room	2nd Floor	Desktop with Computer	Building Contents
33		2	No Restraint	Training Room	2md Floor	Storage Cabinets	Building Contents
34		1	No Restraint	Training Room	2nd Floor	Glass Plaque & Trophy holder	Architectural Components
35		1	No Restraint	Training Room	2nd Floor	Freestanding Heavy TV with cabinets	Building Contents
36		1	No Restraint	Training Room	2nd Floor	Bar style - Corner Storage Table Free standing	Building Contents
37		1	No Restraint/Proper Storage	Training Room	2nd Floor	Movable presentation desk	Building Contents

38		1	No Restraint	Kitchen	2nd Floor	Freestanding Fridge	Building Contents
39		1	No Restraint	Kitchen	2nd Floor	Kitchen Tabletop equipment	Building Contents
40		1	No Restraint	Stairs	Ground to 2nd Floor	Decorations	Architectural Components
41		1	No Restraint	Stairs	Ground to 2nd Floor	Emergency Lights	Electrical Components
42		1	Partial Restraint or Questionable Restraint	Training Room	2nd Floor	Ceiling Projector	Building Contents
43		Approx. 1	Jammed	Buildings	Ground & Second Floor	Doors	Architectural Components

12(b)

VILLAGE OF HARRISON HOT SPRINGS

HARRISON HOT SPRINGS
Naturally Refreshed

REPORT TO COUNCIL

TO:	**Mayor and Council**	**DATE: February 4, 2019**
FROM:	**Ken Cossey, MCIP, RPP**	**FILE: 3090-20-DVP11/18 (102 Rockwell Drive)**

SUBJECT: To start the Development Variance Permit process

ISSUE:

Seeking approval to start the Development Variance Permit process.

BACKGROUND:

Zoning and Parcel Size

The uplands site is approximately 7,500 M^2 (0.75 Ha) in size. The parcel is zoned C-4 and is bounded on the west by Harrison Lake and on the east by Rockwell Drive. The waterside area is approximately 43,459 M^2 (4.34 Ha) in size.

Current Uses

On the waterside is an existing marina and on the uplands side is a gravel parking lot that is also used as a temporary boat storage site.

Proposed Uses

The proposed development; will consist of a new 114-slip marina on the waterside and on the uplands side a 60 unit apartment building, built over two phases, complete with a parkade. There is a community amenity contribution covenant registered on title, that addresses an issue dealing with a past rezoning application.

Variances Requested

The applicant wishes to vary the following C-4 Land Use Regulations as outlined in Zoning Bylaw 1115, 2017:

Front Set back requirements	reduce from 7.5 M down to 3.0 M
Rear Set back requirements	reduce from 6 M down to 2.5 M
Sideline setback requirements	reduce from 3.6 M to 3 M
Building Height requirements	increase from 12 M to 25 M

As with all DVP applications, staff will be reviewing the above referenced variance requests from a health and safety perspective. In keeping with the notification requirements, defined as adjacent lots within 30 M from the development site, they will receive written notification of the various variance requests. Comments received back will be part of the final report submitted to Council.

RECOMMENDATION:

1/. That staff be authorized to start work on application 3090-20-DVP11/18 for land legally described as: DL 5031, Group 1, New Westminster District.

Respectfully submitted;

REVIEWED BY and CONCURRENCE with the RECOMMENDATIONS:

Ken Cossey
Ken Cossey, MCIP, RPP,
Planning Consultant

Madeline McDonald
Madeline McDonald, CAO

Attachments (1) Harrison Bylaw Variance analysis submitted by the applicant

Harrison Bylaw Variance analysis

jan 18 2019

			Current C-4 Zoning	proposed	variance
Permitted Commercial Uses	permitted	Marinas/Float Plane dock	yes	yes	no
	accessory	apartment	yes	yes	no
		accessory Buildings or structures	yes	yes	no
Commercial Development Regulations		minimum lot size for subdivision purposes (sqm)	464	N/A	no
		subdivision for a relative (Ha)	1	N/A	no
		Floor Area Ratio	1.5	1.5	no
		minimum lot width(m)	20	N/A	no
		maximum density (units/ha)	N/A	N/A	no
		Maximum Lot coverage(%)	60	60	no
		Minimum Front Setback(m)	7.5	3	yes
		Minimum rear Setback(m)	6	2.5	yes
		Minimum Interior side setback(m)	3.6	N/A	no
		Minimum Exterior side setback(m)	3.6	3	yes
		Off-Street Parking	As per bylaw requirements	As per bylaw requirements	no
		Off Street Loading	As per bylaw requirements	As per bylaw requirements	no
		Maximum Height (m)	12	25	yes

12(c)

VILLAGE OF HARRISON HOT SPRINGS

HARRISON HOT SPRINGS
Naturally Refreshed

REPORT TO COUNCIL

TO:	**Mayor and Council**	**DATE: February 4, 2019**
FROM:	**Ken Cossey, MCIP, RPP**	**FILE: 3090-20-DVP01/19 (875 Hot Springs Road)**

SUBJECT: To start the Development Variance Permit process

ISSUE:

Seeking approval to start the Development Variance Permit process.

BACKGROUND:

Zoning and Parcel Size

The site is approximately 919 M^2 (0.09 Ha) in size. The parcel is zoned R-2 and is bounded on the west by Hot Springs Road and on the east by an existing subdivision that is accessible from Hope Place.

Current Uses

The site is currently developed as a detached dwelling unit. Associated with this dwelling unit are various outbuildings, consisting of two car shelters and two sheds.

Variances Requested

The applicant wishes to vary the following R-2 Land Use Regulations as outlined in Zoning Bylaw 1115, 2017:

Sideline setback requirements reduce from 1.5 M to 1.19 M

As with all DVP applications, staff will be reviewing the above referenced variance request from a health and safety perspective. In keeping with the notification requirements, defined as adjacent lots within 30 M from the development site, they will receive written notification of the variance request. Comments received back will be part of the final report submitted to Council.

RECOMMENDATION:

1/. That staff be authorized to start work on application 3090-20-DVP01/19 for land legally described as:

Lot G, Sec 12, Twp 4, Rg 29, W6M, New Westminster District Plan 16245.

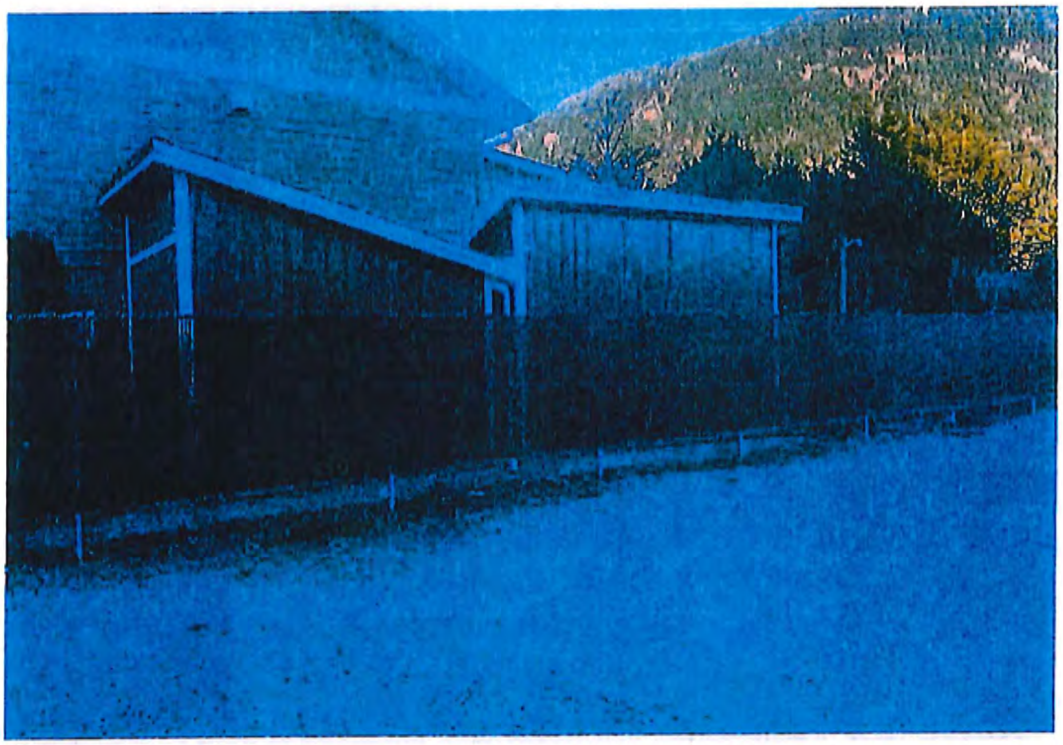
Respectfully submitted;

REVIEWED BY and CONCURRENCE with the RECOMMENDATIONS:

Ken Cossey
Ken Cossey, MCIP, RPP,
Planning Consultant

Madeline McDonald
Madeline McDonald, CAO

Attachments (1) Shed photos



12(d)

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS

REPORT TO COUNCIL

TO:	Mayor and Council	DATE: February 15, 2019
FROM:	Tracey Jones Financial Officer	FILE: 3900-01 / 4300-01
SUBJECT:	Inter-Municipal Business Licence Program	

ISSUE:

Consideration of participation in the Fraser Valley Inter-Municipal Business Licence Program

BACKGROUND:

An Inter-Municipal Business Licence (IMBL) allows eligible businesses to operate across participating communities without having to buy a separate business licence in each community. These licenses can be purchased by a trades contractor or other professional (related to the construction industry) or a contractor who performs maintenance and/or repair of land and buildings from other than their Premises.

The Fraser Valley already has an IMBL program with the following participants:

- Abbotsford
- Chilliwack
- Delta
- Hope
- Langley City
- Langley Township
- Kent
- Maple Ridge
- Mission
- Pitt Meadows
- Surrey

Ninety percent of the revenue received from the purchase of the IMBL is retained by the home jurisdiction that the business exists in, and ten percent of the revenue is shared with the other jurisdictions that participate in the program. In 2018 the Fraser Valley IMBL program sold $989,500 in licences and participants shared in almost $99,000 of IMBL revenue for licences not purchased in their jurisdiction.

The Village has approximately 51 non-resident business licence holders and it is estimated that 27 of these businesses may be eligible to participate in the IMBL program. In addition, the Village has approximately 118 resident business licence holders and it is estimated that 10 may be eligible to participate in the IMBL program.

Based on the 2018 data, it is estimated that the Village might receive up to $8,900 in revenue if it was a participant in the IMBL program and that this would offset any revenue forgone from the non-resident contractors who would no longer have to purchase a Village of Harrison business licence.

RECOMMENDATION:

THAT Council authorize staff to pursue registering the Village of Harrison Hot Springs as a participant in the Fraser Valley Inter-Municipal Business Licence program starting in the year 2020.

Respectfully submitted;

Tracey Jones
Tracey Jones
Financial Officer

Reviewed:

Madeline McDonald
Madeline McDonald
Chief Administrative Officer

13(a)

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS

REPORT TO COUNCIL

TO: **Mayor and Council** **DATE: February 12, 2019**

FROM: **Tracey Jones**
Financial Officer **FILE: 1700-02**

SUBJECT: 2019-2023 Financial Plan Bylaw No. 1134, 2019

ISSUE: To present the 2019-2023 Financial Plan Bylaw No. 1134, 2019 for readings

BACKGROUND:

Pursuant to s. 165(1) of the *Community Charter*, Council must adopt annually, a five year Financial Plan that sets out the objectives and policies of the municipality.

Pursuant to Section 166 of the *Community Charter*, council must undertake a process of public consultation regarding the proposed financial plan before its adoption.

Staff has made one amendment to Schedule A as attached. Transfers from Reserves should have read $846,800 not $1,012,197 and transfer from Surplus should have read $173,042 not $7,645.

The 2019-2023 Financial Plan was made available for Public Consultation at an Open House held on February 15th, 2019 from 2pm to 5pm and is presented at the Regular Meeting of Council on February 19th, 2019 for additional opportunity for the public to provide comment.

Accordingly, the 2019-2023 Financial Plan is attached for Council's consideration.

RECOMMENDATION:

THAT the 2019-2023 Financial Plan Bylaw No. 1134, 2019 be given second reading as amended;

FURTHER THAT the 2019-2023 Financial Plan Bylaw No. 1134, 2019 be given third reading.

Respectfully submitted; Reviewed:

Tracey Jones
Tracey Jones
Financial Officer

Madeline McDonald
Madeline McDonald
Chief Administrative Officer

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS
BYLAW NO. 1134, 2019

A Bylaw of the Village of Harrison Hot Springs to establish the 2019 – 2023 Financial Plan

WHEREAS the *Community Charter* requires the municipality to adopt a five-year financial plan annually;

AND WHEREAS public consultation regarding the financial plan was provided by way of an open meeting;

NOW THEREFORE the Council of the Village of Harrison Hot Springs, in open meeting, lawfully assembled, ENACTS AS FOLLOWS:

1. That Schedule "A" attached hereto and made part of this bylaw is hereby adopted and is the Village of Harrison Hot Springs Financial Plan for the years 2019 - 2023.
2. That Schedule "B" attached hereto and made part of this bylaw is hereby adopted and is the Village of Harrison Hot Springs Financial Plan Objectives and Policies Statement for the year 2019 – 2023.
3. This bylaw may be cited for all purposes as the "Village of Harrison Hot Springs Financial Plan Bylaw No. 1134, 2019"
4. Bylaw No. 1119, 2018 – 2022 Financial Plan is hereby repealed.

READ A FIRST TIME THIS 4th DAY OF FEBRUARY, 2019

AMENDED AND READ A SECOND TIME THIS DAY OF FEBRUARY, 2019

READ A THIRD TIME THIS DAY OF FEBRUARY, 2019

ADOPTED THIS DAY OF MARCH, 2019

Mayor

Corporate Officer

BYLAW NO. 1134, 2019
SCHEDULE "A"
2019-2023 Financial Plan

	2019	2020	2021	2022	2023
	BUDGET	BUDGET	BUDGET	BUDGET	BUDGET
REVENUES:					
PROPERTY TAXES - RESIDENTIAL	1,450,641	1,510,000	1,540,000	1,570,000	1,601,400
PROPERTY TAXES - BUSINESS	616,846	630,000	642,600	655,500	668,610
PROPERTY TAXES - RECREATION/NON-PROFIT	110,388	112,600	114,800	117,200	119,544
COLLECTIONS FOR OTHER GOVERNMENTS & AGENC	1,781,250	1,817,110	1,851,331	1,889,884	1,927,682
PENALTIES & INTEREST - TAXES	8,000	4,000	-	-	-
UTILITY CO. 1% REVENUE TAXES	36,951	37,262	37,262	37,597	38,348
PAYMENTS IN LIEU OF TAXES	4,350	4,350	4,350	4,437	4,526
TOTAL TAXES COLLECTED	4,008,426	4,115,322	4,190,343	4,274,618	4,360,110
REMITTANCES TO OTHER GOVERNMENTS & AGENCI	- 1,781,250	(1,817,110)	(1,851,331)	(1,889,884)	(1,927,682)
NET TAXES FOR MUNICIPAL PURPOSES	2,227,176	2,298,212	2,339,012	2,384,734	2,432,428
REVENUE FROM OWN SOURCES	1,902,560	1,946,700	1,959,700	1,986,970	2,026,109
GRANTS AND DONATIONS	3,001,745	539,000.00	539,000.00	539,028.00	549,810.60
DCC	896,529	-	-	-	-
CONTRIBUTED ASSETS	-	174,000	-	-	-
TOTAL REVENUE	8,028,010	$4,957,912	$4,837,712	$4,910,732	$5,008,348
EXPENSES:					
LEGISLATIVE	142,280	137,010	137,010	138,369	141,136
GENERAL GOVERNMENT	1,112,623	1,110,992	1,124,140	1,156,045	1,179,166
PROTECTIVE SERVICES	258,526	250,282	250,282	254,559	259,650
DEVELOPMENT PLANNING	362,200	122,200	122,200	122,344	124,791
TOURISM AND COMMUNITY IMPROVEMENT	285,211	254,697	256,808	259,184	264,368
ENGINEERING, TRANSPORTATION, STORM WATER	857,774	844,886	849,625	857,742	874,898
SOLID WASTE	199,145	201,946	210,948	197,785	201,741
PARKS, RECREATION & CULTURAL SERVICES	523,270	477,630	482,318	489,169	498,952
WASTEWATER UTILITY	800,360	809,000	822,000	835,882	852,600
WATER UTILITY	471,172	472,435	485,575	481,523	491,153
DEBT- INTEREST	26,450	20,700	15,700	16,014	16,335
TOTAL EXPENDITURES	5,039,011	4,701,778	4,756,606	4,808,616	4,904,789
SURPLUS (DEFICIT)	2,988,999	$256,134	$81,106	$102,116	$103,559
CAPITAL, DEBT, RESERVES, TRANSFERS &					
BORROWING					
CAPITAL EXPENDITURES	(4,024,274)	(785,500)	(254,500)	(219,000)	(111,180)
REPAYMENT ON DEBT	(221,355)	(163,100)	(53,100)	(54,162)	(55,245)
PROCEEDS OF DEBT	-	-	-	110,000	-
CONTRIBUTIONS TO RESERVES	(773,212)	(929,034)	(888,006)	(1,057,954)	(1,078,514)
TRANSFERS FROM RESERVES	846,800	611,500	104,500	109,000	111,180
APPROPRIATION FROM SURPLUS	173,042	-	-	-	-
EQUITY IN TANGIBLE CAPITAL ASSETS	1,010,000	1,010,000	1,010,000	1,010,000	1,030,200
	$(2,988,999)	$(256,134)	$(81,106)	$(102,116)	$(103,559)
SURPLUS (DEFICIT) PLUS CAPITAL, DEBT,	-	$ -	$ -	$ -	$ -

BYLAW NO. 1134, 2019
SCHEDULE "B"
2019 FINANCIAL PLAN OBJECTIVES AND POLICIES

In accordance with Section 165(3.1) of the *Community Charter*, the Village of Harrison Hot Springs is required to include in the Five Year Financial Plan, objectives and policies regarding each of the following:

1. The proportion of total revenue that comes from each of the funding sources described in Section 165(7) of the *Community Charter*;
2. The distribution of property taxes among the property classes, and
3. The use of permissive tax exemptions.

Funding Sources

Table 1 shows the proportion of total revenue proposed to be raised from each funding source in 2018. Property taxes usually form the greatest proportion of revenue. As a revenue source, property taxation offers a stable and reliable source of revenues for services such as:

- Governance & Administration
- Operations & Public Works
- Protective Services
- Recreation, Parks & Culture

User fees and charges typically form the second largest proportion of planned revenue. Many services can be measured and charged on a user-pay basis. Services where fees and charges are applied include water and sewer usage, & solid waste management – these are charged on a user pay basis. User fees are designed to apportion the value of a service to those who use the service.

Table 1: 2019 Funding Sources

Revenue Source	% of Total Revenue	Dollar Value
Property Taxes including Payments in Lieu	**24.6%**	**$2,227,176**
Service Utility Fees (Frontage Taxes)	**5%**	**$455,800**
User fees	**10.7%**	**$974,360**
Reserves	**9.4%**	**$846,800**
Surplus	**1.9%**	**$173,041**
DCC Revenues	**9.9%**	**$896,529**
Borrowing	**0%**	**$0**
Grants/Donations	**33.3%**	**$3,001,746**
Other sources	**5.2%**	**$464,754**

Objective and Policies

- to continue to seek grants for major infrastructure repair and replacement
- to keep the public well-informed about projects and initiatives
- to review utility participation rates to ensure they are equitably funded
- to establish reserve policies to assist in the funding of future capital replacements and to stabilize tax and utility rates
- to ensure that Village services are financially sustainable

Distribution of Property Taxes

Table 2 outlines the distribution of property taxes among the property classes.

Table 2: 2019 Distribution of Property Tax Rates

Property Class	% of Total Property Taxation	Dollar Value
Residential (1)	67%	$1,450,645
Business (6)	28%	$616,848
Recreation/Non-profit (8)	5%	$110,383

Objectives

- Village Council recognizes that residential tax payers are the predominant users of municipal services and therefore should bear a larger portion of the tax burden
- Ensure that the Village is competitive with other similar sized municipalities in British Columbia

Policies

- Set property tax rates that are based on principals of equity and responsiveness to current economic trends
- Regularly review and compare the Village's distribution of tax burden relative to other similar municipalities in British Columbia
- Ensure that property taxes are in line with goals and policies in the Official Community Plan and Regional Growth Strategy

Permissive Tax Exemptions

Policies & Objectives

Council does not currently support permissive tax exemptions. Taxpayers within the various property classes are treated equitably and policies are established for each class and not for individual property owners.

HARRISON HOT SPRINGS

Naturally Refreshed

DRAFT FINANCIAL PLAN (2019-2023)

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
GENERAL FUND									
REVENUE									
PROPERTY TAXES									
GENERAL MUNICIPAL TAXES	1,932,456	1,977,592	2,055,178	2,064,192	2,177,875	2,252,600	2,297,400	2,342,700	2,389,554
COLLECTIONS FOR OTHER GOVERNMENTS & AGENCIES	1,612,846	1,659,496	1,745,566	1,743,815	1,781,250	1,817,110	1,851,331	1,889,884	1,927,682
PENALTIES & INTEREST - TAXES	44,805	73,335	63,558	17,837	8,000	4,000	-	-	-
UTILITY CO. 1% REVENUE TAXES	34,331	34,504	36,121	36,122	36,951	37,262	37,262	37,597	38,348
PAYMENTS IN LIEU OF TAXES	5,352	4,669	4,512	4,650	4,350	4,350	4,350	4,437	4,526
Total taxes collected	3,629,790	3,749,596	3,904,935	3,866,616	4,008,426	4,115,322	4,190,343	4,274,618	4,360,110
REMITTANCES TO OTHER GOVERNMENTS & AGENCIES	(1,612,904)	(1,659,496)	(1,745,566)	(1,743,815)	(1,781,250)	(1,817,110)	(1,851,331)	(1,889,884)	(1,927,682)
Net Taxes for Municipal Purposes	2,016,886	2,090,100	2,159,369	2,122,801	2,227,176	2,298,212	2,339,012	2,384,734	2,432,428
REVENUE FROM OWN SOURCES									
DCC REVENUE RECOGNISED									
RESORT MUNICIPALITY INITIATIVE	37,500	39,000	76,173	45,000	100,000	100,000	100,000	100,000	102,000
CURBSIDE COLLECTION	94,236	118,027	119,169	117,000	130,000	130,000	130,000	130,000	132,600
LICENSES & PERMITS	92,406	32,400	38,460	25,200	30,200	30,200	30,200	30,704	31,318
FINES	15,141	8,926	4,312	2,700	2,700	2,700	2,700	2,754	2,809
RENTAL & LEASE INCOME	46,007	46,348	42,300	49,500	42,000	42,000	42,000	42,490	43,340
PAY PARKING	201,922	194,540	185,378	192,000	212,000	212,000	212,000	212,000	215,640
INTEREST EARNED	42,907	69,877	84,146	45,900	45,900	45,900	45,900	46,818	47,754
GAIN(LOSS) ON DISPOSAL OF ASSETS			(43,408)		-				
OTHER INVESTMENT INCOME	1,115	1,043	1,054	1,100	1,100	1,100	1,100	1,122	1,144
OTHER REVENUE FROM OWN SOURCES	53,651	165,925	216,630	14,000	8,500	8,500	8,500	8,670	8,843
Total Revenue from Own Sources	584,885	676,086	724,215	492,400	572,400	572,400	572,400	574,558	585,449
GRANTS AND DONATIONS									
UNCONDITIONAL GRANTS	326,087	316,487	317,314	316,000	317,500	317,500	317,500	317,500	323,850
CONDITIONAL GRANTS/DONATIONS	115,979	145,774	140,526	225,123	210,645	121,500	121,500	121,528	123,961
Total Grants and Donations	442,066	462,261	457,840	541,123	528,145	439,000	439,000	439,028	447,811
TRANSFERS FROM RESERVES & SURPLUS									
TRANSFERS FROM RESERVES	25,000	-	-	81,500	67,400	-	-	-	-
TRANSFER FROM SURPLUS	-	67,000	45,790	149,290	165,397	-	-	-	-
Total transfers from Reserves & Surplus	25,000	67,000	45,790	230,790	232,797	-	-	-	-
TRANSFER FROM EQUITY IN TCA - GENERAL	593,448	613,839	671,740	608,000	700,000	700,000	700,000	700,000	714,000
TOTAL REVENUE	**3,662,285**	**3,909,285**	**4,058,953**	**3,995,114**	**4,260,518**	**4,009,612**	**4,050,412**	**4,098,320**	**4,179,688**

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
EXPENDITURES									
COUNCIL									
MAYOR FACIO	37,020	41,317	37,568	39,500	40,040	40,040	40,040	40,830	41,647
COUNCILLOR REYERSE/HOOPER	15,908	17,933	18,753	20,550	20,820	20,820	20,820	20,820	21,236
COUNCILLOR BUCKLEY/VIDAL	18,359	18,690	17,521	20,550	20,820	20,820	20,820	20,820	21,236
COUNCILLOR HANSEN/PALMER	15,540	16,018	15,363	20,550	21,040	21,040	21,040	21,444	21,461
COUNCILLOR PIPER	17,702	16,018	19,435	20,550	21,310	21,040	21,040	21,040	21,873
OTHER LEGISLATIVE EXPENSES	4,174	3,884	4,591	8,250	18,250	13,250	13,250	13,415	13,683
Total Legislative Services	108,703	113,859	113,230	129,950	142,280	137,010	137,010	138,369	141,136
ADMINISTRATION									
EXPENSES - STAFF	186,987	192,426	187,973	204,830	202,086	205,791	209,540	213,691	217,965
MANAGEMENT EXPENSES	280,088	334,497	365,328	395,450	403,580	410,900	418,400	426,768	435,303
TRANSPORTATION & COMMUNICATION	13,895	17,969	18,968	18,200	22,200	22,700	22,700	22,874	23,331
INFORMATION SERVICES	25,755	21,842	20,842	30,700	28,700	28,700	28,700	29,134	29,717
PROFESSIONAL & SPECIAL SERVICES	58,911	34,881	74,734	68,650	69,300	51,300	51,300	66,900	68,238
LIBRARY BOARD	61,346	63,767	65,536	65,550	67,707	68,842	70,551	71,962	73,401
MISCELLANEOUS SERVICES	14,653	12,872	13,362	18,200	18,200	18,200	18,200	18,564	18,935
GENERAL GOODS & SUPPLIES	28,089	35,498	37,964	41,600	44,700	48,200	48,200	49,072	50,053
BANK CHARGES & INTEREST	2,319	3,004	3,450	3,400	3,400	3,400	3,400	3,468	3,537
MUNICIPAL OFFICE	41,199	35,308	29,001	31,590	32,750	32,959	33,149	33,612	34,284
AMORTIZATION	157,557	162,422	211,905	163,500	220,000	220,000	220,000	220,000	224,400
Total Administration	870,799	914,487	1,029,063	1,041,670	1,112,623	1,110,992	1,124,140	1,156,045	1,179,166
PROTECTIVE SERVICES									
BYLAW ENFORCEMENT	39,226	39,962	40,649	52,700	52,700	52,700	52,700	53,754	54,829
ANIMAL WASTE STATIONS	5,656	4,354	3,317	4,950	4,260	4,260	4,260	4,320	4,406
EMERGENCY MEASURES	14,005	12,114	12,242	13,450	14,550	14,550	14,550	14,793	15,089
FIRE DEPARTMENT									
FIRE DEPARTMENT ADMINISTRATION	32,155	17,534	9,822	25,450	25,400	25,400	25,400	25,856	26,373
FIREHALL	16,032	30,742	25,347	35,668	30,294	23,250	23,250	23,546	24,017
FIRE REMUNERATION & BENEFITS	48,604	82,146	86,438	100,350	93,661	93,661	93,661	95,332	97,239
FIRE DEPARTMENT VEHICLES	9,848	9,925	12,142	12,024	14,061	12,861	12,861	12,986	13,246
FIRE DEPARTMENT EQUIPMENT	15,395	15,405	14,849	18,600	18,600	18,600	18,600	18,972	19,351
FIRE DEPARTMENT AMORTIZATION	7,164	8,299	4,325	7,500	5,000	5,000	5,000	5,000	5,100
Total Fire Department	129,198	164,051	152,922	199,592	187,016	178,772	178,772	181,692	185,326
Total Protective Services	188,085	220,481	209,131	270,692	258,526	250,282	250,282	254,559	259,650

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
DEVELOPMENT PLANNING									
DEVELOPMENT PLANNING	143,308	109,754	167,128	325,200	362,200	122,200	122,200	122,344	124,791
BUILDING	12,805	-	-	-	-	-	-	-	-
Total Development Planning	156,113	109,754	167,128	325,200	362,200	122,200	122,200	122,344	124,791
TOURISM & COMMUNITY IMPROVEMENT									
TOURIST INFORMATION CENTRE	33,688	35,367	33,887	34,305	24,280	24,320	24,365	24,420	24,908
COMMUNITY DEVELOPMENT & EVENTS	61,554	150,906	160,099	208,717	260,931	230,377	232,443	234,764	239,459
SUSTAINABILITY	7,711	-	-	-	-	-	-	-	-
Total Tourism & Community Improvement	102,953	186,272	193,985	243,022	285,211	254,697	256,808	259,184	264,368
ENGINEERING & TRANSPORTATION SERVICES									
PUBLIC WORKS - COMMON SERVICES	231,303	179,345	206,825	182,696	161,005	173,831	176,429	179,822	183,419
PUBLIC WORKS OFFICE	9,699	12,266	11,598	13,100	19,100	14,600	14,600	14,728	15,023
PUBLIC WORKS SHOP	11,364	6,534	7,432	12,120	10,620	4,120	4,120	4,202	4,286
PUBLIC WORKS YARD	31	11,357	4,672	8,500	2,000	2,000	2,000	2,040	2,081
PUBLIC WORKS EQUIPMENT	6,050	6,342	10,419	9,650	9,200	9,200	9,200	9,200	9,384
TRAINING	16,681	27,695	15,415	25,936	16,370	26,822	27,279	27,825	28,381
FLEET	35,861	42,968	54,988	40,140	45,291	43,596	43,596	44,106	44,988
ROADS & STREETS									
ROAD RESURFACING	1,959	5,539	2,964	10,478	5,958	6,139	6,221	6,305	6,432
ROAD MARKING/SIGNAGE	20,013	24,801	31,120	60,624	44,600	19,870	20,200	20,670	21,083
BRIDGES	10,824	3,742	4,168	6,000	6,000	6,000	6,000	6,120	6,242
DRAINAGE & DITCHING	10,337	17,045	24,074	19,052	20,845	21,150	21,460	21,870	22,307
STREET LIGHTING	46,812	41,872	36,352	72,250	38,250	38,250	38,250	38,895	39,673
STREET CLEANING	4,800	3,620	4,996	5,000	5,000	5,000	5,000	5,100	5,202
SNOW REMOVAL	18,311	33,711	10,693	20,227	20,500	20,923	21,281	21,706	22,141
VILLAGE ENTRANCE	3,802	4,623	4,123	4,539	4,790	4,695	4,749	4,828	4,924
SIDEWALKS	14,624	21,373	15,871	15,749	19,845	20,150	20,460	20,750	21,165
PARKING METERS	35,205	30,190	36,556	32,000	37,000	37,000	37,000	37,640	38,393
TRANSIT		-	-	500	500	500	500	510	520
AMORTIZATION - PUBLIC WORKS	38,626	39,090	15,976	37,000	20,000	20,000	20,000	20,000	20,400
AMORTIZATION - TRANSPORTATION	288,863	301,448	324,402	298,000	336,000	336,000	336,000	336,000	342,720
Total Engineering & Transportation Services	805,165	813,559	822,644	873,561	822,874	809,846	814,345	822,317	838,764
FLOOD PROTECTION									
FLOOD PROTECTION	43,487	9,436	11,990	11,848	12,900	13,040	13,280	13,425	13,694
AMORTIZATION - STORM SEWERS	17,679	18,334	20,765	18,000	22,000	22,000	22,000	22,000	22,440
Total Flood Protection	61,166	27,770	32,755	29,848	34,900	35,040	35,280	35,425	36,134

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
WASTE MANAGEMENT									
WASTE MANAGEMENT - MUNICIPAL OPERATIONS	28,125	43,599	48,120	49,146	48,645	51,446	52,448	53,505	54,575
LANDFILL	16,503	7,159	5,908	8,000	6,500	6,500	14,500	-	-
WASTE MANAGEMENT - CONTRACTED SERVICES	96,671	160,027	125,901	130,000	144,000	144,000	144,000	144,280	147,166
Total Waste Management	141,299	210,784	179,929	187,146	199,145	201,946	210,948	197,785	201,741
PARKS, RECREATION & CULTURAL SERVICES									
BEACH	104,128	96,978	106,732	107,654	108,300	110,200	112,000	114,274	116,559
LAGOON BREAKWATER	1,061	1,367	1,676	3,500	4,000	4,000	4,000	4,040	4,121
BEACH WASHROOMS	30,157	47,647	49,405	50,844	59,200	55,850	56,600	57,386	58,534
BOAT LAUNCH & WASHROOMS	38,842	7,389	20,236	14,293	13,225	13,287	13,350	13,556	13,827
HARRISON LAKE PLAZA	24,260	29,183	23,031	28,840	28,810	29,060	29,310	29,884	30,482
FEDERAL WHARF	508	521	534	1,035	1,035	1,035	1,035	1,056	1,077
FLOAT PLANE DOCK	441	348	4,438	5,360	1,360	1,360	1,360	1,387	1,415
MEMORIAL HALL	37,857	37,256	38,884	40,244	61,620	35,310	35,545	36,124	36,847
ARTS CENTRE	3,766	16,753	1,943	4,881	24,400	4,405	4,410	4,438	4,527
YACHT CLUB	5,508	6,045	6,086	6,550	6,550	6,550	6,550	6,681	6,815
RENDALL PARK	25,317	17,255	17,609	15,793	17,225	17,425	17,625	17,868	18,225
SPRING PARK	14,935	29,932	35,112	41,329	18,810	19,060	19,310	19,690	20,084
BEACH PLAYGROUND	1,163	852	2,670	4,012	3,835	3,888	3,923	4,001	4,081
OTHER GREEN SPACES	76,866	66,208	79,532	75,200	75,900	77,200	78,300	79,784	81,380
ARCHIMEDES PARK			1,653	-	2,000	2,000	2,000	2,000	2,040
AMORTIZATION - PARKS	7,347	8,034	9,101	7,500	10,000	10,000	10,000	10,000	10,200
AMORTIZATION - OTHER INFRASTRUCTURE	76,212	76,212	85,266	76,500	87,000	87,000	87,000	87,000	88,740
Total Parks, Recreation, & Cultural Services	448,368	441,981	483,909	483,535	523,270	477,630	482,318	489,169	498,952
TRANSFERS TO RESERVES AND ALLOWANCES									
CONTRIBUTION TO ALLOWANCES	50,831	70,787	95,461	74,500	215,584	346,169	353,281	356,447	362,977
CONTRIBUTIONS TO STATUTORY RESERVES	164,427	325,288	403,780	235,790	224,000	195,000	195,000	196,500	200,430
Total Transfers to Reserves	215,258	396,075	499,241	310,290	439,584	541,169	548,281	552,947	563,407
TRANSFER TO CAPITAL FUND	123,423	110,437	90,155	100,200	79,905	68,800	68,800	70,176	71,580
Total Transfers	338,681	506,512	589,395	410,490	519,489	609,969	617,081	623,123	634,986
TOTAL EXPENDITURES	**3,221,332**	**3,545,461**	**3,821,170**	**3,995,114**	**4,260,518**	**4,009,612**	**4,050,412**	**4,098,320**	**4,179,688**
SURPLUS (DEFICIT)	**440,953**	**363,824**	**237,783**	-	-	-	-	-	-

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
CAPITAL FUND -REVENUE									
GRANTS - PROVINCIAL/FEDERAL/OTHER	882,932	-	180,356	330,000	250,000	-	-	-	-
DEBT RESERVE INCOME	185	123	139	-	-	-	-	-	-
GAIN ON DISPOSAL OF ASSETS		3,759			36,668				
TRANSFER FROM RESERVES	699,364	28,839	274,006	346,800	394,400	161,500	104,500	109,000	111,180
TRANSFER FROM SURPLUS	415,482	56,664	481,153	562,000	7,645	-	-	-	-
TRANSFER FROM GENERAL FUND	123,423	110,437	90,155	100,200	79,905	68,800	68,800	70,176	71,580
TRANSFER FROM CAPITAL SURPLUS	463,700	-	-	-	-	-	-	-	-
DEFFERED REVENUES RECOGNISED	50,000	10,000	57,925	-	31,529	-	-	-	-
DEBT	-	110,000	-	-	-	-	-	110,000	-
OTHER - CAPITAL REVENUE			2,215						
RMI FUNDING	575,500	62,778	55,993	227,500	623,600	-	-	-	-
DCC REVENUE RECOGNISED					60,000				
CONTRIBUTED ASSETS		411,000	469,300						
TOTAL REVENUES	**3,210,586**	**793,599**	**1,611,242**	**1,566,500**	**1,483,746**	**230,300**	**173,300**	**289,176**	**182,760**
DEBT									
DEBT FINANCING	18,068	17,061	18,557	18,800	16,450	15,700	15,700	16,014	16,335
DEBT REPAYMENTS	64,261	57,614	73,952	71,400	111,355	53,100	53,100	54,162	55,245
	82,329	74,675	92,509	90,200	127,805	68,800	68,800	70,176	71,580
CAPITAL EXPENDITURES									
MUNICIPAL BUILDINGS	8,180								
OFFICE EQUIPMENT	8,008	5,086	4,302	22,000	16,500	16,500	4,500	9,000	9,180
FIRE DEPT VEHICLES			82,819	90,000					
FIRE DEPT EQUIPMENT	14,831	7,879	-	-	-	-	-	-	-
PW VEHICLES		99,971	-	-	-	45,000	-	95,000	-
PW EQUIPMENT	18,495	18,032	92,933	97,500	-	-	-	15,000	-
ESPLANADE	831,800	3,178	-	-	-	-	-	-	-
BUS SHELTER	9,834	-	21,966	30,000	-	-	-	-	-
FLOOD PUMP BUILDING/ARCHIMEDES PARK	1,513,435	10,702	57,925	89,300	99,173	-	-	-	-
PARKING LOT			-	30,000	60,000				
STORMWATER UPGRADES		131,000	356,972	100,000	250,000	100,000	100,000	100,000	102,000
STREET LIGHTING		45,000	-	250,000	250,000				
SIDEWALKS REPLACEMENT		73,176	22,500	15,000					
ROADS REPLACEMENT		185,000	823,323	515,000					
RENDALL PARK TRAIL LIGHTS	24,045	-	-	-	-	-	-	-	-
RMI PROJECTS	9,100	82,778	55,993	237,500	623,600	-	-	-	-
BEACH WASHROMS UPGRADE	628,631	57,121	-	-	-	-	-	-	-
FLOAT PLANE DOCK REPLACEMENT	41,250		-	-	-	-	-	-	-
FEDERAL WHARF REPLACEMENT					20,000				
RECREATION/PLAYGROUND EQUIPMENT	20,648		-	-	-	-	-	-	-
	3,128,257	718,924	1,518,733	1,476,300	1,319,273	161,500	104,500	219,000	111,180
TOTAL EXPENDITURES	**3,210,586**	**793,599**	**1,611,242**	**1,566,500**	**1,447,078**	**230,300**	**173,300**	**289,176**	**182,760**
TFR to RESERVES					**36,668**				
CAPITAL SURPLUS (DEFICIT) / Carry forward	-	-	0	-	-	-	-	-	-

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
WASTE WATER									
REVENUES									
OPERATING REVENUES	533,671	570,839	560,965	603,230	650,360	659,000	672,000	685,882	699,600
FRONTAGE TAXES	203,088	207,863	215,797	213,000	213,000	224,000	224,000	228,480	233,050
DCC REVENUE									
INTEREST	9,277	13,947	22,287						
INFRASTRUCTURE PLANNING GRANT		10,000							
TRANSFER FROM SURPLUS									
TRANSFER FROM EQUITY IN TCA - SEWER	141,495	143,371	145,345	134,000	150,000	150,000	150,000	150,000	153,000
TOTAL REVENUES	**887,531**	**946,021**	**944,394**	**950,230**	**1,013,360**	**1,033,000**	**1,046,000**	**1,064,362**	**1,085,649**
EXPENDITURES									
SEWER ADMINISTRATION	61,418	93,033	99,508	99,800	109,960	110,095	111,795	113,931	116,210
TRAINING	4,614	4,501	300	5,230	6,500	6,500	6,500	6,580	6,712
WASTEWATER COLLECTION	18,875	14,459	17,034	30,400	23,750	20,900	21,020	21,240	21,665
WASTEWATER TREATMENT PLANT	388,525	420,641	334,978	385,400	397,900	408,380	418,685	428,416	436,984
LIFT STATIONS	50,521	78,755	106,574	82,400	112,250	113,125	114,000	115,715	118,029
SEWER PLANNING	35,493								
AMORTIZATION - SEWER	141,495	143,371	145,345	134,000	150,000	150,000	150,000	150,000	153,000
Total Operating Costs	700,941	754,760	703,739	737,230	800,360	809,000	822,000	835,882	852,600
TRANSFERS TO RESERVES AND ALLOWANCES	9,277	13,947	22,287	-	-	-	-	-	-
TRANSFER TO CAPITAL FUND	54,400	67,130	213,000	213,000	213,000	224,000	224,000	228,480	233,050
Total Transfers	63,677	81,077	235,287	213,000	213,000	224,000	224,000	228,480	233,050
TOTAL EXPENDITURES	**764,618**	**835,837**	**939,026**	**950,230**	**1,013,360**	**1,033,000**	**1,046,000**	**1,064,362**	**1,085,649**
Sewer Operating Fund SURPLUS (DEFICIT)	**122,913**	**110,183**	**5,368**	**-**	**-**	**-**	**-**	**-**	**-**
CAPITAL FUND									
REVENUES									
DCC REVENUE RECOGNISED	7,065	-	86,115	1,095,000	805,000				
PROCEEDS FROM DEBT									
TRANSFER FROM SURPLUS		61,182	-	225,000	-				
TRANSFER FROM SEWER OPERATIONS	54,400	67,130	213,000	213,000	213,000	224,000	224,000	228,480	233,050
TRANSFER FROM RESERVES				117,000	385,000	450,000			
CONTRIBUTED ASSETS		55,000	40,500						
INFRASTRUCTURE GRANTS					1,500,000				
TOTAL REVENUES	**61,465**	**183,312**	**339,615**	**1,650,000**	**2,903,000**	**674,000**	**224,000**	**228,480**	**233,050**
DEBT									
DEBT FINANCING	-	-		-	-	-	-		
DEBT REPAYMENTS	-	-		-	-	-	-		
CAPITAL EXPENDITURES	7,065	116,182	126,615	1,437,000	2,690,000	450,000			
WASTEWATER RESERVES	54,400	67,130	213,000	213,000	213,000	224,000	224,000	228,480	233,050
TOTAL EXPENDITURES	**61,465**	**183,312**	**339,615**	**1,650,000**	**2,903,000**	**674,000**	**224,000**	**228,480**	**233,050**
Capital Fund SURPLUS (DEFICIT)	-	-	-	-	-	-	-	-	-

HARRISON HOT SPRINGS - DRAFT 2019 - 2023- FIVE YEAR FINANCIAL PLAN DETAILS

	2016 ACTUAL	2017 ACTUAL	2018 ACTUAL UNAUDITED	2018 BUDGET	2019 BUDGET	2020 BUDGET	2021 BUDGET	2022 BUDGET	2023 BUDGET
WATER FUND									
REVENUES									
OPERATING REVENUES	215,236	336,426	475,951	431,600	324,000	339,000	339,000	345,750	352,665
FRONTAGE TAXES	198,065	203,088	224,611	201,000	242,800	252,300	252,300	252,300	257,346
INTEREST	1,275	627	1,919						
TRANSFER FROM SURPLUS									
TRANSFER FROM RESERVES									
TRANSFER FROM EQUITY IN TCA	117,559	117,898	148,027	118,000	160,000	160,000	160,000	160,000	163,200
TOTAL REVENUES	**532,135**	**658,040**	**850,508**	**750,600**	**726,800**	**751,300**	**751,300**	**758,050**	**773,211**
EXPENSES									
WATER ADMINISTRATION	42,920	62,769	94,053	101,865	121,255	123,110	125,900	127,072	129,613
TRAINING	5,346	3,117	300	5,062	4,500	4,550	4,600	4,670	4,763
WATER SUPPLY & DISTRIBUTION	47,272	70,049	73,705	57,250	71,000	71,960	72,900	74,310	75,796
WATER RESERVOIR	11,132	3,337	3,570	7,822	5,925	5,925	13,925	5,957	6,076
WATER TREATMENT PLANT	74,652	76,864	89,531	81,535	100,367	98,700	100,000	101,104	103,126
PUMPING STATIONS	-	-	-	-	-	-	-	-	-
HYDRANTS	2,423	3,331	3,910	8,980	8,125	8,190	8,250	8,410	8,578
AMORTIZATION - WATER	117,559	117,898	148,027	118,000	160,000	160,000	160,000	160,000	163,200
Total Operating Costs	301,304	337,364	413,095	380,514	471,172	472,435	485,575	481,523	491,153
TRANSFERS TO RESERVES AND ALLOWANCES	1,275	627	1,919						
TRANSFER TO CAPITAL FUND	152,161	217,357	367,985	370,086	255,628	278,865	265,725	276,527	282,058
Total Transfers	153,436	217,984	369,904	370,086	255,628	278,865	265,725	276,527	282,058
TOTAL EXPENDITURES	**454,740**	**555,348**	**782,999**	**750,600**	**726,800**	**751,300**	**751,300**	**758,050**	**773,211**
Water Operating fund SURPLUS (DEFICIT)	**77,395**	**102,692**	**67,509**	**-**	**-**	**-**	**-**	**-**	**-**
CAPITAL FUND									
REVENUES									
DCC REVENUE RECOGNISED			43,944	250,000					
INFRASTRUCTURE GRANTS		128,024	1,988,728	2,297,108					
CONTRIBUTED ASSETS		67,500				174,000			
TRANSFER FROM WATER OPERATING	152,161	217,357	367,985	370,086	255,628	278,865	265,725	276,527	282,058
TRANSFER FROM SURPLUS		-	231,386	347,492		-			
TRANSFER FROM RESERVES									
TOTAL REVENUES	**152,161**	**412,881**	**2,632,043**	**3,264,686**	**255,628**	**452,865**	**265,725**	**276,527**	**282,058**
EXPENDITURES									
DEBT FINANCING	7,541	6,577	6,899	10,000	10,000	5,000	-	-	-
DEBT REPAYMENTS	110,000	110,000	110,000	110,000	110,000	110,000	-	-	-
	117,541	116,577	116,899	120,000	120,000	115,000	-	-	-
TRANSFERS TO RESERVE AND ALLOWANCES	34,620	66,946	119,086	119,086	120,628	163,865	115,725	276,527	282,058
CAPITAL EXPENDITURES		229,359	2,396,058	3,025,600	15,000	174,000	150,000	-	-
TOTAL EXPENDITURES	152,161	412,881	2,632,043	3,264,686	255,628	452,865	265,725	276,527	282,058
Water Capital Fund SURPLUS (DEFICIT)	-	-	-	-	-	-	-	-	-

13(b)

VILLAGE OF HARRISON HOT SPRINGS

REPORT TO COUNCIL

TO:	**Mayor and Council**	**DATE: February 19, 2019**
FROM:	**Ken Cossey, MCIP, RPP** **Planning Consultant**	**FILE: 3900-01**
SUBJECT:	**Business Licence Bylaw 1128, 2018**	

ISSUE:

To repeal Village of Harrison Hot Springs Business Licence and Regulation Bylaw 945, 2010 and replace it with Village of Harrison Hot Springs Business Licence and Regulation Bylaw No. 1128, 2018.

BACKGROUND:

Please note that the current bylaw, Bylaw No. 945, 2010 is seven (7) years old.

Listed below is a summary listing on the changes made to the current bylaw:

1/. Proposed Bylaw – added section 1.3(a) to indicate the area that the bylaw applies to. This was added for clarification purposes.

2/. All of the current definitions were reviewed to ensure that they are still relevant today. The definitions in the current bylaw have either been; updated, removed or revised. Example of one of the changes includes a definition of cannabis

3/. For consistency purposes, a definition may have been crossed referenced to an existing bylaw, a Provincial or Federal Act

4/. Changed the term "shall" (**defined as may**) to "must" (**defined as an obligation**) throughout the bylaw

5/. Inspections – the current bylaw is limited to allowing the Fire Chief to conduct an inspection to ascertain whether the regulations of the current bylaw are being followed. The new Bylaw, depending upon the application, requires a fire inspection report to be submitted Section 2.2(d) page 10

6/. Each application needs to be accompanied, if applicable, by approvals from the Federal or Provincial government Section 2.2(d) page 10

7/. Tied in with the issuance of the Business Licence is the following, if applicable:

- Health Certificate – the appropriate Health Inspector
- Fire Safety Inspection – it must identify and address any required mitigation requirements of any potential fire hazards
- Liquor and Cannabis Regulatory Branch approval

8/. The Business Licence application can be referred to an external third party if required, the referral response time is 30 days. This can be extended by the Village if requested.

9/. Attached to the business licence fee is a $25.00 non-refundable administrative fee.

10/. The prohibited business activities are as follows;

- animal shows;
- Buskers or Busking in an unsanctioned event;
- Cannabis Dispensary;
- Cannabis Operations;
- Door-to-door sales of any type;
- Medical Cannabis Production Facility, located on any non-ALR land;
- Mobile Vendor;
- Mobile Vending or Food Truck;
- Pawnbrokers;
- Pop-up Retailers – in an unsanctioned event; and
- Tourist Accommodations in any Residential Zone.

STAFF RECOMMENDATIONS:

1/. That Bylaw 1128, 2018 be given the first two readings; and

2/. That staff be authorized to set up a community notification process as per the requirements of the *Community Charter*. This will include the posting of the Notice of Intent advertisement and the setting up of a community session to collect any written and/or any verbal comments on the bylaw.

Respectfully submitted;	**REVIEWED BY and Concurrence with the RECOMMENDATIONS:**
Ken Cossey	*Madeline McDonald*
Ken Cossey, MCIP, RPP, Planning Consultant	Madeline McDonald Chief Administrative Officer

Attachments (1) Village of Harrison Hot Springs, Business Licence and Regulation Bylaw, 1128, 2018

DRAFT

BUSINESS LICENCE AND REGULATION BYLAW

For the Village of

HARRISON HOT SPRINGS

BYLAW No. 1128, 2018

HARRISON HOT SPRINGS

Naturally Refreshed

Bylaw 1128, 2018

Table of Contents

HARRISON HOT SPRINGS
Naturally Refreshed

VILLAGE OF HARRISON HOT SPRINGS
BYLAW NO. 1128

A Bylaw to provide for the regulation and licencing of Businesses in the Village of Harrison Hot Springs

WHEREAS section 8(6) of the *Community Charter, SBC 2003, c.26*, as amended from time to time, allows the Council to establish by bylaw, the ability to regulate in relation to Business;

AND WHEREAS the Council is authorized and empowered, under sections 15, 59(1) and 60(1) of the *Community Charter, SBC 2003, c.26*, as amended from time to time, to provide for the collection of licence fees, granting and issuance of Business Licences, establish different classes of Businesses, regulate the conduct of Businesses, or refuse to issue a Business Licence within the Village for the protection of the public and prevent and minimize nuisances and misleading Business practices;

AND WHEREAS section 154 of the *Community Charter, SBC 2003, c.26*, as amended from time to time, Council may, by bylaw, delegate its powers, duties and functions to an employee of the Village;

NOW THEREFORE in open meeting assembled, the Council of the Village of Harrison Hot Springs enacts as follows:

PART 1 TITLE, PURPOSE, APPLICATION AND DEFINITIONS

1.1 Title

a) This Bylaw may be cited for all purposes as the Village of Harrison Hot Springs, "Business Licence and Regulation Bylaw No. 1128, 2018".

1.2 Purpose

a) The purpose of this Bylaw is to regulate the conduct of Business within the Village of Harrison Hot Springs for the benefit of the community.

1.3 Application of this Bylaw

a) This Bylaw applies to all Lands, including the surface of water, and all uses, Buildings and other Structures located within the boundaries of the Village of Harrison Hot Springs, as amended from time to time, and as shown on Schedule "A", the Zoning Map contained within the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time.

1.4 Definitions

a) The following definitions, and this includes the applicable definitions contained within the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time, apply to this Bylaw;

Building or Structure

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time;

Business and Professional Services

means the carrying on or the provision of any Commercial undertakings within the Village Boundaries, whether for profit or not. For the purposes of this Bylaw it does not include any activity carried out on, or by either the Federal or Provincial governments including corporations or agencies owned by them, or by any public transit authority. For the purposes of this Bylaw it also includes any Contractor related activities such as but not limited to any or any combination of the following:

i) construction,
ii) alteration,
iii) repairs, or
iv) maintenance,

upon a Building or Structure;

Business Licence

means a valid and subsisting Business Licence issued and approved pursuant to this Bylaw;

Busker or Busking

means a performance in any of the performing arts, and must be an approved part of an event in which an individual or a group provide free entertainment to the public;

Bylaw Enforcement Officer

means the person duly appointed by Council or under contract with the Village to enforce the regulations of any Village Bylaw;

Cannabis

has the same meaning as outlined in the *Cannabis Act, SC 2018, c 16*, as amended from time to time and includes any product containing Cannabis;

Cannabis Dispensary

means a use of Land, a room, Building or Structure where cannabis or any cannabis by-product is prepared and provided to any member of the Community for a fee or if applicable to any club member that may or may not include any payment of club fees. This includes but is not limited to the delivery of the product and the operation of any club, or any not for profit or profit organization, that provides this type of product or service, but excludes a Medical Cannabis Production Facility;

Cannabis Operation

means the cultivating, growing, producing, packaging, storing, distributing, retail sales, advertising, trading, the performance of any research and innovation activities on legal cannabis or its derivatives but excludes a Medical Cannabis Processing Facility;

Commercial Uses

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time;

Contractor

means an individual or a company that provides any or any combination of the following types of functions within the Village:

i) the construction of any Building or Structure;
ii) any Alteration of any Building or Structure;
iii) any repairs to a Building or Structure; or

iv) any maintenance on a Building or Structure;

and this includes any improvements that run with the Land or are within or attached to any Building or Structure;

Council

means the Council of the Village of Harrison Hot Springs;

Daycare

means either a Commercial Use that provides care for a child under the *Community Care and Assisted Living Act, SBC 2002, c 25*, as amended from time to time or the provision of care without the approval as outlined through the *Community Care and Assisted Living Act, SBC 2002, c 25*, as amended from time to time;

Farmers' Market

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time, but excludes any reference to a Mobile Food Truck;

Fire Safety Inspection

means an inspection of any Lands, Buildings or Structures, that is under consideration for a Business Licence, conducted by either the Village of Harrison Hot Springs Fire Department or a qualified individual or company that can assess the fire hazards of the Lands, Building or Structure.

Franchisee Licence Holder

means either a person or company that has been granted the ability or is legally entitled to do business under a specific trademark, trade name and/or business model, by the owner of the trademark, trade name or business model.

Highway

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time;

Home Occupation

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time;

Land

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw 1115, 2017*, as amended from time to time;

Licencee

means the person who holds a Licence issued pursuant to this Bylaw;

Licenced Premises

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time;

Medical Cannabis Production Facility

means the use of Buildings and Structures for the purposes of growing, processing, packaging, testing, destroying, storing or shipping Marihuana as authorized by a license issued under the *Access to Cannabis for Medical Purposes Regulations*, SOR/2016-230, as amended from time to time;

Micro-Brewery, Winery, Distillery

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time;

Mobile Vendor

means a person who, either on his own account or as an officer, servant, or agent of another, sells or offers for sale food items, excluding liquor, from a Mobile Vending Cart;

Mobile Vending Cart or Food Truck

means a self-contained hand mobile apparatus or other vehicle, used for the sale of food items only and does not include any selling of liquor;

Neighbourhood Pub

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time;

Non-Profit Society

means a charitable society or organization that is incorporated and in good standing under the *Societies Act*, *SBC 2015 c. 18*, as amended from time to time;

Non-Resident Business

means a Business that is carried on in or from premises located outside the Village with respect to which any work or service is performed or offered in the Village;

Pop-Up Retailer

means a temporary use of Public Space, or the temporary authorized use of Land or a Building or Structure to sell retail items, for a short period of time, and the method of sales may or may not include from the back of a truck, a tractor trailer unit, some other type of Motor Vehicle, a trailer or a portable storage unit. This does not include any Tourist Kiosk Sales Booth or any retailer that is affiliated with a sanctioned event;

Public Space

means any real property or portions of real property owned or subject to a right of occupation by the Village to which the public is ordinarily invited or permitted to be in or on, and includes, but is not necessarily limited to, the grounds of any community Building or Structure, boulevard, sidewalk and public parking lots;

Real Estate Licencee

means a person who is a Licencee under the *Real Estate Services Act, SBC 2004, c. 12,* and who occupies or uses Buildings or Structures or Land in the Village for the carrying on of that Business

Tourist Accommodation

has the same meaning as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2017,* as amended from time to time;

Tourist Kiosk Sales Booth

means a stand alone booth, generally placed in a high traffic area to advertise, sell or provide information on tourism related businesses or events;

Restaurant

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time;

Retail Establishment

has the same definition as outlined in the *Village of Harrison Hot Springs Zoning Bylaw, 1115, 2018*, as amended from time to time; and

Village

means the Village of Harrison Hot Springs.

PART 2 BUSINESS LICENCING REGULATIONS

2.1 Business Licence Requirements

(a) Unless specifically exempted by this Bylaw, as outlined in section 2.13 (a)(i) and (ii), a person must not carry on or perform any Business, in the Village unless there is a valid Business Licence issued under this Bylaw.

(b) Every person who owns or operates any Business must apply for, obtain and hold a Business Licence for each type of Business.

(c) Every person who operates a Business from more than one Building or Structure, in the Village, must obtain a separate Business Licence for each Business that they own or operate.

(d) Every person who operates a Business in the Village, must comply with all the applicable Bylaws of the Village and all applicable laws, rules, codes, regulations and orders of all Federal or Provincial authorities having jurisdiction over such Business.

(e) Unless specifically exempted in this Bylaw, a person must have a separate Business Licence for each type of Business that they are operating, own or set up as the authorized franchise licence holder, even if the Businesses are located in the same Building or Structure.

(f) Every Non-Profit Society that carries on a Business, in addition to its primary purpose, is required to hold a valid Business Licence.

(g) Notwithstanding section 2.0(f) above and the provisions of Schedule "A" of this Bylaw, where a Non-Profit Society is registered as a charity under the *Income Tax Act, RSC 1985, c.1 (5th Supp.)*, as amended from time to time, no fee will be charged by the Village for such Business Licence.

2.2 Business Licence Application Requirements and Fees

(a) An application for a Business Licence must be made on the prescribed application for, as amended from time to time, and be accompanied by the required Business Licence fee, as prescribed in Schedule “A” as attached to and forming a part of this Bylaw.

(b) Every application must include a detailed description of the Building or Structure in or upon which the applicant intends to carry on Business. This includes any or all of the following:

- i) square footage information;
- ii) a floor plan;
- iii) the proposed parking area for the required number of parking spaces

(c) The Village reserves the right to request a letter of authorization from the property owner for which the Business will be operated from, if the applicant is not the property owner.

(d) Every application form, as applicable, must be accompanied with a copy of all the necessary approvals from Federal, Provincial or Municipal government authorities such as, but not limit to a:

- i) Health Certificate, from the appropriate Health Inspector;
- ii) Fire Safety Inspection. The inspection report must be in writing and must contain any required mitigation requirements of any potential fire hazards;
- iii) Liquor and Cannabis Regulatory Branch approval or certificate for all Licenced Premises.

(e) Where an applicant applies for more than one Business Licence, the particulars of each Business Licence applied for must be included on a separate application form.

(f) Notwithstanding the annual Business Licence fee prescribed in Schedule “A”, as attached to and forming a part of this Bylaw, a refund may be applicable. If applicable, any refund of the Business Licence fee must be calculated in the following manner:

- i) 100-percent of the fee paid minus a $25.00 non-refundable application fee equals the refundable balance.

(g) If applicable, the refundable balance must be provided, only under the following conditions:

- i) if the application is withdrawn prior to the issuance of the Business Licence; or if

ii) the Business Licence application has been refused.

2.3 Enforcement, Severability and Administration of this Bylaw

2.3.1 Enforcement and Implementation Provisions

a) This Bylaw is designated under the provisions of Section 260 of the *Community Charter, SBC 2003, c. 26*, as amended from time to time, as a Bylaw that may be enforced by means of a ticket issued under the provisions of the Bylaw Notice Enforcement Bylaw;

b) Any person who violates any provision of this Bylaw or who suffers or permits any act or thing to be done in contravention of or in violation of any of the provisions of this bylaw, or who neglects to do, or refrains from doing anything required to be done by any of the provisions of this Bylaw commits an offence is subject to penalties under the Bylaw Notice Enforcement Bylaw;

c) Each day that a contravention or violation of or failure to perform any provision of this Bylaw continues to exist will be deemed to be a separate offence; and

d) Failure to renew a Business Licence for a Business that continues to operate, may be subject to a fine under the Bylaw Notice Enforcement Bylaw for operating a Business without a Business Licence. In addition to the fine, the License holder must pay the penalty fee, as outlined in Schedule "A", that is attached to and forms a part of this Bylaw.

e) The following individuals are hereby authorized and empowered to enter upon any Lot, or Building or Structure, outlined on the Business Licence, between the hours of 8:30 am to 4:30 pm, to ascertain whether the provisions of this Bylaw are being adhered to:

i) Chief Administrative Officer or their delegate;
ii) Bylaw Enforcement Officer; and
iii) Fire Chief.

2.3.2 Severability

a) If any part, section, subsection, paragraph, sentence, clause, phrase or schedule of this Bylaw is for any reason found invalid by the decision of any Court of competent jurisdiction, such decision must not affect the validity of the remainder of this Bylaw or the validity of the Bylaw as a whole.

2.3.3 Administration

a) The Chief Administrative Officer or their delegate is hereby appointed by Council to administer this Bylaw.

2.4 Term of the Business Licence

a) Each Business Licence issued, pursuant to this Bylaw, must be considered as an annual Business Licence for one calendar year that starts on January 1st and expires on the 31st day of December of each year.

2.5 Display of the Business Licence

a) Every Licencee must keep a copy of their Business Licence posted in a conspicuous place in the Building or Structure for which the Licence is issued.

b) Where the Licencee has no Business operating from a Building or Structure in the Village, the Business Licence must be carried upon the Licencee's person at all times when the Licencee is engaged within the Village in the Business for which the Licence was issued.

2.6 Effect of the Business Licence

a) A Business Licence authorizes the Business owner/operator or the franchisee licence holder to provide only the Business described in the Business Licence, and only in the Building or Structure or location provided in the Business Licence.

b) The issuance of a Business Licence is not a representation or warranty that the Licenced Business or the Business operation complies with the Bylaws of the Village or with any other Federal, Provincial regulations or standards.

c) A Business Licence is not transferable to another individual, or any other third party or for use at another location.

2.7 Business Licence Renewal

a) If a Licencee fails to renew a Business Licence prior to February1st of the next year, then, in addition to the annual Licence fee, that person must pay a late payment penalty prescribed in Schedule "A" of this Bylaw.

2.8 Changes in the Business Licence Conditions

a) If an applicant, Business owner/operator or Franchisee Licence Holder proposes any changes to the Business Licence with respect to location or conditions of a licence, the applicant, Business owner/operator or franchisee licence holder must advise the Village Office of such changes, in writing.

2.9 Granting or Reissuing a Business Licence

a) The Village may grant a Business Licence under this Bylaw when the Village is satisfied that the applicant has complied with the requirements of this Bylaw and any other Village Bylaw related to the conduct of the Business.

b) In granting or renewing a Business Licence, the Village may impose terms and conditions in relation to the following aspects of the Business:

(i) hours of operation; and/or
(ii) occupant load.

c) When issuing or reissuing a Business Licence, the Chief Administrator or their delegate must be satisfied that all the Bylaw requirements of the Village have been met. This includes any Bylaws or required inspections that addresses any or all of the following issues:

i) Building regulations;
ii) Zoning regulations;
iii) Health requirements;
iv) Sanitation requirements;
v) Business regulations; and
vi) Fire Inspections.

d) Notwithstanding 2.9(c) above, the Village may refer the Business Licence application to any third party regulatory or review authority as required, to impose any additional terms and conditions. If it referred out the regulatory or receiving agency has 30 Working Days in which to responded to the referral. The Village may extend this referral deadline, if requested in writing.

d) In addition to the above, the Chief Administrative Officer or their delegate may also refer the Business Licence application to Council to impose any additional terms and conditions.

2.10 Refusal of a Business Licence

a) An application for a Business Licence or renewal of a Business Licence may be refused in any specific case, but

i) the application must not be unreasonably refused; and
ii) the reasons for the refusal must be provided to the applicant in writing.

2.11 Suspension or Cancellation of a Business Licence

a) One or more of the following circumstances may, without limitation, constitute reasonable cause for suspension or cancellation of a Licence:

i) the Licencee has made a false declaration or has misrepresented or concealed a material fact with respect to the application for a Business Licence;
(ii) the Licencee fails to maintain the standard of qualification required to carry on the Business for which the Business Licence was issued or with respect to the Lot or the Building or Structure for which the Business Licence was issued;
(iii) the Licencee has failed to comply with this Bylaw or with a term or condition of the Business Licence;
(iv) in the opinion of the Village, the Licencee has engaged in misconduct with respect to the Business or Building or Structure named in the Business Licence, which misconduct warrants the suspension or cancellation of the Business Licence;
(v) the Licencee is found to have committed a violation of any applicable Village Bylaw or is convicted of an offence under a Federal or Provincial enactment in respect of the Business for the which the Licence was issued or with respect to the Premises for which the Licence was issued;
(vi) the Licencee is convicted of an indictable offence in Canada, which offence is, in the opinion of the Village, directly related to the conduct of the Business.

b) A Business Licence that has been suspended may be reinstated, subject to 2.11(a), when the suspension conditions of the Business Licence have been satisfied and applicable fees as prescribed in Schedule "A" of this Bylaw are paid prior to the Business Licence being reissued.

2.12 Right of Reconsideration of Council

a) If the Village suspends, cancels the Business Licence or has refused to grant a Licence, or has imposed a term or condition that the applicant considers is unreasonable, the applicant who is subject to the decision is entitled to have Council reconsider the matter.

b) On reconsideration of the application, Council may either sustain, refuse or amend the application, its terms or the conditions of approval.

2.13 Exemptions to the Business Licence Requirements

a) Notwithstanding section 2.0(b) and 2.5(b) above, the following Businesses are exempt from the requirements of this Bylaw:
   i) Any Day Care Operations; any
   ii) Real Estate Licencee, subject to the following conditions; no Business Licence is required to carry on any real estate Business unless the realtor occupies Land or uses a Building or Structure in the Village to carry on its Business,
   iii) any type of school, or any
   iv) Apartment Business with five or less Dwelling Units for rent.

2.14 Street Address Numbers

a) Every Licencee who operates from premises located in the Village must prominently display, in figures not less than 100 mm (4 inches) in height, the street address assigned to such premises under the street numbering system of the Village.

2.15 Fire Inspection Reviews for the Transfer of a Business Licence

a) The Business Licence applicants must pay the applicable Fire Inspection fee as prescribed in an applicable Bylaw, as amended from time to time, prior to the Business Licence being transferred.

PART 3 BUSINESS TYPES PROHIBITED IN THE VILLAGE OR A PORTION OF THE VILLAGE

3.1 Types of Business Prohibited or Prohibited in Certain Zones

a) The following types of Businesses are prohibited from operating within the Village boundaries, as amended from time to time:

   i) animal shows;
   ii) Buskers or Busking in an unsanctioned event;
   iii) Cannabis Dispensary;
   iv) Cannabis Operations;
   v) Door-to-door sales of any type;

vi) Medical Cannabis Production Facility, located on any non-ALR land;
vii) Mobile Vendor;
viii) Mobile Vending or Food Truck;
ix) Pawnbrokers;
x) Pop-up Retailers – in an unsanctioned event; and
xi) Tourist Accommodations in any Residential Zone.

PART 4 – REPEAL AND EFFECTIVE DATE

4.1 Repeal

a) With the adoption of this Bylaw, the *Village of Harrison Hot Springs Business Licencing and Regulation Bylaw No. 945, 2010* and any amendments thereto are hereby repealed in their entirety.

b) Every reference to a fee for fire inspection in Schedule "A" of the *Miscellaneous Fee Bylaw No. 1094, 2014* is hereby repealed in its entirety.

4.2 Effective Date

READINGS AND ADOPTION

READ A FIRST TIME THIS ___ DAY OF ___________, 2019

READ A SECOND TIME THIS ___ DAY OF _________, 2019

READ A THIRD TIME THIS ___ DAY OF _____________, 2019

ADOPTED THIS _____ DAY OF _______________, 2019

______________________ ______________________

Mayor Corporate Officer

SCHEDULE "A"
BUSINESS LICENCE AND REGULATION
BYLAW NO. 1128, 2018

ANNUAL FEES & CHARGES[1]

1	Business Licence **non-refundable application fee**	$25.00
2	Business Licence fee	$100.00
3	Fire Inspection fee	$75.00
4	The late penalty fee, must be applied on any renewed application received after January 31st	10% of licence fee

Notes:
1/. Notwithstanding the fees in the above referenced table, the final required fee can be any combination of the above.