Village of Port Clements Community Wildfire Protection Plan 2019

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*Cover photo: Monica Nederend – Rainbow Wharf, Village of Port Clements

REGISTERED PROFESSIONAL SIGN AND SEAL

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I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.	
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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 Community Resiliency Investment (CRI) Program, managed by the Union of BC Municipalities (UBCM), 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 Port Clements (VoPC) with a framework that can be used to review and assess areas of identified high fire risk within the community. 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 47 strategic recommendations are found in a tabularized format within this Executive Summary (Table 1). In addition, these recommendations are more thoroughly discussed in their appropriate sections within the document and are found in written format. Because the area of interest extends outside the boundaries of Port Clements onto North Coast Regional District (NCRD) land and therefore outside VoPC jurisdiction, the role of local government may be limited to the role of an influencer in some instances, while other recommendations can be directly implemented by the VoPC. 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; VoPC 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 Policies and Recommendations)				
Item	**Page No.**	**Priority[1]**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Review and amend the current regulatory framework to incorporate wildfire mitigation and preparedness considerations.				
1	10	High (17)	Review and amend the Village of Port Clements (VoPC) OCP to include a policy under Section 19.5 - Wildfire Interface, which considers wildfire risk as a hazard during development planning in interface areas of the community (e.g. Bayview Street and Highway 16 heading northeast to Masset).	~30-45 in-house hours (local government funding /eligible for UBCM/CRI program funding[2])
2	10	Moderate	Review Section 15.0 - Parks, Trails and Recreation Land Use in the VoPC OCP, and consider the maintenance plan of existing parks within the VoPC boundaries through a wildfire lens. This could include applying for funding of Fuel Management Prescriptions for the proposed treatment units in this document which are nearby community parks (e.g. PTU 3, 4, and 5 - see Section 5.1.1). It could also include scheduled clean-up of accumulations of woody debris adjacent to park trails.	~30-40 in-house hours (local government funding or UBCM/CRI program funding).
3	11	Moderate	Consider trail development through a wildfire lens. This includes consideration for the placement, type, width, and objective of trail, as well as for trail maintenance. These activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (through proper placement, clean-up of combustible fuels trailside and work practices which adhere to *Wildfire Act* and Regulations).	~20-30 in-house hours (local government funding)
4	11	High (18)	Update Section 19.5 (Policies – Wildfire Interface) of the VoPC OCP, upon review of the recommendations of this CWPP.	~20-30 in-house hours (local government funding or UBCM/CRI program funding)
5	12	Moderate	Engage with NCRD to review and amend Bylaw No. 276 to allow woody material greater than 7.5 cm in diameter to be deposited at specified locations. Explore the establishment of a specific green waste dump ('stump dump') similar to that in the Village of Masset. These amendments should consider the risk of wildfire given accidental ignition of green waste and include risk mitigation strategies, such as composting, regular pile burning, chipping and/or spreading of waste. The provision of firewood for the community is also an option for woody debris disposal and risk mitigation.	~30-45 in-house hours (local government funding, potentially eligible for UBCM/CRI program funding)

[1] Recommendations rated a 'High' priority have been further ranked in order of importance, from 1 (prioritize first) to 17 (can be prioritized last).

[2] Refer to Section 5.1 and the Union of BC Municipality's website (https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html) for further information on the Community Resiliency Investment (CRI) Program.

6	13	Low	Encourage homeowner participation in affixing current house address numbering, in order to facilitate emergency response and evacuation efforts. Consider a community-wide engagement campaign, and provide incentives such as the opportunity to acquire / purchase discounted address signs (See Recommendation #8). Consider engaging with the NCRD to reach homeowners outside of the municipal boundary of the VoPC. As part of this campaign, provide instructions on how and where best to affix house numbers. Consistent house numbering has the added benefit of making the eventual provision of 911 service on Haida Gwaii more feasible.	~16-24 VoPC staff hours for engagement campaign, depending on scope
Document Section 3: Values at Risk Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Protect critical infrastructure and mitigate post-wildfire impacts				
7	19	High (10)	Complete formal FireSmart assessments for critical infrastructure such as fire halls, emergency operations centre, water infrastructure, and others as identified in this CWPP (see Table 3 and Table 4) by VoPC staff or by a qualified professional. Depending on location of critical infrastructure, a qualified professional could be a Registered Professional Forester [RPF], with 3-5 years' experience conducting fire hazard assessments, or a trained Local FireSmart Representative – see Section 3.2 for details.	Local FireSmart Representative training costs eligible for UBCM/CRI program funding
8	19	High (11)	The use of fire-resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure (see Section 3.2 for details on existing materials about FireSmart construction materials and building design, and recommendations for a qualified professional to consult with). Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines (see Section 3.2 for details about FireSmart landscaping guidelines). Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which cuts power for days, or even weeks.	~4-16 VoPC staff hours per development, depending on quantity of work outsourced
Document Section 5: Risk Management and Mitigation Factors Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Reduce Wildfire Threat Through Fuel Management				
9	43	High (7)	Proceed with detailed assessment, prescription development and treatment of hazardous fuel units identified and prioritized in this CWPP.	UBCM/CRI Program funding / local government funding

Objective: Maintain Fuel Treated Areas to Maintain Acceptable Wildfire Threat Level				
10	51	Moderate	As treatments are implemented, treatment monitoring should be completed by a qualified professional (Registered Professional Forester [RPF] whose scope of practice includes conducting wildfire hazard mitigation and fuels treatment work).	UBCM/CRI Program funding / local government funding
Objective: Reduce Wildfire Hazard on Private Land				
11	57	High (16)	Consider applying for funding from the UBCM CRI 2021 Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties if rated as moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals and standards of FireSmart, as outlined in Section 5.2.1, but rebate amounts can be funded by CRI.	40-80 in-house administrative hours. Eligible for UBCM/CRI Program funding.
12	57	Moderate	Provide homeowners with existing FireSmart landscaping reference guides (see Section 5.2.2 for details). These reference materials give general guidelines, such as features of flammmable, hazardous vegetation, in contrast with non-flammable, safer alternatives.	~4 in-house administrative hours to assemble and print materials.
13	58	Moderate	Following FireSmart assessments of critical infrastructure (Recommendation #7) VoPC should apply for FireSmart demonstration grants through the Community Resiliency Investment (CRI) Program. This type of project can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments. FireSmart demonstration projects are beneficial in that they meet the dual objectives of enhancing public education of wildfire mitigation and FireSmart principles (through signage, community work days, public tours, active demonstrations of operations, etc.) and improving the resilience of a structure to wildfire.	~20-40 in-house administrative hours. Cost varies depending on number of projects and extent of upgrades. Eligible for UBCM CRI Program funding.
14	59	Moderate	Consider establishing a community-wide campaign or contest for 'Most FireSmart Homes', based on FireSmart principles (available for reference in existing materials). Emphasize the management of combustible materials that may have accumulated on and under exterior projections, such as decks and patios, near the home, and in gutters and on roofs). Consider timing this campaign to occur before the wildfire season (early to mid-April) or during conventional yard clean-up times (often spring and fall). Pursue potential funding through CRI to support this project.	~20-40 administrative hours, depending on scope of engagement campaign. Local government / UBCM/CRI Program funding

15	59	Moderate	Make existing reference materials about FireSmart principles of building design and maintenance, available to homeowners, for consideration when renovating, repairing, or building new structures on properties. Consider applying for funding to develop materials to distribute to homeowners which emphasize FireSmart best building practices, and materials and building design that increase wildfire threat. If and when FireSmart rebate program is established, emphasize potential opportunity for rebate of some home improvement costs.	~4-8 in-house hours to promote and distribute materials. Eligible for UBCM/CRI Program funding
16	60	High (14)	VoPC should hire a qualified professional (Registered Professional Forester [RPF] whose scope of practice includes conducting wildfire hazard mitigation) or consider training local fire services staff members as Local FireSmart Representatives to assist the community in complying with FireSmart principles at the neighbourhood and individual home-level. Funding to train and compensate 1-2 regional FireSmart Representatives could be obtained collaboratively by fire departments on Haida Gwaii. Training for a Local FireSmart Representative entails a two-day workshop, after which certification is granted.	~2 days for a staff member to complete Local FireSmart Representative workshop (UBCM/CRI Program funding available for attendance).
17	62	High (9)	As staff and volunteer capacity allows, this CWPP report and associated maps should be made publicly available through the VoPC's 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.	~4-8 hours depending on method of distribution. Updating websites and social media to provide this report may be eligible for UBCM/ CRI Program funding.
18	62	Moderate	As staff and volunteer capacity allows, 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 VoPC'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 Program funding / local government funding
19	62	Moderate	Consider using the VoPC Facebook group and website to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives, FireSmart resources and activities occurring in the VoPC, updates on current fires and associated air quality if affected, and other real-time information (see Section 5.3 for information sources for some of these items).	~1-2 hours as needed, especially during the fire season, to post key updates. Updating websites and social media may be eligible for UBCM / CRI Program funding

20	62	Moderate	Promote FireSmart approaches for wildfire risk reduction to VoPC residents through Town Hall meetings, FireSmart 101 course, 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. Post fire danger ratings and fire bans via the VoPC newsletter and local radio.	Eligible for UBCM / CRI Program funding
21	63	Low	As staff and volunteer capacity allow, consider working 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.	~40 hours/ initiative UBCM/ CRI Program funding available
22	63	Low	As staff and volunteer capacity allow, facilitate the FSCCRP uptake within the VoPC and enhance its applications by including the following: 1) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool; and 2) 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.	~40 hours/ initiative UBCM/ CRI Program funding may be available
23	63	Low	As staff and volunteer capacity allow, 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. UBCM / CRI Program funding may be available
24	63	High (13)	As staff and volunteer capacity allow, develop and work with with all key stakeholders (industrial operators, other local governments and band councils on Haida Gwaii, MFLNRORD, BCWS, recreational groups/representatives, NCRD staff) to formalize an All-Island Emergency Management Team with an associated Interface Steering Committee. The purpose of the Emergency Management Team would be to coordinate planning, management and response for various emergencies. The Interface Steering Committee would help identify wildfire-related issues on Haida Gwaii to develop collaborative solutions to minimize risks.	~ 40 hours to initiate group; an additional ~50 hours/year to plan, advertise/ communicate, attend, and debrief meetings; additional hours required depending on implementable actions and potential sub-committees developed. Eligible for UBCM / CRI Program funding
25	63	Moderate	Promote and provide information to private landowners related to safe firewood storage as a FireSmart prevention measure (see Section 6.2 for brief guidelines and sources of existing reference material to provide homeowners).	~4-8 in-house hours to prepare materials and disseminate information to landowners, depending on method of delivery (local government funding).

Objective: Promote Fuel Management and Joint Initiatives				
26	64	Moderate	Consider engaging with industrial operators to provide feedback on right-of-way maintenance projects around VoPC boundaries. This could include reporting accumulations of fine fuels, or high conifer regeneration. If and when Interface Steering Committee is formed, this group could be used as a platform for such engagement.	4-10 in-house hours, depending on platform of engagement (local government funding).
Document Section 6: Wildfire Response Resources Recommendations				
Item	**Page No.**	**Priority**	**Recommendation / Next Steps**	**Estimated Cost ($) or Person hours**
Objective: Increase Fire Response Capacity in the AOI				
27	65	Moderate	Promote membership in Port Clements VFD by increasing awareness that structural firefighting in the AOI is exterior-only, which is inherently safer than interior firefighting. Promote the training opportunities associated with volunteer firefighting, including first aid. Explore options to compensate members who elect to take advanced training opportunities through institutions like Coast Mountain College, such as OFA Level 3.	~20-30 in-house hours (local government funding)
28	66	High (6)	Continue to pursue funding opportunities for training and wildland specific equipment that can be shared between the Port Clements VFD and/or other fire departments on Haida Gwaii. An off- road capable fire tanker truck and a trailer of wildland specific firefighting equipment should be obtained in collaboration with other fire departments, including a collapsible water tank, portable pump, and hose lengths. Pursuing funding collaboratively may allow for a larger regional grant due to cost-efficiencies in sharing equipment between communities. In the case that coordinating sharing of equipment is burdensome, focus applications on the needs VoPC only.	~10-20 in-house hours to pursue funding
Objective: Improve Water Availability for Emergency Response				
29	68	High (12)	All new development within the boundaries of VoPC should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. The Fire Department should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.	~5-10 hours per development
30	68	Low	Consider completing a fire flow / water vulnerability assessment, with a focus on determining water storage locations and quantities at Juskatla Camp, and potentially in engagement with Taan Forest Ltd. Focus on determining where upgrades to systems, water storage, or secondary power is required.	$10,000 estimated cost for external consultant. May be eligible for UBCM / CRI Program funding

Objective: Improve Access/Egress to Enhance Emergency Preparedness				
31	69	High (4)	Work with the NCRD to expand the capacity of the Prince Rupert 911 Public Safety Answering Point (PSAP) so that 911 service can be provided throughout the Regional District, including on Haida Gwaii. Participate in a feasibility analysis if conducted by the NCRD in consultation with local RCMP, fire departments, and the Ministry of Justice.	~10-20 in-house hours, depending on involvement
32	69	High (1)	VoPC should apply for funding from UBCM to undertake additional evacuation planning and EOC training exercises. Consider seeking other funding options to improve EOC functionality and capacity, and for emergency support services.	~10-20 hours/year. May be eligible for UBCM Community Emergency Preparedness Fund (CEPF) funding
33	70	High (2)	If and when funding is obtained to complete the evacuation plan, complete and participate in regular testing, and updates, of it. Emergency preparedness information sharing should take place with the All-Island Emergency Management team if/when it is formed. This will help coordinate efforts regionally.	~30-40 hours to plan and stage; 8 hours to complete testing
34	70	High (3)	Promote ePACT sign-up during an annual month-long campaign; target a certain level of resident sign up, i.e. 90%. Use all available platforms, including the VoPC webpage and social media, local radio, posters at businesses and community buildings, a phone call campaign, and door-to-door canvassing. Ensure that VoPC staff are knowledgeable about the system and how to use it.	~30-60 in-house hours (local government funding).
35	71	High (8)	Consider engaging with the NCRD to develop a Total Access Plan for areas of the AOI which are in their jurisdiction. A good platform for this discussion could be a meeting of the Interface Steering Committee, if and when it is established. A Total Access Plan is a 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.	~8-40 in-house hours, depending on scope of involvement
36	71	Low	Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.	10-20 external consultant hours to review current trails/map, provide recommendations

Objective: Increase and Continually Develop Port Clements Volunteer Fire Department (VFD) Staff Training				
37	72	Moderate	The Port Clements Volunteer Fire Department (VFD) should work with BC Wildfire Service (BCWS) to initiate an annual interface training program. As part of the training, it is recommended to conduct annual reviews to ensure personal protective equipment (PPE) and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the Port Clements VFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of structural protection units (SPUs). Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.	Cost and time dependent upon training exercise (scope, number of participating members etc.). Some interagency cooperation initiatives eligible for UBCM / CRI Program funding
38	72	Moderate	The Port Clements VFD should engage in regular communication with BCWS to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities, such as combining BCWS training with vegetation management in the interface or providing local information to support wildfire suppression and mitigation in the AOI.	~4 in-house hours/ year
39	72	High (5)	As training resources / budgets allow, build the capacity of the Port Clements VFD members to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all firefighter training includes S-100 and S-185 (combined) or SPP-WFF1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fires service hose and hydrants) in the application of structural protection units (SPUs).	UBCM / CRI Program / local government funding

Objective: Structure Protection				
40	73	Moderate	Implement programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled community chipping opportunities, or yard waste dumpsters available by month Programs should be available during times of greatest resident activity (likely spring and fall). Programs may also include a community burning day; however, this method of wood waste disposal may be restricted by venting requirements and open burning bans (including Category 2 and 3 burning bans) and / or operational guidance from BCWS. VoPC staff could consider seeking guidance from new BCWS personnel stationed on Haida Gwaii to navigate these restrictions.	~15-30 in-house hours, depending on scope of program. Eligible for UBCM/CRI Program funding.
41	73	Moderate	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.	~$1,500-$5,000 per location (consultant cost). Eligible for UBCM CRI program funding.
42	74	Moderate	Depending on availability of funding to support this purchase, consider collaborating with other Graham Island communities (i.e., Queen Charlotte, Skidegate, Masset / Old Massett and Sandspit) to purchase a Type 2 structural protection unit (SPU) trailer, with the aim of making the unit available to the PCVFD and / or BCWS to use within their jurisdiction in the event of a wildfire close to the community.	$100,000-$150,000 depending on configuration. May be available for UBCM / CRI program funding.

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COMMONLY USED ACRONYMS

ALR	Agricultural Land Reserve
BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CEPF	Community Emergency Preparedness Fund
CHN	Council of the Haida Nation
CFFDRS	Canadian Forest Fire Danger Rating System
CMT	Culturally Modified Tree
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
EOC	Emergency Operations Centre
EMAP	Emergency Management Assistance Program
FBP	Fire Behaviour Prediction System
FMP	Fire Management Plan
FPD	Fire Protection District
FSCCRP	FireSmart Canada Community Recognition Program
HCA	Heritage Conservation Act
HGMC	Haida Gwaii Management Council
HIZ	Home Ignition Zone
ICS	Incident Command System
ISI	Initial Spread Index
LUOO	Land Use Objectives Order MFLNRORD Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NCRD	North Coast Regional District
NFPA	National Fire Protection Agency
OFC	Office of the Fire Commissioner
PSTA	Provincial Strategic Threat Analysis
PTU	Proposed Treatment Unit
SWPI	Strategic Wildfire Prevention Initiative
TSA	Timber Supply Area
UBCM	Union of British Columbian Municipalities
VFD	Volunteer Fire Department
VoPC	Village of Port Clements
WUI	Wildland Urban Interface
WWG	Wildfire Working Group

SECTION 1: INTRODUCTION

In 2019, B.A. Blackwell and Associates Ltd. was retained to assist the Village of Port Clements (VoPC) in developing a Community Wildfire Protection Plan (CWPP); hereinafter referred to as the CWPP, for the municipality. 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 into the document. Furthermore, VoPC 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, 2017 and 2018 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. The total suppression costs for the 2018 season were calculated at $615 million and 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 and update the wildfire risks within and surrounding the VoPC 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 VoPC a current and accurate understanding of the threats to human life, property and critical infrastructure faced by the community 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 enter, and 3) reduce the negative economic and social impacts of wildfire to the community.

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 a two-kilometer spotting buffer around values at risk (structures)

[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 E – Wildland Urban Interface Defined for a more detailed discussion.

within the Village of Port Clements, and the surrounding area. The CWPP process consists of four general phases:

1) **Consultation involving key local government representatives, structural and wildfire specialists, and stakeholders**. Information sharing with the Haida Nation at various stages of the Plan 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 (2019), and field work, fuel type verification, completion of WUI Threat Forms and GIS wildfire threat analyses.
3) **Developing a risk mitigation strategy**. A guide for the Village of Port Clements 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 risk 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 (See Section 1.2.1 for specifics).

1.2.1 Consultation

Broad engagement with local government, Provincial government landowner representatives, stakeholders and the Haida Nation 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 VoPC staff, including the Mayor, Chief Administrative Officer, Volunteer Fire Chief and Deputy Fire Chief, Public Works Superintendent, and Emergency Coordinator. At the initial meeting of the Wildfire Working Group (WWG), the objective was to obtain information on wildfire risk mitigation initiatives currently in place or completed, existing plans and policies, current resources, identify areas of concern, identify vulnerabilities, and to determine priorities and potential mitigation strategies. Members of the WWG were consulted on an ongoing basis throughout plan development and were integral in providing Plan review and approval.

BCWS representatives 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 questionnaire regarding concerns and priorities of BCWS with respect to wildfire and emergency planning in the AOI; and 3) revision of draft document upon plan completion.

Information sharing took place with the Council of the Haida Nation as identified through the Consultative Areas Database, regarding the CWPP and locations or potential for possible cultural values at risk requiring protection consideration. Information sharing consisted of an in-person introduction during the field visit, 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. These stakeholders included the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) Haida Gwaii Natural Resource District Engineering and Recreation Officer and Resource Technologist; and the Ministry of Transportation and Infrastructure (MOTI) Skeena District Manager. Industrial stakeholders were also consulted, including BC Hydro, and representatives from Husby Forest Products Ltd and Taan Forestry Ltd. 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 and concepts of wildfire threat and risk are elaborated on in Section 4. The wildfire threat in the Village of Port Clements were 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).

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 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 community from local government staff and officials, to key stakeholders and residents in wildfire protection planning activities is key to ensuring successful implementation. A community engagement and education strategy is described in Section 5.3. A presentation to the VoPC Council will aim to ensure high level approval and support for this CWPP.

SECTION 2: LOCAL AREA DESCRIPTION

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

2.1 CWPP AREA OF INTEREST

The Village of Port Clements is located at the southeastern edge of Masset Inlet on Graham Island, the northernmost island in the archipelago of Haida Gwaii. The area of interest (AOI) for this CWPP represents a two-kilometer (km) spotting buffer around values at risk (structures) within and surrounding the Village of Port Clements. The AOI includes three geographically discontinuous polygons overlapping the following areas: 1) the community of Port Clements; 2) Juskatla logging camp; and 3) the Ferguson Bay dry land sort.

Around the Village of Port Clements, on Masset Inlet, the AOI buffers the municipal boundary and extends north approximately six kilometers from the northernmost tip of the municipal boundary, partially overlapping the Kamdis Conservancy. The Ferguson Bay dryland sort is located at the edge of Masset Inlet, about six kilometers west from the VoPC. Juskatla Camp is located at the edge of Juskatla Inlet, south of Masset Inlet. This portion of the AOI includes the northern and southern shoreline of Juskatla Inlet, and the network of forest service roads around the camp. Juskatla and Ferguson Bay are within the legally defined bounds of the VoPC municipality; however, they are industrial sites that are part of TFL 60.

The AOI is within the Haida Gwaii Natural Resource District. The AOI for the CWPP is illustrated below in Map 1. The Village of Port Clements has a population of approximately 282[4]; however, the overall population of the AOI may be double this, including the persons residing outside the municipal boundaries, in the jurisdiction of the NCRD.[5] It covers an area of roughly 88 km^2. A breakdown of the AOI's land ownership is provided in Table 2.

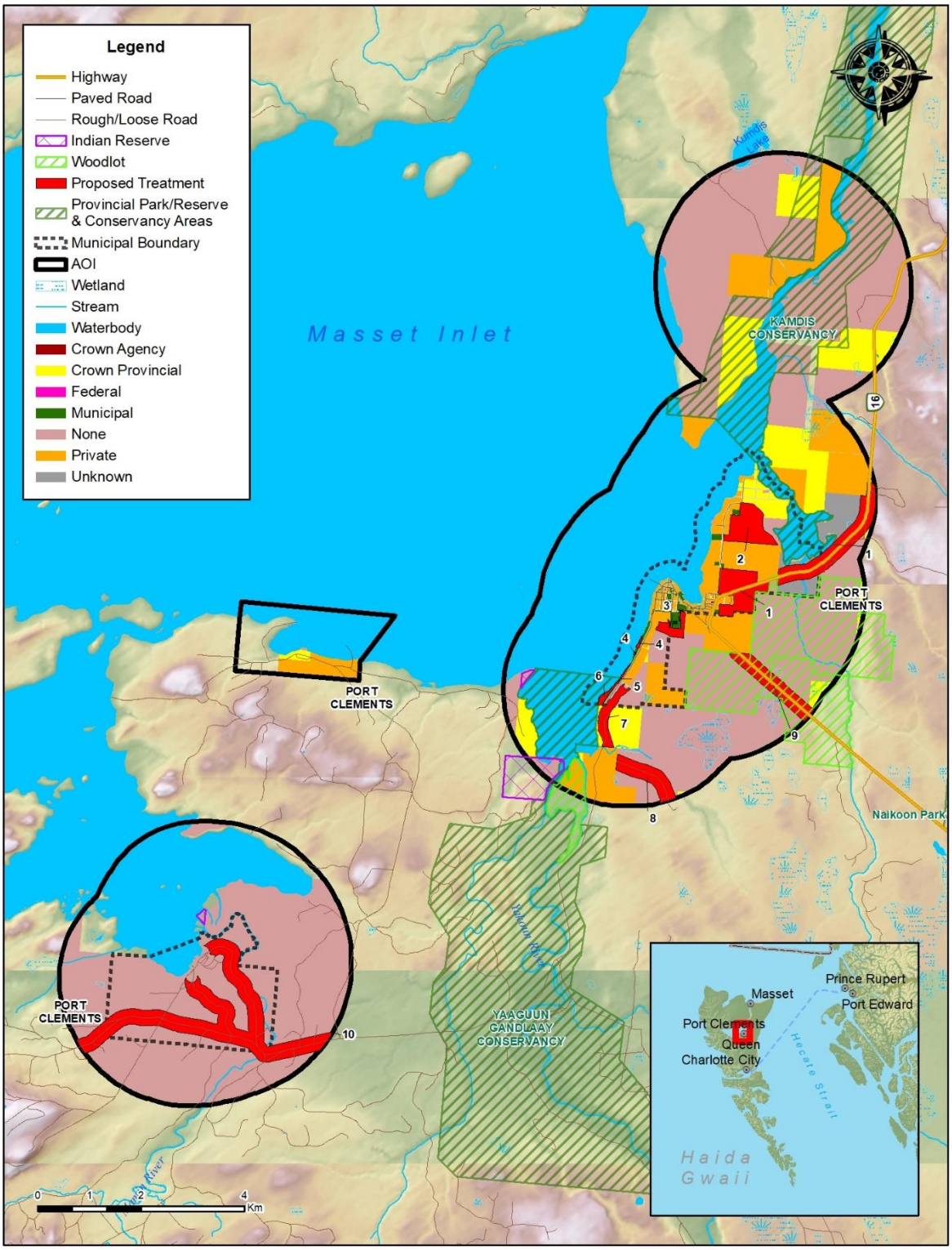
Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
Crown Agency	2
Crown Provincial	7813
Federal	21
Municipal	32
Private	827
Unknown	130
Total	**8,825**

*The land ownership source is ParcelMap BC, provided by the Land Title and Survey Authority (LTSA). This dataset does not differentiate Indian Reserves as Federal Crown parcels.

[4] Statistics Canada, 2016. Dataset – Census Profile. Retrieved from:https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

[5] Doug Daugert, personal correspondence, June 8, 2020.



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

Port Clements is the smallest incorporated community on Haida Gwaii, with a population of 282.[4] Services to residents of Port Clements are provided both at the regional district and municipal level. The regional government provides emergency planning, economic development, land use planning, garbage collection, and owns and operates the Islands Solid Waste Landfill located outside to the AOI. Water and sewer services within the municipal boundaries are provided by the VoPC. Water and sewage services outside the municipal boundaries are provided by private wells and septic systems. Fire protection is provided by the Port Clements Volunteer Fire Department. Within the logging camp and dry land sort areas, infrastructure is owned by Taan Forestry Ltd. The camp and dry land sort are comprised of several permanent structures including administration buildings, storage spaces, repair shops, and refueling stations for boats and vehicles. There are no residential structures at these sites, and the Village of Port Clements does not own or operate water or sewage services at these sites.

Haida Gwaii has been inhabited by the Haida people since time immemorial and the AOI is the traditional territory of the Haida Nation. The largest Haida communities are in Old Massett, and Skidegate. There are several unpopulated reserve parcels within the AOI: Mammin River 25, at the edge of Mamin Bay, near Juskatla Camp; and Satunquin 5 and a portion of Lanas 4, at the edge of Yakoun Bay. A minority of residents of the Village of Port Clements identify as Aboriginal. [4]

The AOI surrounding the community is a flat to rolling area at the edge of Masset Inlet. There are areas of higher elevation further southeast along Highway 16, but the terrain remains low-lying around the two logging camps. Two important water bodies are adjacent to the Village of Port Clements: the Kamdis Slough, which runs through the northern portion of the AOI adjacent to the VoPC, before terminating at McIntyre Bay, and the Yakoun River, which enters Yakoun Bay at the southwest edge of the AOI. There are large tidal flats at both of these locations.

The economy of Port Clements and area has historically revolved around logging and forestry activities, since the establishment of the Juskatla logging camp in the early 1940s. Since the 1990s, the forestry industry has been significantly reduced in the area.[6] Developing secondary manufacturing capacity for forest products in conjunction with a container port, and supporting tourism initiatives were goals of the OCP in response to this downturn.

Fire protection within the AOI is the responsibility of the Port Clements Volunteer Fire Department (VFD). The fire protection district (FPD) of the Port Clements VFD does not extend past the municipal boundaries of Port Clements. BCWS is responsible for responding to fires that are beyond the boundaries of the department FPD. In the event of a wildfire, residents of the Village of Port Clements have only one main emergency access/egress route. Highway 16 is a paved route that runs south from Masset along Masset Inlet to Port Clements, across the Skidegate Plateau, and then south along the coast to Queen Charlotte. Another option is the forest service road that runs west to Rennell Sound and then south to Queen Charlotte. This route is longer, less reliably maintained, and may not be accessible to all

[6] Port Clements, 2012. *Official Community Plan.*

vehicles. This not only presents a challenge for emergency access and egress, but also limits the ability of fire crews to respond to fires and safely evacuate residents.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

Based on the BC Wildfire Service (BCWS) historical wildfire dataset, there have been eight wildfire occurrences within the AOI, all occurring between 1922 and 1944 and within the first two weeks of June. The largest fire, which occurred in 1944, burned 547 ha about 1.5 km from the current municipal boundary, around what is now a stretch of Highway 16. All fires were person caused, but no specific information on the mechanism of ignition is available. No significant wildfire events have occurred since then within the AOI.

The BC Wildfire Service historical ignition dataset demonstrates that the proportion of human-caused fires within the AOI is substantially greater than that of the province as a whole.[7] Within the AOI, all recorded ignitions have been human-caused, compared to 40% in the province of BC.[8] This statistic may be explained by the lower proportion and occurrence of lightning strikes on Haida Gwaii relative to other areas in the province. Additionally, high recreational use within parts of the AOI, specifically for camping, and the prevalence of forestry and other industrial activities likely also contribute to this statistic.

Evacuation planning on Haida Gwaii has historically been focused on tsunami preparedness. Haida Gwaii is a low-lying, seismically active area, with a history of high-magnitude earthquake events.[9] In 2018, communities on Haida Gwaii evacuated in response to a tsunami warning. In Port Clements, areas of higher ground used as community evacuation sites include the Port Clements village office, and Mayer Lake, a site 10 km southeast from the VoPC on Highway 16. Learnings from this evacuation are applicable to wildfire response. Challenges identified by members of the Wildfire Working Group include: the lack of a formal evacuation plan; maintenance of an up-to-date emergency preparedness plan; and coordination of planning with other municipalities. The lack of well-maintained, alternative access and egress routes to Highway 16 was also emphasized as an emergency planning issue.

2.4 CURRENT COMMUNITY ENGAGEMENT

Although Haida Gwaii has historically had few wildfires and emergency awareness has been mainly focused on tsunamis, the recognition from staff and residents of the VoPC of the threat posed by wildfire is growing. Recently, hot and dry summers with high wildfire incidences around the province have increased awareness. There has been little community engagement in FireSmart initiatives to this point within the AOI. A barrier to community FireSmart engagement is the lack of trained FireSmart representatives in the communities and on Haida Gwaii in general. Although there is interest from members of the local fire departments and other fire departments on Haida Gwaii to attend a FireSmart

[7] BC Wildfire Service, 2019. Provincial Strategic Threat Analysis Dataset. Fire Incident Locations – Historical. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes

[8] 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

[9] Moore, Carmin. 2017. Tsunami Pole Project: An Innovative Approach to Tsunami Preparedness in Haida Gwaii. . https://www.ncrdbc.com/sites/default/files/docs/about-us/news/tsunami_pole_project_report.pdf

workshop, no FireSmart workshop has taken place on Haida Gwaii. The time and cost of getting to the mainland to attend such a workshop is a significant barrier for volunteer firefighters.

Interface fire hazards, as well as strategies to reduce risk of wildfire and increase ability to fight wildfire, were noted within the AOI during field assessments. Recommendations include building and making modifications to existing structures by building in accordance with the 'FireSmart Begins at Home Manual'.[10] Cedar siding and cedar shake roofs were noted, as were some coniferous vegetation adjacent to buildings. A review of the VoPC Official Community Plan (OCP) should be undertaken to address issues relating to public safety, including road design for access and egress and the integration of FireSmart principles into new bylaws. Further recommendations include educating homeowners/residents on FireSmart principles for building material use, landscaping and appropriate setbacks from forested areas. FireSmart brochures can be distributed by the local fire department and made available at community events and at central community locations like the Village Office/multiplex.

It is suggested that the VoPC Volunteer Fire Department webpage on the VoPC website[11] be expanded to include more information about wildfire planning and prevention, as well as to provide the emergency and non-emergency contact information. This could facilitate volunteer recruitment and provide a platform from which to share FireSmart materials. This webpage could include the current Fire Danger Rating, a FireSmart workshop request contact, links to FireSmart resources, a "how-to" video on FireSmart-ing your home, and purchasing information for Wildfire Automated Sprinkler Protection (WASP) systems[12]. Other social media platforms could be created or maintained for this purpose as well (In order to increase public uptake and participation future initiatives should focus efforts following an active fire season in BC to maximize the resources available for community engagement. See Section 5.3 for recommendations related to community education and engagement.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of VoPC, NCRD and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments and emergency planning. Local, regional, and provincial plans and policies will be analyzed in this section to identify current actions being taken to mitigate fire hazard and wildfire threat in and around the VoPC and to identify regulations that may impact fuel management planning in the AOI. This section will also identify gaps in wildfire hazard policy and planning that can be addressed by the VoPC, and will provide corresponding recommendations.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by the VoPC. The unincorporated areas outside of the VoPC municipal boundary are managed by the NCRD under the Emergency Response and Recovery

[10] FireSmart Canada. Resources. Available from https://firesmartcanada.ca/resources/ and British Columbia FireSmart. Guides & Manuals. Available at https://firesmartbc.ca/resource-types/guides-manuals/

[11] https://portclements.ca/municipal-information/village-office/fire-department/

[12] WASP systems are system roof-mounted sprinkler available to homeowners to reduce the potential of damage to their home in the event of a wildfire. A description of one type of WASP system is referenced here: https://www.100milefreepress.net/news/wasp-offers-sprinkler-systems-to-help-protect-homes-from-wildfires/

Plan for Area D, with an associated Emergency Program Guide. The plan was developed to optimize the response, resources and planning for incidents that may occur within the NCRD. The plan outlines the Emergency Operations Centre (EOC) functions, EOC activation, contingency plans for specific disasters, and the chain of command and the roles of each section (operations, planning, logistics, and administration) in the event of an emergency.

Skeena-Queen Charlotte Regional District[13] Electoral Areas D, E, and F Emergency Program Guide (2006)

This guide was developed to manage emergencies in the NCRD and is a companion to the Skeena-Queen Charlotte Regional District Electoral Area 'D' Emergency Response and Recovery Plan (2006). It outlines objectives, strategies, and action items for mitigating risk in the community. [14] The primary hazards identified in the guide are earthquakes, power outages, landslides, and airplane crashes; however, the program is inclusive of all possible emergencies, including wildfire. The program addresses 'site-support' of a major emergency, including implementation of an Emergency Operations Centre (EOC) and the Incident Command System (ICS). The program has six objectives with related strategies. Some of the strategies to achieve these objectives are relevant to the CWPP process, including: assessing risks, mitigating risks, developing a plan for both response and recovery, ensuring preparedness, and evaluating and renewing the program. The creation of the CWPP works towards achieving many of these objectives. Detailed tasks are also outlined for each objective and strategy, with a responsible member of the NCRD designated. Dates and budgets are to be determined.

Skeena-Queen Charlotte Regional District[13] Electoral Area D Emergency Response and Recovery Plan (2006)

The purpose of the emergency response plan is to mitigate deleterious effects from major emergencies in the NCRD Electoral Area D.[15] The plan contains operational guidelines for response to emergencies, including delegation of authority and procedures to be followed. Interface fires are to managed using unified command with Incident Commanders (ICs), supplied by MFLRNORD. The EOC will support MFLNRORD if requested during interface fires and during wildfires. By default, the Fire Chief is the Operations Chief of the EOC. Operations include determining the need for and coordinating evacuation, advising utilities, and coordinating traffic.

2.5.2 Affiliated CWPPs

No CWPPs have previously been developed for communities on Haida Gwaii. However, the same consultant is developing CWPPs for the communities of Queen Charlotte/Skidegate, Port Clements, Masset/Old Massett and NCRD Electoral Area E (Sandspit). This will help ensure consistency in recommendations at the regional level and synergies within proposed future fuel treatment works. At

[13] The Skeena-Queen Charlotte Regional District is an older name for the area now termed the North Coast Regional District. The name change occurred in 2016. The two names are interchangeable.
[14] Skeena-Queen Charlotte Regional District. 2006. Skeena-Queen Charlotte Regional District Electoral Areas D, E, and F Emergency Program Guide. Retrieved from: https://www.ncrdbc.com/sites/default/files/docs/services/sqrcd-areas_d_e_and_f_emergency_program_guide-final_jan_2006.pdf
[15] Skeena-Queen Charlotte Regional District. 2006. Skeena-Queen Charlotte Regional District Electoral Area D Emergency Response and Recovery Plan. https://www.ncrdbc.com/sites/default/files/docs/services/sqcrd-area_d_emergency_response_and_recovery_plan-final_jan_2006.pdf

the time of writing, a CWPP for the Tlell and Tow Hill areas of Electoral Area D is in initial stages of development, also by the same consultant.

2.5.3 Local Government 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. The following municipal bylaws, strategies and policies are relevant to wildfire planning in the AOI.

Village of Port Clements Official Community Plan (Bylaw No. 398, 2012)

The Official Community Plan (OCP) for the VoPC provides guidance for general policies, land-use area designations, development, environmental protection, infrastructure and services within municipal boundaries. The following sections contain objectives and policies which are directly relevant to wildfire risk reduction, emergency response, and community resilience post-disaster as described below.

2012 Village of Port Clements Official Community Plan, Subsection 6.0: Community Growth

This section of the OCP speaks to the expansion of development within the Village and describes the objectives and policies associated with future development.

RECOMMENDATION #1: Review and amend the Village of Port Clements OCP to include a policy under Section 19.5 - Wildfire Interface, which considers wildfire risk as a hazard during development planning in interface areas of the community (e.g. Bayview Street and Highway 16 heading northeast to Masset).

2012 Village of Port Clements Official Community Plan, Subsection 15.3: Parks, Trails and Recreation Land Use

This section of the OCP emphasizes the importance of park and trail creation and acquisition for the Village and provides policies that enable this process.

RECOMMENDATION #2: Review Section 15.0 - Parks, Trails and Recreation Land Use in the VoPC OCP, and consider the maintenance plan of existing parks within the VoPC boundaries through a wildfire lens. This could include applying for funding of Fuel Management Prescriptions for the proposed treatment units in this document which are nearby community parks (e.g. PTU 3, 4, and 5 - see Section 5.1.1). It could also include scheduled clean-up of accumulations of woody debris adjacent to park trails.

RECOMMENDATION #3 Consider trail development through a wildfire lens. This includes consideration for the placement, type, width, and objective of trail, as well as for trail maintenance. These activities can either increase wildfire risk (through fuels accumulations and unsafe work practices) or decrease wildfire risk (through proper placement, clean-up of combustible fuels trailside and work practices which adhere to *Wildfire Act* and Regulations).

2012 Village of Port Clements Official Community Plan, Subsection 17.3: Water Supply

This section of the OCP outlines the current water supply and sewer system for the Village of Port Clements. Policies are in place to encourage water conservation among residents, and to maximize efficiency of water distribution by measures that include the installation of water meters and the requirement of water-saving fixtures in new construction.

2012 Village of Port Clements Official Community Plan, Section 19: Environmental Management

This section of the OCP outlines hazards posed by the natural environment within and adjacent to the OCP area, and also outlines protections necessary to protect important or sensitive natural features. Subsection 19.5 contains a policy suggesting a wildfire interface study. This study would identify areas for future development that may be susceptible to wildfire, and identify mitigation actions.

RECOMMENDATION #4 Update Section 19.5 (Policies – Wildfire Interface) of the VoPC OCP, upon review of the recommendations of this CWPP.

Official Community Plan for Rural Graham Island: Area D - Skeena Queen Charlotte Regional District (Bylaw 532, 2011)

The Official Community Plan (OCP) for the unincorporated areas of NCRD Electoral Area D (which encompasses all of the area on Graham Island and the small islands off its coastline, but excludes the municipalities of Masset, Port Clements, and Queen Charlotte) provides guidance for general policies, land-use area designations, development, environmental protection, infrastructure and services throughout Graham Island. This document applies to the area of the AOI that is outside the boundaries of Port Clements and reserve lands. The following sections contain objectives and policies which are relevant to the CWPP.

Official Community Plan for Rural Graham Island: Area D – Skeena Queen Charlotte Regional District: Section 9 - Transportation and Mobility Access

The fire departments on Graham Island are encouraged to work with the Ministry of Transportation and Infrastructure (MOTI) to identify roads that require upgrading or where the road network can be extended for fire protection purposes.

Official Community Plan for Rural Graham Island: Area D – Skeena Queen Charlotte Regional District: Section 10.6 - Fire Protection

This section of the OCP considers enacting policies to extend existing FPD boundaries to include rural parts of Electoral Area D that do not have fire protection service or adequate water supply for firefighting. This applies to areas within the AOI outside of municipal boundaries.

Official Community Plan for Rural Graham Island: Area D – Skeena Queen Charlotte Regional District: Section 11.3 - Institutional/Community Uses and Facilities

An objective of the OCP is to encourage islanders to take individual and community responsibility for fire protection and prevention.

North Coast Regional District Bylaw No. 400 (2000): Rural Graham Island House Numbering Bylaw

A bylaw to adopt a system of house numbers for rural Graham Island. The bylaw stipulates that all numbers assigned to buildings and structures should be attached so as to be easily read from the road and identified.

North Coast Regional District Bylaw No. 276 (1995): Islands Solid Waste Management Regulations, Fees and Charges Bylaw (consolidated to 2013) and amendment Bylaws No. 573 (2014) and No. 584 (2014)

Requires residents to participate in the garbage collection service on Haida Gwaii. The bylaw sets fees for solid waste disposal and regulates the type of waste that can be deposited. Prohibited wastes including ignitable waste (defined as flammable gas, liquids, solids, or substances liable to spontaneous combustion) and explosives cannot be deposited without a permit from the NCRD. Propane tanks are accepted for recycling at both the Port Clements Landfill and transfer stations located in Skidegate, Masset, and Sandspit. The bylaw allows yard and garden waste to be deposited but requires woody material to be less than 7.5 cm in diameter.

RECOMMENDATION #5: Engage with NCRD to review and amend Bylaw No. 276 to allow woody material greater than 7.5 cm in diameter to be deposited at specified locations. Explore the establishment of a specific green waste dump ('stump dump') similar to that in the Village of Masset. These amendments should consider the risk of wildfire given accidental ignition of green waste and include risk mitigation strategies, such as composting, regular pile burning, chipping and/or spreading of waste. The provision of firewood for the community is also an option for woody debris disposal and risk mitigation.

Village of Port Clements Bylaw No. 91, 1980: Fire Department Bylaw

This bylaw establishes a volunteer fire department for the island. It regulates the call or fire emergency response boundaries of the fire department. It also regulates fire lighting within the Village of Port Clements boundaries, including permitted burning dates (Nov 1st to April 30th).

Village of Port Clements Bylaw No. 139: House Numbering

This bylaw speaks to house numbering system within the VoPC. Numbers assigned to buildings and structures shall be so placed as to be easily read from the highway, upon whichever building or structure is deemed to border it, as indicated by the numbers assigned on the "Schedule". See bylaw for specific signage requirements.

RECOMMENDATION #6: Encourage homeowner participation in affixing current house address numbering, in order to facilitate emergency response and evacuation efforts. Consider a community-wide engagement campaign, and provide incentives such as the opportunity to acquire / purchase discounted address signs (See Recommendation #8). Consider engaging with the NCRD to reach homeowners outside of the municipal boundary of the VoPC. As part of this campaign, provide instructions on how and where best to affix house numbers. Consistent house numbering has the added benefit of making the eventual provision of 911 service on Haida Gwaii more feasible.

Village of Port Clements Bylaw No. 195: Subdivision Servicing

This bylaw regulates services in respect to the subdivision of land pursuant to the Community Charter. Water systems (water distribution, sanitary sewer, drainage works and underground wiring) are to be provided within all subdivisions. Communities that are not served with a water system must have an approved year-round supply of ground water (wells) in accordance with specific rules and regulations.

Village of Port Clements Bylaw No. 377: PCVFD Amendment

This bylaw amends the existing Village of Port Clements Volunteer Fire Department Bylaw No 91, 1980. These changes include modifications made to service areas and boundaries of fire protection. These areas include:

- To a property within the Fire Protection District as approved by Council annually within the Community Charter powers established under Section 13;
- To a motor vehicle incident within the Fire Protection District;
- When called upon for assistance for fire or motor vehicle incident by other Fire Protection agencies on the Islands including Tlell, Masset and Queen Charlotte;
- When called upon by the Area coordinator for the Provincial Emergency Program in the event of a National or Local Disaster, or d) when called upon for the assistance by the Forest Officer or Regional Manager as appointed by the " Ministry of Forests Act"

Village of Port Clements Bylaw No. 408: Emergency Management Committee

This bylaw establishes an emergency management committee, comprised of at least five members. It is tasked with preparing and presenting an annual report on plans regarding preparation for, response to, and recovery from emergencies and disasters.

2.5.4 Higher Level Plans and Relevant Legislation

Haida Gwaii Strategic Land Use Agreement (2007) and Land Use Objectives Order (2010)

The Haida Gwaii Strategic Land Use Agreement[16] (SLUA) and Haida Gwaii Land Use Objectives Order[17] (LUOO) were jointly completed between the Council of the Haida Nation and the Province of BC in 2007 and 2010 respectively. The purpose of the SLUA was to confirm strategic land use zones, ecosystem-based management (EBM) objectives, and provide a framework for implementation. The LUOO establishes legal objectives for forest-based values to support implementation of the EMB objectives identified in the SLUA.

LUOO are currently implemented by the Haida Gwaii Management Council (HGMC), a joint decision-making body comprised of two representatives of the Haida Nation and two representatives of the Province of BC. In addition to implementing the Haida Gwaii LUOO, the HGMC also determines the Annual Allowable Cut (AAC) for Haida Gwaii, approves management plans for protected areas, and develops polices for identifying and conserving heritage sites.[18]

The AOI overlaps with several areas to which legal objectives apply under the Haida Gwaii LUOO. These include one forest reserve (similar to an Old Growth Management Area (OGMA)), four Cedar Stewardship areas, many occurrences of Type I and II Fish Habitat, Marbled Murrelet Nesting Habitat, a Northern Saw-whet Owl Reserve and a Sensitive Watershed.[17] Any proposed fuel treatment that may overlap these areas requires HGMC oversight at the prescription development phase, and works can only occur following HGMC consultation and approval. Other legal objectives include but are not limited

[16] Ministry of Agriculture and Lands, The Council of the Haida Nation, 2007. *Haida Gwaii Strategic Land Use Agreement.*
[17] Ministry of Agriculture and Lands, The Council of the Haida Nation, 2014. *Land Use Objectives Order Haida Gwaii (Consolidated Version).*
[18] Haida Gwaii Management Council, 2019. *FAQs.* Retrieved from: http://www.haidagwaiimanagementcouncil.ca/faqs/

to retention of western redcedar, yellow-cedar, and western yew retention; protection of culturally modified trees and monumental cedar; and protection of red and blue listed ecological communities.

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.

Haida Gwaii Natural Resource District Response Fire Management Plan

The Haida Gwaii Natural Resource District Response Fire Management Plan (FMP)[19] describes landscape level fire management planning at the Natural Resource District level. The FMP was completed in 2019 by MFLNRORD with the Council of the Haida Nation (CHN) as signatories and co-authors to the Plan. The FMP identifies values at risk and prioritizes broad categories of values as 'themes' for categorizing response through the Resource Strategic Wildfire Allocation Protocol (RSWAP). Culturally sensitive areas were identified by the CHN and are not mapped in the plan, but can be requested in the event of a wildfire from CHN. The FMP speaks to the unique challenges faced when responding to wildfire on Haida Gwaii. Because of the historical occurrence and intensity of fires on Haida Gwaii is lower than in many other parts of the province, the time lag required to mobilize a BCWS crew and resources from the mainland to Haida Gwaii in the event of a wildfire poses a significant challenge to rapid response. The FMP also identifies opportunities for modified response, where a fire is actively managed, but not extinguished. The FMP also describes the management of logging debris for wildfire hazard abatement on Haida Gwaii, but potential fuel breaks around municipalities and critical infrastructure are not identified in the FMP. To address this gap, fuel treatment opportunities to protect values at risk have been identified and mapped as part of this CWPP. These proposed treatment units have been recommended in order to protect critical infrastructure in the AOI, as well as to serve as strategic anchors for fire suppression and to reduce the potential for extreme crown fire behavior.

Forest Stewardship Plans

Numerous active Forest Development Units (FDU) are located within the AOI, with associated Forest Stewardship Plans (FSP). FSPs set specific forest practices obligations applicable to specific forest licensees. FSPs for the three major forest licensees operating in the TSA (Taan Forest Ltd., Husby Forest Products Ltd., and A&A Trading), as well as BC Timber Sales (BCTS), were recently renewed and are available online.[20, 21,22,23] The FSPs each contain results and strategies to achieve government objectives, and are tied to legal objectives established in the Haida Gwaii LUOO. The FSPs contain strategies for the protection of cultural features, aquatic habitats, biodiversity, and wildlife, including the identification of Haida Traditional Forest Features, the retention of cedar and western yew, and the protection of fish habitat, red and blue-listed ecological communities, and Marbeled Murrelet nesting habitat. The FSPs

[19] Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2019. Haida Gwaii Natural Resource District Response Fire Management Plan.
[20] Husby Group Haida Gwaii FSP 2018-2023. 2018. Available from http://www.husbyforestproducts.com/
[21] A&A Trading Ltd. FSP 2018-2023. 2018. Available from https://www.aatrading.com/sustainability.html
[22] Taan Forest Ltd. & Limited Partnership: FSP 2018-2023. 2018. Available from https://www.taanforest.com/resource-planning
[23] BC Timber Sales. BCTS Chinook Business Area FSP Haida Gwaii NRD 2019-2014. 2019. Available from https://www2.gov.bc.ca/gov/content/industry/forestry/bc-timber-sales/fsp/haida-gwaii-41865

also spatially identifies legal reserves, declared areas (cutblocks and roads), measures for invasive species, and stocking standards.

Taan Forest Ltd. Wildfire Preparedness and Response Plan

Taan Forest Ltd. has developed a wildfire preparedness and response plan to provide guidance to the company and contractors in preventing and responding to wildfires.[24] The plan includes a list of approved blocks, their location and ease of public access; emergency contacts; designated roles, responsibilities, and procedures in the event of a fire; legal requirements; guidelines for working with MFLNRORD/BCWS; and an inventory of wildfire suppression equipment held by Taan Forest Ltd. and their contractors.

Protected Area Management Plans

Kamdis, located north of the Village of Port Clements, is the only protected area located within the AOI. It is formally protected by both the Haida Nation as a Haida Heritage Site and by BC Parks as a conservancy. A management plan for Kamdis was completed in 2011. Small-scale tree removal (defined as a few trees, or less than 1 ha in area) is identified in this plan as an acceptable management option when required to facilitate approved development, for ecological restoration, or forest health management projects. Private lands and properties are present close to the protected area on Kumdis Island.

Forest Health Management

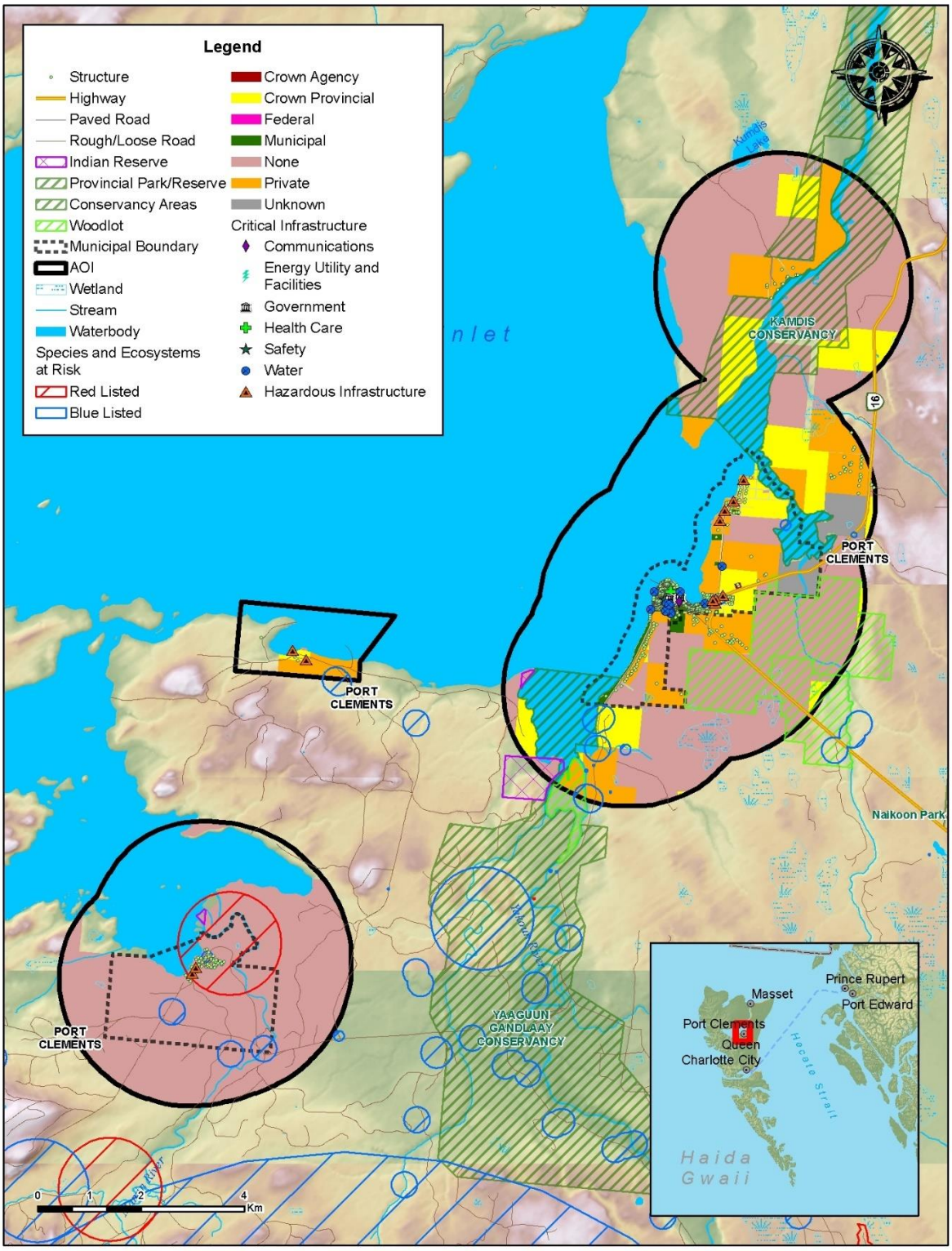
The AOI is located within Haida Gwaii Timber Supply Area (TSA). Forest health management and associated initiatives within the Haida Gwaii TSA are guided by the Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview[25]. This plan must be reviewed, considered, and addressed during the 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 Port Clements. 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.

[24] Taan Forest Ltd. 2018. Wildfire Preparedness and Response Plan. Available from https://www.taanforest.com/resource-planning

[25] Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2015. *2015-17 Coastal Timber Supply Areas Forest Health Overview.*



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.[26]

Human life and safety are 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 causing 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 Port Clements declined approximately 25% between 2011 and 2016.[4] Within Port Clements there are approximately 365 occupied dwellings, 65% of which are single-detached homes. The area attracts visitors for fishing, boating, and camping, particularly during the fire season (May – October). All of these factors increase 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 AOI, consultation with the WWG, and access to recent orthophotography has enabled the development a spatial layer with structure locations that accounts for the most recent development.

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 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.

A critical infrastructure dataset was identified using available orthophotography and a field visit and was verified with the WWG. Locations of critical infrastructure are shown in Map 2. Table 3 provides an inventory of identified critical infrastructure.

Protection of critical infrastructure is essential for wildfire preparedness, community services and business continuity. 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

[26] Province of British Columbia, 2016. *BC Provincial Coordination Plan for Wildland Urban Interface Fires.* Retrieved from: 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

reducing wildfire risk to both classes of structure and are reflected in the outlined recommendations. During the field visit, it was observed that critical infrastructure in the AOI (i.e. village multiplex, Juskatla workshops, water treatment facilities, etc.) is in various levels of compliance with FireSmart principles.

It is recommended that FireSmart assessments be made of critical infrastructure by a qualified professional. Depending on the site at which critical infrastructure is located, individuals with different qualifications may be suited to make this assessment. If the critical infrastructure is located in urbanized or modified (agricultural, brownfield, or greenfield) sites than the assessment can be performed by a trained Local FireSmart Representative in the volunteer fire department. However, if the critical infrastructure is surrounded by or is proximal to forested vegetation, then a forest professional whose scope of practice includes wildfire management (as per the ABCFP Guidelines) and is also a trained Local FireSmart Representative should be used for these assessments.

It is also recommended that fire-resistant construction materials, building design and landscaping should be considered for critical infrastructure upgrades or construction. Basic references to these materials, design, and landscaping standards can be obtained in FireSmart Canada manuals.[27] A qualified professional could also be consulted to make recommendations for critical infrastructure construction. The best professional to consult with would have experience conducting FireSmart assessments, and be familiar with the range of building materials used. Most likely this professional will be a registered forester (RPF) whose scope of practice includes wildfire hazard mitigation and fuels treatment work. It may be necessary to consult with more than one professional, depending on the project; a forester may not have the knowledge base to recommend building materials, and an architect or engineer may not have the knowledge base to account for wildfire behavior. One possible strategy for the construction or renovation of critical infrastructure to fire-resistant standards, is to consult with an architect for building material information and include a FireSmart assessment in a request for proposal, to be contracted out separately.

RECOMMENDATION #7: Complete formal FireSmart assessments by a qualified professional for critical infrastructure such as fire halls, emergency operations centre, water infrastructure, and others as identified in this CWPP (see Table 3 and Table 4) or by VoPC staff. Depending on location of critical infrastructure, a qualified professional could be a Registered Professional Forester [RPF], whose scope of practice includes conducting wildfire hazard mitigation and fuels treatment work, or a trained Local FireSmart Representative.

RECOMMENDATION #8: The use of fire-resistant construction materials, building design and landscaping should be considered for all CI when completing upgrades or establishing new infrastructure (see Section 3.2 for details on existing materials about FireSmart construction materials and building design, and recommendations for a qualified professional to consult with). Additionally, vegetation setbacks around critical infrastructure should be compliant with FireSmart guidelines (see Section 3.2 for details about FireSmart landscaping guidelines). Secondary power sources are

[27] See for example the Home Owner's FireSmart Manual, B.C. Edition (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/preparedbc/homeowner-firesmart.pdf), and the FireSmart Combustible Siding Fact Sheet (https://firesmartcanada.ca/wp-content/uploads/2019/10/FireSmart-Combustible_Siding_Fact_Sheet_Final.pdf) Additional resources available here: https://firesmartcanada.ca/resources/

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 the VoPC is received through a network of wood pole transmission infrastructure, supplied by BC Hydro. Major transmission lines run south from Masset along Highway 16 to Skidegate and Queen Charlotte. The VoPC is part of the northern electrical grid on Haida Gwaii, which also serves Masset and Old Massett, and which is powered by the BC Hydro Masset Diesel Generation facility, located approximately 2 km east of Masset. WWG members reported an established relationship and strong communication with BC Hydro. An underground backup generator is also available as a secondary power source, if required.

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.

Although the generation facility itself is in a vegetation free space, neighbourhoods with small, street-side wooden poles to connect homes are particularly vulnerable to fire. It is recommended that right-of-way best management practices (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. 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.[28]

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 in the AOI. The Port Clements Elementary School has solar power back-up, but the rest of the Village Multiplex, including the Village Office does not. The VoPC firehall and water treatment plant both have backup generators. There is a mobile generator that can provide backup power to the sewer lift stations and well pumps. Vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale outage occur, and fuel shortages in the event of very long outages. Diesel is barged in from Prince Rupert, which is a significant vulnerability for Haida Gwaii communities. Refer to Section 6.1 for discussion and recommendations related to backup power and water availability for fire suppression.

3.2.2 Communications, Pipelines and Municipal Buildings

Wood stoves are the primary sources of residential heating in the AOI. Heat pumps are also used. There are no natural gas transmission pipelines on Haida Gwaii. Many residences also have wood burning stoves. A biomass heating plant provides heat to the Village Multiplex, and the VoPC firehall. There is no backup source of power for the biomass plant.

[28] BC Hydro, 2019. *Earthquakes, wildfires and floods*. Retrieved from: https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html

Residents are serviced by the Port Clements Medical Clinic, located in the Village centre. There is a larger hospital in the Village of Queen Charlotte and one between Masset and Old Massett. The VoPC firehall was identified as the Emergency Operations Center (EOC) for the VoPC. The Village Multiplex has also been identified as a tsunami evacuation site. For emergencies that require the organization of the regional district, the NCRD office in Prince Rupert has been identified as an EOC.

A new cell tower was constructed in Port Clements in March 2019, which provides the village and nearby areas with high-speed wireless voice and internet services. It has enabled more reliable and effective delivery of emergency alerts to residents, including through the ePact network (see Section 6.1.3 for further details).

A full inventory of critical infrastructure for communications and emergency operations with updated locations is presented in Table 3, below.

Table 3. Critical Infrastructure identified in CWPP field visit.

Critical Infrastructure Type	Location
Port Clements Volunteer Fire Hall	35 Tingley Street
Village Office	36 Cedar Avenue
Radio/cellular communication tower	Corner of Park Street and Tingley Street
Port Clements Elementary School & Gym	14 Park Street
Port Clements Medical Clinic/Ambulance Station	12 Park Street
Telus communications building	40 Bayview Drive
Gwaii Communications internet hub	35 Tingley Street (inside Port Clements Fire Hall)
Angela's Place Social Café & Gas Station	2 Grouse Street
Port Clements Museum	45 Bayview Drive

3.2.3 Water and Sewage

The VoPC operates water and sewage systems for its residents. Both the water and sewer systems service only the core of the Village of Port Clements. The water supply area extends west from Ryland Road to the end of Bayview Street, excluding Industrial Park Road. The sewer supply area extends south from the lagoon on Industrial Site Road to the core of the Port Clements residential area (not extending south of Williams Road); and from Ryland Road at the eastern edge to the water on the western edge. There are no water or sewage system services at Juskatla camp or Ferguson dryland sort, or on Kumdis Island. Approximately 60% of VoPC residents are serviced by the municipal water supply system and 50% of residents are serviced by the municipal sewer collection system.

The water system in the VoPC is supplied by two active groundwater wells. WWG members reported that two additional wells have been drilled in 2019, but are not currently producing water, and are not expected to produce water in the near future. WWG members report that the main well normally operates at 70% capacity, and may be run at up to 100% capacity under drought condition. From the two wells, water flows to the water treatment plant. The water treatment plant was installed in 2012, and treats water in a three-step process. Following treatment, water is sent to the three reservoir tanks. Water is pumped through the distribution network at a pumphouse located adjacent to the water

treatment building.[29] There is limited hydrant service within the AOI boundaries and the water service supply area. In the case of a power outage, there is a diesel generator that can provide backup power for the water treatment plant, and a mobile generator that can provide backup power for sewer pumps.

A detailed account of water availability for wildfire suppression is provided in Section 6.1.2. Locations for water infrastructure within the AOI are detailed below in Table 4.

Table 4. Critical Infrastructure Identified in CWPP field visit.

Critical Infrastructure Type	Description
Water supply	The Village of Port Clements water system and associated infrastructure include the following: • Water treatment plant • Reservoirs (3) • Wells (4) • Pump station • Hydrants
Sanitary sewer system	The Village of Port Clements sewage system and associated infrastructure include the following: • Sewage lagoon • Wastewater treatment plant • Sewage lift stations (4)

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 very 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

Drinking water is supplied through two groundwater wells in the AOI. One is located near the Village treatment building and one is located approximately 235 m southeast in Community Park. A groundwater assessment report conducted in 2016 noted that there are no provincially mapped aquifers underlying the village, but that based on local logs, wells are accessing a confined aquifer located between approximately 40 and 60 meters below ground surface. This report also states that there are no occurrences of water shortages in summer months from these wells. [29]

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.[30] 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

[29] McElhanney Consulting Services Ltd., 2017. *Village of Port Clements Water System Study Report*. Retrieved from: https://www.portclements.ca/wp-content/uploads/2017/01/2016-Water-Study.pdf

[30] 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.

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.[31]

3.3.2 Cultural Values

The Haida have occupied Haida Gwaii since time immemorial and are the only Aboriginal group whose territory overlaps the AOI. The Council of the Haida Nation (CHN) has offices in both Skidegate and Masset and is a management partner in the Kamdis Conservancy, as well as the other parks and protected areas on Haida Gwaii. The Haida are currently engaged in a legal dispute over title to Haida Gwaii.

Archaeological sites and remains in BC that pre-date 1846 are protected from disturbance, intentional and inadvertent, by the *Heritage Conservation Act* (HCA), which applies on both private and public lands. Sites that are of an unknown age that have a likely probability of dating prior to 1846 (i.e., 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 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 many sites exist throughout the AOI. If and when fuel management prescriptions are carried out in the proposed treatment units, further assessment of archaeological features may be necessary to ensure that cultural heritage features are not inadvertently damaged or destroyed. This may include preliminary reconnaissance surveys or archaeological impact assessments. Determining the necessity of further archaeological assessment is the responsibility of the professional developing the fuel management prescription.

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 the CHN at the site level and with 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 several areas to which legal objectives apply under the Haida Gwaii LUOO. These include two forest reserves (similar to an Old Growth Management Area (OGMA)), four Cedar Stewardship areas, many occurrences of Type I and II Fish Habitat, four Marbled Murrelet Nesting Habitat areas, a Northern Saw-whet Owl Reserve and a Sensitive Watershed.[17] Any proposed fuel treatment that may overlap these areas requires HGMC oversight at the prescription development phase, and works can only occur following HGMC consultation and approval. It is possible surveys such as a Other legal objectives include but are not limited to retention of western redcedar, yellow-cedar,

[31] Public Safety Canada. 2019. National Disaster Mitigation Program (NDMP). https://www.publicsafety.gc.ca/cnt/mrgnc-mngmnt/dsstr-prvntn-mtgtn/ndmp/index-en.aspx

and western yew retention; protection of CMTs and monumental cedar; and protection of red and blue listed ecological communities.

Species and ecosystems at risk are an environmental value of high importance within the AOI; habitat for species at risk, and key areas of ecosystems at risk are a value that can be threatened by wildfire. 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 area of interest, 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.

Based on their conservation status, the CDC assigns species at risk to a red, blue, or yellow list, which corresponds to the level of concern about their risk and helps to set conservation priorities. There are multiple occurrences of red-listed species (a species or ecosystem that is extirpated, endangered, or threatened) and blue-listed species (a species or ecosystem of special concern) within the AOI (Table 5). Through consultation with the CDC and a biologist or qualified professional, 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 qualified professional (QP) with local knowledge may also be recommended at the prescription phase.

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

Common Name	Scientific Name	Category	BC List	Habitat Type
Angled bittercress	*Cardamine angulata*	Vascular Plant	Red	Terrestrial; forest needleleaf
Northern red-legged frog[32]	*Rana aurora*	Vertebrate Animal	Blue	Estuarine: shrub wetland, forested wetland; riverine: creek; Terrestrial: roadside; estuarine: tidal flat; riverine: medium river
Northern saw-whet owl, *brooksi* subspecies	*Aegolius acadicus brooksi*	Vertebrate Animal	Blue	Terrestrial: roadside, forest needleleaf, old forest; marine: beach
Oldgrowth specklebelly	*Pseudocyphellaria rainierensis*	Fungus	Blue	Terrestrial: old forest, epiphytic
Slender-spiked mannagrass	*Glyceria leptostachya*	Vascular Plant	Blue	Riverine; creek; terrestrial
Western cowbane	*Oxypolis occidentalis*	Vascular Plant	Blue	Terrestrial: grassland/herbaceous

3.4 OTHER RESOURCE VALUES

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

The Haida Gwaii Timber Supply Area (TSA) encompasses the AOI. The Haida Gwaii TSA is within the West Coast Natural Resource Region and is administered by the Haida Gwaii Natural Resource District. The Allowable Annual Cut for Haida Gwaii is determined by the HGMC and is partitioned among licensees by the Chief Forester.[33] The most recent Timber Supply Review (TSR) and the first TSR by the HGMC was completed in 2012, with a determination of 512,000 cubic meters per year (the AAC is not applicable to private managed forest land).[34] The effective timber harvesting land base in the TSA is 188,718 ha or approximately 19% of the total land area.[34] At the time of writing, the HGMC is undergoing a timber supply review for a 2020 AAC determination.

Fuel reduction treatments on provincial Crown land 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. Several types of forest tenure exist on Crown land in the AOI. Taan Forestry Ltd. holds a tree farm license (TFL 60) which has significant overlaps in all three polygons of the AOI. There are also private managed forest lands, held by Island Timberlands, which overlap Ferguson Bay. There may be potential opportunities to

[32] *Rana aurora* was identified as overlapping with the AOI, using CDC data in iMapBC. It is blue-listed in the South Coast area of the Province. According to the Recovery Plan for the Northern Red-legged Frog (*Rana aurora)* in British Columbia however, (B.C. Ministry of Environment. 2015. Recovery plan for the Northern Red-legged Frog (*Rana aurora*) in British Columbia. B.C. Ministry of Environment, Victoria, BC. 51 pp.), the population on Graham Island is most likely introduced.

[33] Haida Gwaii Management Council, 2019. *Allowable Annual Cut*. http://www.haidagwaiimanagementcouncil.ca/allowable-annual-cut/

[34] Haida Gwaii Management Council, 2012. *Rationale for the Allowable Annual Cut (AAC) Determination for Haida Gwaii.* Retrieved from: http://www.haidagwaiimanagementcouncil.ca/wp-content/uploads/2019/03/2012-AAC.pdf

work with local licensees on commercial thinning projects that meet multiple management objectives, including fuel management.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders. The AOI has several industrial sites and facilities that can be considered hazardous values. Because of the proximity to forestry operations, the reliance on petroleum fuel for heating and electricity and the prevalence of motorized recreation in the area (boating, ATVing), there are many locations where liquid fuel is stored. Juskatla and Ferguson bay both have marine and vehicle fueling stations. There is an additional fuel storage location at Juskatla. There are other industrial sites a, a card lock, and a gas station within the AOI that are categorized as hazardous values; the complete list is detailed in Table 6. The Haida Gwaii landfill is located adjacent to the boundary of the AOI, but is not contained within it.

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	Location
Petroleum fuel storage	Fuel is stored at many locations in the AOI including: • Angela's Place Social Café and Gas Station, 2 Grouse Street. • Mechanical shop, 3 Grouse Street. • Highways Yard, 180 Highway 16. • Mechanical shop, 60 Highway 16. • Two fuelling stations (marine and vehicle) at Juskatla camp. • Two fuelling stations (marine and vehicle) at Ferguson Bay dry land sort.
Other hazardous substances	Other potentially hazardous substances are stored in the AOI, including: • Woody debris at old pole plant, 150 – 290 Industrial Park Road. • Log storage and woody debris at mill, pellet plant, and dry land sort, 130 Industrial Park Road. • Small wood mills and fleet of small fishing boats, Kumdis River Road.

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.

The relationship between wildfire hazard, threat and risk is defined as follows:

$$Wildfire\ risk\ =\ Probability\ x\ Consequence$$

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.).

4.1 FIRE REGIME, FIRE WEATHER 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 and Fire Weather

Historic Fire Regime

The Biogeoclimatic Ecosystem Classification (BEC) system describes zones by vegetation, soils, and climate. 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.[35] 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 NDT classification is based on the frequency and severity of pre-European disturbance events (including but limited to wildfires) and provides an indication of historical fire regime. 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[36]. The AOI is characterized by the Coastal Western Hemlock, wet hypermaritime, submontane variant (CWHwh1) BEC zone, subzone, and variant. As such, the AOI is composed entirely of Natural Disturbance Type 1 (NDT1) forest ecosystems with historically rare stand-initiating events.

NDT1 comprises ecosystems with rare stand-initiating events. These are forest ecosystems that experience relatively small disturbances in terms of spatial extent. They have historically resulted in uneven-aged, heterogeneous stand structures from rare and small disturbances caused by fire, wind and/or landslides. The mean return interval for these disturbances has generally been 250 years for the CWH. While natural disturbance regimes are useful for describing the historical disturbance pattern typical for an area, fire history is complex and highly variable across space and time for many

[35] Province of British Columbia. *BECWeb Zone and Subzone Descriptions*. Retrieved from: https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

[36] Province of British Columbia, 1995. *Forest Practices Code of British Columbia Biodiversity Guidebook.*

ecosystems.[37] Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes and fuel hazard around the community.

Forest Health Issues

The Coast Forest Health Overview outlines forest health issues present within the Haida Gwaii TSA. The most recent aerial overview survey of the TSA was conducted in 2019.[38] Western black-headed budworm and lodgepole pine sawfly were the only biotic forest health agents prevalent in terms of impacted area. Abiotic forest health factors include windthrow and drought mortality. The Coast Forest Health Overview also identifies deer browse as a forest health factor, primarily on western red cedar seedlings. Although deer browse protectors are placed on most cedar seedlings, lack of prompt removal has resulted in increased stem defects. [39]

Fuel treatments have the potential to exacerbate the occurrence of western blackheaded budworm, a defoliator of western hemlock. Mortality from western blackheaded budworm has been observed to be more severe in immature second-growth stands that have been thinned, potentially due to easier access to the crown.[25] The risk to forest health from western blackheaded budworm must be assessed and mitigated at the prescription level.

Spatial data available through DataBC[40] indicates that there have been few recorded outbreaks of blackheaded budworm overlapping the AOI. Outbreaks that do overlap the AOI occurred mostly between 2010 and 2011. One outbreak of spruce aphid occurred in the AOI in 1984; the total area of this outbreak, which partially overlaps the AOI close to the Kamdis Conservancy, is about 740 ha. There are a few occurrences of flooding overlapping with the AOI; the largest is 19.1 ha. Spruce aphid is not considered to be a significant forestry pest and attacks are usually limited to the coastline.[25] Some losses from flooding were observed in the AOI in 2015, with the largest polygon rated as severe comprising over 100 ha.

These forest health factors have implications for the level of surface fuel accumulation in affected stands, access and working conditions for firefighters in the event of wildfire, and for proposed treatments. Proposed treatments should take into account susceptibility to disease and attempt to mitigate risk at the prescription level through appropriate targets for stem density and crown closure.

Human Development and Natural Events

There are several causes associated with land cover change in the AOI, including rural residential development, industrial development, and forest harvesting. Residential development has entailed land clearing and road building. Forest harvesting occurs 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

[37] Hall, E. 2010. *Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective.* Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.

[38] The most recent provincial forest health aerial survey data is available by TSA at https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health/aerial-overview-surveys/data-files

[39] Ministry of Forests, Lands, Natural Resource Operations and Rural Development. 2015. 2015-17 Coastal Timber Supply Areas Forest Health Overview.

[40] Province of British Columbia, 2019. Data Catalogue- Pest Infestation Polygons. Retrieved from https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons

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 O-1a/b fuel types (see Appendix A-1 for a description of fuel types).

Since the establishment of settler communities within the AOI, 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 behavior:

- Residential land development has occurred in the AOI since the arrival of non-Haida settlers in the early 1900s. This has generally resulted in an increased wildland-urban interface in particular areas (Section **Error! Reference source not found.**) and an increase in fire suppression. Although the population of the AOI is currently experiencing a decline, as the tourism and service industries grow on the islands this trend may reverse.
- Forest industry activities – forest harvesting occurs on provincial Crown land as well as on private land within the AOI. Poor slash hazard abatement practices have been attributed to some operations which can lead to high fuel loading along roadsides.

Fire Weather Rating

The Canadian Forest 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' is considered as 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 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 depicts the proportion of each fire danger class per year during the fire season (April – October) over the years 2010 – 2019. This graph demonstrates that the proportion of high fire danger class days is substantially larger in the last five years (2015 – 2019) than the five years prior (2010 – 2014). In terms of the average frequency of danger class days during the fire season (Figure 2), the months with the highest average number of 'high' fire danger class days are July and August, with an average of 3 and 6 days, respectively. August also has an average of one 'extreme' fire danger class day over the past ten years. The data summarized comes from the Honna weather station (years 2010 - 2019) which is the only BCWS weather station on Haida Gwaii, located west of Queen Charlotte.

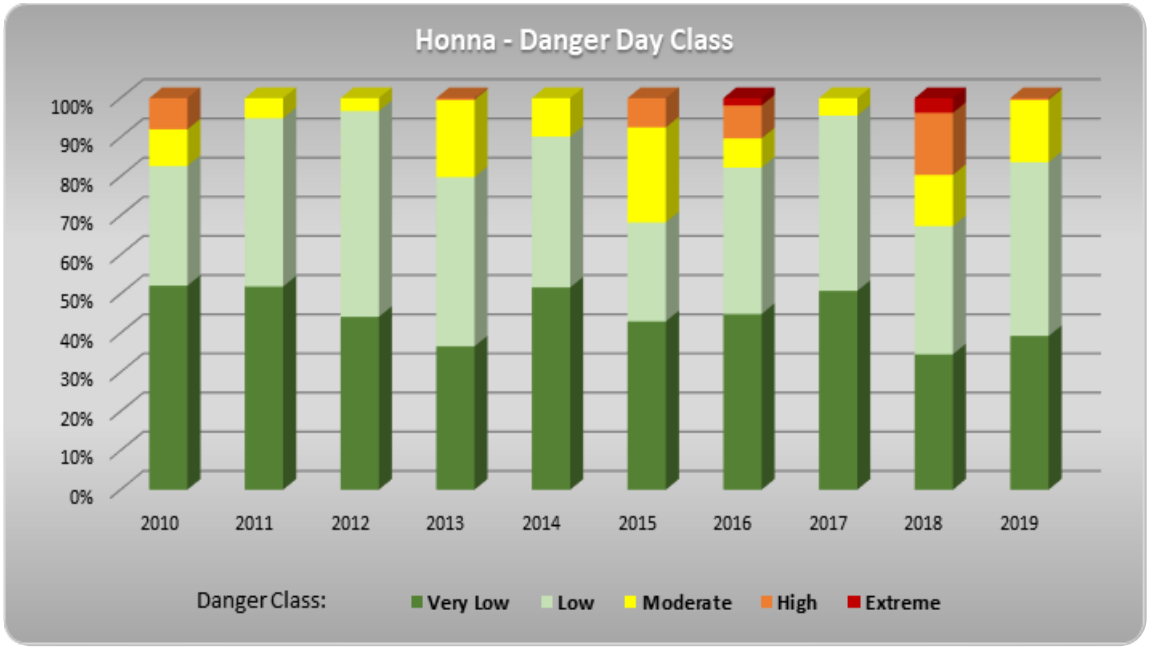


Figure 1. Proportion of each fire danger class per year between April and October for the Honna weather station. Summary of fire weather data for the years 2010 - 2019.

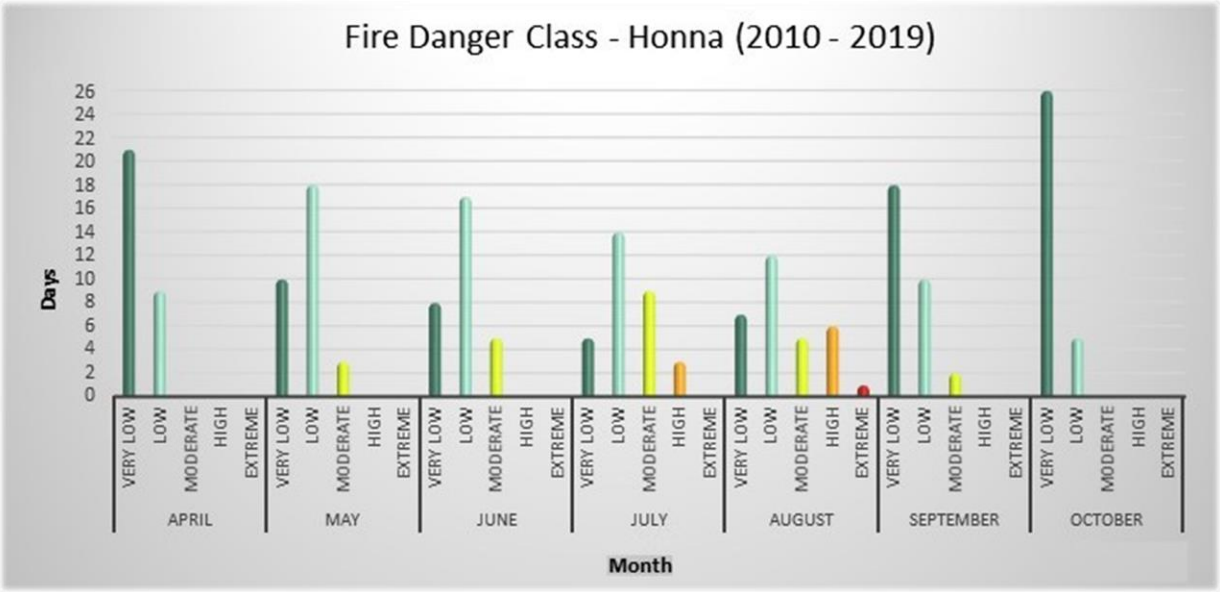


Figure 2. Average number of danger class days for the Honna weather station. Summary of fire weather data for the years 2010 - 2019.

4.1.2 Climate Change

Climate change is a serious and complex aspect to consider in wildfire management planning. "Climate change projections point to a warmer and drier environment and shifts in vegetation with the following implications in some areas of the province:

- Increased disturbances due to insects and disease
- Shifts in vegetation. Potential ranges of species will move northward and upward in elevation
- Increased forest fire frequency
- Longer and more intense wildfire seasons
- Increased number of high and extreme fire danger days for an average year.

As a result, some existing forests have an increased probability of more frequent, intense and more difficult to control wildfires that are likely to result in increased tree mortality, detrimental impacts to soils and hydrology, and increased threat to the community and interface areas."[41] Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.[42] Although there are uncertainties regarding the extent of these impacts 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.[43] Despite the uncertainties, trends within the data are visible.

[41] Community Resiliency Investment Program, 2018. *Community Wildfire Protection Plan Template.*
[42] Flannigan, M.D et al., 2009. *Implications of changing climate for global wildland fire*. International Journal of Wildland Fire 18, 483-507.
[43] 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.

As outlined in *Coastal vulnerability to climate change and sea-level rise, Northeast Graham Island, Haida Gwaii (Queen Charlotte Islands), British Columbia,*[44] the northeastern coast of Graham Island is one of the most vulnerable areas in Canada in terms of climate change. The following climate projections for the region are made:

- Year round increases in temperature: a mean annual temperature increase of up to 2°C for 2020s-2050s and up to 5.5 °C by the 2080s);
- Increase in precipitation of up to 5-7% by 2050s to as much as 10-15% by 2080. However, the seasonality and interannual variability of precipitation is expected to increase, leading to more snowfall, increased flooding, and more prolonged summer droughts (increasing fire behaviour potential and changing water supply).
- Increase in sea-level by up to 90 cm by 2100, although projections of 18 - 59 cm are also made.
- Increase in natural disturbances, including storm surges.

Changes to the climatic regime and an increased frequency of natural disturbance events could impact values in some of the following ways:

- Damage to and increased maintenance costs for docks and port facilities, Highway 16 and other coastal roads, water and sewer infrastructure
- Erosion of shoreline and flooding of low-lying properties
- Collapse of salmon fisheries and an increase of hake, sardine, and tuna
- Increase in fire activity and windthrow

In summary, climate change is likely to threaten critical infrastructure and resource-based industries in the AOI and bring about an increase in natural disturbance events, including wildfires. 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 plan is designed to mitigate the possible impacts to the community by identifying opportunities to reduce fire risk and to increase capacity to respond in the event of a fire. This trend is expected to be disproportionately felt in northern latitudes.[45]

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 approximate relative wildfire threats across BC. It provides a starting point to assess the local wildfire threat. Three inputs are combined to create the PSTA wildfire threat analysis component[46]:

[44] Walker, I.J. and CCIAP A580 Team. 2007. Coastal vulnerability to climate change and sea-level rise, Northeast Graham Island, Haida Gwaii (Queen Charlotte Islands), British Columbia.
[45] Much of the research noted was completed for Canada or globally. Direct application of trends to the study area may not be appropriate, although general expectations for Canada were noted to be consistent across multiple studies.
[46] BC Wildfire Service. 2017. Provincial Strategic Threat Analysis: 2017 Update. Retrieved from: ftp://ftp.for.gov.bc.ca/HPR/external/!publish/PSTA/Documents/Provincial%20Strategic%20Threat%20Analysis_2017%20Update.pdf.

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).
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 wildfire threat analysis, 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. HFI is correlated with flame length and fire behaviour. The greater the fire intensity (kW/m), or HFI 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. The HFI used in the wildfire threat analysis 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[47]. 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 PSTA wildfire threat analysis component based upon the accuracy of the source data and the modelling 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,
- 90th percentile rating for HFI, which represents a near worst-case scenario which may be artificial in some circumstances.

Consequently, the PSTA is complemented by a finer scale local wildfire threat analysis considering local factors to improve the wildfire threat assessment. The key steps to completing the local wildfire threat analysis and a detailed assessment of the local wildfire threat are described in Section 4.3 and Appendix A – Local Wildfire Threat Process.

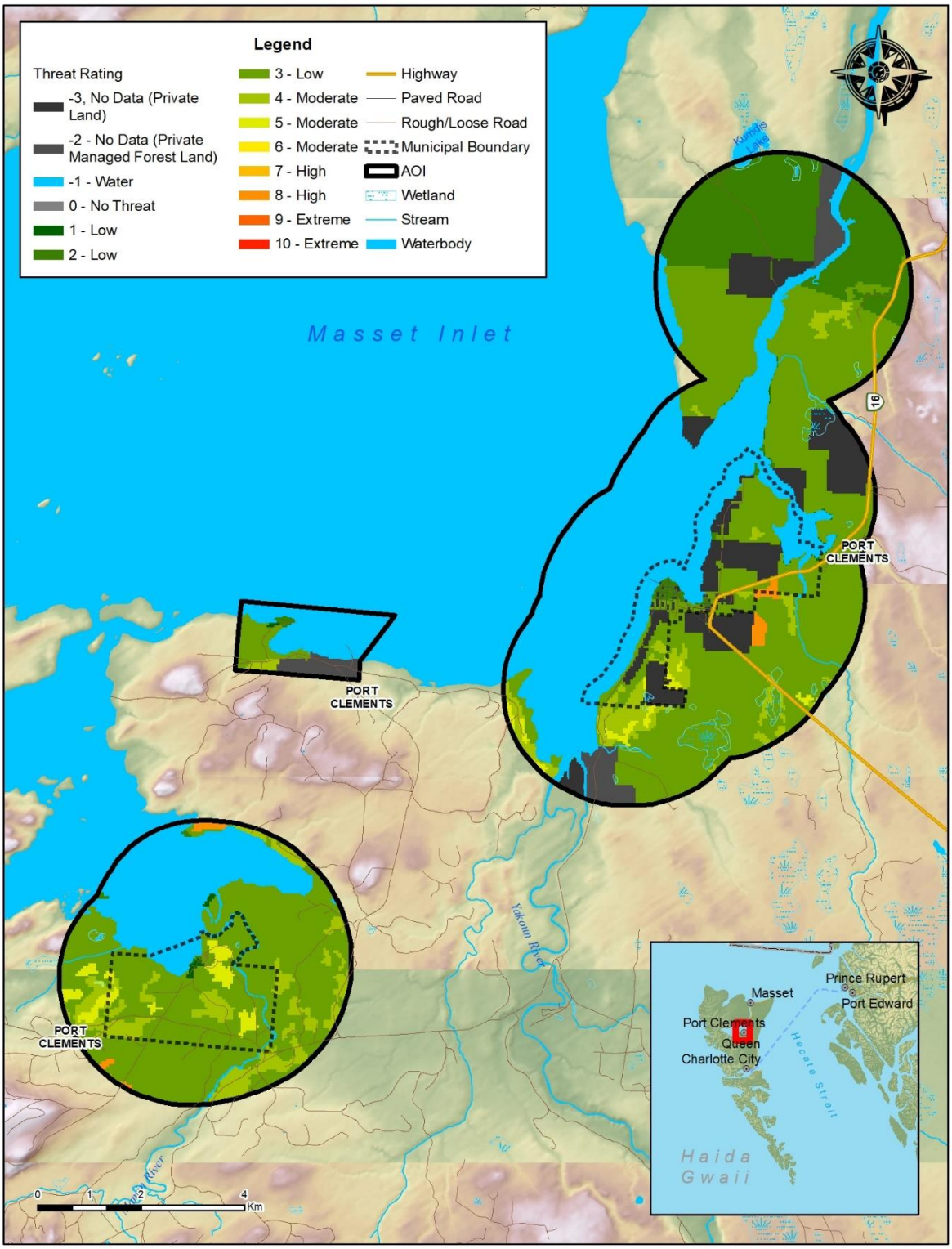
The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 7 and spatially illustrated in Map 3. A small portion (9%) of the AOI is categorized as either private land or private managed forest land and has no data for wildfire threat in the PSTA dataset. Low threat areas cover over half the AOI (55%). Water covers close to a third of the AOI. Approximately 7% of the AOI is categorized as having a

[47] Weighting of the three PSTA wildfire threat analysis components: Fire density 30%; HFI 60%; spotting impact 10% (water bodies were automatically given a value of 'no threat' [-1])

moderate wildfire threat rating in the provincial Wildfire Threat Analysis (Table 7). A few, very small portions of the AOI are categorized as high threat areas. These areas mostly represent recent cutblocks with accumulations of slash. There are no areas of extreme threat in the AOI. (Map 3).

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

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	592	No Data (Private Land)	7%
-2	218	No Data (Private Managed Forest Land)	2%
-1	2,496	Water	28%
0	0	No Threat	0%
1	86		
2	868	Low	55%
3	3,877		
4	519		
5	126	Moderate	7%
6	0		
7	0	High	0%
8	44		
9	0	**Extreme**	0%
10	0		
Total	8,825	-	**100%**



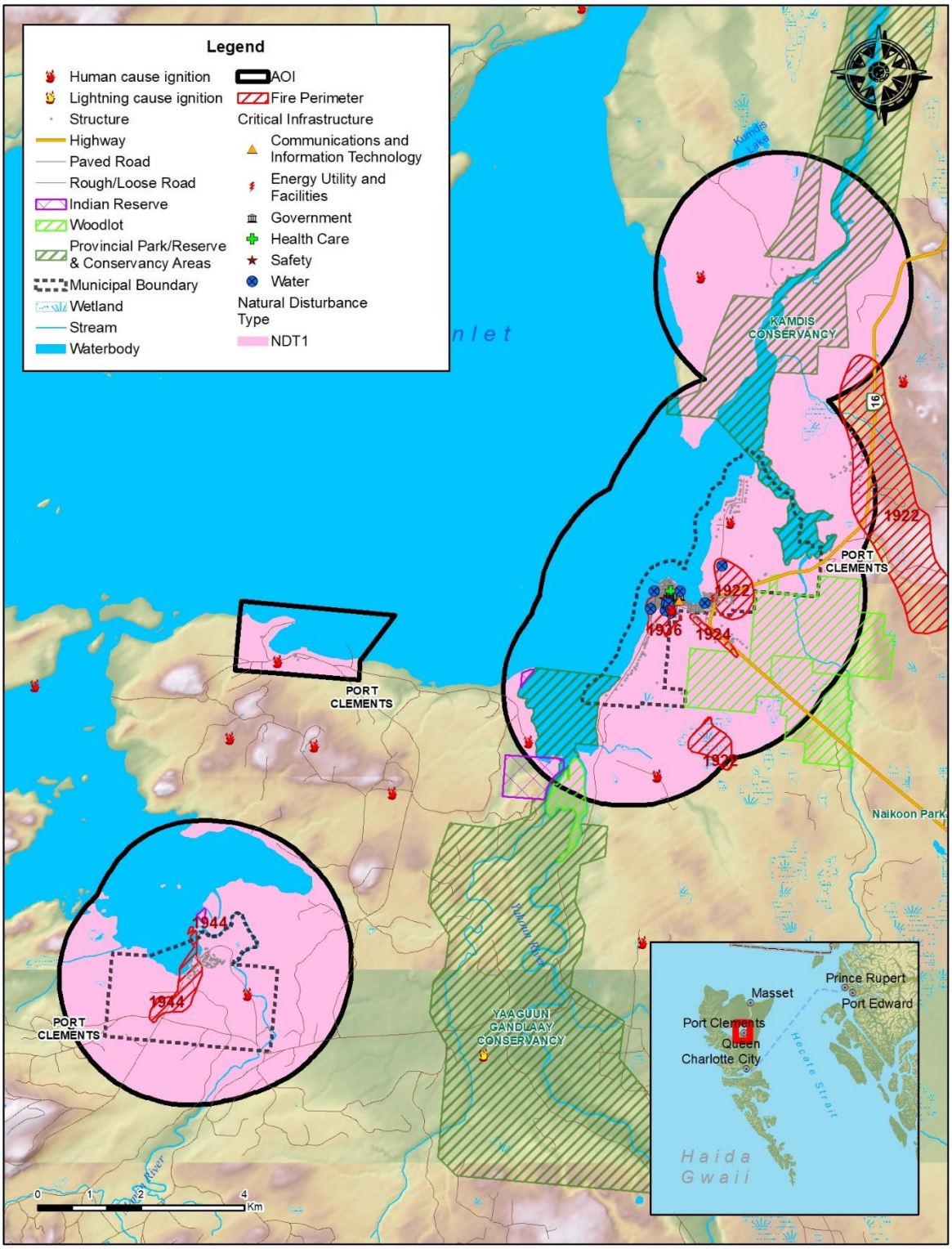
Map 3. Provincial Strategic Threat Rating.

4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 4. Fire ignition data for the area is available for 1950-2019 and fire perimeter data from 1919-2018.

Based on the fire ignition data, from the year 1950 to 2019, there have been 16 fire incidents in the AOI; all of these events, except one, were identified as human-caused ignitions. A large proportion of these ignitions (44%) occurred in the town of Port Clements. Others are concentrated at Juskatla Camp, the Ferguson Bay dryland sort, and adjacent to other harvesting operations, on forest service roads. More than half of these ignitions took place in the 1950s and 1960s.

Based on the fire perimeter data from 1919 to 2019, seven wildfires have burned within the AOI. The largest fire burned approximately 547 ha in 1922. The remaining six fires, however, each burned less than 70 ha. All seven wildfires occurred between 1922 and 1944 and they were identified as human-caused incidents.



Map 4. Fire Regime, Ecology and Climate Change.

4.3 LOCAL WILDFIRE THREAT ASSESSMENT

The local wildfire threat assessment process includes several key steps as outlined in Appendix A – Local Wildfire Threat Process and summarized as follows:

- Fuel type attribute assessment, ground truthing/verification and updating as required to develop a local fuel type map (Appendix A-1).
- Consideration of the proximity of fuel to the community, recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2).
- Analysis of predominant summer fire spread patterns using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3). Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread.
- Consideration of topography in relation to values (Appendix A-4). Slope percentage and slope position of the value are considered, where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill.
- Stratification of the WUI according to relative wildfire threat based on the above considerations, other local factors and field assessment of priority wildfire risk areas.

WUI Threat Assessments were completed over five field days in November of 2019, in conjunction with verification of fuel types (see Appendix C – Wildfire Threat Assessment Worksheets and Photos). 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 AOI to support 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:

- 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.
- 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 26 WUI threat plots were completed and approximately 225 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F – WUI Threat Plot Locations).

Using the verified and updated fuel types (Appendix A-1, Map 7) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to A-3), local wildfire threat for the AOI was updated. Using the Wildfire Threat Assessment methodology[48], 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 AOI is composed of a mosaic of low, moderate and high threat class stands, as well as areas of no threat (a significant proportion of these areas of no threat in the AOI are water); the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the landbase. The AOI is less than 1% extreme threat class rating, 14% high, 33% moderate, 14% low and 29% very low/water (Table 8, Map 5). The remaining 9% of the AOI is classified as private land and private managed forest land and as such has not been allocated fire threat data. Assessment of fire threat on private land is outside the scope of this CWPP. Table 8 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behaviour threat.

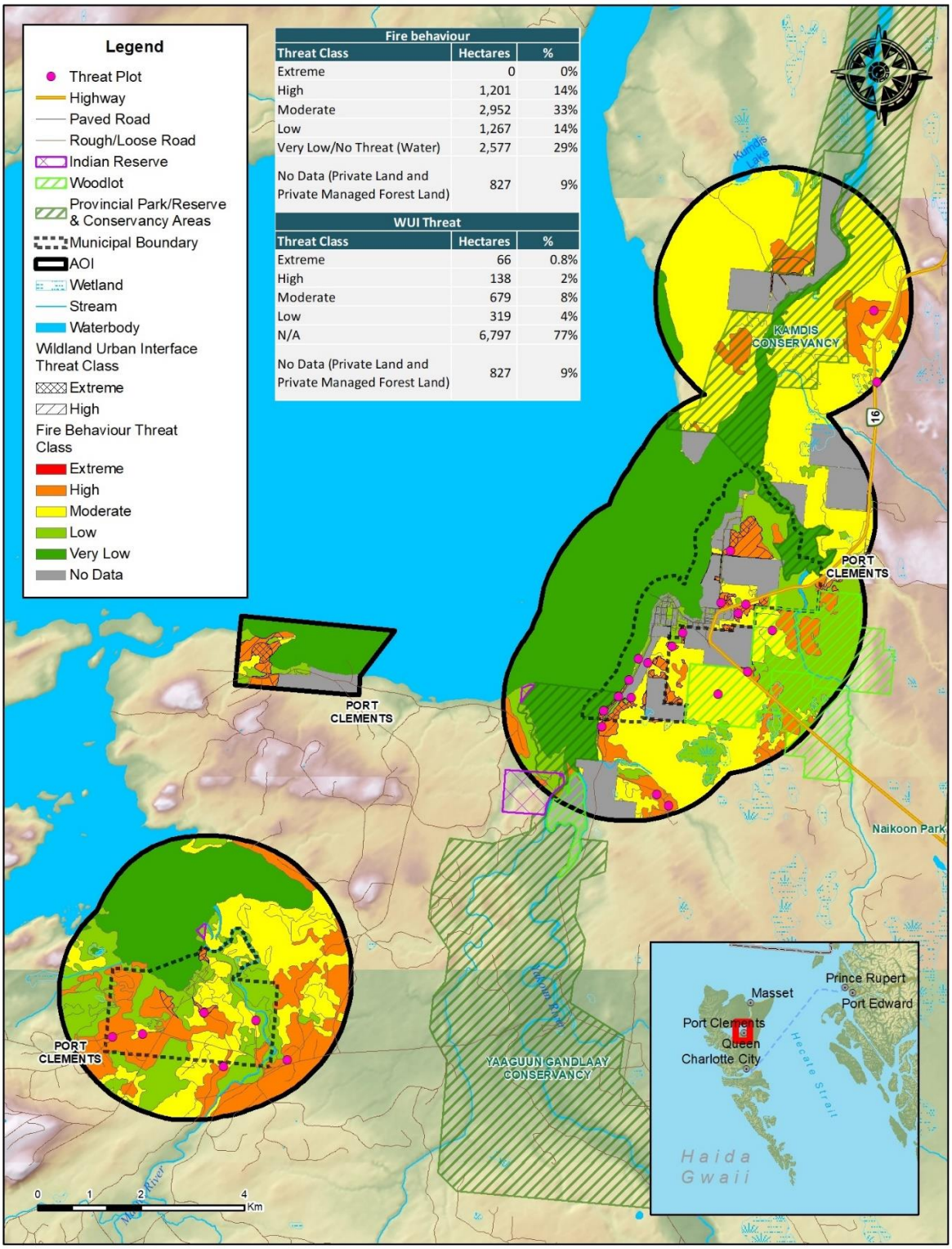
The areas that represent the highest wildfire behavior potential and greatest risk to values within the VoPC are areas of high threat class at the north end of the village, near Industrial Site Road; areas around Bayview Street and Port Main Forest Service Road; areas in the north end of the AOI on either side of Highway 16; and areas around Ferguson Bay dryland sort and Juskatla camp (Map 5).

For detailed field data collection and spatial analysis methodology for the local threat assessment and classification, see Appendix H – WUI Threat Assessment Methodology.

Table 8. Fire behaviour threat summary for the AOI.

Wildfire Behaviour Threat Class	2019 PSTA Data	2019 CWPP
	Percent of AOI	Percent of AOI
Extreme	0%	<1%
High	0.5%	14%
Moderate	7%	33%
Low	55%	14%
No Threat / Water	28%	29%
No Data (Private Land and Private Managed Forest Land)	9%	9%

[48] Using the 2012 WUI Wildfire Threat Assessments in B.C. Guide (https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf)



Fire behaviour		
Threat Class	Hectares	%
Extreme	0	0%
High	1,201	14%
Moderate	2,952	33%
Low	1,267	14%
Very Low/No Threat (Water)	2,577	29%
No Data (Private Land and Private Managed Forest Land)	827	9%

WUI Threat		
Threat Class	Hectares	%
Extreme	66	0.8%
High	138	2%
Moderate	679	8%
Low	319	4%
N/A	6,797	77%
No Data (Private Land and Private Managed Forest Land)	827	9%

Map 5. 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).

The objectives for fuel management are to:

- Reduce wildfire threat on private and public lands near 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.

Fuel management on local government and provincial Crown land may be funded by the Union of BC Municipalities (UBCM) through the Community Resiliency Investment (CRI) Program (subject to current program requirements). The CRI Program (formerly the Strategic Wildfire Prevention Initiative or SWPI) also provides funding for selected FireSmart activities and planning on private land (subject to program requirements and limits).[49] It is important to recognize that a portion if the AOI (9%) is located on private land, which increases some of the challenges encountered in mitigation of fuels on private lands. The best approach to mitigate fuels on private lands is 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 qualified 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 prescription's 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 primary and interface fuel breaks and interface fuel treatment 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 best management practice 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 retention of broadleaf species.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the CRI Program will consider fire prevention activities on provincial Crown land, local government and reserve land[50]. Fire prevention activities on private land

[49] Union of BC Municipalities, 2019. *2019 CRI FireSmart Community Funding & Supports – Program & Application Guide.* Retrieved from: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

[50] This new funding program (up to $50 million over three years) was initiated in 2018 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

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) or have been identified as landscape level fuel treatments and are located on Crown provincial or municipal land. It should be noted that the location of proposed treatment units on these land ownership types does not imply that high and extreme hazard areas do not exist on private land within the AOI. As stated in Section 5.1, mitigation approaches should also be pursued on private land where hazard exists, bearing in mind the different funding resources and objectives on these land types. Recommendation for treatment in areas of moderate fire hazard 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 9 and displayed in Map 6. These fuel treatment opportunities include the use of trailside treatments, interface fuel treatments (the treatment of both patches of fuels and linear interface fuel breaks) and primary fuel breaks as defined below.

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 and Primary Fuel Break), and applying FireSmart Standards to structures and the surrounding vegetation. Fuel breaks require periodic maintenance to retain their effectiveness.

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.

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.

Primary Fuel Break

Primary Fuel Breaks are located on Crown land in strategic locations beyond the interface fuel treatments. Private land may be included in a primary fuel break so that the break represents a continuous fuel reduced area. Primary Fuel Breaks are designed to modify fire behaviour and create fire suppression options that reduce the risk of a crown fire reaching a community and/or adjacent private lands. Primary Fuel Breaks may be located to completely surround a community or be strategically placed upwind of communities and perpendicular to fire season winds. Primary Fuel Breaks have sufficient width and appropriate fuel reduction measures to break the crown fire threshold and reduce fire intensity such that overstory fire moves to the ground surface and spread rates are reduced. While there are no absolute standards for fuel break width or fuel manipulation in the literature and fuel break width will vary based on fuel type, topography, and expected fire behaviour[51], a 300-metre fuel break width is generally recommended. Fuel breaks should be designed to take advantage of natural and man-made fire resilient features and topography to enhance effectiveness. Surface fire spread across, and spotting over the fuel break are both concerns, and depend on the application of suppression resources to be effective.

RECOMMENDATION #9: Proceed with detailed assessment, prescription development and treatment of hazardous fuel units identified and prioritized in this CWPP.

[51] Agree, J.K., Bahro, B., Finney, M.A., Omi, P.N., Sapsis, D.B., Skinner, C.N., van Wagtendonk, J.W., Weatherspoon, C.P. *The use of shaded fuelbreaks in landscape fire management*. Forest Ecology and Management, 127 (2000), 55-66.

Table 9. Proposed Treatment Area Summary Table.

PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
1	Highway 16 South/ Industrial Site Road	High	140.9	Interface Fuel Break	24.7	83.4	29.1	3.7	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order, including the following overlaps: Type I fish habitat, a watershed and face unit type upland stream area, a sub basin type upland stream area and marbled murrelet nesting habitat. This PTU overlaps with various Crown tenures, including: two environment, conservation & recreation reserve tenures; a sand and gravel quarry reserve tenure; and a license of occupation for public works purposes. This PTU overlaps with a trapline and a guide outfitter tenure, with overhead transmission lines. Approximately 10% of this PTU overlaps with a forest harvest authorization and a license to cut for Haida Gwaii Green Diesel Ltd. There are CDC red- and blue-listed species present in this PTU including: occurences of *Rana aurora* (northern red-legged frog, blue-listed), *Oxypolis occidentalis* (western cowbane, blue-listed), and *Mustela erminea haidarum* (Ermine, *haidarum* subspecies). Consultation with the Council of the Haida Nation, MFLNRORD Haida Gwaii Natural Resource District, an ecosystem biologist, a regional hydrologist, and all appropriate licensees must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU is a multi-part polygon; one that abuts Industrial Site Road and overlaps Highway 16; and one that buffers either side of Highway 16. Hazardous values at risk, including industrial sites are located 200-300 meters away from the polygon abutting Industrial Site Road, in several locations. Stands characteristics of this treatment unit are primarily classified as C-3 fuel type, with moderate to high densities of understorey stems that result in continuous ladder fuels; moderate levels of fine and medium surface fuel accumulations; and patches of significant coarse woody debris accumulations from blowdown. The combination of these factors lends to increased potential for crown fire behaviour. This unit is recommended for treatment due to the presence of hazardous fuels; to reduce the potential of ignition from industrial sources and from other human-caused sources along the access/egress routes.

PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
2	Industrial Park	Moderate	48.8	Interface Fuel Break	44.7	0.5	3.6	-	This FDU overlaps a watershed and face unit type upland stream area, a sub basin type upland stream area and marbled murrelet nesting habitat, class 2 (Haida Gwaii Land Use Objectives Order objective). There are two minor overlaps with light industrial reserve tenures. This PTU also overlaps with a trapline and a guide outfitter tenure. Consultation with the Council of the Haida Nation, MFLNRORD Haida Gwaii Natural Resource District and all appropriate license holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located within 200-300 meters from multiple hazardous values at risk, including industrial sites. The stands characteristic of this area are classified as a C-3 fuel type, with high densities of overstorey stems and high crown closure; scattered to patchy ladder fuels composed of moderate densities of understorey stems; and moderate accumulations of coarse, medium, and fine woody debris. This type of stand exhibits potential for crown fire behavior during periods of high or extreme fire danger. This unit is recommended for treatment both to reduce the potential of ignition from industrial sources, as well as to reduce wildfire risk to residents.
3	Community Park	High	12.3	Interface Fuel Break	4.3	7.5	0.5	-	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order, including: Type I fish habitat; a watershed and face unit type upland stream area, a sub basin type upland stream area and a watershed. This PTU also overlaps with a trapline and a guide outfitter tenure. There is one occurrence of a CDC red-listed species, *Mustela erminea haidarum* present. Consultation with the Council of the Haida Nation, an ecosystem biologist, MFLNRORD Haida Gwaii Natural Resource District, and all appropriate license holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The proposed treatment unit is located south of the Port Clements Community Park. This area has been recommended for treatment due to its proximity to a high-traffic recreational area and the presence of hazardous fuels. The stands characteristic of this area are classified as a C-3 fuel type. Stands are characterized by high overstorey crown closure, moderate to high numbers of understorey stems, and high levels of fine and medium surface fuel loading, attributes which increase the risk of crown fire behaviour during periods of high or extreme fire danger.

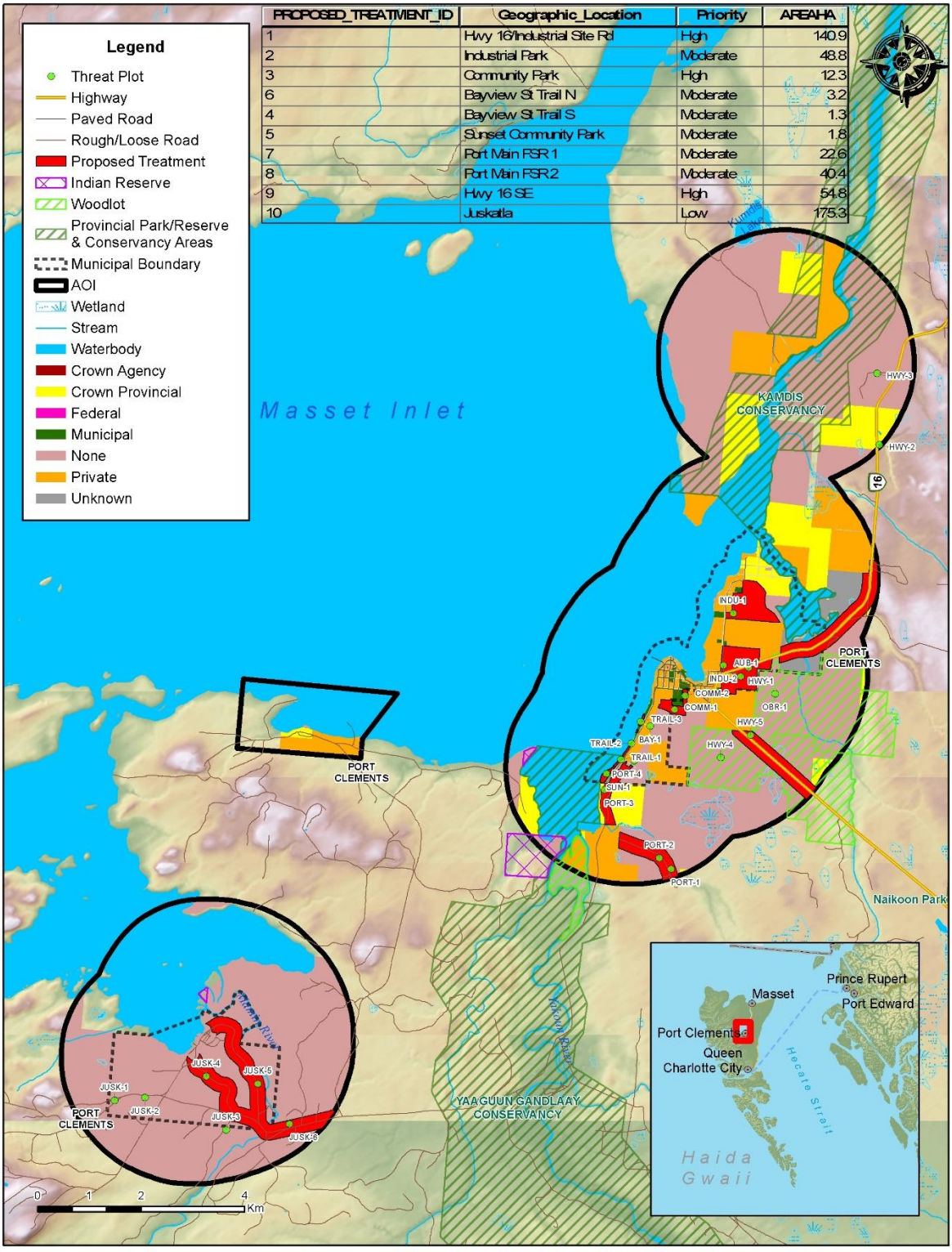
PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
4	Bayview Street Trail North	Moderate	1.3	Trailside Treatment	-	1.3	-	-	This PTU overlaps with two objectives from the Haida Gwaii Land Use Objectives Order: a watershed and face unit type upland stream area. The PTU also overlaps a trapline and a guide outfitter tenure. Consultation with the Council of the Haida Nation, MFLNRORD Haida Gwaii Natural Resource District and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located <200 m from private residences on Bayview Street. It has been recommended for treatment due to the presence of hazardous fuels and its proximity to high-traffic recreational areas. This unit buffers a trail that extends parallel to Bayview Street. Stands characteristic of this unit are classified as a M-1/2 (75% conifer) mixed conifer-deciduous fuel type, with patches of moderate to high density understorey stems, and patches of moderate to high coarse, medium, and fine surface fuel loading. Wood waste that has been deposited in this area has increased fuel loading and hazard.
5	Bayview Street Trail South	Moderate	1.8	Trailside Treatment	1.8	-	-	-	This PTU overlaps with two objectives from the Haida Gwaii Land Use Objectives Order: a watershed and a face unit type upland stream area. The PTU also overlaps with a trapline, and a guide outfitter tenure. Consultation with the Council of the Haida Nation, a MFLNRORD regional hydrologist, MFLNRORD Haida Gwaii Natural Resource District, and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	The proposed treatment area is located <200 m from private residences on Bayview Street. It has been recommended for treatment due to the presence of hazardous fuels and its proximity to high-traffic recreational areas. In addition, it is located adjacent to Sunset Community Park and Campground, which is a site of special concern to the municipality. Stands characteristic of this area are classified as a C-3 fuel type, with some mature stems with low crown base heights; patches of very high density understorey stems; and patches of very high fine and medium surface fuel loading. These attributes increase the risk of crown fire behaviour during periods of high or extreme fire danger.

PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
6	Sunset Community Park	Moderate	3.2	Interface Fuel Break	3.2	-	-	-	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order: Type I and II fish habitat, a watershed and a face unit type upland stream area. This PTU overlaps with a trapline and a guide outfitter tenure. Consultation with the Council of the Haida Nation, an ecosystem biologist, a MFLNRORD regional hydrologist, MFLNRORD Haida Gwaii Natural Resource District, and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This treatment unit overlaps Sunset Community Park and Campground, and is located in close proximity to residences on Bayview Drive (100-200 meters). This area is recommended for treatment due to its proximity to values at risk and the presence of hazardous fuels. The stands characteristic of this area are classified as M-1/2 (mixed deciduous coniferous) fuel types with 70% conifer, patches of high density understorey stems, and moderate to high accumulations of fine surface fuels. These attributes increase the likelihood of crown fire behaviour during periods of high or extreme fire danger.
7	Port Main FSR 1	Moderate	22.6	Interface Fuel Break	22.6	-	-	-	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order: a watershed and a face unit type upland stream area. This PTU also overlaps with a guide outfitter and two trapline tenures. A portion of the PTU overlaps with the Agricultural Land Reserve (ALR) and two quarry reserve tenures (sand and gravel purposes). There is a small overlap with an occurrence of *Mustela erminea haidarum* (Ermine, *haidarum* subspecies – BC CDC Red-listed), and an overlap with two occurrences of *Aegolius acadicus brooksi* (northern saw-whet owl, *brooksi* subspecies – BC CDC Blue-listed). Consultation with the Council of the Haida Nation, an ecosystem biologist, a MFLNRORD regional hydrologist, MFLNRORD Haida Gwaii Natural Resource District, the Agricultural Land Commission and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This treatment unit buffers the east side of Bayview Street where it terminates and becomes Port Main Road. It also extends behind private properties and residences on the east side of Bayview Street (200 meters). This area is recommended for treatment due to its proximity to residences and the risk of human-caused ignitions along the roadway. The stands characteristic of this area are classified as a C-3 fuel type, with integrated overstorey crowns, scattered ladder fuels, and moderate to high accumulations of medium and fine surface fuels. These attributes increase the potential for crown fire behaviour during periods of high or extreme fire danger.

PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
8	Port Main FSR 2	Moderate	40.4	Primary Fuel Break	27.6	8.9	3.9	-	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order: a watershed and face unit type upland stream area, and a sub-basin type upland stream area. This PTU overlaps with a guide outfitter and two traplines tenures. There are minor overlaps with two active forest harvest authorizations for Taan Forest Ltd. Most of the PTU overlaps with the ALR. The entire PTU overlaps with an occurrence of *Mustela erminea haidarum* (Ermine, *haidarum* subspecies – BC CDC Red-listed). Consultation with an ecosystem biologist, a MFLNRORD regional hydrologist, MFLNRORD Haida Gwaii Natural Resource District, the Agricultural Land Commission and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU buffers either side of Farm Main Forest Service Road, outside of the VoPC. Stands characteristic of this area are classified as fuel type C-3, with scattered to uniform ladder fuels, and a moderate to high density overstorey with high crown closure. Some areas have a significant proportion of standing dead stems. These attributes can increase the potential for crown fire behaviour during periods of high or extreme fire danger. This PTU was strategically located given its location upwind of the VoPC.
9	Highway 16 Southeast	High	54.8	Interface Fuel Break/ Primary Fuel Break	17.0	15.4	22.6	-	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order: a watershed and a face unit type upland stream area. This PTU overlaps with a guide outfitter and two traplines tenures. It also overlaps with an active forest harvest authorization for Old Massett Village Council. The entire PTU overlaps with an occurrence of *Mustela erminea haidarum* (Ermine, *haidarum* subspecies – BC CDC Red-listed). Consultation with the Council of the Haida Nation, an ecosystem biologist, a MFLNRORD regional hydrologist, MFLNRORD Haida Gwaii Natural Resource District, and all appropriate license holders must take place during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU buffers either side of Highway 16, south east of the VoPC. Stands characteristic of this area are classified as fuel type C-3, with patchy ladder fuels resulting from high understorey stem densities and low crown base heights, and high overstorey crown closure. These attributes increase the potential for crown fire behaviour during periods of high or extreme fire danger. This PTU was recommended for treatment due to the presence of hazardous fuels, its proximity to residences (within 200-300 meters of structures); the hazard of human-caused ignitions along roadways; and to enhance safe access and egress from the VoPC.

PTU # and Stratum	Geographic Area	Priority	Total Area (ha)	Treatment Unit Type/ Objective	Local Fire Threat (ha)				Overlapping Values / Treatment Constraints*	Treatment Rationale
					High	Mod	Low	Very Low		
10	Juskatla	Low	175.3	Primary Fuel Break	66.0	50.4	58.5	0.4	This PTU overlaps with several objectives from the Haida Gwaii Land Use Objectives Order: a sensitive watershed; a northern saw-whet owl reserve; Type I fish habitat; two upland stream area watersheds polygons and two cedar stewardship areas. This PTU overlaps with a guide outfitter and two traplines tenures. The entire PTU overlaps with TFL 60 (Taan Forest Ltd.). Approximately half of the PTU overlaps with the ALR. There is overlap with numerous growth and yield plots. There is also a small amount of overlap with three occurrences of *Aegolius acadicus brooksi* (northern saw-whet owl, *brooksi* subspecies – BC CDC Blue-listed). Consultation with the Council of the Haida Nation, with an ecosystem biologist, a MFLNRORD regional hydrologist, the Forest Inventory MFLNRORD department, the Agricultural Land Commission, MFLNRORD Haida Gwaii Natural Resource District, and all appropriate licence holders must occur during the prescription development phase and prior to implementation to ensure all concerns are addressed.	This PTU buffers portions of the Port Main FSR, Port Mainline and New Mainline FSR around Juskatla camp. This unit were recommended for treatment due to the presence of hazardous fuels, proximity to industrial infrastructure; the hazard of human-caused ignitions (including those from industrial sources) along roadways and to bolster the access and egress route from the site. Stands within this PTU are primarily classified as C-3, with minor proportion of mature C-5. Wildfire threat in these polygons ranges from moderate to extreme. Stands rated high and extreme are characterized by high understorey and moderate to high overstorey stem densities, high overstorey crown closure, sparse to patchy ladder fuels, and moderate surface fuel loading. These stand characteristics leads to increased potential for crown fire behaviour during periods of high or extreme fire danger.

*Some of the proposed fuel treatment units have direct overlap with known archaeological site(s). Consultation with the Haida Nation and the MFLNRORD Archaeology Branch should occur during the prescription development phase and implementation to ensure that sites are protected during the implementation phase.



PROPOSED_TREATMENT_ID	Geographic_Location	Priority	AREAHA
1	Hwy 16/Industrial Site Rd	High	140.9
2	Industrial Park	Moderate	48.8
3	Community Park	High	12.3
6	Bayview St Trail N	Moderate	3.2
4	Bayview St Trail S	Moderate	1.3
5	Sunset Community Park	Moderate	1.8
7	Port Main FSR 1	Moderate	22.6
8	Port Main FSR 2	Moderate	40.4
9	Hwy 16 SE	High	54.8
10	Juskatla	Low	175.3

Map 6. Proposed Fuel Treatments.

5.1.2 Maintenance of Previously Treated Areas

As no fuel treatments have occurred within the AOI, maintenance activities of previously treated areas are not applicable. However, if fuel treatments are to occur in the community 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 #13: As treatments are implemented, treatment monitoring should be completed by a qualified professional (Registered Professional Forester [RPF] whose scope of practice includes conducting wildfire hazard mitigation and fuels treatment work).

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.[52] 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[53], 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. Solutions are required at all scales from individual backyards, to communities and the wider landscape. In order

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

[53] FireSmart guidelines first published in the 1999 manual "*FireSmart: Protecting Your Community from Wildfire*", with a second edition published in 2003. The most recent "*FireSmart Begins at Home Manual*" is available at https://firesmartcanada.ca/resources/. The "*British Columbia FireSmart Begins at Home Manual"* provides detailed guidance and is available at BC FireSmart: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

to succeed, these efforts must be integrated across the mosaic of land ownership (Figure 3). The highest level of planning within the FireSmart program is strategic direction, such as that provided in CWPPs.

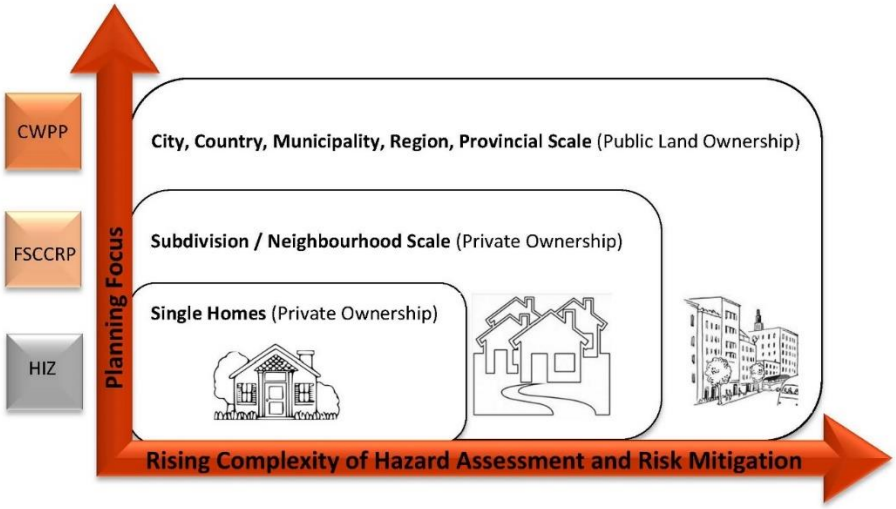


Figure 3. Diagram of the various, coordinated levels of the FireSmart program.[54] CWPP: Community Wildfire Protection Plan, FSCCRP: FireSmart Canada Community Recognition Program, HIZ: Home Ignition Zone.

The overarching goal of FireSmart is to encourage communities and citizens to adopt and conduct FireSmart practices to mitigate the negative impacts of wildfire to assets on public and private property. While responsibility for effectively mitigating hazards must be shared between many entities including homeowners, industry, businesses and governments;[55] 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. Findings from an investigation of how homes survived and ignited during the Fort McMurray 2016 Horse River wildfire, indicate that the vast majority of initial home ignitions in the WUI were caused by embers rather than direct contact by flames or radiant heat.[56] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[56]

The goal of FireSmart with respect to private properties is to encourage homeowners to implement FireSmart practices to reduce damages to their property and minimize the hazards associated with wildfire. These FireSmart practices should aim to accomplish the following:

- "Reduce the potential for an active crown fire to move through private land
- Reduce the potential for ember transport through private land and structures

[54] Figure and content developed by A. Westhaver. Adapted by A. Duszynska, 2017.
[55] FireSmart Canada, 2019. Retrieved from: https://www.firesmartcanada.ca
[56] Westhaver, A. 2017. *Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster.* Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

- Create landscape conditions around properties where fire suppression efforts can be effective and safe for responders and resources
- Treat fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact and ember transport
- Implement measures to structures and assets that reduce the probability of ignition and loss" [41]

Home Ignition Zone

Multiple studies (including the previously referenced recent Fort McMurray WUI fire investigation) 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).[57,58] The HIZ includes the structure itself and four concentric, progressively wider Priority Zones. HIZ Priority Zones are based upon distance from structure: 0 to 1.5 m (Priority Zone 1a-fuel free zone), 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 1a, 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 priority zones can be found in the FireSmart Manual[59].

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 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.[58] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[60] 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.

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[57] 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.
[58] Cohen, J. *Preventing Disaster Home Ignitability in the Wildland-urban Interface*. Journal of Forestry. p 15 - 21.
[59] https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart
[60] 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. Retrieved from: 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 4).

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.[60] Figure 4 illustrates that 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 removing the consequences of multiple structures lost.

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.[60]

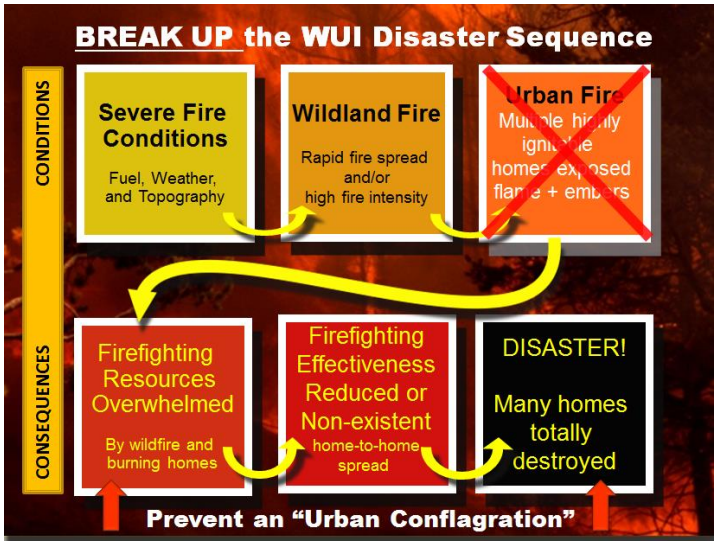


Figure 4. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.[61]

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 AOI is also presented in this section.

Education

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, VoPC 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 VoPC has not yet undertaken public education outreach in the community or online. the VoPC should consider developing a school fire education program to include an element of wildfire preparedness education to be presented annually in the school. Programming could include volunteer/advocacy work from professional foresters, wildland firefighters or prevention officers, and

[61] Graphic adapted from Calkin et. al, by A. Westhaver.

trained VoPC staff. FireSmart BC has created an education package[62], developed for four age groups from kindergarten to grade 12, which can be used to guide education programs in the community. 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 and Education strategy is presented in Section 5.3.

Planning and Development Considerations

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 and practices 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 objectives/considerations for the VoPC are:

- To include wildfire considerations in the planning and acquisition strategy for parks and recreational areas.
- To develop policies and practices for design and maintenance of FireSmart publicly owned land such as community parks and open spaces and FireSmart publicly owned buildings.
- To conduct FireSmart and/or risk assessments of publicly owned lands and buildings to inform planning for prevention and mitigation activities as required.

FireSmart policies and practices can be incorporated in various aspects of development design, zoning and permitting to reduce wildfire hazard on private land and in the community at large. The development objectives/considerations for the VoPC are:

- 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).
- To ensure higher level planning and regulation (i.e., OCP and/or land use, engineering and public works bylaws) incorporate FireSmart policies, as applicable, to reduce wildfire hazard in vulnerable WUI neighbourhoods, and include measures that address wildfire prevention and suppression in subdivision design.
- To ensure multiple departments (including fire departments and/or emergency management staff) are included in the referral process for new developments.

FireSmart Vegetation Management

Some examples of actionable items for the VoPC with regards to vegetation or fuel management and the FireSmart approach include: 1) policy development and implementation of FireSmart maintenance

[62] British Columbia Fire Smart. Education Box Resource Manual. Available from https://firesmartbc.ca/wp-content/uploads/2019/04/FireSmart-BC-Education-Package-KinderSmart.pdf

for community parks and open spaces (as per planning considerations discussed above); 2) implementing fire resistive landscaping requirements as part of the development permitting process (as per development considerations discussed above); and 3) provision of incentives (i.e., a local rebate program) and/or collection services for private landowners with a focus on pruning, yard and thinning debris (FireSmart activities for private land). More detailed recommendations regarding FireSmart activities for private land are discussed below.

The VoPC has not yet engaged in a proactive vegetation management strategy for high risk areas within and immediately adjacent to developed areas. There are no FireSmart landscaping requirements, or development permit areas, or bylaws to prohibit the accumulation of combustible materials on private land or the dumping of materials on public land. While these are strategic planning and enforcement options that may be suitable for larger communities, they are currently outside the resources, feasibility, and necessity of a small community like the VoPC.

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

RECOMMENDATION #11: Consider applying for funding from the UBCM CRI 2021 Program to develop a local FireSmart rebate program. This will allow homeowners to access partial rebates for FireSmart activities on their properties if rated as moderate, high or extreme risk in a FireSmart home and property assessment. The rebate program must adhere to the goals and standards of FireSmart, as outlined in Section 5.2.1., but rebate amounts can be funded by CRI.

RECOMMENDATION #12: Provide homeowners with existing FireSmart landscaping reference guides. These reference materials give general guidelines, such as features of flammable, hazardous vegetation, in contrast with non-flammable, safer alternatives. [63]

Subdivision Design

If any new neighbourhoods or development are created in the Village of Port Clements or elsewhere in the AOI, design should include consideration to reduce the overall risk 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. When the time for evacuation is limited, poor access and egress from neighborhoods has contributed to deaths associated with entrapments on dead-end roads or cul-de-sacs, and vehicle collisions during wildfires.[64] Methods 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.[64]For new development in rural settings where hydrants are limited or unavailable (or it is otherwise determined by the VoPC 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

[63] See, for example, the FireSmart Guide to Landscaping: https://firesmartcanada.ca/wp-content/uploads/2019/10/FireSmart-Guide-to-Lanscaping.pdf

[64] 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

or artificial). Alternative water sources, such as water usage agreements for accessing water on private land, or cisterns or other underground storage, etc., could be reviewed by the VoPC fire department prior to development approval to ensure they meet the need for fire suppression.

Increasing Local Capacity – Interagency Cooperation, Emergency Planning and Cross Training

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

- Development and/or maintenance of Structural Protection Units (SPUs) which can be deployed in the event of a WUI fire;
- Conducting a comprehensive review of Emergency Management BC SPU deployment procedures for the purpose of fighting interface fires;
- Provision of sprinkler kits to community residents (at a cost);
- 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;
- Participation in cross-jurisdictional tabletop exercises and seasonal readiness meetings;
- Development and/or participation in regional or multi-agency fire or fuel management tables (i.e., interface steering committee or wildfire working group) to facilitate communication and co-operation between groups and agencies responsible for wildfire preparation and response; and
- Provision of training and/or professional development for Local FireSmart Representatives, community champions to increase capacity for FireSmart activities.

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

FireSmart Demonstration Projects

FireSmart demonstration projects for publicly owned buildings or public and provincially owned critical infrastructure (as identified in Section 3.2) can display the practices and principles of FireSmart to the public. This may be in the form of replacing building materials with fire resistant materials, replacing landscaping with fire-resistant plants, and demonstration HIZ fuel treatments. Ideally, these projects would include elements of public education (signage, public tours, active demonstrations of operations, etc.). Appropriate/candidate FireSmart demonstration projects may be identified by the VoPC based on assessment by internal trained Local FireSmart Representatives or external Local FireSmart Representative consultant.

RECOMMENDATION #13: Following FireSmart assessments of critical infrastructure (Recommendation #7) VoPC should apply for FireSmart demonstration grants through the Community Resiliency Investment (CRI) Program. This type of project can display the practices and principles of FireSmart activities to the public in the form of demonstration treatments. FireSmart demonstration projects are beneficial in that they meet the dual objectives of enhancing public education of wildfire mitigation and FireSmart principles (through signage, community work days, public tours, active demonstrations of operations, etc.) and improving the resilience of a structure to wildfire.

FireSmart Activities for Private Land

The best approach to mitigate fuels on private lands is to urge private landowners to comply with FireSmart guidelines and to conduct appropriate fuel modifications using their own resources (CRI program funding may be available subject to current funding requirements). The VoPC can facilitate uptake within the community by: 1) supporting and/or facilitating planning for private land (with property owners' consent); 2) offering local rebate programs to homeowners on private land who complete eligible FireSmart activities on their properties; and as previously indicated (FireSmart vegetation management), 3) providing off-site debris disposal for private landowners who undertake their own vegetation management (with a focus on pruning, yard and thinning debris). Off-site debris disposal options include providing a dumpster, chipper or other collection method and providing curbside debris pick-up. Planning for private land may include developing FireSmart Community Plans for identified areas (i.e., a WUI neighbourhood, community, subdivision) and conducting FireSmart home and property assessments.

RECOMMENDATION #14: Consider establishing a community-wide campaign or contest for 'Most FireSmart Homes', based on FireSmart principles (available for reference in existing materials). Emphasize the management of combustible materials that may have accumulated on and under exterior projections, such as decks and patios, near the home, adn in gutters and on roofs). Consider timing this campaign to occur before the wildfire season (early to mid-April) or during conventional yard clean-up times (often spring and fall). Pursue potential funding through CRI to support this project.

RECOMMENDATION #15: Make existing reference materials about FireSmart principles of building design and maintenance, available to homeowners, for consideration when renovating, repairing, or building new structures on properties. Consider applying for funding to develop materials to distribute to homeowners which emphasize FireSmart best building practices, and materials and building design that increase wildfire threat. If and when FireSmart rebate program is established, emphasize potential opportunity for rebate of some home improvement costs.

FireSmart Compliance within the Area of Interest

As could be expected, there is a range of FireSmart compliance on private properties in the AOI. There are differences in the degree to which FireSmart best practices are visible within individual HIZs, and in neighbourhoods or industrial sites throughout the AOI. Vegetation surrounding homes in the AOI is also in a range of FireSmart compliance. Generally speaking, many homes in interface areas maintain a lawn and/or a 10 m defensible space. However, some homes are built directly adjacent to forest land. Some residences are offset from mature forest, but ingress of coniferous shrubs and saplings has occurred over time, resulting in fuel accumulations around the property. Accumulations of conifer foliage in roof corners and gutters was also not uncommon. Storage of combustible items under decks, carports, and other horizontal surfaces was common.

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 vulnerability of structures and the amount of effort required to achieve a FireSmart rating for individual homes, neighbourhoods or the communities 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 municipal-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 Port Clements were unofficially surveyed during field work. The following observations were made:

- Wildfire hazard levels range from moderate to high across neighbourhoods within the AOI;
- The bulk of hazards are associated with conditions of natural coniferous 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;
- Hazards are magnified in some areas due to poor access (i.e., presence of private and gated roads) and distance from nearest water supply or fire hydrant location; and,
- There is an opportunity to mitigate risk through individual and collective action.

RECOMMENDATION #16: VoPC should hire a qualified professional (Registered Professional Forester [RPF] whose scope of practice includes conducting wildfire hazard mitigation) or consider training local fire services staff members as Local FireSmart Representatives to assist the community in complying with FireSmart principles at the neighbourhood and individual home-level. Funding to train and compensate 1-2 regional FireSmart Representatives could be obtained collaboratively by fire departments on Haida Gwaii. Training for a Local FireSmart Representative entails a two-day workshop, after which certification is granted.

Training Local FireSmart Representatives can help homeowners implement of FireSmart principles on private land and reduce wildfire risk to their homes. The best options for providing these workshops to Port Clements Volunteer Fire Department members has been an ongoing topic of discussion, and at the time of writing, the options of delivering Local FireSmart Representative training through BC FireSmart, or FireSmart Canada have been declined, at least partly due to prohibitive costs. Attending training on the northwest mainland is currently the most viable option.[65]

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 VoPC and are not based on a scientific sample or formal data collection. Recommended FireSmart activities are essentially

[65] D. Donavan, personal communication, July 22, 2020.

the same for each neighbourhood or area; however, it is recommended that the VoPC prioritize the neighbourhoods in Table 10.

Table 10. Summary of FireSmart Priority Areas.

Area	FireSmart Y/N	FireSmart Canada Recognition Received Y/N	Recommended FireSmart Activities
Priority Area #1: Industrial Site Road, north end	N	N	The following is a non-extensive list of FireSmart activities for which the VoPC 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; 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.
Priority Area #2: Bayview Street	N	N	
Priority Area #3: Industrial Site Road, south end at Highway 16	N	N	
Priority Area #4: Critical infrastructure	N	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 does not reach higher than 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, 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 underdeveloped or inaccurate.

Based on the consultation completed during the development of this CWPP, it is evident that VoPC staff and some residents have a good level of awareness of interface fire risk and a strong level of commitment to continue to grow 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 beyond these times. The communication and education objectives for the VoPC 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 VoPC should consider creating a joint Interface Steering Committee to coordinate wildfire risk reduction efforts. The steering committee could include key stakeholders such as municipal/village council staff, Council of the Haida Nation, 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 #17: As staff and volunteer capacity allows, this CWPP report and associated maps should be made publicly available through the VoPC's 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 #18: As staff and volunteer capacity allows, 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 VoPC'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 #19: Consider using the VoPC Facebook group and website to communicate fire bans, high or extreme Fire Danger days, wildfire prevention initiatives, FireSmart resources and activities occurring in the VoPC, updates on current fires and associated air quality if affected, and other real-time information.

RECOMMENDATION #20: Promote FireSmart approaches for wildfire risk reduction to VoPC residents through Town Hall meetings, FireSmart 101 course, 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. Post fire danger ratings and fire bans via the VoPC newsletter and local radio.

RECOMMENDATION #21: As staff and volunteer capacity allow, consider working 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 #22: As staff and volunteer capacity allow, facilitate the FSCCRP uptake within the VoPC and enhance its applications by including the following: 1) Encourage individual homeowner participants to complete the self-administered FireSmart home assessment tool; and 2) 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 #23: As staff and volunteer capacity allow, 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..

RECOMMENDATION #24: As staff and volunteer capacity allow, develop and work with all key stakeholders (industrial operators, other Local Governments and band councils on Haida Gwaii, MFLNRORD, BCWS, recreational groups/representatives and NCRD Staff) to formalize an All-Island Emergency Management Team with an associated Interface Steering Committee. The purpose of the Emergency Management Team would be to coordinate planning, management and response for various emergencies. The Interface Steering Committee would help identify wildfire-related issues on Haida Gwaii to develop collaborative solutions to minimize risks. The following subject areas are recommended for the group to explore: 1) Development of large, landscape level fuel breaks; 2) Public education and awareness needs; 3) Multi-disciplinary, multi-jurisdictional fuel treatment projects/ hazard abatement projects; 4) Development of a funding strategy; and 5) Reduction of human-caused fires, fire prevention and right-of-way management.

RECOMMENDATION #25: Promote and provide information to private landowners related to safe firewood storage as a FireSmart prevention measure (see Section 6.2 for brief guidelines and sources of existing reference material to provide homeowners).

5.4 OTHER PREVENTION MEASURES

In addition to fuel treatment and community communication and education, fire prevention in the AOI can also be addressed via the following avenues: the public display of danger class rating signs throughout the AOI, which should be updated on a weekly basis; and providing incentives to comply with local bylaws/policies that relate to fire prevention and suppression. 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 AOI is not limited to private property owners and individual residents. Power lines 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 AOI, especially given the risk of earthquakes in the AOI that can also damage transmission infrastructure. WWG members expressed concern over vegetation maintenance practices in right-of-ways. A cooperative approach for addressing the industrial area concerns must be undertaken by the VoPC, NCRD and pertinent industrial partners.

RECOMMENDATION #26: Consider engaging with industrial operators to provide feedback on right-of-way maintenance projects around VoPC boundaries. This could include reporting accumulations of fine fuels, or high conifer regeneration. If and when Interface Steering Committee is formed, this group could be used as a platform for such engagement.

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.[26] The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia.

6.1 LOCAL GOVERNMENT 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 VoPC has access to mobile diesel generators to power critical infrastructure such as the fire hall and water treatment plant. However, should a wide-scale outage occur, known vulnerabilities to secondary power sources include mechanical failure and potential fuel shortages. Although the local government has not identified any issues with water pressure within areas that have fire hydrant service, there are known limitations to water supply, the specific limitations of which are detailed in Section 6.1.2.

The Port Clements Volunteer Fire Department (VFD) is the only fire department within the AOI. Informal mutual aid agreements are in effect between the Port Clements VFD and the Masset VFD, and Tlell VFD, whose fire response areas are outside of the AOI (more detail is provided in Section 6.1.1). In the event of a WUI fire emergency, mutual aid in the AOI is activated, as required, between these three fire departments. WUI fire events may also lead to aid requests with BCWS.

6.1.1 Fire Department and Equipment

Fire protection with the AOI is primarily the responsibility of the Port Clements VFD whose fire response area encompasses the municipal boundary of the VoPC.

Table 11 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. In total, the various fire protection services encompass the commercial and residential core of the VoPC; industrial sites along Industrial Park Road; and residences along Bayview Street. The Ferguson Bay dry land sort and Juskatla camp are not encompassed in the fire response area. Both of these areas have industrial sites located on them, and operators are responsible for ensuring equipment is kept on site that is adequate for suppressing wildfire ignitions. The type and quantity of firefighting tools that is considered adequate will vary depending on the number of workers, type of activity, and the risk of ignition associated with work being performed.[66] The Port Clements VFD will respond to motor vehicle accidents outside the fire response area. WWG members stated that the Port Clements VFD would also likely respond to an incident at Juskatla or the Ferguson Bay dry land sort if assistance was required.

Fire department members are all volunteer. The greatest personnel deficiencies reported by fire department are difficulty in attracting new members. Currently, a Junior Firefighter program is pursued to boost youth participation.[65] The VoPC also reported that a lack of funding has been a barrier to upgrading and servicing fire equipment and apparatuses, gear, and the fire hall itself. WWG members specifically identified the 1981 tanker as needing replacement, due to age and limited water storage, which restricts response efficacy. Should a marine response be required, WWG members stated that some small crafts with pumping capacity are stationed over the Kumdis River bridge, and may be available to be commandeered by the VFD in the case of an emergency. However, these apparatuses do not belong to the Port Clements VFD and should not be counted on as necessarily available. The Port Clements Volunteer Fire Department does not have wildfire fighting equipment, but a cache of tools and gear from BCWS is stored with the VFD (more details in
Table 11).

RECOMMENDATION #27: Promote membership in Port Clements VFD by increasing awareness that structural firefighting in the AOI is exterior-only, which is inherently safer than interior firefighting. Promote the training opportunities associated with volunteer firefighting, including first aid. Explore options to compensate members who elect to take advanced training opportunities through institutions like Coast Mountain College, such as OFA Level 3.

[66] BC Forest Safe, 2008. *Guidelines for Fire Suppression Systems and Fire Fighting Hand Tools for British Columbia, Draft, Version 4*. Retrieved from: http://www.bcforestsafe.org/files/files/Forms%20and%20Templates/Guidelines-fire-suppression-systems-hand-tools-July-16.pdf

Funding opportunities, i.e. through UBCM and Indigenous Services Canada, should continue to be pursued to obtain required wildland firefighting equipment. The opportunity also exists to collaborate with other fire departments on Haida Gwaii to obtain the following wildland firefighting equipment that would be shared between departments and stored in Port Clements: 4x4 water tender with draft capacity a collapsible water tank, portable pump and hose, and an SPU.

RECOMMENDATION #28: Continue to pursue funding opportunities for training and wildland specific equipment that can be shared between the Port Clements VFD and/or other fire departments on Haida Gwaii. An off- road capable fire tanker truck and a trailer of wildland specific firefighting equipment should be obtained in collaboration with other fire departments, including a collapsible water tank, portable pump, and hose lengths. Pursuing funding collaboratively may allow for a larger regional grant due to cost-efficiencies in sharing equipment between communities. In the case that coordinating sharing of equipment is burdensome, focus applications on the needs VoPC only.

Table 11. Fire department capacity and equipment within the AOI.

Fire Protection Zones	Fire Department	Number of Stations	Number of Members	Apparatus type and number
Port Clements Fire Protection District	Port Clements Volunteer Fire Department	1	Fire Chief, Deputy Fire Chief, 18 firefighters (volunteer)	1 superior pumper, 1 rescue pumper and 1 tanker.
n/a	BCWS	n/a	n/a	Equipment cache stored with the VoPC

The Port Clements VFD has confirmed informal mutual aid agreements with the Tlell VFD and the Masset VFD, the two closest fire departments on the island. These mutual aid agreements are not frequently called upon, but are important in case of large incidents or fires. Training for VFD members is focused primarily on structural firefighting. WWG members reported that there are several barriers to maintaining currency in training, including wildland fire training. It is expensive to have third-party instructors come to the islands. Often trainers will offer classes only for a minimum number of participants, and there are logistical difficulties in fulfilling this requirement for a small VFD. It is also expensive both in actual cost of travel and time lost at work for volunteers to commit to training workshops off-island. There are few members of the VFD with a current S-100 certification.

It is recommended that all fire services members within the AOI 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. Cross-training with the BCWS would enable local fire departments to prepare their responders with technical and practical firefighting training in order to action both structural and wildland fires.

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).[67] 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;
- Piping that is correctly installed and in good condition; and
- 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 AOI 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. The Fire Underwriter's Survey[67] recommends that the source of supply, including impounding reservoirs, and each part of the supply works, should normally be able to maintain the maximum daily consumption plus the maximum required fire flow. As previously noted in Sections 3.2.3 and 3.3.1, water service is supplied by two groundwater wells. There are three storage reservoirs, which are each capable of holding a volume of 136, 000 liters. WWG members state that the capacity of the water system is sufficient for structural firefighting, but not for larger incidents (multiple homes) or a wildfire response. Although this was not reported in the 2016 water study[29], WWG members state that there are currently concerns about producing sufficient water for normal daily use during drought conditions.

The water system in the VoPC can provide supply for two to three days of conservative use in the case of a power outage; there are also backup diesel generators available that can extend service availability beyond this period. The greatest challenge identified by WWG members in the case of a prolonged power outage for the VoPC is fuel availability (as it must be barged in from Prince Rupert) or catastrophic mechanical failure of the generator, which is aging. There are no municipal water supply systems at Juskatla, the Ferguson Bay dry land sort, or on Kumdis Island. There is some uncertainty about what, if any, water service infrastructure exists in Juskatla. A well may have been drilled on site by forest industry operators, but the condition and location have not been identified or mapped.

For suppression within the AOI, hydrant service is provided within the fire service area boundaries at varying levels of coverage. Several areas or neighbourhoods that have a lack of hydrants, or water supply were identified which create suppression challenges in the AOI. Hydrant service is available in the core residential and commercial areas of the Village of Port Clements, but not outside the boundaries of the AOI. There is no hydrant coverage on Industrial Park Road, extending north of town. WWG members

[67] Fire Underwriters Survey, 1999. *Water Supply for Public Fire Protection*. Retrieved from: http://www.scm- rms.ca/docs/Fire%20Underwriters%20Survey%20- 201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf

noted that areas that lack hydrant coverage are also interface or intermix areas, with added industrial hazards or risks for ignition. WWG members did not identify any areas where reduced water pressure resulted in inadequate water supply or flow for firefighting capacity.

The water supply system in the VoPC is sourced from well water, and as such is less vulnerable to climate change than surface water sources might be. However, WWG members state that the production well is normally run at 70% capacity, and that under drought conditions, it may become necessary to run the well at 100% production capacity, in order to meet demand. Reservoir capacity thus may become a concern in the case of a large fire event, and increasing reservoir capacity would be helpful to increase water supply.

To supplement water availability for firefighting, the Port Clements VFD can draft from natural and static water sources such as lakes, rivers and ponds (i.e., Kumdis River, Coho Creek, Yakoun River, and Rennie Creek) using either truck mounted or portable pumps. WWG members stated that drafting ocean water is a possibility, but the process is hard on equipment. WWG members also stated that equipment deficiencies constrain their ability to draft from natural sources. Specific issues that were identified included the age of the tanker truck, its limited storage capacity, and the inability to drive back roads. It should be noted that natural water sources are often at risk of drying or experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days. It is recommended that natural water sources most at risk for drying, which would otherwise be relied upon as a secondary water source in the case of a large fire event, be identified and mapped.

RECOMMENDATION #29: All new development within the boundaries of VoPC should have a water system which meets or exceeds minimum standards of NFPA 1142, Standard on Water Supplies for Suburban and Rural Fire Fighting. The Fire Department should review the water supply to ensure it provides sufficient placement, flow, and reliability for suppression needs and that secondary power is available in the event of power outages.

RECOMMENDATION #30: Consider completing a fire flow / water vulnerability assessment, with a focus on determining water storage locations and quantities at Juskatla Camp, and potentially in engagement with Taan Forest Ltd. Focus on determining where upgrades to systems, water storage, or secondary power is required.

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 Yellowhead Highway (Highway 16) is the only reliable, paved access route in and out of the AOI. The Queen Charlotte Mainline is an existing alternate route that traverses from the western edge of the VoPC through the backcountry to Queen Charlotte. However, it is not paved, nor reliably maintained. If a wildfire were to block Highway 16, 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. WWG

members state that an evacuation would be conducted by the Port Clements VFD and the RCMP, in consultation with the MFLNRORD.

Several impediments to access and egress in interface areas were noted. Addresses are often unmarked on properties. WWG members state this is not currently an impediment to efficient response, as Port Clements is a small community and first responders generally know where residents live. However, this may not be the case if first responders are not local. Some neighborhoods within the VoPC are located on single access roads, including the Ryland Road subdivision, and the area surrounding Industrial Park Road. The area around Juskatla and Ferguson Bay have limited access; road access is only on unpaved forest service roads, however, boat access and egress is possible at both of those sites. Single access roads can limit the ability of fire crews to respond to fires and safely evacuate residents or workers.

One locked gate was noted at the Ferguson Bay dry land sort. It is critical for all relevant agencies to have the most recent information on gate locations and ownership. Local government agencies and industrial landowners who have installed locked gates may have concerns regarding security and safety and information sharing and access should be conducted or limited with this in mind. Additionally, some of the critical infrastructure within the AOI is reached via narrow and/or private, forested roads, which may impede suppression efforts and response times. Furthermore, there is a significant portion of land within the AOI which is inaccessible by roads.

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. The VoPC has developed an Emergency Preparedness Plan (EPP) in 2017 which includes basic contingencies in the event of an emergency (i.e., contacts and roles of local government personnel). However, the EPP does not specify evacuation routes to be used during an emergency situation. In the event of a wildfire emergency within the AOI, the Village Multiplex Building is designated as the EOC. It is recommended that the VoPC 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.

It should be noted that 911 service is not currently provided on Haida Gwaii. In 2015 the Ministry of Justice published a discussion paper regarding the modernization of 911 service provision across BC.[68]

RECOMMENDATION #31: Work with the NCRD to expand the capacity of the Prince Rupert 911 Public Safety Answering Point (PSAP) so that 911 service can be provided throughout the Regional District,

[68] Ministry of Justice. 2015. Emergency Communications Service Delivery in British Columbia- Police Communication Centres and 911 PSAP- Strategic Vision Discussion Paper. Available at https://www2.gov.bc.ca/assets/gov/law-crime-and-justice/criminal-justice/police/publications/government/emerg-comm-strategic-vision.pdf

including on Haida Gwaii. Participate in a feasibility analysis if conducted by the NCRD in consultation with local RCMP, fire departments, and the Ministry of Justice.

RECOMMENDATION #32: VoPC should apply for funding from UBCM to undertake additional evacuation planning and EOC training exercises. Consider seeking other funding options to improve EOC functionality and capacity, and for emergency support services.

RECOMMENDATION #33: If and when funding is obtained to complete the evacuation plan, complete and participate in regular testing, and updates, of it. Emergency preparedness information sharing should take place with the All-Island Emergency Management team if/when it is formed. This will help coordinate efforts regionally.

Another emergency preparedness tool available to local government and emergency management officials in the VoPC is the ePACT emergency notification system. It is a program designed to provide residents with alerts and news updates by telephone, text, and email in the case of an emergency. In some communities on the island, the system is also used to store information about vulnerable residents that may require help during an evacuation. However, registration for this system is voluntary, and not all residents may be registered at any given time. In other communities on the island, high resident turnover is a barrier to reaching full community participation. It is recommended that the ePACT system be promoted, to increase registration, and that VoPC staff familiarize themselves with the use of the system.

RECOMMENDATION #34: Promote ePACT sign-up during an annual month-long campaign; target a certain level of resident sign up, i.e. 90%. Use all available platforms, including the VoPC webpage and social media, local radio, posters at businesses and community buildings, a phone call campaign, and door-to-door canvassing. Ensure that VoPC staff are knowledgeable about the system and how to use it.

If recreation trails are built to support ATVs, they 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 the installation of gates or other barriers to minimize access by unauthorized users can be used as a tool that increases the ability of local fire departments to access interface areas.

The creation of a map book or spatial file that displays the road and trail network available for fire departments to access during an emergency or for fire suppression planning must accompany any fire access trail building activities and would be a useful component of a local emergency plan. In order to effectively use the trails as crew access or as fuel breaks during suppression efforts, it is recommended that a Total Access Plan be developed. This plan should be made available to the fire departments 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 (including location of wetlands or other natural fire barriers), 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 or 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 or control lines, trail and 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, as well as reduce rehabilitation costs.

It is recognized that the municipal area of the VoPC is small, and that much of the surrounding area where forest service roads, and informal or formal trails either exist or may be developed in, is outside of its jurisdiction. Therefore, a Total Access Plan for the area would likely need to be created in collaboration with the NCRD, to encompass the forested area which interfaces with the edges of the VoPC municipality.

RECOMMENDATION #35: Consider engaging with the NCRD to develop a Total Access Plan for areas of the AOI which are in their jurisdiction. A good platform for this discussion could be a meeting of the Interface Steering Committee, if and when it is established. A Total Access Plan is a 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.

RECOMMENDATION #36: Include a qualified professional with experience in operational wildland/interface fire suppression in the planning and strategic siting of future trails and parks.

6.1.4 Training

The VoPC fire department maintains a current level of structural protection training as described in Section 6.1.1. 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. It is recommended that all fire department members at minimum have S-100 and/or SPP-WFF1 (or equivalent), and that the fire departments engage in yearly practical wildland fire training with BCWS. It must be noted that SPP-WFF 1 is a new S-100 equivalent course for structure firefighters only, and as such BCWS has phased out instruction of S-100 training for fire departments. SPP-WFF 1 also replaces S-185 (Fire Entrapment Avoidance) and takes only 6 hours to be delivered.[69]

[69] Office of the Fire Commissioner. 2013. SPP-WFF 1 (Wildland Firefighter Level 1), as per NFPA 1051 Level 1 standard, backgrounder.

Wildfire Working Group members noted in the development of this CWPP the administrative and logistical challenges of maintaining training requirements on a yearly basis. Instructors for courses such as S100 are sparse on Haida Gwaii, and the time commitments required for attending training off-island can be burdensome. At the time of writing, an alternative, cost-effective solution to certify Volunteer Fire Department members on Haida Gwaii in SPP-WFF 1 may be pursued, wherein the Office of the Fire Commissioner could screen experienced members from all Volunteer Fire Departments for certification in SPP-WFF 1.[65] This would enable Volunteer Fire Departments on Haida Gwaii to meet the baseline training requirements for wildland operations, while avoiding incurring travel and administrative costs.

If a suitable delivery option can be made available, the Volunteer Fire Department training program might also be expanded to incorporate the SPP-115 course, which trains structural firefighters on the use of wildfire pumps and hoses. This training would be most relevant if a structural protection unit (a cache of equipment kept in a trailer, that can be used to defend structures threatened by wildfire) is obtained by local or regional governments. If a structural protection unit is acquired, equipment should be selected to match the unique coastal fuel type and fire behaviour of Haida Gwaii. [65]

The level of engagement between fire departments and the BCWS has generally not been strong in recent years. It is recommended that the fire departments work cooperatively with the BCWS (Fraser Fire Zone) to conduct yearly mock exercises, where information and technical/practical knowledge are shared, such as: fireline construction, Mark 3 pump operations, sprinkler protection, skid/slip-on unit 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. Such training would likely have to take place on Haida Gwaii because finding time and funding for volunteer firefighters to travel to the mainland to participate in such training is not likely to be feasible. Another option is to have a tabletop exercise run by BCWS personnel over video conference.

Additional training options could include engaging fire departments on Haida Gwaii outside of the AOI (e.g., Tlell, Masset, and Old Massett) to conduct joint training so as to further strengthen regional emergency response and firefighting training. Strong communication and the will to collaborate already exists between fire departments on Haida Gwaii. Annual All-Island Fire Chiefs meetings have taken place since 2018.

RECOMMENDATION #37: The Port Clements Volunteer Fire Department (VFD) should work with BC Wildfire Service (BCWS) to initiate an annual interface training program. As part of the training, it is recommended to conduct annual reviews to ensure personal protective equipment (PPE) and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. It is recommended the Port Clements VFD engage in yearly practical wildland fire training with BCWS that covers at a minimum: pump, hose, hydrant, air tanker awareness, and employment of structural protection units (SPUs). Interface training should include completion of a joint wildfire simulation exercise and safety training specific to wildland fire and risks inherent with natural areas. It is recognized that BCWS crew resources are limited and their availability and is highly dependent upon the current fire season and other BCWS priorities.

RECOMMENDATION #38: The Port Clements VFD should engage in regular communication with BCWS to foster a strong relationship and identify potential cooperative wildfire risk reduction opportunities, such as combining BCWS training with vegetation management in the interface or providing local information to support wildfire suppression and mitigation in the AOI.

RECOMMENDATION #39: As training resources/budgets allow, build the capacity of the Port Clements VFD members to effectively suppress wildland fires, through wildfire-specific training sessions. Ensure all firefighter training includes S-100 and S-185 (combined) or SPP-WFF1 at a minimum. Consider expanding the training program to maintain a high level of member education and training specific to interface and wildland fires. SPP-115 provides training to structural firefighters on the use of wildfire pumps and hose (and fires service hose and hydrants) in the application of structural protection units (SPUs).

6.2 STRUCTURE PROTECTION

No fire departments on Haida Gwaii are 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 of 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 the "*FireSmart Begins at Home Manual*"[70].

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,

[70] Available at https://firesmartcanada.ca/resources/ (FireSmart Canada) and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart (BC FireSmart)

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.

An issue of importance in a community where a primary heating source is woodstoves is the safe storage of firewood. The following are some basic guidelines[71] which should be followed to reduce potential hazards to homes or other structures:

1. Pile firewood at least 10 meters from your home (avoiding downslope locations if possible), and out from under decks and patios.
2. Clean up any areas where firewood is stored regularly, since easily ignited debris can collect there.
3. Firewood should be kept in a fuel-free zone, away from overhanging branches, coniferous vegetation, or other accumulations of combustible woody debris above or around the pile.
4. Avoid stacking firewood against a wooden fence if the fence abuts the house.

The structure protection objectives for the VoPC 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.

RECOMMENDATION #40: Implement programs which serve to remove barriers to action for homeowners by providing methods for them to cheaply and easily dispose of wood waste removed from their property. Programs may include scheduled community chipping opportunities, or yard waste dumpsters available by month Programs should be available during times of greatest resident activity (likely spring and fall). Programs may also include a community burning day; however, this method of wood waste disposal may be restricted by venting requirements and open burning bans (including Category 2 and 3 burning bans) and / or operational guidance from BCWS. VoPC staff could consider seeking guidance from new BCWS personnel stationed on Haida Gwaii to navigate these restrictions.

RECOMMENDATION #41: 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.

[71] See FireSmart Begins At Home (https://firesmartbc.ca/wp-content/uploads/2019/09/FireSmart_Booklet_web-Updated.pdf) and FireSmart Homeowner's Manual (https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/preparedbc/homeowner-firesmart.pdf) for more details.

RECOMMENDATION #42: Depending on availability of funding to support this purchase, consider collaborating with other Graham Island communities (i.e., Queen Charlotte, Skidegate, Masset / Old Massett and Sandspit) to purchase a Type 2 structural protection unit (SPU) trailer, with the aim of making the unit available to the PCVFD and / or BCWS to use within their jurisdiction in the event of a wildfire close to the community.

REFERENCES

Agree, J.K., Bahro, B., Finney, M.A., Omi, P.N., Sapsis, D.B., Skinner, C.N., van Wagtendonk, J.W., Weatherspoon, C.P. *The use of shaded fuelbreaks in landscape fire management*. Forest Ecology and Management, 127 (2000), 55-66.

BC Forest Safe, 2008. *Guidelines for Fire Suppression Systems and Fire Fighting Hand Tools for British Columbia, Draft, Version 4*. Retrieved from: http://www.bcforestsafe.org/files/files/Forms%20and%20Templates/Guidelines-fire-suppression-systems-hand-tools-July-16.pdf

BC Hydro, 2019. *Earthquakes, wildfires and floods*. Retrieved from: https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html

BC Wildfire Service. 2017. Provincial Strategic Threat Analysis: 2017 Update. Retrieved from: ftp://ftp.for.gov.bc.ca/HPR/external/!publish/PSTA/Documents/Provincial%20Strategic%20Threat%20Analysis_2017%20Update.pdf.

BC Wildfire Service, 2019. Provincial Strategic Threat Analysis Dataset. Fire Incident Locations – Historical. Retrieved from: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/about-bcws/wildfire-response/fire-characteristics/causes

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. Retrieved from: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3896199/.

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

Community Resiliency Investment Program, 2018. *Community Wildfire Protection Plan Template.*

Council of the Haida Nation, 2020. *History of the Haida Nation.* Retrieved from: http://www.haidanation.ca/?page_id=26

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.

Fire Underwriters Survey, 1999. *Water Supply for Public Fire Protection*. Retrieved from: http://www.scm- rms.ca/docs/Fire%20Underwriters%20Survey%20- 201999%20Water%20Supply%20for%20Public%20Fire%20Protection.pdf

FireSmart Canada, 2019. Retrieved from: https://www.firesmartcanada.ca

Flannigan, M.D et al., 2009. *Implications of changing climate for global wildland fire*. International Journal of Wildland Fire 18, 483-507.

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

Haida Gwaii Management Council, 2012. *Rationale for the Allowable Annual Cut (AAC) Determination for Haida Gwaii.* Retrieved from: http://www.haidagwaiimanagementcouncil.ca/wp-content/uploads/2019/03/2012-AAC.pdf

Haida Gwaii Management Council, 2019. *Allowable Annual Cut*. http://www.haidagwaiimanagementcouncil.ca/allowable-annual-cut/

Haida Gwaii Management Council, 2019. *FAQs.* Retrieved from: http://www.haidagwaiimanagementcouncil.ca/faqs/

Hall, E. 2010. *Maintaining Fire in British Columbia's Ecosystems: An Ecological Perspective.* Report submitted to the Wildfire Management Branch, Ministry of Forests and Range.

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.

McElhanney Consulting Services Ltd., 2017. *Village of Port Clements Water System Study Report*. Retrieved from: https://www.portclements.ca/wp-content/uploads/2017/01/2016-Water-Study.pdf

Ministry of Agriculture and Lands, The Council of the Haida Nation, 2007. *Haida Gwaii Strategic Land Use Agreement.*

Ministry of Agriculture and Lands, The Council of the Haida Nation, 2014. *Land Use Objectives Order Haida Gwaii (Consolidated Version).*

Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2019. *Haida Gwaii Natural Resource District Response Fire Management Plan.*

Ministry of Forests, Lands, Natural Resource Operations and Rural Development, 2015. *2015-17 Coastal Timber Supply Areas Forest Health Overview.*

Moore, Carmin. 2017. Tsunami Pole Project: An Innovative Approach to Tsunami Preparedness in Haida Gwaii. . https://www.ncrdbc.com/sites/default/files/docs/about-us/news/tsunami_pole_project_report.pdf

National Fire Protection Association (NFPA), 2017. *Standard on Water Supplies for Suburban and Rural Fire Fighting.* Retrieved from: https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1142

NCRD, 2019. *Emergency Planning*. Retrieved from: https://www.ncrdbc.com/services/public-safety/emergency-planning

Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2018 Version.

Province of British Columbia, 1995. *Forest Practices Code of British Columbia Biodiversity Guidebook.*

Province of British Columbia, 2016. *BC Provincial Coordination Plan for Wildland Urban Interface Fires.* Retrieved from: 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

Province of British Columbia, 2019. Data Catalogue – BEC Zone Polygons. Retrieved from: https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons

Province of British Columbia, 2019. Data Catalogue- Pest Infestation Polygons. Retrieved from https://catalogue.data.gov.bc.ca/pt_BR/dataset/pest-infestation-polygons

Province of British Columbia. *BECWeb Zone and Subzone Descriptions*. Retrieved from: https://www.for.gov.bc.ca/HRE/becweb/resources/classificationreports/subzones/index.html

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.

Statistics Canada, 2016. Dataset – Census Profile. Retrieved from:https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E

This new funding program (up to $50 million over three years) was initiated in 2018 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

Union of BC Municipalities, 2019. *2019 CRI FireSmart Community Funding & Supports – Program & Application Guide.* Retrieved from: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2019-program-guide.pdf

Using the 2012 WUI Wildfire Threat Assessments in B.C. Guide (https://www.ubcm.ca/assets/Funding~Programs/LGPS/SWPI/Resources/swpi-WUI-WTA-Guide-2012-Update.pdf)

Village of Port Clements, 2012. *Official Community Plan.*

Walker, I.J., Barrie, J.V., Dolan, A.H., Gedalof, Z., Manson, G., Smith, D., and S. Wolfe. 2007. *Coastal vulnerability to climate change and sea-level rise, Northeast Graham Island, Haida Gwaii (Queen Charlotte Islands), British Columbia.* CCIAP Project A580 Final Report.

Weighting of the three PSTA wildfire threat analysis components: Fire density 30%; HFI 60%; spotting impact 10% (water bodies were automatically given a value of 'no threat' [-1])

Westhaver, A. 2017. *Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster.* Institute for Catastrophic Loss Reduction (ICLR) research paper series – number 56.

APPENDIX A – LOCAL WILDFIRE THREAT PROCESS

The key steps to complete the local wildfire threat assessment are outlined below:

1. Fuel type attribute assessment, ground truthing/verification and updating as required to develop a local fuel type map (Appendix G – Fuel Typing Methodology and Limitations).
2. Consideration of the proximity of fuel to the community, recognizing that fuel closest to the community usually represents the highest hazard (Appendix A-2).
3. Analysis of predominant summer fire spread patterns using wind speed and wind direction during the peak burning period using ISI Rose(s) from BCWS weather station(s) (Appendix A-3). Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread.
4. Consideration of topography in relation to values (Appendix A-3). Slope percentage and slope position of the value are considered, where slope percentage influences the fire's trajectory and rate of spread and slope position relates to the ability of a fire to gain momentum uphill.
5. Stratification of the WUI based on relative wildfire threat, considering all of the above.
6. Consider other local factors (i.e., previous mitigation efforts, and local knowledge regarding hazardous or vulnerable areas)
7. Identify priority wildfire risk areas for field assessment.

The basis for the prioritization of field assessment locations is further detailed in Section 4.3. Wildfire Threat Assessment plot worksheets are provided in Appendix C – Wildfire Threat Assessment Worksheets and Photos (under separate cover), plot locations are summarized in Appendix F – WUI Threat Plot Locations, and the field data collection and spatial analysis methodology is detailed in Appendix H – WUI Threat Assessment Methodology.

A-1 FUEL TYPE ATTRIBUTE ASSESSMENT

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.[72] 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.[73] 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 AOI, fuel types which cannot accurately capture the natural variability within a polygon, and limitations in the data used to create initial fuel types.[73] Details regarding fuel typing methodology and limitations are found in Appendix G – Fuel Typing Methodology and Limitations. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower

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

[73] Perrakis, D.B., Eade G., and Hicks, D. 2018. Natural Resources Canada. Canadian Forest Service. *British Columbia Wildfire Fuel Typing and Fuel Type Layer Description* 2018 Version.

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 12 summarizes the fuel types by general fire behaviour (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the AOI is C-3, 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.[73] An M-1/2 fuel type 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-1a/b 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.[73] The O-1a/b fuel type was also attributed to sites dominated by invasive shrubs such as Scotch Broom. 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.

Table 12. Fuel Type Categories and Crown Fire Spot Potential. Only summaries of fuel types encountered within the AOI are provided (as such, other fuel types, i.e., C-1, C-2, C-4 and C-7 are not summarized below).

Fuel Type	FBP / CFDDRS Description	AOI 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

Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
O-1a/b	Grass	Matted and standing grass communities. Continuous standing grass with sparse or scattered shrubs and down woody debris. Vegetated, non-treed areas dominated by shrubs or herbs in dry ecosystems. Areas of very scattered trees. Hay fields. Areas harvested 7 – 24 years ago (dense or open and >4 m in height). Scotch-Broom dominated right-of-ways.	Rapidly spreading, high- intensity surface fire when cured	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
S-1/2	Slash (jack / lodgepole pine, white spruce / balsam, and coastal cedar / hemlock/ Douglas-fir, respectively)	Jack or lodgepole pine slash, white pine/ balsam slash, coastal cedar/ hemlock/ Douglas-fir slash	Moderate to high rate of spread and high to very high intensity surface fire	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

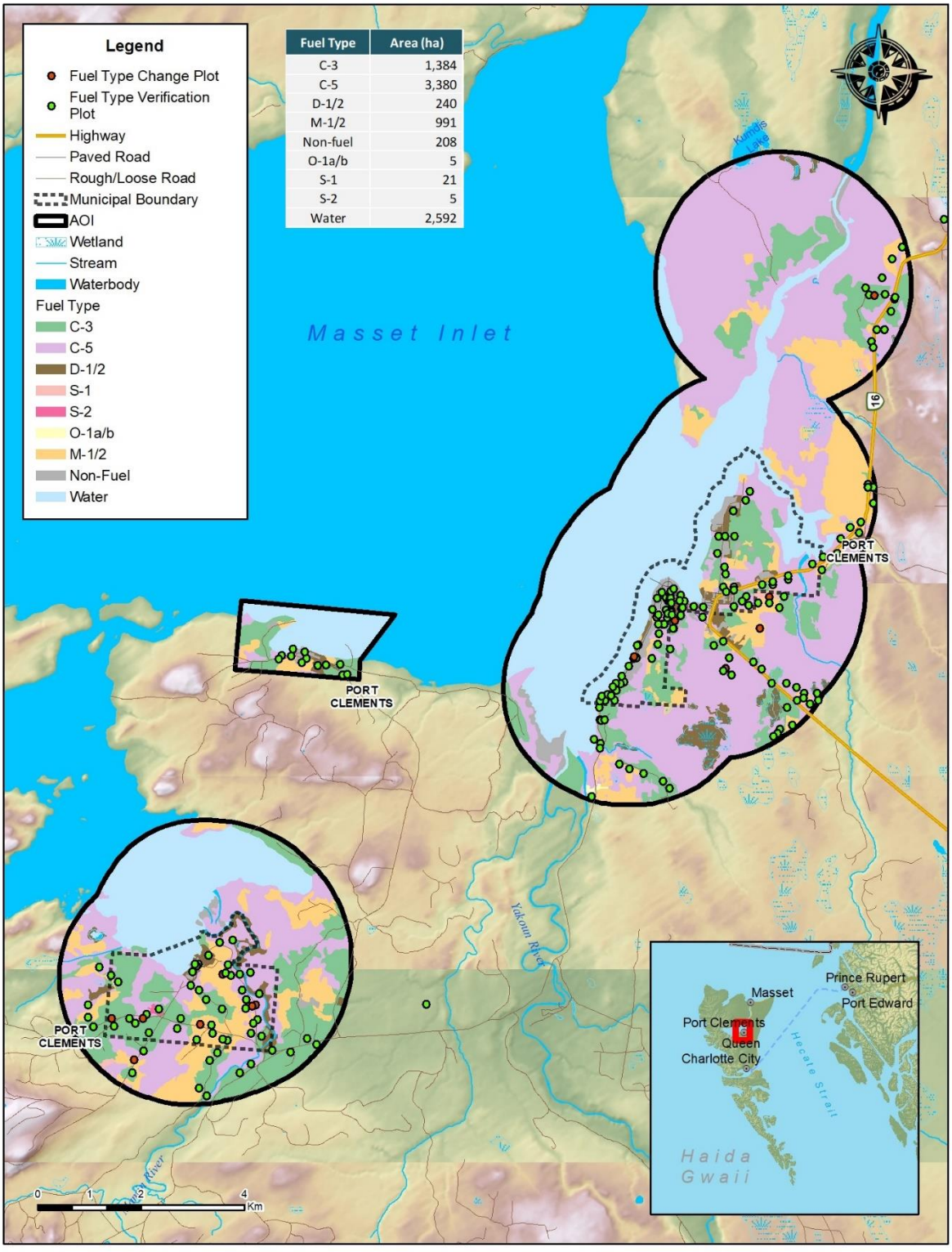
**C-3 fuel type is considered to have a high crown fire and spotting potential within the AOI due to the presence of moderate to high fuel loading (dead standing and partially or fully down woody material), and continuous conifer ladder fuels (i.e., western redcedar, Cw, and/or Douglas-fir, Fd).*

During field visits, 13 recurring patterns of fuel type errors were found in the provincial dataset. They were:

- C-5 fuel types being incorrectly identified by the PSTA as C-3,
- C-5 fuel types identified as S-2,

- C-5 fuel types identified as S-3,
- C-3 fuel types identified as C-5,
- C-3 fuel types identified as D-1/2,
- M-1/2 fuel types identified as C-5,
- M-1/2 fuel types identified as D-1/2,
- M-1/2 fuel types identified as S-1,
- M-1/2 fuel types identified as S-3,
- S-1 fuel types identified as C-5,
- S-3 fuel types identified as C-5,
- O1-a/b fuel types identified as D-1/2, and
- Non-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 B – Wildfire Threat Assessment – FBP Fuel Type Change Rationale).



Map 7. Updated Fuel Type.

A-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 13 describes the classes associated with proximity of fuels to the interface.

Table 13. 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 is FireSmart.
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.*

A-3 FIRE SPREAD PATTERNS (I.E. ISI ROSES)

Wind speed, wind direction, and fine fuel moisture condition influence wildfire trajectory and rate of spread. The influence of topography on fire spread patterns is discussed in Appendix A-4. 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. The Initial Spread Index (ISI) is a numeric rating of the expected rate of fire spread that combines the effects of wind speed and fine fuel moisture.

The local representative BCWS weather station for the AOI is the Honna Fire Weather Station. Honna is located across the Skidegate Inlet from the AOI, west of Queen Charlotte at an elevation of 100 m. ISI roses can help plan the location of fuel treatments on the landscape to protect values at risk based on the predominant wind direction and frequency of higher ISI values. Wildfire that occurs upwind of a

value poses a more significant threat to that value than one which occurs downwind. Hourly ISI roses depicting the frequency of ISI values by wind direction for Honna are shown below in Figure 5.

During the fire season (April – October) daytime winds (between 6 am and 6 pm) predominate from the southeast and to a lesser degree from the southwest. Overnight winds (6 pm to 6 am) occur from the north and northeast (Figure 5). 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.

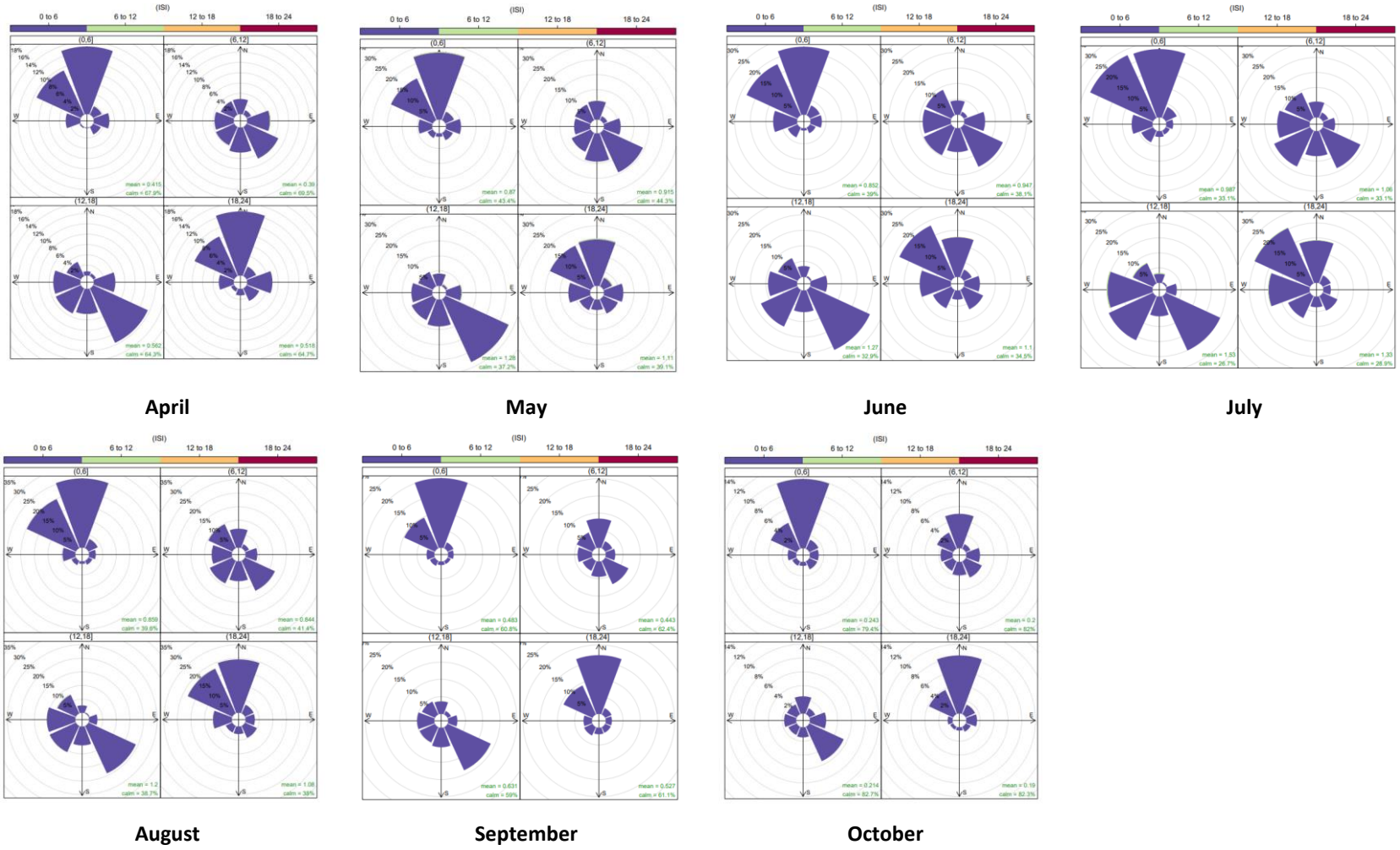


Figure 5. Hourly ISI roses depicting frequency of ISI counts by wind direction for the fire season April – October. Data is an average recorded at the Honna weather station from 1997-2016. Each subplot shows ISI roses for four six-hour time periods: from top left proceeding left to right and top to bottom: 0000-0600, 0600-1200, 1200-1800, 1800-2400. The length and orientation of the wedge indicates the frequency of wind from that direction and the color indicates the range of ISI, which is directly related to wind speed (purple is 0-6).

A-4 TOPOGRAPHY

Topography is an important environmental component that influences fire behaviour. Considerations include slope percentage (steepness) and slope position where slope percentage 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 14 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 15. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 14). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 15). Almost all of the AOI (>99%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Less than 1% of the AOI is likely to experience an increased or high rate of spread. On the larger topographic scale, the community in the AOI and surrounding agricultural, industrial, commercial, recreational and residential developments would be considered bottom of the slope or valley bottom.

Table 14. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	>99%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	<1%	Flame tilt begins to preheat fuel, increase rate of spread.
31-45%	<1%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
46-60%	0%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 15. 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 increase 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.

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

Provided separately as PDF package.

APPENDIX C – WILDFIRE THREAT ASSESSMENT WORKSHEETS AND PHOTOS

Provided separately as PDF package.

APPENDIX D – MAPS

Provided separately as PDF package.

APPENDIX E – 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. 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.

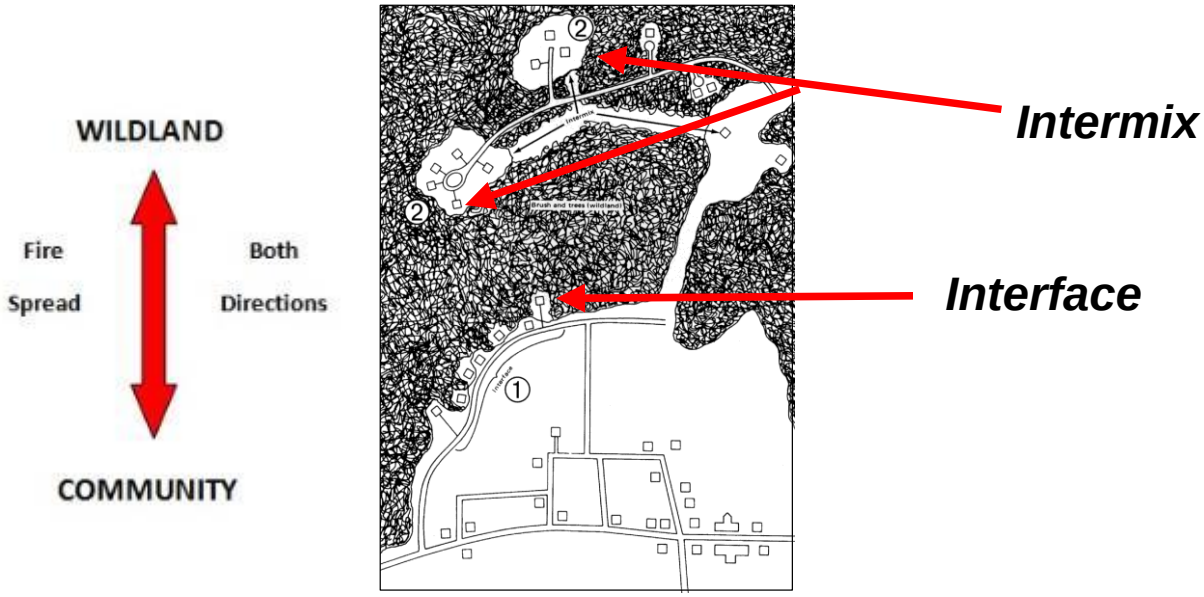


Figure 6. Illustration of intermix and interface situations.

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.

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.

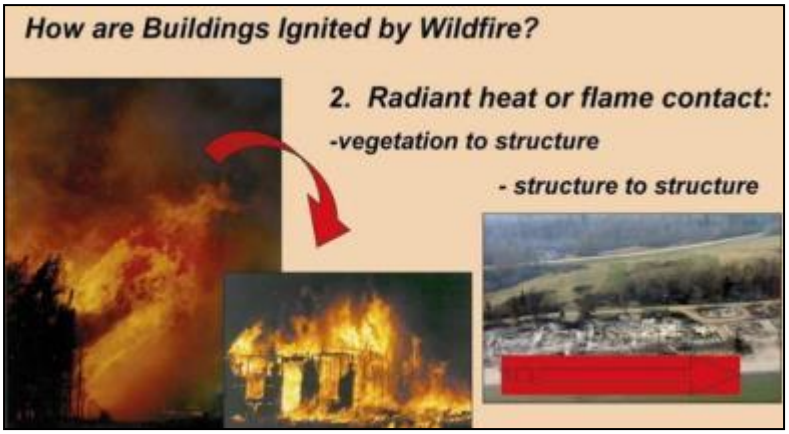


Figure 8. Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

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 combine to provide fire pathways allowing spot fires ignited by embers to spread and carry flames or smoldering fire into contact with structures.

APPENDIX F – WUI THREAT PLOT LOCATIONS

Table 16 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 16. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
AUB-1	Highway 16	High	Moderate
BAY-1	Bayview Street	Moderate	N/A
COMM-1	Community Park	High	Moderate
COMM-2	Community Park	High	High
HWY-1	Highway 16	Moderate	N/A
HWY-2	Highway 16	Moderate	N/A
HWY-3	Highway 16	High	Moderate
HWY-4	Highway 16	Moderate	N/A
HWY-5	Highway 16	High	Low
INDU-1	Industrial Park	High	Moderate
INDU-2	Industrial Site Road	High	Moderate
JUSK-1	Juskatla Camp	High	High
JUSK-2	Juskatla Camp	Moderate	N/A
JUSK-3	Juskatla Camp	High	Moderate
JUSK-4	Juskatla Camp	High	Moderate
JUSK-5	Juskatla Camp	Moderate	N/A

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
JUSK-6	Juskatla Camp	High	Moderate
OBR-1	O'Brien Logging	Moderate	N/A
PORT-1	Port Main Forest Service Road	High	Moderate
PORT-2	Port Main Forest Service Road	High	Moderate
PORT-3	Port Main Forest Service Road	High	Moderate
PORT-4	Port Main Forest Service Road	Moderate	N/A
SUN-1	Sunset Community Park	High	Moderate
TRAIL-1	Bayview Street Trail	High	Moderate
TRAIL-2	Bayview Street Trail	High	Moderate
TRAIL-3	Bayview Street Trail	High	High

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

APPENDIX G – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the AOI was the 2019 provincial fuel typing layer provided by BCWS as part of the *2019 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 AOI have been updated using orthoimagery of the 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 AOI. As a result, the local 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 local MFLNRORD region. Additionally, provincial fuel typing depends heavily on 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, Eade, and Hicks, 2018.[73]

APPENDIX H – 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
- 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
- Proposed Treatment
- Threat Plot

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 update. This is accomplished by traversing as much of the AOI 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 AOI 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 26 WUI threat plots on a variety of fuel types, aspects, and slopes and approximately 225 additional 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 17 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 17. 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	
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 AOI 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.

Limitations

The threat class ratings are based initially upon (geographic information systems) GIS analysis that best represents the WUI wildfire threat assessment worksheet and are updated with ground-truthing WUI threat plots. WUI threat plots were completed in a variety of fuel types, slopes, and aspects in order to be able to confidently refine the GIS analysis. It should be noted that there are subcomponents in the worksheet which are not able to be analyzed using spatial analysis; these are factors that do not exist in the GIS environment.

The threat assessment is based largely on fuel typing, therefore the limitations with fuel typing accuracy (as detailed in Appendix A-1 and Appendix G – Fuel Typing Methodology and Limitations) impacts the threat assessment, as well.