North Coast Regional District
Electoral Area D: Rural Graham Island
Community Wildfire Protection Plan 2020

Submitted by:

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NORTH COAST
REGIONAL DISTRICT

ACKNOWLEDGEMENTS

The authors would like to thank the following North Coast Regional District representatives: Daniel Fish (Chief Administrative officer - North Coast Regional District), and Mike Richardson (Fire Chief - Tlell Volunteer Fire Association). These individuals invested substantial time in meetings, answering questions, reviewing and commenting on the contents of this document.

In addition, the authors would like to thank BC Wildfire Service staff: Dana Hicks (Wildfire Prevention Specialist) and Vic Upshaw (Wildfire Technician, Fraser Fire Zone); BC Parks staff: Lucy Stefanyk (Area Supervisor - Haida Gwaii), Lindsay Vandesteeg (Provincial Land and Resources Section Head), and Chris Ahurst (Senior Park Ranger); Ministry of Forests, Lands, Natural Resource Operations and Rural Development staff: Larry Duke, Recreation Officer, as well as the Council of the Haida Nation: Marline Liddle (Heritage and Natural Resources Department). This report would not be possible without the Community Resiliency Investment (CRI) Program and funding from the Union of British Columbia Municipalities (UBCM).

*Cover photo: Debrah Zemanek, View of Tow Hill from Agate Beach Campground.

REGISTERED PROFESSIONAL SIGN AND SEAL

RPF PRINTED NAME	
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DATE SIGNED	
June 4, 2021	
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 Program (CRI), managed and funded through 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 North Coast Regional District (NCRD) with a framework that can be used to review and assess areas of identified high fire risk throughout rural Graham Island. 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. Potentially hazardous forest lands on provincial Crown land adjacent to the community are currently administered by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development under the Crown Land Wildfire Risk Reduction CRI program stream.

Wildfire management requires a multi-faceted approach for greatest efficacy and risk reduction outcomes. A total of 31 strategic recommendations are found in a tabularized format within this Executive Summary and at the end of relevant sections within the document. Ultimately, the recommendations within this strategy should be considered a toolbox of options to help reduce the wildfire threat to the community. There is not one combination or course of action which is the answer; the NCRD 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 2.5 Planning					
Item	**Priority**	**Recommendation / Action**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
1	Low	Consider amending the *Island Solid Waste Management Regulation, Fees and Changes Bylaw No. 276, 2013* to allow woody material greater than 7.5 cm in diameter to be deposited at the Port Clements Landfill or Skidegate Transfer Station. Explore the establishment of a specific green waste dump/community composting facility at either location similar to the 'stump dump' 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 firewood provision, composting, regular pile burning, chipping and/or spreading of waste.	Encourages FireSmart vegetation management and provides an alternative to open burning on private properties.	40-80 in-house hours (local government funding/UBCM CRI program funding).	NCRD initiative
2	Moderate	Work to expand awareness of Bylaw 665 (House Numbering) in collaboration with local Fire Departments. Focus on the direct link between enabling the update of NCRD address data and the provision of 911 on Haida Gwaii. Consider incentivizing the installment of reflective address signs or procuring signs at a discounted rate.	Provision of 911 in the AOI was identified as a priority by all fire departments on Haida Gwaii. There are too many different emergency numbers.	15-30 NCRD staff for material development and distribution for incentive/ engagement campaign.	NCRD initiative
3	Low	Provide residents with links to the national FireSmart landscaping guide and inform residents of BC specific FireSmart landscaping guide to be released Spring 2021. Alternatively, develop a Haida Gwaii-specific landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce wildfire hazard. Can be provided at issue of building permit and made available online.	Increase awareness of wildfire hazard and increase FireSmarting of private properties. FireSmart landscaping was observed as semi-compliant during field visits.	FireSmart landscaping guide is free	NCRD initiative

Document Section 2.5 Planning					
Item	**Priority**	**Recommendation / Action**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
4	Low	Develop utility right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs in coordination with BC Hydro to help reduce fire risk, utility pole damage and subsequent outages. In addition, BC Hydro, and the Ministry of Transportation and Infrastructure (MOTI) should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state. (to serve as fuel breaks).	Some encroachment of branches near powerlines was noted during site visits	~15 Local government funding, plus 1 to 2 meetings per fire season with BC Hydro	NCRD in collaboration with BC Hydro and MOTI

Section 5.1: Fuel Management					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
5	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP. Work with BC Parks and forest licensees (where applicable) and the Council of the Haida Nation prior to funding applications to address any possible impact to values. Prioritize local work opportunities.	Reduce wildfire hazard in priority treatment units.	UBCM CRI program funding/local government funding	NCRD initiative
6	Moderate	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.	Ensure continued efficacy of treatment areas. Prompt re-treatment saves costs as regeneration is small.	UBCM CRI funding available	NCRD initiative

Section 5.2: FireSmart Planning and Activities					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
7	High	The NCRD should continue to ensure that one or more local fire department staff or community members are trained as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighborhood and individual home-level.	Enable delivery of public education programs and FireSmart assessments	LFR training currently free online by FireSmart BC; costs of attending training fundable by UBCM CRI	NCRD initiative
8	Moderate	Apply for funding from the UBCM CRI 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 high or extreme risk in a FireSmart home and property assessment. The rebate program is described in detail in the CRI Program 2021 FireSmart Community Funding and Supports (FCFS) program and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, NCRD resources available to execute the program should be reviewed.	Improve local uptake of FireSmart programming.	Local/UBCM Funding. FireSmart Community Funding & Supports program funding	NCRD initiative. May be facilitated by a part-time LFR
9	Moderate	Consider offering driveway chipping services with the help of the Tlell Fire Department or a Local FireSmart Representative if possible. Consider offering chipping services as an incentive for participating in a FireSmart workshop. Education of FireSmart yard and landscaping principles, including chipping specifications should be incorporated into the program. Programs should be available during times of greatest resident activity (likely spring and fall).	Encourage vegetation management on private property and the safe disposal of woody debris	Eligible for UBCM CRI Program funding. Example cost is $7,400: chipping contractor costs (four 8-hour days @ ~$200 per hour); $1000 for outreach/advertising	NCRD initiative

Section 5.2: FireSmart Planning and Activities					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
10	Low	Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, or changes to stand structure. The frequency of updates is highly dependent upon major changes which would impact the NCRD'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.	Ensure continued effectiveness of wildfire protection planning.	CRI/UBCM funding available	NCRD initiative
11	Moderate	Create a FireSmart demonstration site, funded if possible through the CRI program. The grant could cover retrofits to the Tlell Fire Hall and/or vegetation management surrounding the hall or Anvil Trail as recommended in this CWPP. Combine with signage and point out aspects that are already FireSmart.	Improve local FireSmart awareness and mitigate risk around the Tlell Fire Hall. Supported by the Tlell Fire Department	UBCM/CRI funding may be available. Grants of this nature were available in 2021 under the FireSmart Economic Recovery Fund	NCRD initiative

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
12	High	The NCRD should consider installing a Fire Danger rating sign on Tow Hill Road on the way to Agate Beach. This sign, along with the sign by the BC Parks office should be updated regularly during the Fire Season (April – October). Responsibility for updating the new sign should be discussed between the NCRD, BC Parks, and the Village of Masset/Old Massett.	High levels of tourism in the AOI makes communicating fire danger and associated fire bans important	~$5,000 for signage, Local government funding	NCRD in collaboration with VFDS and/or BC Parks

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
13	High	Develop a FireSmart/Wildfire Preparedness page on the NCRD website and use all available media platforms (radio, newsletters, television channels, social media, websites, and local bulletin boards) to publicize FireSmart activities that are underway, promote FireSmart events, and communicate messages on fire risk and preparedness during the fire season.	Improve FireSmart awareness and resources. Aligns with recommendations in NCRD Electoral Area E (Sandspit) CWPP.	~40 hours to design webpage. Additional daily/weekly hours to implement and update depending on strategy.	NCRD initiative
14	High	Promote FireSmart to local residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart resources to homeowners during these engagement campaigns and promote the FireSmart Begins At Home mobile app as a method of conducting home assessments.	Improve FireSmart awareness and compliance in the AOI.	~20 hours. UBCM CRI Program funding available. Example workshop cost: $1,700 consultant costs (20 hrs @ 85/hr); $1,500 advertising costs	NCRD initiative. May be facilitated by a part-time LFR
15	Low	Promote and provide information to private landowners related to exterior residential sprinklers as a FireSmart prevention measure, especially targeting residents outside of the Fire Protection Area. At FireSmart events distribute information on exterior sprinkler component parts, manufacturers, and water supply system requirements to ensure they are effective measures to wet down homes and Fire Priority Zone 1 (0-10 m) and discourage home ignition.[1]	Improve structure protection.	10-20 in-house hours to prepare materials and disseminate information to landowners.	NCRD initiative, uptake via private residents

[1] Example: https://waspwildfire.com/products/gutter-mount-sprinkler-system/

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
16	Low	Consider working with local hardware stores and general store on Graham Island to improve education of homeowners and remove some barriers to FireSmart action. Initiatives may include: 1) Advocating for a FireSmart branding in stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost. 2) Compile a database of local service providers and retailers which can help to install or complete FireSmart home improvements. 3) Develop general cost implications of improvements so property owners can prioritize replacements.	Improve public education and awareness, reduce barriers to action for homeowners and share the burden for public education with the private sector	~60 hours	NCRD initiative in partnership with local stores, i.e., Coop
17	Moderate	Promote improved planning and preparedness of ranchers/agriculture producers in the NCRD and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on improved NCRD website, mailouts).	Improve wildfire preparedness amongst agriculture producers and ranchers.	~15 - 20 in-house hours (local government funding). May be eligible for UBCM CRI program funding	NCRD initiative
18	Moderate	The NCRD should work collaboratively with BC Ferries to announce fire danger and any local fire bans on incoming ferries during the summer.	Improve public awareness of fire danger and associated fire bans on Haida Gwaii. Supported by Tlell Fire Department	~20 in-house hours (local government funding) and BC Ferries hours	NCRD initiative in partnership with BC Ferries

Section 5.4: Other Prevention Measures					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
19	Moderate	Consider developing a rationale for reduced stocking standards applicable to the NCRD, by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Coast Fire Centre) and MFLNRORD. Engage private land owners and forest tenure holders to apply the MFLNRORD approved reduced fire management stocking standards in the wildland urban interface to reduce interface wildfire threat.	Reduce wildfire hazard in regenerating forest stands in the wildland urban interface. Cutblocks were frequently assessed as having higher wildfire threat during field visits	$3,000 - $ 5,000 local government funding	NCRD initiative, in collaboration with forest tenure holders
20	Moderate	Work with forest tenure holders to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act.	Increase wildfire awareness and compliance amongst resource/industrial workers/ and backcountry users.	4-8 in-house hours	NCRD initiative in collaboration with forest tenure holders

Section 5.4: Other Prevention Measures					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
21	High	Develop and work with First Nations (CHN) and all key stakeholders (BC Parks, forest tenure holders, MFLNRORD, BCWS, NCRD staff) to formalize a Community FireSmart Resiliency Committee. The purpose of the committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Harvest planning to integrate existing and planned fuel breaks with future cutblocks to address identified hazardous fuel types and spotting potential; 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.	Collaboration and communication will facilitate wildfire protection planning and help streamline funding applications, plus ensure that work isn't unnecessarily duplicated	A 'Community FireSmart Resilience Committee' is eligible for funding. Total cost ~$7,000 (local government costs): ~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	NCRD initiative in collaboration with key stakeholders (forest tenure holders, MFLNRORD, BCWS, BC Parks) and CHN staff.

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
22	Moderate	Pursue funding opportunities for wildland specific equipment for the Tlell Fire Department, and/or petition BCWS to augment the Tlell cache. Desired equipment includes more ¾ and 1.5 inch wildland hoses for the cache, and a 'beach attack' ATV for responding to beach fires and medical calls. The ATV should include a slip-on 150 gallon water tank that can be replaced with a stretcher.	Upgrade wildland firefighting suppression resources according to recommendations from the Tlell Fire Department. Existing vehicles not suitable for beach response.	NCRD or grant funding, not eligible through UBCM CRI; BCWS	Tlell VFD initiative; NCRD may support through funding; or BCWS
23	High	Prioritize the delivery of a SPP-WFF1 Train the Trainer course on Haida Gwaii. Select members from each fire department to participate and deliver SPP-WFF1 annually to each fire department.	SPP-WFF1 can be delivered annually to all fire departments. Cost to attend training is prohibitive and not all Tlell fire department members are trained in S-100/SPP-WFF1. Supported by local fire departments	UBCM CRI program funding available	NCRD initiative in collaboration with Haida Gwaii fire departments
24	High	The Tlell fire department should determine funding for and feasibility of installing a water cistern on Richardson Road to increase the availability and distribution of water for wildfire suppression. Water sources should be regularly inspected to ensure they have adequate supply in the event of a fire. Consider other locations as well, such as Lawnhill/Miller Creek.	Richardson Road lacks natural water sources. A cistern would give time to fill pumper from river.	NCRD or grant funding, not eligible through UBCM CRI. 500-gallon steel cistern ~$1,000 plus shipping	Tlell VFD initiative; NCRD may support through funding

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
25	High	The NCRD should work with local governments to update civic address data throughout the island, followed by advocacy for the expansion of a 911 Public Safety Answering Point (PSAP). A feasibility analysis should be conducted in consultation with relevant stakeholders, such as local first responders.	Improve emergency response by enabling 911 on Haida Gwaii. Significant support from local first responders.	~40-80 hours per municipality / community	NCRD initiative in collaboration local governments and with the Province of BC
26	Moderate	Complete and participate in regular testing of, and updates to, the evacuation plan for Electoral Area D. Procedures for evacuation of livestock should be included in the plan.	Lack of cell service and large area complicates evacuation. Testing will help identify any weaknesses	~10-30 hours to plan and stage; 8 hours to complete testing. UBCM CEPF funding available	NCRD initiative
27	High	Develop an Emergency Access Map for the NCRD to inventory trail and road network for strategic fire suppression planning. Ground-truthed locations of existing and potential fuel breaks, water sources, Local Fire Threat and tenure holders contact information should be incorporated within the map. The map should be included in the Emergency Response Plan and shared with fire suppression personnel, BCWS, BC Parks and forest tenure holders to support emergency response in the event of a wildfire. The map should be reviewed as needed to incorporate additions and/or changes, especially as forestry roads are built or deactivated.	Increase knowledge of wildfire suppression access points within parks and forested areas.	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)	NCRD initiative contracted out
28	Moderate	The Tlell VFD should aim to establish formal mutual aid agreements with all Volunteer Fire Departments within Haida Gwaii (Masset, Old Massett, Port Clements, Skidegate, Queen Charlotte and Sandspit). Currently, the only formal agreement is between Skidegate and Queen Charlotte VFDs.	Insurance protection.	Local government funding	Tlell VFD initiative; NCRD may support

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
29	Moderate	The NCRD should undertake a public approval process to determine the feasibility of expanding fire service boundaries to include Tow Hill. In conjunction, water availability should be reviewed. Possible solutions include a local fire brigade/equipment cache, water tanker, or cistern. The Masset/Old Masset VFDs and the Tow Hill Community Association should be involved in the process.	There is no formal fire protection in Tow Hill. Current protection by Masset/Old Masset VFDs is limited: outside of service area, and lack of water availability.	Local government time. Comprehensive fire services reviews may be funded and outsourced to specialized consultants.	NCRD initiative; collaboration with the Village of Masset and Old Masset; Tow Hill Community Association
30	Moderate	Tlell VFD should work with other fire departments on Haida Gwaii to initiate an annual wildland fire training day. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. Training should include completion of a joint wildfire simulation exercise and safety training and could leverage the expertise of BCWS through virtual platforms.	Improve ability to respond to wildfires and strengthen relationship with BCWS	Volunteer time; not currently eligible for CRI fund	Tlell VFD initiative
31	Moderate	Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences) for Graham Island. An SPU could be shared between all fire departments on Haida Gwaii. If an SPU is obtained, pursue funding to train fire members in SPP-115 (the application of SPUs).	Improve available firefighting resources.	$100,000-$150,000 depending on configuration. SPP-115 funded by UBCM CRI	Tlell VFD initiative

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COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CDC	Conservation Data Centre
CHN	Council of the Haida Nation
CFFDRS	Canadian Forest Fire Danger Rating System
CRI	Community Resiliency Investment Program
CWPP	Community Wildfire Protection Plan
DPA	Development Permit Area
EA	Electoral Area
FBP	Fire Behaviour Prediction System
FMP	Fire Management Plan
FPA	Fire Protection Area
FPRS	Fire Protection and Rescue Service
FSCCRP	FireSmart Canada Community Recognition Program
GAR	Government Actions Regulation
HIZ	Home Ignition Zone
HNRD	[Council of the Haida Nation] Heritage and Natural Resources Department
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MOTI	Ministry of Transportation and Infrastructure
NCRD	North Coast Regional District
NDT	Natural Disturbance Types
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
TVFA	Tlell Volunteer Fire Association
UBCM	Union of British Columbian Municipalities
VFD	Volunteer Fire Department
WRR	Wildfire Risk Reduction. Crown Land WRR is a category of funding for risk reduction activities on provincial Crown Land (introduced in 2019)
WUI	Wildland Urban Interface

SECTION 1: INTRODUCTION

Although forest fires are both inevitable and essential to the health of forested ecosystems, the 2003, 2009, 2017 and 2018 wildfire seasons resulted in significant economic, social and environmental losses in BC. The 2003 fires lead to the development of the Filmon Report[2] and a standardized process to address emergency planning. Community Wildfire Protection Planning (CWPP) arose from the Filmon Report recommendations to fill the identified planning need.

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 (WUI).[3]Even in coastal regions of BC, a busy wildfire season can overwhelm available resources. CWPPs are an invaluable opportunity to proactively manage wildfire risk and increase community resilience to wildfire.

1.1 PURPOSE

The CWPP is a framework the community can use to assess and mitigate risk. The information contained in this report will help guide the development of emergency plans, emergency response, public education programs, community planning, and the management of forested lands adjacent to the communities on rural Graham Island.

The plan will update and provide the NCRD community with the following assessments:

- an updated assessment of wildfire risk in the Area of Interest (AOI);
- an updated assessment of values at risk and potential consequences from wildfire;
- maps of fuel types and recommended areas for fuel treatments;
- an updated assessment of emergency response capacity and community FireSmart status and;
- options and strategies to reduce wildfire risk in seven FireSmart disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management.

CWPPs are funded in BC by the Union of BC Municipalities (UBCM) under the Community Resiliency Investment (CRI) FireSmart Community Funding and Supports Program. As per funding requirements, this CWPP is completed according to the 2018 CRI template.

[2] Filmon, G. 2004. Firestorm 2003 - Provincial Report.

[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 for a more detailed discussion.

1.2 CWPP PLANNING PROCESS

This CWPP is a review and synthesis of the background information and current data related to the AOI, which represents a two-kilometer spotting buffer around a threshold density of values at risk (VAR), such as structures. The CWPP process consists of four general phases:

1) **Consultation involving key local government representatives, structural and wildfire specialists, First Nations and stakeholders**.
2) **Identification of the VAR and assessment of the local wildfire threat**.
3) **Developing a wildfire risk mitigation strategy**.
4) **Building a community engagement and education strategy**.

1.2.1 Consultation

Engagement with local government, provincial government representatives, stakeholders and the Haida Nation played a key role in the development of this CWPP.

The first step in the consultation process was to assemble the key players in the 'Wildfire Working Group'. The Wildfire Working Group (WWG) consisted of NCRD Chief Administrative Officer and the Tlell Fire Department Chief. No in-person meetings were held to follow provincial guidelines during the COVID-19 pandemic. The objective of communications with the WWG was to obtain information on the current status of community wildfire preparedness in the AOI, identify community values and areas of concern, and determine priorities and potential mitigation strategies. The WWG was integral to the review and approval of this plan, and provided ongoing support throughout the CWPP process.

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 NCRD Electoral Area D; and 3) revision of draft document upon plan completion.

Information sharing took place with the Council of the Haida Nation (CHN), as identified through the Consultative Areas Database, regarding the CWPP and locations of or potential for possible cultural values at risk requiring protection consideration. Communications were established between the consultant and CHN in 2019-2020 during concurrent development of four other CWPPs on Haida Gwaii. Information sharing for this plan consisted of an initial phone call and the distribution of a referral letter and information sharing package (spatial data, explanation of CWPP, and CWPP draft), and a phone meeting with the Acting Manager of the Heritage and Natural Resources Department (HNRD).

Additional stakeholders were consulted to identify synergies, potential opportunities for collaboration, and to ensure linkages with adjacent and overlapping planning. These stakeholders included: the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD); BC Parks; Taan Forest Ltd., and Husby Forest Products. 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 NCRD was assessed through a combination of the following approaches:

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

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 seven FireSmart disciplines:

- Education,
- Legislation and Planning,
- Development Considerations,
- Interagency Cooperation,
- Cross-training,
- Emergency Planning, and
- Vegetation Management.

1.2.4 Building Community Engagement and Education Strategy

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

SECTION 2: LOCAL AREA DESCRIPTION

This section defines the AOI and describes the communities within it. This section also summarizes the current community engagement with regards to wildfire prevention and mitigation, and identifies linkages to other plans and policies with relevance to wildfire planning.

2.1 AREA OF INTEREST

The AOI for this CWPP is illustrated below in Map 1. To generate the AOI, BC Wildfire Service (BCWS)WUI Human Interface Buffer polygons were clipped to the AOIs of adjacent CWPPs. WUI polygons represent a 2 km spotting buffer around areas with a structure density > 6 per km^2.[4]WUI polygons in rural Graham Island that were very small and isolated were not included in the AOI (e.g., Yakoun River Hatchery). A breakdown of the AOI's land ownership is provided in Table 2.

[4] BC Data Catalogue. https://catalogue.data.gov.bc.ca/dataset/bc-wildfire-wui-human-interface-buffer

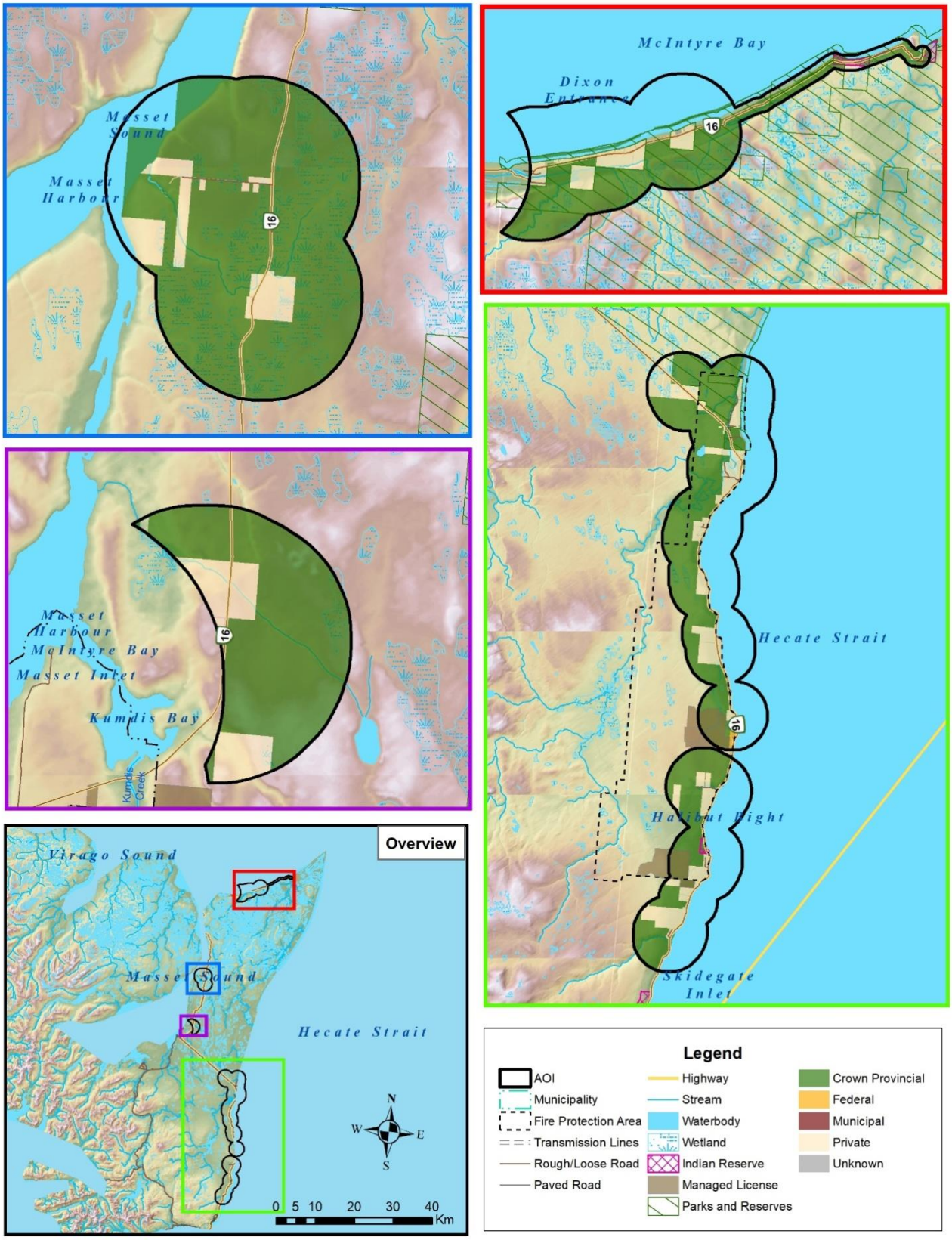
The AOI is within Electoral Area D of the NCRD. Electoral Area D is geographically defined by Graham Island and excludes all incorporated municipalities (Masset, Port Clements, Queen Charlotte) and First Nation land including Old Massett and Skidegate. The AOI contains the unincorporated communities of Tlell and Tow Hill, as well as the northern rural areas of Port Clements. Three Haida First Nation reserve parcels (Skaigha 2, Yagan 3, and Hiellan 2) overlap the AOI, but were not assessed as part of this CWPP.

The AOI can be divided into three WUI areas: Tlell/Coast includes all portions of the AOI around Tlell, along Highway 16; North Port Clements includes rural properties north of the township; Tow Hill includes residents east of Masset outside of the municipal boundary along Tow Hill Road. The AOI also overlaps with the Tlall Heritage Park/Conservancy in the Tlell/Coast portion of the AOI, Naikoon Provincial Park and Tow Hill Ecological Reserve in the Tow Hill portion of the AOI, and the Kamdis Conservancy and Naang Xaldangaas Conservancy in the North Port Clements portion of the AOI.

Table 2. Summary of AOI by land ownership.

Land Ownership	Hectares
Crown Provincial	17,811.90
Federal	51.37
Municipal	0.88
Private	2,208.71
Unknown	4.59

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



Map 1. Area of Interest (AOI).

2.2 COMMUNITY DESCRIPTION

Rural Graham Island is characterized by a mix of isolated rural properties, small residential neighbourhoods, parkland, and forest tenure. Almost all of the AOI is close to sea level. Significant areas of the landscape are wet, unproductive bogs; other areas are commercially harvested for timber. In addition to forestry, tourism is an important economic driver in the area, especially in the summer.

Fire protection within the Tlell/Coast WUI is primarily the responsibility of the Tlell Volunteer Fire Association (TVFA), also known as the Tlell Volunteer Fire Department (VFD); however, the Skidegate/Queen Charlotte VFDs may respond to fires south of Tlell that are closer to the Skidegate Fire Hall.[5] The Masset/Old Massett VFDs currently respond to fires along Tow Hill Road, although it is outside of their fire service areas; likewise, the Port Clements VFD would respond to fires in the North Port Clements WUI. Informal mutual aid agreements exist between Tlell VFD and other fire departments on Haida Gwaii and fire protection is often provided outside of fire service areas.[5] BCWS will respond to wildfires in the AOI when an aid request is made by local fire departments, although there is a significant response lag time as no there is no crew stationed on Haida Gwaii. Response resources would be provided via the Coastal Fire Center, Fraser Fire Zone.

The Tlell VFD or TVFA is a non-profit society department funded by the NCRD. Other services provided by the NCRD include emergency planning and response, economic development, land use planning, recreation, and waste management.

Access and egress are a concern within the AOI, due to single access routes and/or isolated properties that cause suppression and evacuation concerns. In the event of a wildfire, Highway 16 would be the only arterial evacuation route for residents travelling north or south through the AOI. This not only presents a challenge for wildfire evacuation, but also limits the ability of fire crews to respond to fires.

2.3 PAST WILDFIRES, EVACUATIONS AND IMPACTS

There have been no significant wildfires within the AOI in the past century. Wildfires on Graham Island, and Haida Gwaii in general, have been infrequent and relatively small in size, and are most often the result of escaped campfires, burn piles or industrial ignitions. The last fire greater than 0.1 ha (30x30 m) occurred in the 1980s. However, it has been reported that a large wildfire burned much of Graham Island, from Masset to Tlell River, in the mid-1800s.[6,7] It is unknown how the fire started, but it has resulted in second growth stands that are distinct from the western red cedar/western hemlock old growth that is present elsewhere.

Although recent fires on Haida Gwaii have been small and easy to contain, BC Parks staff have reported that human-caused ignitions around Graham Island and Naikoon Provincial Park in particular have been

[5] Personal communication, Wildfire Working Group

[6] BC Parks and Council of the Haida Nation. 2011. Tlaal Management Plan.

[7] Gaston, A.J.; Golumbia, T.E.; Martin, J.-L.; Sharpe, S.T. (eds). 2008. Lessons from the Islands: introduced species and what they tell us about how ecosystems work. Proceedings from the Research Group on Introduced Species 2002 Symposium, Queen Charlotte City, Queen Charlotte Islands, British Columbia. Canadian Wildlife Service, Environment Canada, Ottawa

problematic in the last 15 years. Most ignitions are unattended beach fires that threaten to spread into the forest.

2.4 CURRENT COMMUNITY ENGAGEMENT

The NCRD has no formal FireSmart program, and there is little community recognition on Haida Gwaii of the threat posed by wildfires, as they are so infrequent. However, local fire departments and the NCRD are aware of the importance of wildfire prevention. A CWPP was developed for Electoral Area E of the NCRD (Sandspit/Moresby Island) in 2019 and has been made publicly available on the NCRD Fire Prevention webpage.

As summer seasons become hotter and drier on Haida Gwaii, community awareness of risk and support for wildfire prevention initiatives is likely to increase.

2.5 LINKAGES TO OTHER PLANS AND POLICIES

The following is a summary of NCRD (previously known as Skeena-Queen Charlotte Regional District (SQCRD)), and provincial policies and guidelines that relate to strategic wildfire management, wildfire threat reduction, operational fuel treatments, and emergency planning. Regional policies and bylaws are tools available to mitigate wildfire risk to a community. This section recommends amendments to plans and bylaws to further recognize and require compliance with FireSmart principles.

2.5.1 Local Authority Emergency Plan

Emergency preparedness and response is managed by the NCRD under the Emergency Response and Recovery Plan (ERRP) for Electoral Area D, with an associated Emergency Program Guide. Under the provincial Emergency Program Act, local governments are required to prepare local emergency plans that outline preparation for, response to, and recovery from potential disasters, including wildfire. The NCRD emergency plan outlines the activation and function of an Emergency Operations Centre (EOC), contingency plans for specific disasters, and the chain of command and the roles of each response section (e.g., operations, planning, logistics, and administration) in the event of an emergency.

Table 3. Local Authority Emergency Planning Documents

Plan	Description/Relationship to CWPP
Skeena-Queen Charlotte Regional District [8] Electoral Areas D, E, and F Emergency Program Guide (2006)[9]	• Companion to the SQCRD EA D ERRP. • Primary hazards identified: earthquakes, power outages, landslides, and airplane crashes. • Wildfire included as a possible emergency. • Lists program objectives with related strategies.

[8] 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.

[9] 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

Skeena-Queen Charlotte Regional District Electoral Area D Emergency Response and Recovery Plan SQCCRD EA D (2006)[10]	• Default EOC location: Prince Rupert NCRD regional office. • Interface fires are to be managed by Incident Commanders (ICs) supplied by MFLRNORD. • NCRD EOC will support MFLNRORD, if requested during interface fires and during wildfires. • Fire Chief is the default Operations Chief of the NCRD EOC for interface fires and manages evacuation, advising utilities, and traffic.

2.5.2 Affiliated CWPPs

In 2019, CWPPs were developed for NCRD Electoral Area E (Sandspit), the Village of Queen Charlotte/Skidegate, the Village of Masset/Old Massett, and the Village of Port Clements. These CWPPs were completed by the same consultant, and recommendations have been coordinated where possible to increase efficiency in planning and applying for implementation funding.

2.5.3 Regional 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.

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, Queen Charlotte, and Old Massett and Skidegate). The OCP provides guidance for general policies, land-use area designations, development, environmental protection, infrastructure, and services throughout Graham Island.

OCP Section	Description	Relationship to CWPP
Section 5.5 – Natural Hazards	• Identifies significant natural hazards on Graham Island.	• Opportunity to include wildfire risk into the list of natural hazards.
Section 6.2 – Growth Management and Development	• Identifies the retention, protection, and enhancement of the current rural character of Graham Island as a priority for the NCRD. It also emphasizes directing future residential growth	• Growth strategy already limits the spread of the wildland urban interface.

[10] 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

OCP Section	Description	Relationship to CWPP
	towards established settlement areas.	
Section 8.4 – Forest Lands	• Identifies forest lands as a major environmental and economic development resource for the islands. • Ensures lands designated as "sustainable resource" are primarily intended to be used for sustainable forestry, conservation, and/or recreational purposes. • Adopts and supports policies such as the Haida Gwaii Strategic Land Use Agreement. • Provides an overview of the community's interests, views, and objectives with regards to forest lands within the Electoral Area.	• Utilize this information to inform where treatment units are recommended within the AOI.
Section 9.3 – Vehicle Traffic and Roads	• Describes the advocacy policy between the MOTI and Rural Graham Island's volunteer fire departments work together to identify: (1) Roads requiring upgrading for fire protection purposes; and (2) Locations where the existing road network should be extended or where improved road interconnections should be provided, to increase the ability to provide fire protection services in the planning area.	• Strengthens emergency access/egress • Supports recommendations to work with MOTI
Section 10.6 – Fire Protection	• Identifies priorities and policies for fire protection planning on Rural Graham Island. These policies include: • Consider extending existing fire services boundaries to include unprotected areas of Electoral Area D.	• Would protect fire departments when providing services outside of boundaries.

OCP Section	Description	Relationship to CWPP
	• Rezoning or subdivision (10+ parcels) of land should be conditional on the inclusion of adequate measures to address fire protection (e.g., water supply).	
Section 11.4 – Parks, Trails and Recreation	• Prioritizes parks, trail and recreation planning and the preservation of large tracks of natural land. • Encourages the acquisition of parkland and trail development. • Emphasizes the need for a Parks and Recreation Plan for Rural Graham Island.	• Opportunity to incorporate FireSmart principles into the planning process.
Section 12.1 – Local Area Plans – Tow Hill	• Community and institutional policies include: (1) Developers should give consideration to providing water sources for firefighting purposes within proposed development areas. (2) Tow Hill Community Association should maintain regular liaison with the Village of Masset concerning on-going access to the Masset Volunteer Fire Department's equipment and personnel in the event of a fire or other emergency in the Tow Hill Road area.	• Ensures water availability for fire suppression. • Improves communication between the Masset Volunteer Fire Department and the Tow Hill Community Association.
Section 12.3 – Local Area Plans – Tlell	• Residential Policy: Consideration should be given to providing a water storage tank/reservoir for firefighting purposes on subdivisions of 10 parcels or greater	• Ensures water availability for fire suppression.
Section 12.3.1 – Local Area Plans – Miller Creek	• Defines residential policies, pertaining to the development and rezoning in Lawnhill - Miller Creek. • Policies stipulate that should future	• Strengthens emergency access/egress. • Ensures water availability for fire suppression.

OCP Section	Description	Relationship to CWPP
	development occur, the provision of a water storage tank or reservoir for firefighting purposes should be considered. • Policies recommend restricted direct parcel access off of Hwy 16 be restricted and safety precautions be improved to be in line with the MOTI recommendations for improved line of sight and decreased speeds on access roads such as Lawnhill Road.	
Section 13.0 – Development Permit Areas and Development Approval Information	• Two Development Permit Areas are included in this OCP: (1) Environmental Development Permit Area, which was established to protect sensitive ecosystem areas such as floodplains and riparian areas; and (2) Natural Hazards Development, which was established to protect people and property from natural hazards including slope erosion (applies to land with >46% slope) and flooding (land within 30 meters of high-water marks).	• There is the option to include wildfire hazard in the list of Natural Hazards; • or, create a distinct wildfire hazard DPA for Electoral Area D.

Table 4. Summary of relevant NCRD Bylaws

Bylaw	Description	Relationship to CWPP
Tlell Fire Protection and Rescue Service Area Establishment Bylaw No. 618, 2017.	• Outlines Fire Department Funding. • Defines the Fire Departments boundaries. • Permits the NCRD to enter into mutual aid agreements according to Tlell VFD recommendations.	• Defines fire protection jurisdiction within the AOI.
Electoral Area 'D' Interim Zoning Bylaw No. 192, 2013.	• Outlines zoning districts; location and siting of	• May be applicable to wildfire preparedness and

Bylaw	Description	Relationship to CWPP
	buildings; and uses permitted in all zones. • Zoning districts include: rural, agri-forestry, residential, commercial, and heavy industrial. • Consolidates bylaws 247, 248, 256, 259, 282, 295 and 397.	FireSmart implementation.
Skeena-Queen Charlotte Regional District Queen Charlotte Island Solid Waste Management Regulation, Fees and Changes Bylaw No. 276, 2013 and amendment bylaws No. 573 (2014) and No. 584 (2014).	• Sets fees for garbage disposal and regulates waste disposal • Ignitable/flammable waste cannot be deposited without a permit from the NCRD • Green waste may be deposited up to 7.5 cm in diameter	• May result in more open burning of woody debris • A barrier to FireSmart thinning on private land
Regional District of Skeen-Queen Charlotte Emergency Program Service Establishing Bylaw No. 495, 2006 and amendment bylaw No. 552, 2013.	• Provides an emergency service program, as an extended service under the Emergency Program Act, in Electoral Areas D, E, and F. • Amended to separate emergency programs for each Electoral Area	• Improves emergency response services.
Skeena-Queen Charlotte Regional District Emergency Response and Recovery Plan for Electoral Areas D, E, and F Bylaw No. 460, 2004	• Initiates the development and implementation of an emergency response and recovery plan for Electoral Areas D, E, and F. • Establishes an All-Island Emergency Program Committee (AIEPC) to implement the emergency management program, including provision of emergency resources	• Improves emergency management planning. • Supports emergency response services including provision of emergency social services (ESS)
Electoral Area 'D' Parks and Recreation Service Establishing Bylaw No. 633, 2019.	• Establishes a parks and recreation service, which allows for funding to be allocated towards the acquisition, operation, maintenance, and capital improvement of parks and recreation amenities.	• Potential for collaboration between parks management and future fuel treatment programs.

Bylaw	Description	Relationship to CWPP
North Coast Regional District Tlell Fire Service General Reserve Fund Establishment Bylaw No. 661, 2019.	• Establishes a reserve fund for the Tlell Fire Service. • Money in the reserve fund is to be used for any of the following purposes: (a) Unanticipated expenditures for operations; (b) Funding of one-time projects; (c) Mitigation of sudden and marked increases to taxation and/or fees; and (d) Capital acquisition and maintenance.	• Supports the fire department in the event of unforeseen circumstances, such as a wildfire event.
North Coast Regional District Electoral Area D Civic Addressing Bylaw No. 665, 2019.	• Regulates how address numbers are displayed on buildings, including a provision that numbers must be clearly visible from the road both day and night.	• Supports 911 provision on Haida Gwaii and aids fire department response

2.5.4 Higher Level Plans and Relevant Legislation

Awareness of all relevant provincial legislation and regulations and land management plans is a critical step in ensuring a proactive and effective wildfire mitigation approach in the AOI.

Table 5. Key Higher-Level Plans and Relationship to the CWPP

Plan	Description	Relationship to CWPP
Haida Gwaii Strategic Land Use Agreement (2007) and Land Use Objectives Order (2010).	• Agreement and framework for implementing ecosystem-based management objectives. • Orders are implemented by the Haida Gwaii Management Council.[11]	• Fuel treatment requires compliance with legal objectives with and consultation with HGMC.
Haida Gwaii Natural Resource District Response Fire Management Plan (FMP) (2019).	• Fire management planning at the Natural Resource District level. • Prioritizes values at risk.	• Time required to mobilize a BCWS crew to Haida Gwaii is identified as a challenge. • No fuel breaks identified in the FMP.
Forest Stewardship Plans.	• Set forest practices obligations to specific licensees' forest	• Consult licensees (Husby, A&A, Taan) for treatment units overlapping FDUs.

[11] A joint decision-making body comprised of two representatives of the Haida Nation and two representatives of the Province of BC

Plan	Description	Relationship to CWPP
	development units (FDUs).	
Taan Forest Ltd. Wildfire Preparedness and Response Plan (2018).	• Provides guidance for wildfire response, including available suppression equipment.	• Information on licensee wildfire preparedness.
Naikoon Provincial Park Management Plan (1999).[12]	• Establishes management priorities and action items.	• Wildfires may have modified response in Wilderness Recreation Zone; full suppression in all other Zones (near homes/beaches). • BC Parks and CHN must be consulted prior to fuel management treatments.
Coast Area 2015-17 Coastal Timber Supply Areas Forest Health Overview.	• Summarizes forest health issues and guides management.	• Fuel management treatments should apply best forest health management practices.

[12] Update underway [personal communication]

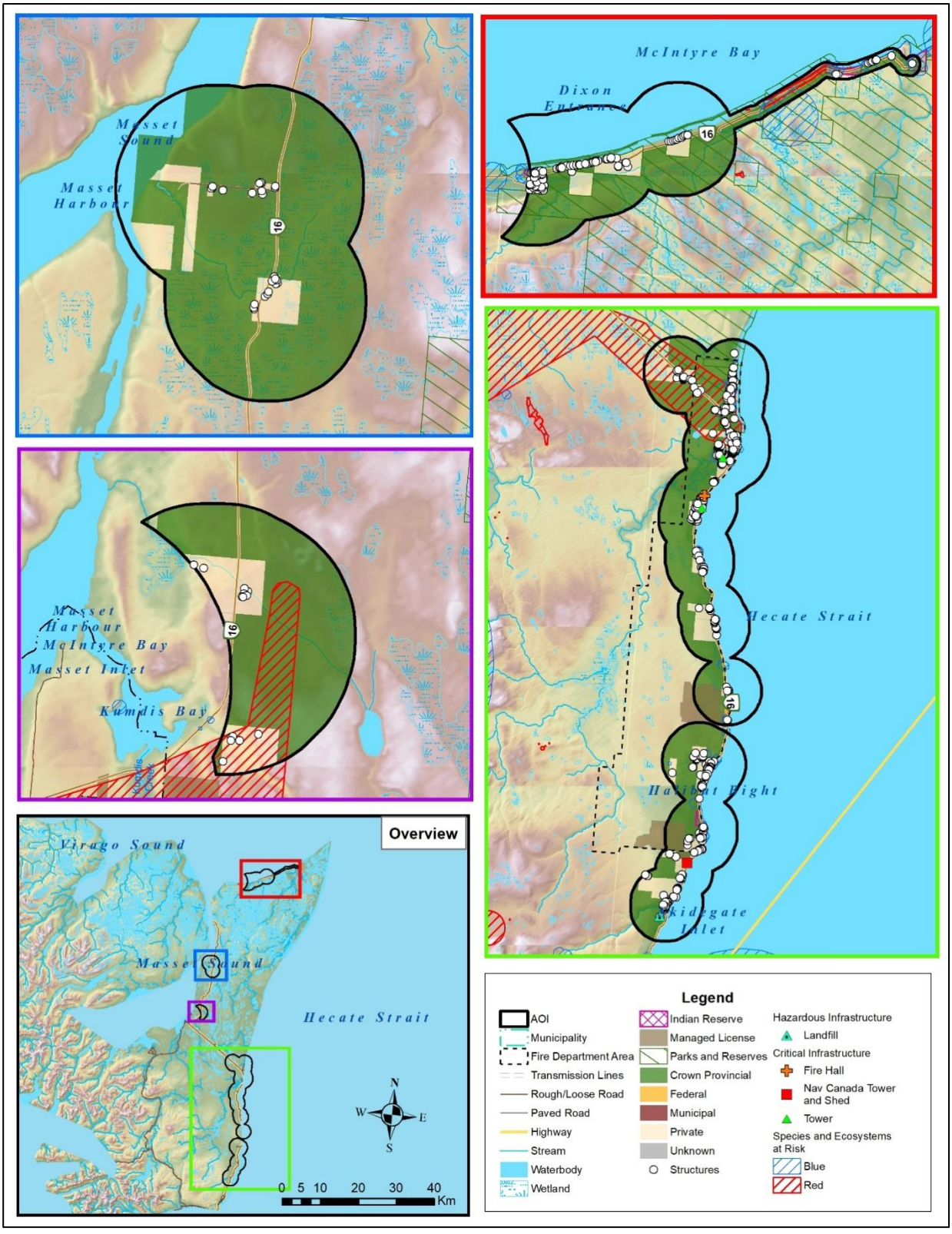
Table 6. Summary of Planning Recommendations

Document Section 2.5 Planning					
Item	**Priority**	**Recommendation / Action**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
1	Low	Consider amending the *Island Solid Waste Management Regulation, Fees and Changes Bylaw No. 276, 2013* to allow woody material greater than 7.5 cm in diameter to be deposited at the Port Clements Landfill or Skidegate Transfer Station. Explore the establishment of a specific green waste dump/community composting facility at either location similar to the 'stump dump' 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 firewood provision, composting, regular pile burning, chipping and/or spreading of waste.	Encourages FireSmart vegetation management and provides an alternative to open burning on private properties.	40-80 in-house hours (local government funding/UBCM CRI program funding).	NCRD initiative
2	Moderate	Work to expand awareness of Bylaw 665 (House Numbering) in collaboration with local Fire Departments. Focus on the direct link between enabling the update of NCRD address data and the provision of 911 on Haida Gwaii. Consider incentivizing the installment of reflective address signs or procuring signs at a discounted rate.	Provision of 911 in the AOI was identified as a priority by all fire departments on Haida Gwaii. There are too many different emergency numbers.	15-30 NCRD staff for material development and distribution for incentive/ engagement campaign.	NCRD initiative
3	Low	Provide residents with links to the national FireSmart landscaping guide and inform residents of BC specific FireSmart landscaping guide to be released Spring 2021. Alternatively, develop a Haida Gwaii-specific landscaping standard which lists flammable non-compliant vegetation and landscaping materials, non-flammable drought and pest resistant alternatives, and tips on landscape design to reduce wildfire hazard. Can be provided at issue of building permit and made available online.	Increase awareness of wildfire hazard and increase FireSmarting of private properties. FireSmart landscaping was observed as semi-compliant during field visits.	FireSmart landscaping guide is free	NCRD initiative

Document Section 2.5 Planning					
Item	**Priority**	**Recommendation / Action**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
4	Low	Develop utility right-of-way best management practices (BMPs) for regular brushing and clearing of woody debris and shrubs in coordination with BC Hydro to help reduce fire risk, utility pole damage and subsequent outages. In addition, BC Hydro, and the Ministry of Transportation and Infrastructure (MOTI) should ensure rights-of-way do not contain fine fuel accumulations (< 7.5 cm, easily cured) and significant regeneration of conifer vegetation prior to and during the fire season and are maintained in a low hazard state. (to serve as fuel breaks).	Some encroachment of branches near powerlines was noted during site visits	~15 Local government funding, plus 1 to 2 meetings per fire season with BC Hydro	NCRD in collaboration with BC Hydro and MOTI

SECTION 3: VALUES AT RISK

The following section is a description of the extent to which wildfire has the potential to impact the values at risk (VAR), within the AOI. The 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.



Map 2. Values at Risk within the AOI.

3.1 HUMAN LIFE AND SAFETY

Human life and safety are the first priority in the event of a wildfire. Population distribution is a key consideration in wildfire evacuation. 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.

Census data of NCRD Electoral Area D - Rural Graham Island, records a total population of 539 in 2016, which is a 2.6% increase from 2011 populations.[13] The average age of the population was 43.2 years old and the number of occupied private dwellings in 2016 was 321. Only approximately 75% of dwellings are occupied on a regular basis. The population of Electoral Area D is concentrated around the unincorporated communities of Tow Hill, rural Port Clements, Tlell, and Lawnhill. Dwellings are scattered throughout these areas. As a result, there are large areas of continuous forests interspersed with rural residences and narrow single access roads.

The population of Electoral Area D significantly fluctuates throughout the year because of tourism. Graham Island attracts visitors for fishing, camping, hiking, sailing, motor boating, and other recreational endeavors year-round, but particularly during the fire season (May – October). Parks, recreation areas, beaches and rivers throughout the AOI are highly used during the summer months, including Naikoon Provincial Park (which includes Misty Meadows campground, Agate Beach Campground and Tow Hill), North Beach, Jungle Beach, and the Sangan and Tlell Rivers. This increases the number of people and time it takes to evacuate the island 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, consultation with the Wildfire Working Group, and access to recent orthophotography has enabled the development of a spatial layer with structure locations that accounts for the most recent developments.

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 natural gas services, transportation, water, social services, and communications infrastructure. A critical infrastructure dataset was built upon available provincial and national datasets and through consultation with the WWG, and this data was included in Map 2 and Table 7.

[13]Census Canada. 2016. Skeena – Queen Charlotte D. Retrieved from: https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=5947027&Geo2=PR&Code2=59&SearchText=Skeena-Queen%20Charlotte%20D&SearchType=Begins&SearchPR=01&B1=All&GeoLevel=PR&GeoCode=5947027&TABID=1&type=0

3.2.1 Electrical Power

The WWG communicated that the main source of power in Electoral Area D comes from a hydroelectric dam located in Mitchel Inlet and is backed up by a diesel generation plant in Sandspit. Electrical service for most of the AOI is received through a network of wooden pole distribution lines supplied by BC Hydro. 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.[14]

A large fire has the potential to impact electrical service by causing disruption in network distribution through direct or indirect processes. For example, heat from flames or fallen trees associated with a fire event may cause power outages. Many wooden pole transmission lines have significant understory brush and 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. Neighbourhoods with small, street-side wooden poles that connect to homes are particularly vulnerable to fire.

Secondary power sources are important to reduce critical infrastructure vulnerability in the event of an emergency which can cut-off power for days, or even weeks. Due to the rural nature and remoteness of Graham Island, along with the island's exposure to south/southwesterly and northeasterly winds during the summer and winter months, power outages for prolonged periods of time during winter months are common. As such, the majority of households within the AOI are equipped with backup generators as power-outages are expected on an annual basis, especially during winter months. The Tlell Fire Department also has a mobile backup diesel generator. Vulnerabilities for secondary power sources include mechanical failure, potentially insufficient power sources should a wide-scale outage occur, and fuel shortage in the event of very long outages. New residents to Graham Island may be unfamiliar with the anticipated power outages and thus, may not be outfitted to endure such an event. 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

The Tlell Fire Hall is the only critical community building in the AOI, although residents rely on important services and critical structures in neighboring municipalities, including hospitals in Queen Charlotte and Masset. The Emergency Operations Centre (EOC) for the AOI is the NCRD office in Prince Rupert, although the WWG communicated that the Tlell Fire Hall could also be used as an alternate EOC. There is spotty cell service throughout the AOI, provided by various communication towers. A full inventory of critical infrastructure with updated locations is presented in Table 7, below.

Table 7. Critical Infrastructure Identified in CWPP field visits.

Critical Infrastructure Type	Location
Nav Canada Tower	North of Wiggins Road and Richardson Road intersection
Tlell Volunteer Fire Hall	West of Highway 16, ~2.6 km south of Skaigha 2 IR
Communication Tower	West of Highway 16, ~700 m north of Brandt Road and Highway 16 intersection

[14] https://www.bchydro.com/safety-outages/emergency-preparation/natural-disasters.html

Critical Infrastructure Type	Location
Communication Tower	Intersection of Highway 16 and Brandt Road

3.2.3 Water and Sewage

Residents throughout the AOI rely on private wells and septic tanks for their water and sewage needs. Water utility services are not provided by the NCRD in the AOI. These water utilities are mainly supplied through groundwater sources, although there are some private residents who may also have surface water diversions. The reliance on private water systems ultimately reduces the vulnerability of residents of rural Graham Island to possible service disruptions from a wildfire, as a wildfire would only affect the water supply to structures and residents in the immediate vicinity of the fire.

3.3 HIGH ENVIRONMENTAL AND CULTURAL VALUES

The following section identifies high cultural, environmental, and recreational values that are present within 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

Within the AOI, there are no officially designated community watersheds and water is mainly supplied via private groundwater wells as discussed above. Although the relatively gentle topography and prevalence of groundwater wells limits the vulnerability of rural Graham Island's drinking water quality to wildfire, there is still the potential for wildfire to result in impacts to water supply. Depending on fire size and severity, there is the potential for significant hydrological impacts, extending for years post-burn.[15] Some areas may have a lower threshold for precipitation triggered events and would be particularly vulnerable to post-wildfire debris flows, mass wasting, landslides, and flooding. This could directly impact the communities through structure loss and risk to public safety, or indirectly, through loss or damage of critical infrastructure, roads, or impacts on the water supply affecting water quality. The low slope gradient throughout most of the AOI mitigates this risk and no recommendations are made to increase community wildfire resiliency with regards to water supply.

3.3.2 Cultural Values

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.

Under the Haida Gwaii Land Use Objectives Order (LUOO), certain Cultural Features are also given legal protection. A Cultural Features Identification Survey performed by a CHN-certified surveyor must be undertaken prior to all forestry and/or road building activities to ensure compliance with the LUOO.[16]

[15]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.

The four categories of Cultural Features protected under the LUOO are Haida Traditional Heritage Features, Haida Traditional Forest Features, Culturally Modified Trees, and Monumental Cedar.[16] The LUOO also protects environmental/wildlife features, as described below.

Due to site sensitivity, the locations of archaeological sites are not publicly available. However, data provided by the MFLNRORD Archaeology Branch confirms that there are known overlaps with archeological sites within the AOI, and there is high to moderate potential for previously unidentified archeological sites to exist elsewhere in the AOI. The CHN also maintains an internal record of archeological data (RAAD). A Cultural Features Identification Survey or consultation with CHN and/or the BC Archeology Branch may identify the need to engage a professional archeologist. Depending on the location and type of treatment, an Archeological Impact Assessment may be required to ensure that cultural values are not inadvertently damaged or destroyed.

3.3.3 High Environmental Values

The AOI overlaps with several areas to which legal objectives apply under the Haida Gwaii Land Use Objectives Order (LUOO). These include forest reserves (similar to an Old Growth Management Area [OGMA]), sensitive watersheds, cedar stewardship areas, fish habitat, and marbled murrelet nesting habitat.[17] Any proposed fuel treatments that may overlap these areas require Haida Gwaii Management Council (HGMC) oversight at the prescription development phase, and works can only occur following HGMC consultation and approval. The HGMC is a joint decision-making body that includes representatives from CHN and MFLNRORD. Other legal objectives include but are not limited to retention of western red-cedar, yellow-cedar, and western yew; and protection of red and blue listed ecological communities.

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

There are many occurrences of red and blue-listed vertebrate species and many red and blue-listed plant species within the AOI (Table 8). 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,

[16] Council of the Haida Nation Cultural Feature Identification Standards Manual. 2016.
[17] Ministry of Agriculture and Lands. Land Use Objectives Order Haida Gwaii. 2014.

consultation with a qualified professional with local knowledge may also be recommended at the prescription phase.

Table 8. Publicly available occurrences of Red and Blue-listed species recorded within the AOI.

Common Name	Scientific Name	Category	BC List	Habitat Type
American Glehnia	*Glehnia littoralis ssp. leiocarpa*	Vascular Plant	Blue	MARINE: Beach; TERRESTRIAL: Sand/Dune
Beach Groundsel	*Senecio pseudoarnica*	Vascular Plant	Blue	MARINE: Beach
Ermine, Haidarum Subspecies	*Mustela erminea haidarum*	Vertebrate Animal	Red	TERRESTRIAL: Forest Needleleaf, Forest Mixed, Old Field; PALUSTRINE: Bog/Fen; RIVERINE: Riparian; MARINE: Beach
Ermine, Haidarum Subspecies	*Mustela erminea haidarum*	Vertebrate Animal	Red	TERRESTRIAL: Roadside; MARINE: Beach
Hornemann's Willowherb	*Epilobium hornemannii ssp. behringianum*	Vascular Plant	Unknown	TERRESTRIAL; ROCK OUTCROP
Northern Saw-whet Owl, Brooksi Subspecies	*Aegolius acadicus brooksi*	Vertebrate Animal	Blue	TERRESTRIAL: Suburban/Orchard, Roadside, Forest Needleleaf; MARINE: Beach
Northern Saw-whet Owl, Brooksi Subspecies	*Aegolius acadicus brooksi*	Vertebrate Animal	Blue	MARINE: Beach; PALUSTRINE: Herbaceous Wetland; TERRESTRIAL: Forest Needleleaf
Northern Saw-whet Owl, Brooksi Subspecies	*Aegolius acadicus brooksi*	Vertebrate Animal	Blue	TERRESTRIAL: Forest Needleleaf; RIVERINE: Riparian; MARINE: Beach
Oldgrowth specklebelly	*Pseudocyphellaria rainierensis*	Fungus	Blue	TERRESTRIAL: Old Forest, Epiphytic
Sea Bluebells	*Mertensia maritima var. asiatica*	Vascular Plant	Blue	MARINE: Beach
Sea Bluebells	*Mertensia maritima var. asiatica*	Vascular Plant	Blue	MARINE; SAND/DUNE
Sea Bluebells	*Mertensia maritima var. asiatica*	Vascular Plant	Blue	MARINE
Silky Beach Pea	*Lathyrus littoralis*	Vascular Plant	Red	
Silky Beach Pea	*Lathyrus littoralis*	Vascular Plant	Red	MARINE: Beach
Western Cowbane	*Oxypolis occidentalis*	Vascular Plant	Blue	TERRESTRIAL: Forest Mixed
Yellow Sand-verbena	*Abronia latifolia*	Vascular Plant	Blue	TERRESTRIAL: Sand/Dune

3.4 OTHER RESOURCE VALUES

There are multiple resources values associated with the land base, including timber supply, agriculture, wildlife habitat, non-timber forest products, fishing, recreation and tourism.

The Haida Gwaii 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 (AAC) for Haida Gwaii is determined by the HGMC and is partitioned among licensees by the Chief Forester.[18]As of October 27, 2020 the new AAC for the Haida Gwaii TSA is 398,000 cubic meters per year.[18] This AAC is not applicable to private managed forest land, which is present within the AOI. The TSA covers roughly308,000 hectares or approximately 30% of the total land area.[19]

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. The opportunity exists to work with local tenure holders and private forest land managers on commercial thinning projects that meet fuel management objectives.

There are many areas with high recreational and ecological value within the AOI. North Beach by Tow Hill is popular for surfing, hiking, camping, and off-roading; public beaches and trails intersect the AOI north and south of Tlell. Naikoon Provincial Park overlaps much of the AOI and are significant tourist draws. In the summer, camping and campfires are common throughout the AOI but especially on North Beach and beaches near Tlell such as Jungle Beach. The Tlall Conservancy, Kamdis Conservancy, Naang Xaldangaas Conservancy, and the Tow Hill Ecological Reserve also overlap the AOI and protect significant environmental values.

3.5 HAZARDOUS VALUES

Hazardous values are defined as values that pose a safety hazard to emergency responders including areas where fuel or hazardous chemicals are stored. The only hazardous value identified in the AOI is the transfer station south of Tlell. The Tlell transfer station collects waste and recyclables, including household and industrial organic waste and a variety of household hazardous materials and/or combustible materials (e.g., tires, vehicle batteries, propane tanks, oil and oil filters and containers).

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. Best management practices (BMPs) recommended for management of hazardous values include incorporating FireSmart planning and setback requirements for all infrastructure in this category. A fuel treatment unit around the Tlell transfer station is recommended.

Table 9. Hazardous Infrastructure Identified in CWPP field visits.

Hazardous Infrastructure Name	Location
Refuse Transfer Station	West of Highway 16, ~2.8 km north of Skidegate 1 IR

[18] Haida Gwaii Management Council. 2019. Allowable Annual Cut. https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/timber-supply-review-and-allowable-annual-cut/allowable-annual-cut-timber-supply-areas/haida-gwaii-tsa

[19] Haida Gwaii Management Council. 2020. Rationale for the Allowable Annual Cut (AAC) Determination for Haida Gwaii. Retrieved from: http://www.haidagwaiimanagementcouncil.ca/wp-content/uploads/2020/05/HG-AAC-Rationale.pdf0

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 toa 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.[20]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 disturbance events (such as wildfires), pre-European contact, 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

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

applicable ensure that treatments are ecologically and socially acceptable.[21]The AOI is characterized by the BEC subzone and associated NDT as outlined in Table 10 and Map 3.

Table 10. BEC zones and natural disturbance types found within the AOI.[22]

Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CWHwh1: Coastal Western Hemlock, Wet Hypermaritime Submontane variant	NDT1	20,077.45	100%

The entire AOI is classified as NDT1: ecosystems with infrequent stand-initiating events. NDT1 includes biogeoclimatic unit CWHwh1, which is found at the low and moderate elevations that characterize the AOI. 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.[23]

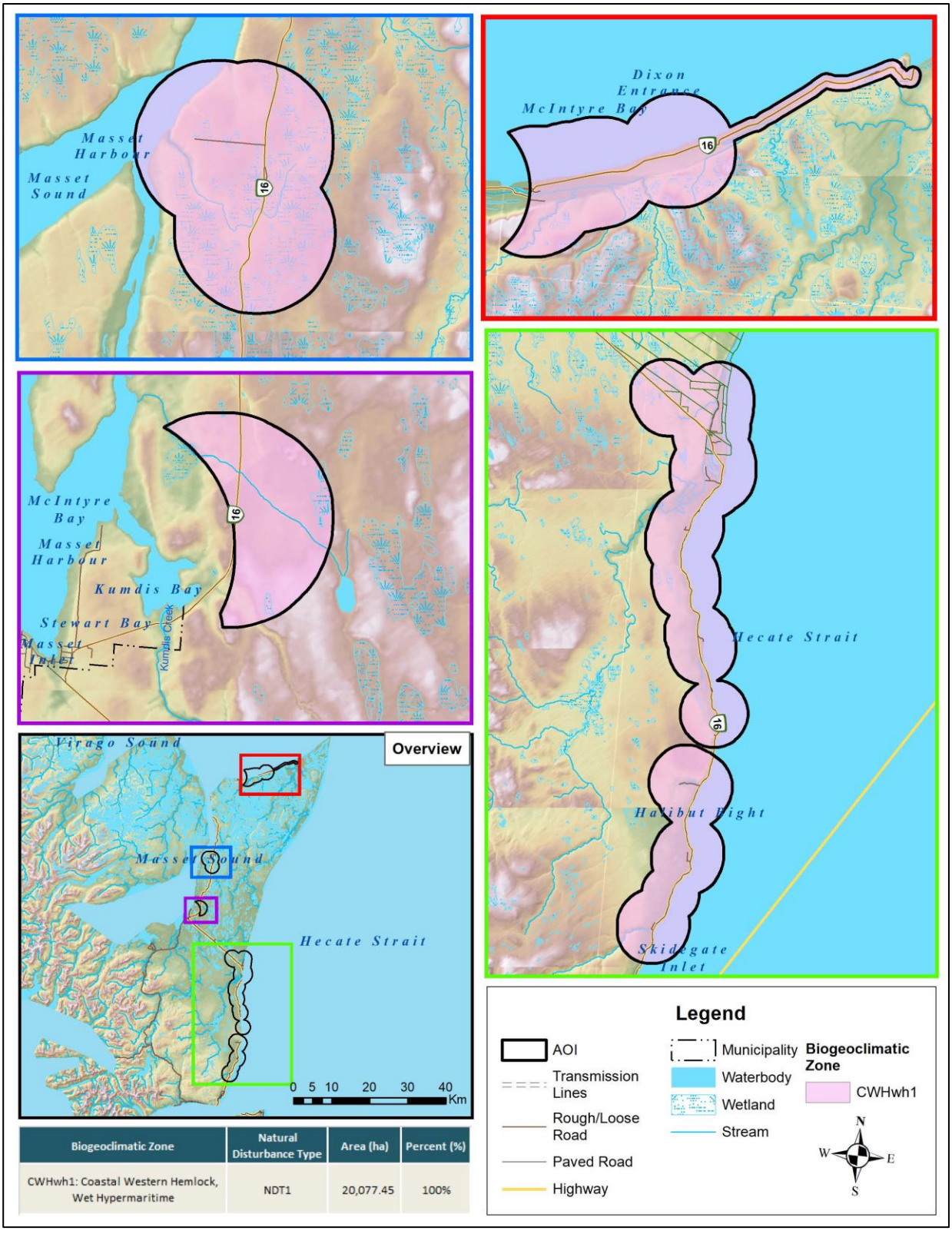
While natural disturbance regimes are useful for describing the historical disturbance pattern typical for an area, fire history is complex and highly variable across space and time for many ecosystems.[24] Furthermore, forest health issues, human development and natural events contribute to changes in the fire regime, forest attributes, and fuel hazard around the community.

[21] Province of British Columbia, 1995. Biodiversity Guidebook.

[22]Ministry of Forests, Lands, Natural Resources and Rural Development BEC Map (DataBC). Retrieved February 2021 from https://catalogue.data.gov.bc.ca/dataset/bec-map.

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

[24] 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.



Biogeoclimatic Zone	Natural Disturbance Type	Area (ha)	Percent (%)
CWHwh1: Coastal Western Hemlock, Wet Hypermaritime	NDT1	20,077.45	100%

Map 3. Biogeoclimatic Zones and natural disturbance regimes within the AOI.

Forest Health Issues

The Coast Forest Health Overview outlines forest health issues present within the Haida Gwaii Timber Supply Area (TSA). The most recent aerial overview survey of the TSA was conducted in 2020, and the most up to date report for the coast region is available online.[25]Mountain pine beetle, western black-headed budworm and lodgepole pine sawfly were the only biotic forest health agents prevalent in terms of impacted area. In the past aphids and adelgids have also affected forest stands on Graham Island. The most severe abiotic occurrences were due to landslide and yellow cedar decline, in addition to 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.[26]

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. Fuel treatments have the potential to exacerbate the occurrence of western black-headed budworm, a defoliator of western hemlock. Mortality from western black-headed 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.[26]The risk to forest health from western black-headed budworm must be assessed and mitigated at the prescription level.

Human Development and Natural Events

Most land cover change in the AOI can be described as agricultural and forestry operations and, rural development. This process entails land clearing and road building. Forest harvesting is common on provincial Crown land as well as on private managed forest land within the AOI. Abiotic and biotic natural events occur at small geographic scales. The overall implication of human development is an increase in human ignition potential with a decrease in hazardous fuels cover, as land clearing for human development generally increases the non-fuel and open/grass (O-1a/b) fuel types (see Appendix A-1 for a list of fuel types).

There have been numerous anthropogenic and natural changes that have occurred on the landscape in the past few decades. 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 settlers in the early 1900s. This has generally resulted in an increased wildland-urban interface in particular areas (Section 5.2.3) and an increase in fire suppression in an ecosystem that had a historic fire interval of 250+ years. Privacy and a natural setting are likely to be highly valued by rural dwellers, and new developments are likely to be highly intermixed within conifer leading stands. Furthermore,

[25] 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

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

residents have limited water supply and the majority of structures are located on one way access/egress routes.

- Forest industry activities can result in poor slash hazard abatement practices which can lead to high fuel loading along roadsides and on private forested parcels.

Fire Weather Rating

The Canadian Forestry Service developed the Canadian Forest Fire Danger Rating System (CFFDRS) to assess fire danger and potential fire behavior. 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 forest lands within a community. The information can be obtained from the BCWS and is most commonly utilized by local governments 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, 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.

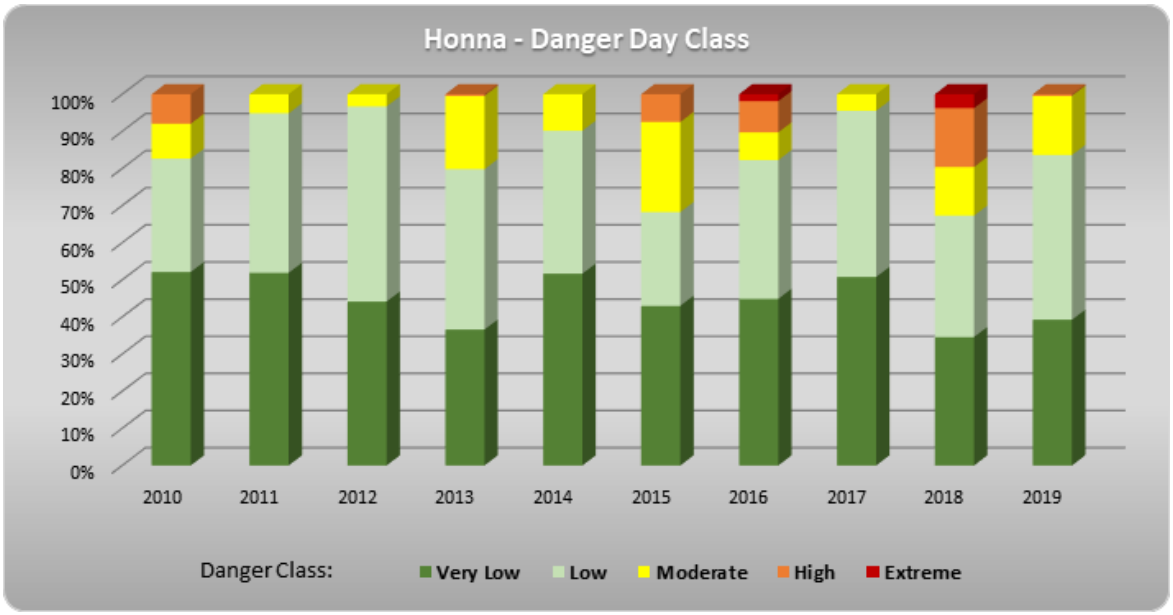


Figure 1. Proportion of each fire danger class per year between April and October for the Honna weather station. Summary of fire weather data for the years 2010 - 2019.

4.1.2 Climate Change

Climate change is a serious and complex aspect to consider in wildfire management planning. Numerous studies outline the nature of climate change impacts on wildland fire across Canada, and globally.[27] 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.[28] Despite the uncertainties, trends within the data are visible.

As outlined in *Coastal Vulnerability to Climate Change and Sea-level Rise, Northeast Graham Island, Haida Gwaii (Queen Charlotte Islands), British Columbia*,[29] Haida Gwaii is one of the most vulnerable areas in Canada to climate change. The report makes the following climate projections for Graham Island:

- Year round increases in temperature: a mean annual temperature increases of up to 2°C for 2020s-2050s and up to 5.5°C by the 2080s);

[27]Flannigan, M.D et al. 2009. Implications of changing climate for global wildland fire. International Journal of Wildland Fire 18, 483-507.
[28]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.
[29]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.

- 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 0.18 to 0.59 m are also made. The current sea-level rise rate in Haida Gwaii is 1.6 mm/year; and
- Increase in natural disturbances, including storm surges.

Changes to the climatic regime and an increased frequency of natural disturbance events could impact values in the AOI in some of the following ways:[29]

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

In summary, climate change is likely to threaten roadways, private homes, critical infrastructure, and resource-based industries in the AOI and has the potential to bring about an increase in natural disturbance events, including wildfires. This plan is designed to mitigate the possible impacts to the community of a wildfire by identifying opportunities to reduce fire risk and to increase capacity to respond in the event of a fire.[30]

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:[31]

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.

[30]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.
[31]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.

3) **Head fire intensity (HFI)**: represents the intensity (kW/m) of the fire front. HFI is correlated with flame length and fire behavior. The greater the fire intensity (kW/m), or HFI and fire intensity class, the more extreme the fire behavior 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.[32] 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 behavior 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.

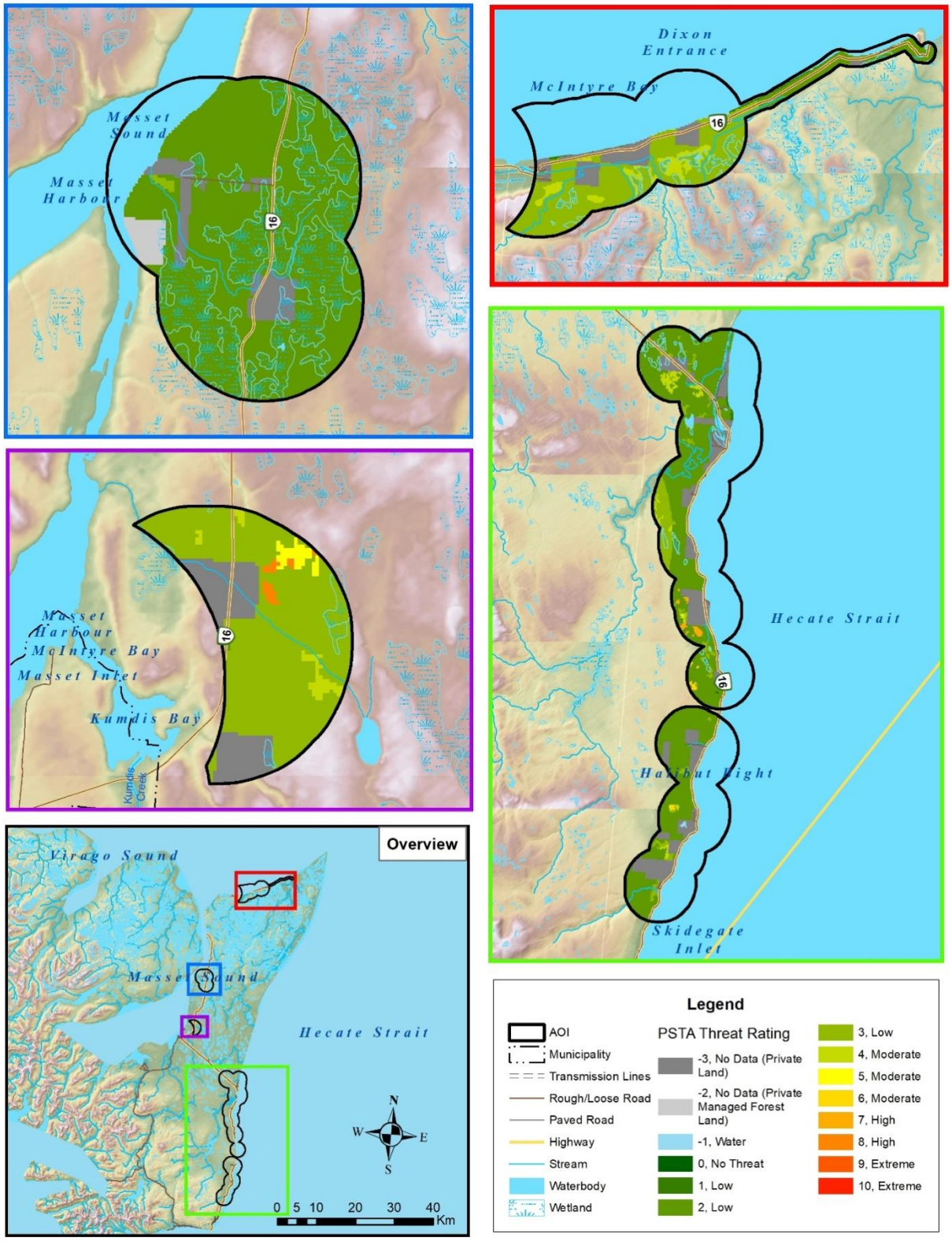
The fire threat ratings from the 2019 PSTA are summarized for the AOI in Table 11 and spatially illustrated in Map 4. Over half of the AOI (51%) is categorized as low threat areas, and approximately 11% of the land is private land or has no data for wildfire threat in the PSTA dataset. Moderate areas cover 2% of the AOI. There are no high or extreme threat areas in the AOI. Water makes up 36% of the AOI.

Table 11. Overall PSTA Wildfire Threat Analysis for the AOI (rounded to the nearest hectare).

Threat Class	Area (ha)	Threat Class Description	Percent of AOI
-3	2179.9	No Data (Private Land)	11%
-2	48.6	No Data (Private Managed Forest Land)	0%
-1	7166.0	Water	36%
0	0.0	No Threat	0%
1	96.1	Low	51%

[32] 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])

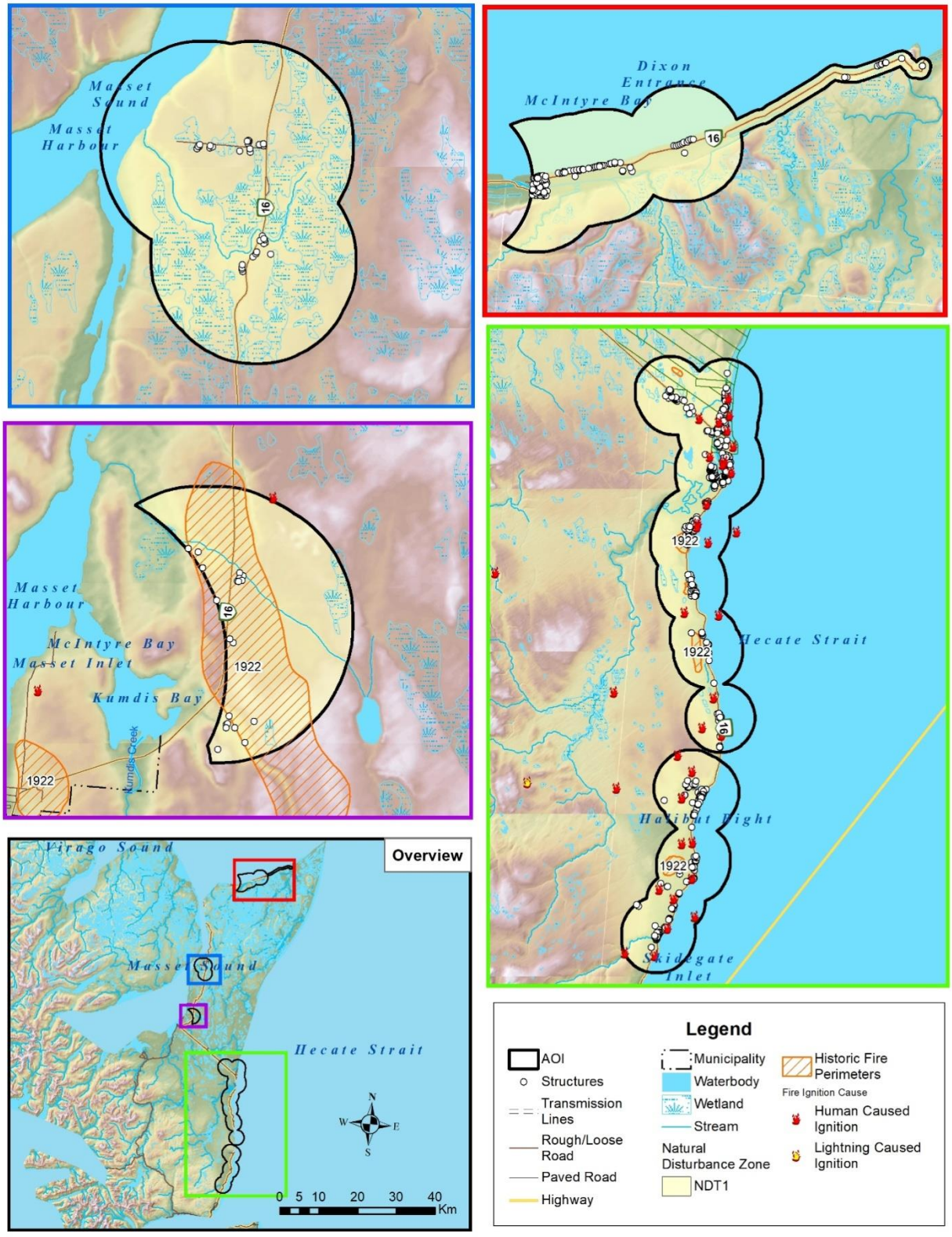
Threat Class	Area (ha)	Threat Class Description	Percent of AOI
2	7880.7		
3	2266.5		
4	329.2	Moderate	2%
5	17.0		
6	29.2		
7	53.3	High	0%
8	10.9		
9	0.0	Extreme	0%
10	0.0		
Total	**20077.4**	-	**100%**



Map 4. Provincial Strategic Threat Rating.

4.2.1 Fire History

Fire ignition and perimeter data are depicted in Map 5 below. BCWS historical fire ignition data is available from 1950-2018 and fire perimeter data is available from 1919-2018 for the area. All of the historical fire ignitions in the eastern half of rural Graham Island were human-caused (with the exception of one undetermined cause). The vast majority are from escaped or abandoned campfires and open burning; less frequent causes include equipment fires, discarded cigarettes, and arson. Since 1934, there have been no large sized, recorded fires that have burned within the AOI. Known fire ignition dates show that over the century, fires have burned from April through October, but that the largest fires occurred in July and August.



Map 5. 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 seven field days in November of 2020, in conjunction with verification of fuel types (see Appendix C – Wildfire Threat Assessment Worksheets and Photos). WUI Threat Assessments were completed in 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 assessed.

Field assessment locations were prioritized based upon the following:

- Proximity to values at risk – Field assessments were clustered in the intermix and interface, as well as around critical infrastructure.
- High PSTA Threat Rating – areas with a high PSTA threat rating were specifically assessed to ground-truth the hazard. This included cut blocks with a range of harvest dates.
- Public access – areas with public access, including trails, forest service roads, and campsites.
- Observations – Additional areas potentially not recognized prior to field work were visually identified as hazardous and assessed during the week.

A total of 19 WUI threat plots were completed and over 500 other field stops (e.g., qualitative notes, fuel type verification, and/or photograph documentation) were made across the AOI (see Appendix F for WUI threat plot locations).

Using the verified and updated fuel types (Appendix A-1, Map 8) combined with field wildfire threat assessments and office-based analysis (Appendix A-1 to A-4), local wildfire threat for the AOI was updated. Using the Wildfire Threat Assessment methodology,[33] there are two main components of the

[33] 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)

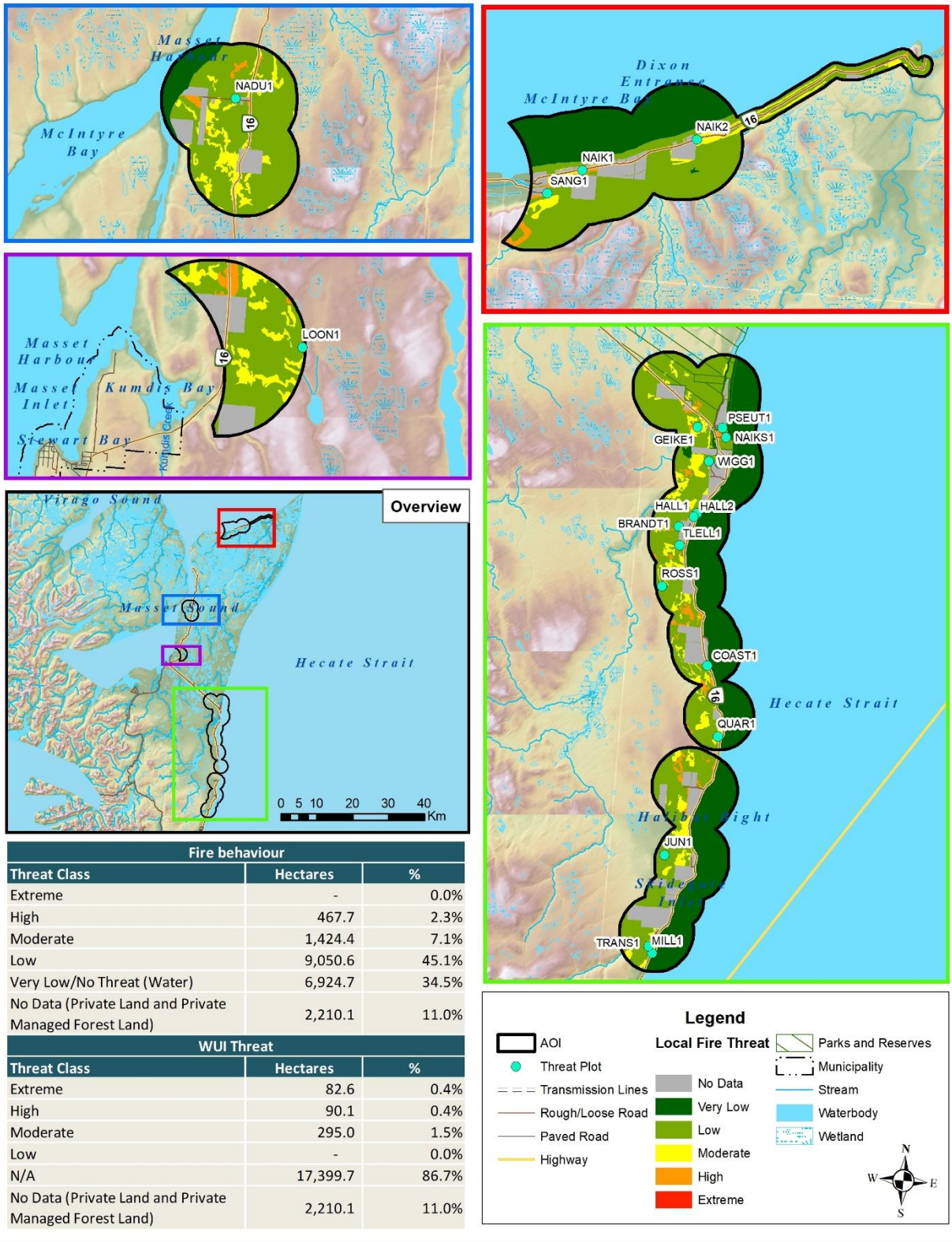
threat rating system: the wildfire behavior threat class (fuels, weather and topography sub-components) and the WUI threat class (structural sub-component).

The result of the analysis shows that the AOI is composed of a mosaic of very low, low, moderate and high threat class stands; the variability in wildfire threat is dictated primarily by the level of natural and anthropogenic disturbances that have historically occurred and persist on the land base. The AOI is 2.3% high threat class rating, 7.1% moderate, 45.1% low, and 34.5% very low/water (Table 12). The remaining 11% of the AOI is classified as private land and as such has not been allocated fire threat data. Assessment of fire threat on private land is not funded by CRI and is therefore outside the scope of this CWPP. Table 12 also indicates the differences between the original PSTA threat rating and this CWPP's corrected fire behavior threat.

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

Table 12. Fire behavior threat summary for the AOI.

Wildfire Behaviour Threat Class	2019 PSTA Data	2020 CWPP
	Percent of AOI	Percent of AOI
Extreme	1.3%	0.0%
High	22.2%	2.3%
Moderate	32.4%	7.1%
Low	1.8%	45.1%
Very Low/ No Threat (Water)	9.2%	34.5%
No Data (Private Land and Private Managed Forest Land)	33.1%	11.0%



Fire behaviour		
Threat Class	**Hectares**	**%**
Extreme	-	0.0%
High	467.7	2.3%
Moderate	1,424.4	7.1%
Low	9,050.6	45.1%
Very Low/No Threat (Water)	6,924.7	34.5%
No Data (Private Land and Private Managed Forest Land)	2,210.1	11.0%

WUI Threat		
Threat Class	**Hectares**	**%**
Extreme	82.6	0.4%
High	90.1	0.4%
Moderate	295.0	1.5%
Low	-	0.0%
N/A	17,399.7	86.7%
No Data (Private Land and Private Managed Forest Land)	2,210.1	11.0%

Map 6. Local Fire Behaviour Threat Rating and WUI Threat Rating.

SECTION 5: RISK MANAGEMENT AND MITIGATION FACTORS

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 behavior 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 (FireSmart priority Zone 3 and beyond).

The objectives for fuel management are to:

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

Ideally, these objectives will enhance the protection of homes and critical infrastructure from wildfire. Caveats associated with the statement include: 1) wildfire behavior 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.

Fuel management on municipal and First Nation land, or in Regional Parks, may be funded by the Union of BC Municipalities (UBCM), through the Community Resiliency Investment (CRI) Program. Fuel management on Provincial Crown land only may be funded by the Crown Land Wildfire Risk Reduction (WRR) funding category[34] under the CRI Program (administered by MFLNRORD). The CRI Program also provides funding for selected FireSmart activities and planning on private land.[35]

[34]Crown Land WRR is a recently introduced category of CRI Program funding for risk reduction activities on provincial Crown Land effective 2020 that will be led by MFLNRORD (in partnership with local government and others) for wildfire risk reduction activities targeting provincially identified critical infrastructure, and treatment activities on provincial Crown land around communities.

[35]CRI FireSmart Community Funding & Supports – Program & Application Guide. 2020. Retrieved from: https://www.ubcm.ca/assets/Funding~Programs/LGPS/CRI/cri-2020-program-guide.pdf

The fuel treatment opportunities identified in this CWPP include the use of fuel breaks and fuel treatment polygons, as defined in Section 5.1, to reduce the wildfire potential within and around the AOI. Potential treatment activities include commercial or non-commercial thinning, stand conversion, pruning, surface fuel removal, pile burning, chipping, prescribed burning, or a combination of two or more of these activities.

5.1.1 Proposed Treatment Units

Funding opportunities from UBCM under the 2021 CRI Program, specifically under the FireSmart Community Funding and Supports program, will consider fuel management activities in Regional District parks, on municipal Crown land, or First Nations land within the municipal boundary. Fuel treatments that represent contiguous, logical units that extend onto Crown land or outside of local government boundaries may also be considered for funding through the CRI Program if the fuel management activities are adjacent to community structures and the units extend no further than 1 km from the structure density threshold, as defined by the CRI program. All units proposed herein are located on provincial Crown land and/or are located adjacent to community structures. Eligible activities include development of fuel management prescriptions and burn plans, as well as operational implementation of those plans (treatments or prescribed burns).[36]

Funding for fuel treatments located exclusively on Crown land, outside of municipal boundaries, Regional District parks or First Nations land is administered through MFLNRORD under the Crown Land Wildfire Risk Reduction (WRR) program.[37]

The potential treatment areas represent moderate, high or extreme fire hazard areas on public land which are close to values at risk (structures or infrastructure) or have been identified as landscape level fuel treatments. All polygons identified for potential treatment have been prioritized based on fire hazard, operational feasibility, type and number of values at risk, and common fire weather (wind direction).

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. Prescription development must be carried out by a qualified forest professional and 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, the Council of the Haida Nation (CHN) and stakeholders. It is essential that feedback is received from the BC Parks Conservation Specialist and the CHN Heritage and Natural Resources Department (HNRC) prior to the prescription of any units overlapping Naikoon Provincial Park or Tlall Conservancy. As such, these units are marked as 'Draft.'

Consultation with CHN must occur as early as possible in the prescription development process. The Cultural Features Inventory Survey must occur prior to field work. The prescription will be reviewed by the Solutions Table, a joint CHN/MFLNRORD management body that is overseen by the Haida Gwaii

[36] The 2021 CRI program guide is available at https://www.ubcm.ca/EN/main/funding/lgps/community-resiliency-investment.html
[37] The 2020 -2021 Crown Land Wildfire Risk Reduction Planning Guide is available at https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/funding-for-wildfire-prevention/crip/wrr.

Management Council (HGMC), for compliance with the Haida Gwaii Land Use Objectives Order. The BC Archeology Branch should also be consulted during prescription development (see Section 3.3.2).

Recommended potential treatment areas within the AOI are outlined in Table 13 and displayed in Map 7. Fuel treatment opportunities may be fuel breaks (linear, beginning and ending at an anchor point, and a minimum of 1 km where possible) or polygon treatments (not necessarily forming a continuous fuel break unit or anchored into an anchor point). Potential fuel treatment units recommended within the plan are a combination of linear and polygon treatment units.

A fuel break in and of itself is unlikely to stop a fire under most conditions, but should be designed to transition and keep a crown fire on the ground where wildfire crews have suppression opportunities. 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. FireSmart standards should be applied to structures and surrounding vegetation to reduce the risk of structures igniting from a spot fire. Fuel treatment units require periodic maintenance to retain their effectiveness.

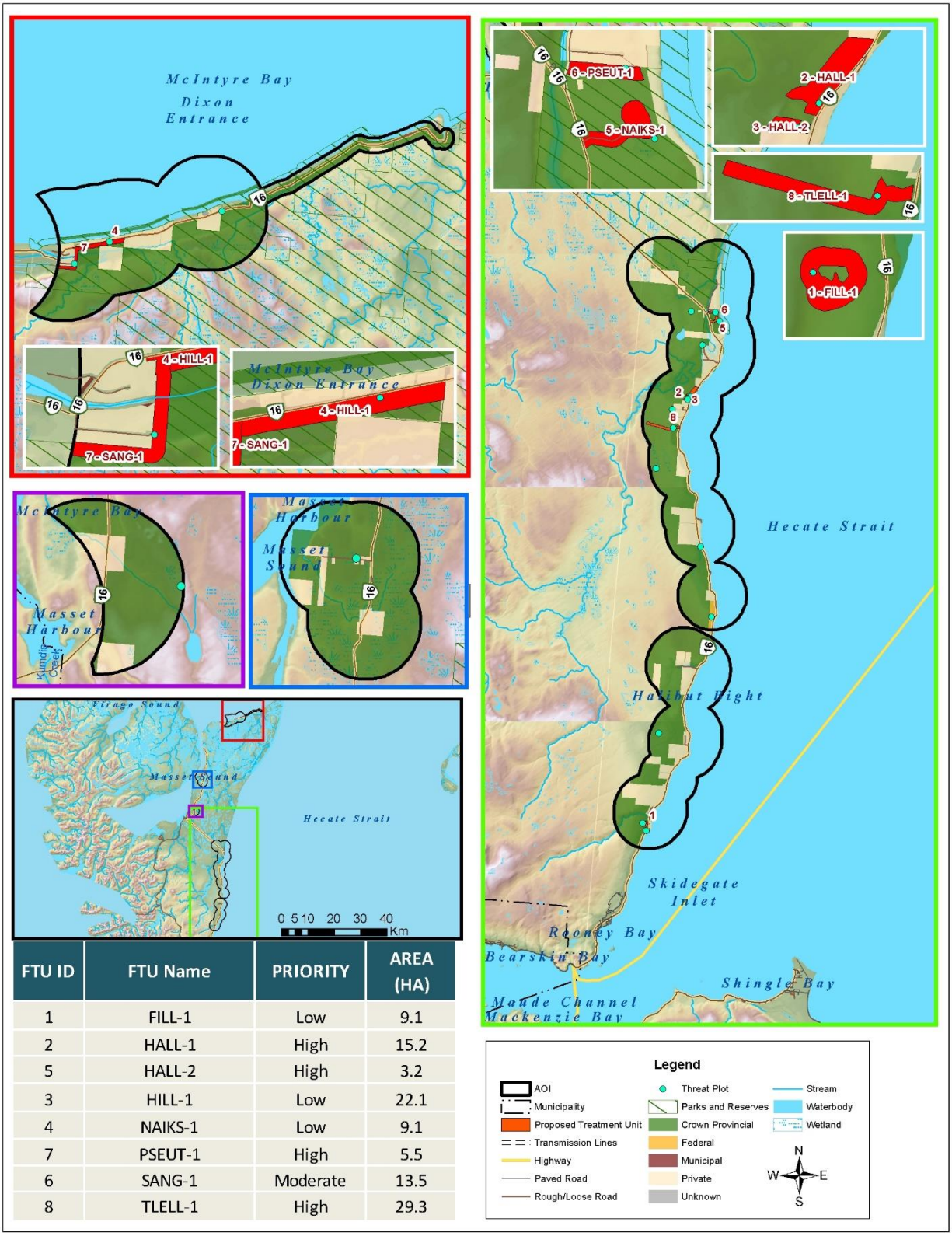
Table 13. Proposed Fuel Treatment Unit (FTU) Summary Table.

FTU ID	FTU Name	Total Area (ha)	Priority	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
					High	Mod	Low	Very Low		
*All FTUs are located within the Coast and Mountains eco-province and the CWHwh1 BEC Zone. Due to the presence of archeological sites and cultural features within the AOI, CHN and the BC Archeology Branch must be consulted as a first step in prescription development. Prescriptions will be reviewed by the Haida Gwaii Solutions Table for compliance with the LUOO. Overlapping tenure holders, adjacent private land holders, and any other stakeholders such as BC Parks must be consulted at the prescription development phase to identify and mitigate impacts to values. A wildlife biologist should be involved where overlaps with species at risk occurrences are concerned. ^Draft units. Feedback must be received from the BC Parks Conservation Specialist and the Council of the Haida Nation prior to prescription of the portion of these units that overlap Naikoon Provincial Parks and/or Tlall Conservancy.										
1	FILL-1	9.1	Low	Polygon- hazardous infrastructure	0.0	7.9	1.1	0.0	Overlap with ALR (polygon #4834513), and overlaps with Crown tenures relating to the Tlell Transfer Site as well as an aggregate quarry. There are also overlaps with the following Haida Gwaii Land Use Order Objectives (LUOO) and designations: Honna Landscape Unit, Chinukundl Creek and Queen Charlotte Skidegate Residual 1 sensitive watersheds, and two upland stream area watershed sub-units. Overlap with trapline area identifier: TR0613T007 and a guide outfitter area. Overlap with visual quality objective polygon: partial retention (VLI polygon #474), and blue-listed northern saw-whet owl (*Aegolius acadius brooksi),* species at risk occurrence.	This unit is located in the Tlell/Coast AOI polygon and forms a 100 m buffer around the Tlell Transfer Site. Stands are characterized by transitional C-3 to C-5, or M-1/2 60% fuel types, stem density is over 2000 stems per hectare (sph) and ladder fuels are present. This treatment is intended to prevent the ignition of hazardous material on site from an approaching wildfire and to prevent the spread of fire that may result from the burning of refuse on site, which was observed during field visits. Treatment recommendations include surface fuel removal (SFR) and thinning from below (TFB).
2	HALL-1^	15.2	High	Polygon- critical infrastructure	10.4	0.0	4.8	0.0	Very small overlap with the Tlall Conservancy and complete overlap with ALR (polygon #4837387) and with the Haida Gwaii Land Use Order Objective (LUOO): Tlell Landscape Unit. Complete overlap with trapline area identifier: TR0613T012 and a guide outfitter area. Partial overlap with community facility – licence of occupation tenure. Complete overlap with one upland stream area watershed sub-unit. Partial overlap by two visual quality objective polygons: both are modification (VLI polygon 306 and 283).	This unit is located in the Tlell/Coast AOI polygon, roughly 50 m south of the Tlell Fire Hall. This unit forms a 100 m buffer between private properties and the Tlell Fire Hall. Stands are characterized by dense C-3 fuel types, stem density is over 4000 sph, and species composition is comprised of wester hemlock and Sitka spruce. This treatment is intended to protect the Fire Hall from wildfire and improve safe access and egress along Highway 16 in the event of a wildfire. Treatment recommendations include: TFB, prune (PRU) to 3 m, and SFR. There is an opportunity here to provide a fuel treatment demonstration.

FTU ID	FTU Name	Total Area (ha)	Priority	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
					High	Mod	Low	Very Low		
5	HALL-2	3.2	High	Linear-interface / recreation	3.2	0.0	0.0	0.0	Overlap with trapline area identifier: TR0613T012 and a guide outfitter area, complete overlap by two visual quality objective polygons: both are modification (VLI polygon 306 and 283). Complete overlap with ALR (polygon #4837387). Slight overlap with a community facility – licence of occupation tenure. Complete overlap with the Haida Gwaii Land Use Order Objective (LUOO): Tlell Landscape Unit and overlap with two upland stream area watershed sub-units.	This unit is located in the Tlell/Coast AOI polygon, roughly 50 m north of the Tlell Fire Hall. This treatment unit forms a 200 m buffer north of the Fire Hall along Highway 16 and encompasses part of the Anvil Trail. Stands are characterized by dense C-3 and C-5 fuel types. Crown base heights on mature conifers are relatively high (>3 m). Surface fuel loading is higher due to self thinning and pruning within the stand. This treatment is recommended to protect nearby residences, the fire hall, and to improve safe access and egress along Highway 16. Treatment recommendations include: SFR, and TFB. There is an opportunity for a treatment here to increase recreational/aesthetic values and provide a fuel treatment demonstration opportunity.
3	HILL-1^	22.1	Low	Linear-interface	9.2	12.2	0.7	0.0	Complete overlap with the Naikoon landscape unit and Naikoon Provincial Park and partial overlap with Haida Gwaii Land Use Order Objective (LUOO): two upland stream area watershed sub-units. Overlap with guide outfitter area.	This unit is located in the Masset/Tow Hill AOI polygon and is within Naikoon Provincial Park. This treatment unit forms a 150 m buffer along Tow Hill Road. Stands are characterized by M-1/2 60% and C-3 fuel types. Species composition is a mix of western hemlock and Sitka spruce. Tree mortality and standing dead contribute to heavier surface fuel loading. This treatment is recommended to protect private homes from wildfire and to improve safe access and egress along Tow Hill Road. Treatment recommendations include SFR, PRU, and TFB.
4	NAIKS-1^	9.1	Low	Polygon-interface /recreation	8.8	0.0	0.3	0.0	Complete overlap with Naikoon Provincial Park – Misty Meadows Campground, trapline area identifier: TR0613T012, a guide outfitter area and partial overlap with ALR polygon ID #4837387. Overlap with the Tlell landscape unit and two upland stream area watershed sub-units. Partial overlap with visual quality objective polygon: modification (VLI polygon #283). Partial overlap with mapped wetland (waterbody polygon ID #59147716). Complete overlap	This unit is located in the Tlell/Coast AOI polygon within and surrounding the Misty Meadows Campground in Naikoon Provincial Park. This treatment forms a 100 m buffer within and around the campground. Stands are characterized by C-3 and C-5 fuel types with high stem density and laddering potential into open crowns. Overstory species composition is composed of lodgepole pine and Sitka spruce. Surface fuel loading is moderate and dense salal and thick mosses contribute to potentially flashy surface fuels under dry

FTU ID	FTU Name	Total Area (ha)	Priority	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
					High	Mod	Low	Very Low		
									with red-listed ermine, haidarum subspecies (*Mustela erminea haidarum*), and partial overlap with blue-listed northern saw-whet owl (*Aegolius acadius brooksi),* species at risk occurrence.	summer conditions. This treatment it recommended to protect the park from wildfire but also to prevent the potential spread of fire from unattended campfires. Treatment recommendations include TFB, SFR and PRU.
7	PSEUT-1^	5.5	High	Linear-Interface	4.8	0.0	0.7	0.0	Complete overlap with Naikoon Provincial Park and directly adjacent to private land. Completely overlapped by trapline area identifier: TR0613T012 and a guide outfitter area. Complete overlap with red-listed ermine, haidarum subspecies (*Mustela erminea haidarum)* species at risk occurrence. Complete overlap with two upland stream area watershed sub-units and with the Tlell landscape unit.	This unit is located in the Tlell/Coast AOI polygon, within Naikoon Provincial Park and adjacent to private properties. This treatment forms a 100 m interface buffer between forested stands and private homes. Stands are characterized by dense C-3 and mature C-5 fuel types. Surface fuel loading is moderate though standing dead is expected to contribute to surface fuel loading in the future, dense salal and thick mosses also contribute to potentially flashy surface fuel accumulations under dry summer conditions. This treatment is recommended and an interface fuel break to protect values upwind. Treatment recommendations include TFB, SFR, PRU.
6	SANG-1^	13.5	Moderate	Polygon - interface	6.6	2.9	4.0	0.0	Completely overlapped by the Naikoon landscape unit and Naikoon Provincial Park, unit is situated directly adjacent to private land. Overlaps with the following Haida Gwaii Land Use Order Objectives (LUOO): two type I fish habitats, partial overlap with marbled murrelet nesting habitat, and partial overlap with two upland stream area watershed sub-units. Overlap with guide outfitter area.	This unit is located in the Masset/Tow Hill AOI polygon, within Naikoon Provincial Park. This treatment unit forms a 100 m buffer around private residences. Stands are characterized by a mix of C-3 and C-5 fuel types. Hemlock regeneration is dense in these stands and blowdown contributes to surface fuel loading. This treatment is recommended to protect interface neighbourhood upwind of treatment unit. Recommended treatments include: TFB, PRU and SFR.
8	TLELL-1^	29.3	High	Linear-Landscape	8.5	6.8	14.0	0.0	Partial overlap with the Tlall Conservancy and ALR (polygon #4837387), and complete overlap with trapline area identifier: TR0613T012 and a guide outfitter area. Overlap with one forest reserve area, opening ID: 1618496. Overlaps with the Haida Gwaii Land Use Order Objective (LUOO): Tlell Landscape Unit. Partial overlap with visual quality objective polygon: retention (VLI polygon #322) and modification (VLI polygon #306). Completely overlapped by three upland	This unit is located in the Tlell/Coast AOI polygon, and forms a 150 m landscape level fuel break. Stands are characterized by a mix of C-3, C-5, and M-1/2 50% fuel types. Primary species composition includes intermediate and merchantable Sitka spruce, stem density is over 2500 stems per hectare and conifer base heights are low. Supressed stems are dead and dying and are expected to contribute to surface fuel loading in the future. This treatment is recommended to protect

FTU ID	FTU Name	Total Area (ha)	Priority	Treatment Unit Type/ Objective	Wildfire Behaviour Threat				Overlapping Values / Treatment Constraints	Treatment Rationale
					High	Mod	Low	Very Low		
									stream area watershed sub-units. Partial overlap with Licence to Cut (LTC), client name: Haida Gwaii Green Diesel Ltd.	values upwind of a potential fire. Treatment recommendations include TFB, SFR, and PRU.



FTU ID	FTU Name	PRIORITY	AREA (HA)
1	FILL-1	Low	9.1
2	HALL-1	High	15.2
5	HALL-2	High	3.2
3	HILL-1	Low	22.1
4	NAIKS-1	Low	9.1
7	PSEUT-1	High	5.5
6	SANG-1	Moderate	13.5
8	TLELL-1	High	29.3

Map 7. Proposed Fuel Treatments.

5.1.2 Maintenance of Previously Treated Areas

The return interval for maintenance of treatment units depends upon site productivity and 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. Treated units should be assessed around the 5–10-year mark, but may not require maintenance for 15-20 years. Maintenance activities may include additional thinning, conifer regeneration reduction, or removal of excess woody debris generated over time from windthrow or other disturbance. Prompt re-treatment can avoid larger costs later, as regenerating conifers are small.

Dense regeneration of conifers was observed at the edges of cutblocks and roads, or where canopy openings allowed sufficient sunlight penetration. Maintaining crown closure in the fuel treatment implementation phase will be an important factor in maximizing intervals between maintenance treatments. Much of the AOI is flat and productive, and not moisture-limited.

Recommendations for fuel management activities in the AOI are summarized in Table 14 below.

Table 14. Summary of Fuel Management Recommendations

Section 5.1: Fuel Management					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
5	High	Proceed with detailed assessment, prescription development and treatment of fuel treatment units identified and prioritized in this CWPP. Work with BC Parks and forest licensees (where applicable) and the Council of the Haida Nation prior to funding applications to address any possible impact to values. Prioritize local work opportunities.	Reduce wildfire hazard in priority treatment units.	UBCM CRI program funding/local government funding	NCRD initiative
6	Moderate	When operational fuel treatments are conducted, treatment monitoring 5-10 years out should be completed by a qualified professional to assess the efficacy of the treatment and to schedule maintenance activities. This can be completed with a CWPP update or as a stand-alone exercise.	Ensure continued efficacy of treatment areas. Prompt re-treatment saves costs as regeneration is small.	UBCM CRI funding available	NCRD initiative

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 Neighbourhood Recognition Program (FSCNRP); and 3) recommended potential FireSmart activities that can be applied within the AOI in the future. Recommendations are summarized in Table 17 at the end of this subsection.

5.2.1 FireSmart Goals and Objectives

FireSmart® is the comprehensive nationally accepted set of principles, practices, and programs for reducing losses from wildfire.[38]The FireSmart approach and concepts, including recommended FireSmart guidelines,[39] 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). FireSmart includes seven disciplines: education, legislation and planning, development considerations, interagency cooperation, cross-training, emergency planning, and vegetation management. Together, these disciplines provide a sound framework for reducing wildfire risk to communities.

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;[40] 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.[41] Surviving homes in both urban and rural areas exhibited many attributes of FireSmart principles, regardless of the broader wildfire threat surrounding them.[41]

Home Ignition Zone

Multiple studies have shown that the principal factors regarding home loss to wildfire are the structure's characteristics and immediate surroundings.[41] The area that determines the ignition potential of a structure to wildfire is referred to as the Home Ignition Zone (HIZ).[42,43] The HIZ includes the structure

[38] FireSmartis the registered trademark held by the Partners in Protection Association.
[39]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 andis available at BC FireSmart: https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart
[40]https://www.firesmartcanada.ca
[41] 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.
[42] 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.
[43] Cohen, J. Preventing Disaster Home Ignitability in the Wildland-urban Interface. Journal of Forestry. p 15 - 21.

itself and four concentric, progressively wider Priority Zones out to 100 m from the structure. More detail on priority zones can be found in the FireSmart Manual.[44]

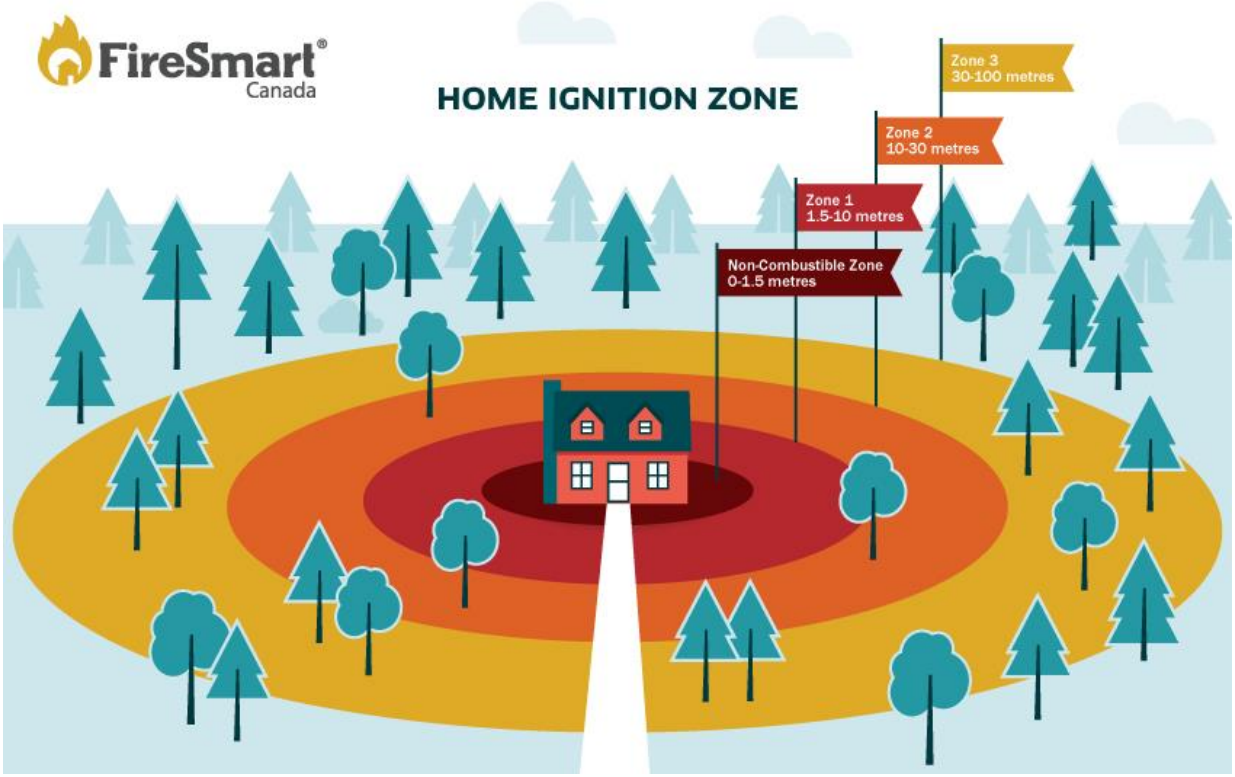


Figure 2. The Home Ignition Zone (HIZ) determines the likelihood of structure ignition during a wildfire event; the highest priority zones are located closest to the structure.[45]

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.[43] Increasing ignition resistance would reduce the number of homes simultaneously on fire; extreme wildfire conditions do not necessarily result in WUI fire disasters.[46] It is for this reason that the key to reducing WUI fire

[44]https://firesmartcanada.ca/ and https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/firesmart

[45] FireSmart Canada. Understanding the Home Ignition Zone. https://firesmartcanada.ca/what-is-firesmart/understanding-firesmart/home-ignition-zone/

[46]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.

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.

FireSmart Canada Neighborhood 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 Neighbourhood Recognition Program (FSNRP Program) is a 5-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.

Overall, FireSmart leads to communities that are better adapted to wildfire, more resilient and able to recover after a wildfire, 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.

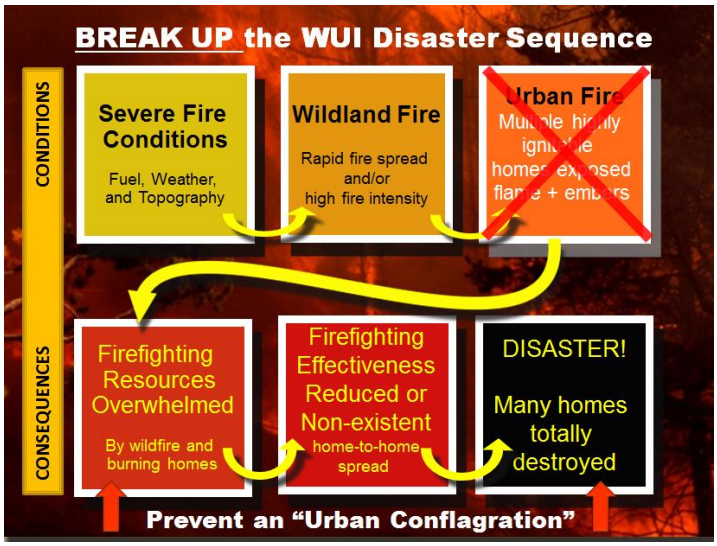


Figure 3. The wildland/urban interface disaster sequence and the possibility to break up the disaster sequence by decreasing the number of highly ignitable homes.[47]

5.2.2 Key Aspects of FireSmart for Local Governments

A community wildfire risk mitigation strategy requires coordinated action from local governments, developers, private land owners, and industrial operators. This section presents FireSmart activities, which when enacted, provide avenues for reducing fire risk on rural Graham Island. An evaluation of the current level of FireSmart implementation within the AOI is also presented in this section. All the activities listed in Table 15 are eligible for funding under the 2021 CRI FireSmart Community Funding and Supports program.

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

Table 15. FireSmart activities and their level of implementation in the AOI

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
Education (See Section 5.3)	• Install public signage, create social media strategy, create a FireSmart webpage, update websites and/or newsletters	Minimal public signage, no current social media presence, no official volunteer fire department website.
	• Distribute FireSmart educational materials and resources	Currently no FireSmart education materials are disseminated to residents.
	• Develop education for the reduction of local human-caused fires	Currently no public outreach program in place
	• Organize and/or host a FireSmart events and workshops (e.g., Wildfire Community Preparedness Day)	Currently no FireSmart events or workshops are being hosted.
	• Support neighbourhoods to apply for FireSmart Canada Neighbourhood Recognition Program	No applications have been submitted.
Planning (See Section 2.5)	• Develop or amend a CWPP	In progress.
	• Develop FireSmart policies for the design and maintenance of public land and infrastructure, such as regional parks, or buildings	Not achieved
	• Conduct FireSmart Assessments for critical infrastructure (e.g., Tlell Fire Hall)	No FireSmart assessments have been completed to this date.
Development Considerations (See Section 2.5)	• Amend OCPs or bylaws to incorporate FireSmart principles	Not yet achieved
	• Revise zoning documents to include FireSmart considerations	Not yet achieved
	• Establish Development Permit Areas for Wildfire Hazard	Not yet achieved
	• Include wildfire prevention and suppression considerations in the design of subdivisions	Not yet achieved
Interagency Cooperation	• Develop, coordinate and/or participate in a Community FireSmart Resiliency Committee	Involve planning and emergency management staff.
Cross-Training (See Section 6.1)	• Provide or attend training for Local FireSmart Representatives (LFR)	Not yet achieved
	• Recruit and support LFRs to attend facilitator training	Not yet achieved
	• Cross-train volunteer fire department members ○ SPP-WFF-1 Wildland Firefighter Level 1	Only S-100 training thus far.

FireSmart Discipline/CRI Funding Category	FireSmart Activities	Current Status
	○ S-100 Basic fire suppression and safety ○ S-185 Fire entrapment avoidance and safety ○ ICS-100	
	• Cross-train emergency management personnel: ○ ICS-100 ○ Professional development to increase capacity for FireSmart activities	Not yet achieved
Emergency Planning (See Section 2.5.1)	• Develop and/or participate in cross-jurisdictional meetings and tabletop exercises focused on wildfire preparedness	Not yet achieved
	• Assess structural protection capacity	Areas with suppression challenges have been identified.
	• Use and/or promote EMBC Wildfire Preparedness Guide for community emergency preparedness events focused on wildfire	Not yet achieved
Vegetation Management (See Section 5.1)	• Undertake fuel management on publicly owned land (fuel management prescriptions, treatments, maintenance, or prescribed burns)	Not yet achieved
FireSmart Projects for Critical Infrastructure (See Section 3.2)	• Replace building materials with fire-resistant materials	Not yet achieved
	• Remove or reduce flammable vegetation up to 100 m from critical infrastructure	Not yet achieved
FireSmart Activities for Residential Areas (See Section 5.2.3)	• Develop plans for residential areas ○ Conduct HIZ assessments for individual properties ○ Develop FireSmart Neighbourhood Plans ○ Undertake Neighbourhood Wildfire Risk Assessments for neighbourhoods pursing FSCCRP	Not yet achieved
	• Offer FireSmart rebate program	Not yet achieved
	• Provide vegetative debris disposal for homeowners ○ Provide a dumpster or chipper ○ Waive tipping fees	Not yet achieved
	• Provide curbside debris pick-up	Not yet achieved

5.2.3 Priority Areas within the AOI for FireSmart

This section identifies priority areas within the AOI that would benefit from FireSmart activities, assesses FireSmart compliance within the AOI, and provides recommendations for FireSmart programs to improve compliance. Recommendations surrounding communication and education are found in Section 5.3.

Priority areas are based on informal field observations, communication with the Wildfire Working Group, local wildfire threat (Section 4.3), and level of FireSmart implementation. Recommended FireSmart activities are essentially the same for each neighborhood or area; however, it is recommended that the NCRD prioritize the neighborhoods in Table 16.

Table 16. Summary of FireSmart Priority Areas.

Area/Neighbourhood	FireSmart Rationale	Suggested Priority Actions
Priority Area #1: Sangan Road	Highly intermixed; dense C3 fuel types surrounding homes; outside of Fire Protection and Rescue Service (FPRS) area boundary.	Widen road/thin roadside trees; Promote FireSmart, especially vegetation setbacks
Priority Area #2: Nadu Road	Highly intermixed; long narrow, forested drives; dense C3 fuel types surrounding homes; outside of FPRS area boundary	Promote FireSmart, especially vegetation setbacks, and firewood/fuel storage, and the non-combustible zone. Consider residential exterior sprinkler systems/water cisterns
Priority Area #3: Andrews Place Road	Highly intermixed; long forested drives	Promote FireSmart, especially vegetation setbacks, and firewood/fuel storage, deck enclosure, vent screening and the non-combustible zone. Consider residential exterior sprinkler systems/water cisterns
Priority Area #4: Richardson Road and Wiggins Road	Intermixed, long private, forested drives, dense vegetation below distribution lines	Promote FireSmart, especially vegetation setbacks and the non-combustible zone.
Priority Area #5: Tow Hill Road (west)	Long forested road, unpaved, outside of FPRS area boundary.	Promote FireSmart, especially vegetation setbacks, and firewood/fuel storage, deck enclosure, vent screening and the non-combustible zone.
Priority Area #6: Critical Infrastructure – Fire Hall	Dense C3 fuel type along backside of building	Promote FireSmart, especially vegetation setbacks

FireSmart Compliance within the Area of Interest

FireSmart compliance on private properties in the AOI is moderate. Within the AOI, there is variability between homes that do and do not maintain 10 m defensible space. Common concerns seen through-

out the AOI include: long narrow, forested drives, wooden construction buildings, accumulations of combustible materials on private property, and the lack of defensible space between property footprints and adjacent forested/grassland areas. Most homes in the AOI are in intermix neighborhoods or are on larger acreages surrounded by forest and/or grassy fields. Storage of combustible items (flammable building materials, firewood, propane cylinders) under decks, carports, and other horizontal surfaces was observed. Nevertheless, there were also residences in compliance with FireSmart guidelines that were surrounded by mowed and maintained lawns, and with 10 m conifer setbacks. It should be noted that grassland or non-irrigated hay fields (O-1a/b fuel type) can carry a fast-moving surface fire when grass is cured, and so FireSmart should be a priority for homes surrounded by grassland as well as forest. Nevertheless, the majority of structures within the AOI have Class A (high resistance to fire) roofing materials (metal roofs and asphalt shingles), which is a critical component of preventing structure ignition.

Figure 4. Intermix structures with wood siding and combustible material stored within the home ignition zone, typical throughout the AOI.

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 NCRD can facilitate uptake within the AOI by: 1) encouraging self-organization under the FireSmart Canada Neighbourhood Recognition Program;2) encouraging Home Ignition Zone assessments;3) targeting delivery of FireSmart presentations and workshops in FireSmart priority areas; 4) offering FireSmart rebate programs to homeowners who complete eligible retrofits and yard work; 5) 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 or providing curbside debris pick-up.

FireSmart demonstration projects, should be held at the Tlell Fire Hall and should 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,[48] and demonstration Home Ignition Zone fuel treatments. Ideally, these projects would include elements of public education (e.g., signage, public tours, active demonstrations of operations, etc.).

[48]FireSmart Canada. FireSmart Guide to Landscaping, Second Edition. Retrieved from: https://firesmartcanada.ca/wp-content/uploads/2020/06/328254-PIP-Landscape-low-res.pdf *Note that a guide specific to BC will be released by FireSmart BC this spring (2021).

Table 17. Summary of FireSmart Planning and Activities Recommendations

Section 5.2: FireSmart Planning and Activities					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
7	High	The NCRD should continue to ensure that one or more local fire department staff or community members are trained as Local FireSmart Representatives to assist the various communities in complying with FireSmart principles at the neighborhood and individual home-level.	Enable delivery of public education programs and FireSmart assessments	LFR training currently free online by FireSmart BC; costs of attending training fundable by UBCM CRI	NCRD initiative
8	Moderate	Apply for funding from the UBCM CRI 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 high or extreme risk in a FireSmart home and property assessment. The rebate program is described in detail in the CRI Program 2021 FireSmart Community Funding and Supports (FCFS) program and must adhere to the goals and objectives of FireSmart, as outlined in Section 5.2.1. Before applying for funding, NCRD resources available to execute the program should be reviewed.	Improve local uptake of FireSmart programming.	Local/UBCM Funding. FireSmart Community Funding & Supports program funding	NCRD initiative. May be facilitated by a part-time LFR
9	Moderate	Consider offering driveway chipping services with the help of the Tlell Fire Department or a Local FireSmart Representative if possible. Consider offering chipping services as an incentive for participating in a FireSmart workshop. Education of FireSmart yard and landscaping principles, including chipping specifications should be incorporated into the program. Programs should be available during times of greatest resident activity (likely spring and fall).	Encourage vegetation management on private property and the safe disposal of woody debris	Eligible for UBCM CRI Program funding. Example cost is $7,400: chipping contractor costs (four 8-hour days @ ~$200 per hour); $1000 for outreach/advertising	NCRD initiative

Section 5.2: FireSmart Planning and Activities					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
10	Low	Complete or schedule periodic updates of the CWPP to gauge progress and update the threat assessment (hazard mapping) for changes in fuels, forest health, land planning, or changes to stand structure. The frequency of updates is highly dependent upon major changes which would impact the NCRD'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.	Ensure continued effectiveness of wildfire protection planning.	CRI/UBCM funding available	NCRD initiative
11	Moderate	Create a FireSmart demonstration site, funded if possible through the CRI program. The grant could cover retrofits to the Tlell Fire Hall and/or vegetation management surrounding the hall or Anvil Trail as recommended in this CWPP. Combine with signage and point out aspects that are already FireSmart.	Improve local FireSmart awareness and mitigate risk around the Tlell Fire Hall. Supported by the Tlell Fire Department	UBCM/CRI funding may be available. Grants of this nature were available in 2021 under the FireSmart Economic Recovery Fund	NCRD initiative

5.3 COMMUNICATION AND EDUCATION

Community education and engagement is a key aspect of a successful wildfire risk mitigation strategy. Moving from a CWPP to the implementation of specific actions requires that the public and stakeholders are aware of the reasons for and benefits of specific activities. A communication strategy must be enacted to effectively build support for actions that are being undertaken in the community.

FireSmart educational material is readily available and simple for governments 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. To strengthen community engagement, the CWPP must be made available to the public.

The NCRD has not undertaken much public education or outreach in the community or online. Since the NCRD is based out of Prince Rupert, most in-person outreach will have to come from the Tlell VFD. Public engagement can be improved through community events and the distribution of learning materials in person or on community bulletin boards and online. A Tlell VFD member has recently been trained as a Local FireSmart Representative (LFR).

There is a Fire Danger Rating sign by the BC Parks office in Tlell that is regularly updated during the fire season. It is recommended that an additional Fire Danger Rating sign is procured and installed along Tow Hill Road. This is a strategic location for a second sign because of the popularity of Agate Beach and Tow Hill for tourist use during summer months. Furthermore, the NCRD should work with BC Ferries to have local fire danger and fire bans announced on all incoming ferry rides during the fire season.

Social media could also be used to engage the public with fire danger information, advisories, and educating homeowners about FireSmarting their properties. The NCRD, in partnership with the Tlell VFD, should consider holding a wildland specific Fire Prevention Day, or similarly formatted event, in the spring prior to the wildfire season. Timely educational materials to increase preparedness would be most effective immediately prior to the fire season.

Bringing organizations and surrounding communities 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 NCRD should consider developing a Community FireSmart Resiliency Committee to coordinate wildfire risk reduction efforts with local governments (First Nations or municipal), BC Parks, MFLNRORD, forest tenure holders, and other stakeholders. Such a committee will also facilitate a shared understanding of wildfire risk mitigation and prevention.

Some private land areas in the AOI (surrounding and south of Tlell) are overlapping with Agricultural Land Reserves (ALRs), supporting livestock and small-scale produce production. The agriculture sector faces unique challenges with respect to wildfire planning and preparedness (including but not limited to

livestock relocation). Consequently, the Climate & Agriculture Initiative (CAI)BC, in collaboration with partners and through workshops delivered in various agriculture communities in BC, has developed wildfire planning resources specific to the agriculture sector. These resources incorporate FireSmart practices and facilitate collaboration and communication with local government. Recognizing and disseminating these CAI resources[49] to the ranching/agriculture community in the NCRD will promote improved planning and preparedness and encourage FireSmart practices on private farmland. FireSmart Canada offers a workshop on farm and ranch preparedness, which the Tlell LFR has participated in.

Recommendations for communication and education are summarized in below in Table 18.

[49]BCAG Climate Action. 2020. Wildfire Preparedness and Mitigation Plan – Guide and Workbook. Retrieved from: https://www.bcagclimateaction.ca/library/wildfire-preparedness/.

Table 18. Summary of Communication and Education Recommendations

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
12	High	The NCRD should consider installing a Fire Danger rating sign on Tow Hill Road on the way to Agate Beach. This sign, along with the sign by the BC Parks office should be updated regularly during the Fire Season (April – October). Responsibility for updating the new sign should be discussed between the NCRD, BC Parks, and the Village of Masset/Old Massett.	High levels of tourism in the AOI makes communicating fire danger and associated fire bans important	~$5,000 for signage, Local government funding	NCRD in collaboration with VFDS and/or BC Parks
13	High	Develop a FireSmart/Wildfire Preparedness page on the NCRD website and use all available media platforms (radio, newsletters, television channels, social media, websites, and local bulletin boards) to publicize FireSmart activities that are underway, promote FireSmart events, and communicate messages on fire risk and preparedness during the fire season.	Improve FireSmart awareness and resources. Aligns with recommendations in NCRD Electoral Area E (Sandspit) CWPP.	~40 hours to design webpage. Additional daily/weekly hours to implement and update depending on strategy.	NCRD initiative
14	High	Promote FireSmart to local residents through FireSmart workshops and/or presentations. Aim to conduct the engagement/promotion campaign prior and during the fire season. Supply FireSmart resources to homeowners during these engagement campaigns and promote the FireSmart Begins At Home mobile app as a method of conducting home assessments.	Improve FireSmart awareness and compliance in the AOI.	~20 hours. UBCM CRI Program funding available. Example workshop cost: $1,700 consultant costs (20 hrs @ 85/hr); $1,500 advertising costs	NCRD initiative. May be facilitated by a part-time LFR

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
15	Low	Promote and provide information to private landowners related to exterior residential sprinklers as a FireSmart prevention measure, especially targeting residents outside of the Fire Protection Area. At FireSmart events distribute information on exterior sprinkler component parts, manufacturers, and water supply system requirements to ensure they are effective measures to wet down homes and Fire Priority Zone 1 (0-10 m) and discourage home ignition.[50]	Improve structure protection.	10-20 in-house hours to prepare materials and disseminate information to landowners.	NCRD initiative, uptake via private residents
16	Low	Consider working with local hardware stores and general store on Graham Island to improve education of homeowners and remove some barriers to FireSmart action. Initiatives may include: 1) Advocating for a FireSmart branding in stores (could be stickers on shelf pricing or a FireSmart-specific section) to increase public exposure to projects that can be done at a relatively low cost. 2) Compile a database of local service providers and retailers which can help to install or complete FireSmart home improvements. 3) Develop general cost implications of improvements so property owners can prioritize replacements.	Improve public education and awareness, reduce barriers to action for homeowners and share the burden for public education with the private sector	~60 hours	NCRD initiative in partnership with local stores, i.e., Coop

[50] Example: https://waspwildfire.com/products/gutter-mount-sprinkler-system/

Section 5.3: Communication and Education					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
17	Moderate	Promote improved planning and preparedness of ranchers/agriculture producers in the NCRD and encourage FireSmart practices on private farm land through distribution or sharing of wildfire action planning resources prepared specifically for the agriculture sector by the BC Agriculture & Food Climate Action Initiative (i.e., on improved NCRD website, mailouts).	Improve wildfire preparedness amongst agriculture producers and ranchers.	~15 - 20 in-house hours (local government funding). May be eligible for UBCM CRI program funding	NCRD initiative
18	Moderate	The NCRD should work collaboratively with BC Ferries to announce fire danger and any local fire bans on incoming ferries during the summer.	Improve public awareness of fire danger and associated fire bans on Haida Gwaii. Supported by Tlell Fire Department	~20 in-house hours (local government funding) and BC Ferries hours	NCRD initiative in partnership with BC Ferries

5.4 OTHER PREVENTION MEASURES

In addition to policy changes (Section 2.5), fuel management (Section 5.1), FireSmart planning and activities (Section 5.2), and public communication and education (Section 5.3), there are additional measures that local governments can take as part of a wildfire risk mitigation strategy. Working with local BC Parks staff and forest land managers can reduce wildfire risk, increase UBCM funding opportunities and allow the NCRD to obtain valuable local knowledge.

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. Engagement can be formal or informal and can take place through existing communication channels. Relevant recommendations are summarized in Table 19.

Table 19. Summary of Other Prevention Measures Recommendations

Section 5.4: Other Prevention Measures					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
19	Moderate	Consider developing a rationale for reduced stocking standards applicable to the NCRD, by employing a qualified wildfire management professional, and in consultation with the Fuel Management Specialist (Coast Fire Centre) and MFLNRORD. Engage private land owners and forest tenure holders to apply the MFLNRORD approved reduced fire management stocking standards in the wildland urban interface to reduce interface wildfire threat.	Reduce wildfire hazard in regenerating forest stands in the wildland urban interface. Cutblocks were frequently assessed as having higher wildfire threat during field visits	$3,000 - $ 5,000 local government funding	NCRD initiative, in collaboration with forest tenure holders
20	Moderate	Work with forest tenure holders to ensure that high risk activities, such as vegetation management, pile burning and harvesting do not occur during high/extreme fire danger times to reduce chance of ignitions as per the Wildfire Act.	Increase wildfire awareness and compliance amongst resource/industrial workers/ and backcountry users.	4-8 in-house hours	NCRD initiative in collaboration with forest tenure holders

Section 5.4: Other Prevention Measures					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
21	High	Develop and work with First Nations (CHN) and all key stakeholders (BC Parks, forest tenure holders, MFLNRORD, BCWS, NCRD staff) to formalize a Community FireSmart Resiliency Committee. The purpose of the committee would be to identify wildfire related issues in the area and to develop collaborative solutions to minimize wildfire risks. The following subject areas are recommended for the group to explore: 1) Harvest planning to integrate existing and planned fuel breaks with future cutblocks to address identified hazardous fuel types and spotting potential; 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.	Collaboration and communication will facilitate wildfire protection planning and help streamline funding applications, plus ensure that work isn't unnecessarily duplicated	A 'Community FireSmart Resilience Committee' is eligible for funding. Total cost ~$7,000 (local government costs): ~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	NCRD initiative in collaboration with key stakeholders (forest tenure holders, MFLNRORD, BCWS, BC Parks) and CHN staff.

SECTION 6: WILDFIRE RESPONSE RESOURCES

This section provides a high-level overview of the local government resources available for interface wildfire suppression. 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.[51].The aforementioned document establishes a protocol for collaborative and integrated emergency management in the event of WUI fires within British Columbia. Recommendations for wildfire response are summarized in Table 21 at the end of this section.

6.1 LOCAL GOVERNMENT FIREFIGHTING RESOURCES

Informal mutual aid agreements exist between the Tlell Volunteer Fire Department (VFD) and the Masset/Old Massett, Port Clements, Queen Charlotte/Skidegate and Sandspit VFDs. In the event of a wildfire in the AOI, response would come from the closest VFD, with a Response Officer deployed from the MFLNRORD office in Queen Charlotte. Incident Command support may also be provided remotely from BCWS on the mainland.[52] BCWS crews would be mobilized to the fire if more resources were required.

Table 20 provides an overview of the fire services capacity in the AOI, including fire department personnel and equipment. The Tlell Fire Protection and Rescue Service Area (FPRS) covers most of the Coast/Tlell WUI. Nevertheless, the Tlell VFD regularly responds to calls outside of its service area, roughly once or twice throughout the year. The Masset/Old Massett VFDs currently respond to fires in Tow Hill. However, response is limited because Tow Hill is outside of the Masset fire service area and water availability in Tow Hill is poor. It is recommended that the NCRD undertake a public approval process to determine the feasibility of expanding fire service boundaries to include Tow Hill, and review response capacity. Possible solutions include establishing a local fire brigade and/or equipment cache, obtaining a water tanker, or installing a water cistern. This review process should involve the Tow Hill Community Association and the Village of Masset/Old Masset VFDs, as solutions must take into account available resources and existing department configurations.

The Tlell VFD responds mainly to structural fires, and some wildland fires and calls related to unattended fires. 2018 and 2019 were both above average years for call outs- most calls were to unattended campfires. Unattended campfires can be hazardous under strong wind conditions and have been the source of numerous historical fires in the AOI, however small. Driftwood accumulations can ignite and there is the potential for burning embers to be blown towards residences.

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

[52] Personal communication with Vic Upshaw, Wildfire Technician Fraser Fire Zone

Fire protection equipment includes a pumper truck with 1400-gallon tank and a rescue truck. The pumper truck is well equipped for wildfire response, with a 1500-gallon portable bladder, hose, multiple portable pumps, and 40 feet of suction line which allows the pumper to be filled from natural water sources. The Tlell VFD also has access to a BCWS cache in Tlell that is supplied with a portable Wajax pump and accessories, suction hose, 1.5-inch hose (1500 feet/15 lengths), ¾ inch hose (600 feet/12 lengths), hand tools (shovels, Pulaskis), and safety equipment (gloves, hard hats, Nomex coveralls etc.) for 6 to 10 people. Additional BCWS caches are located in Port Clements, Queen Charlotte, and Sandspit (Moresby Island). The Tlell VFD currently has 12 on-call volunteers. In consultation with the Wildfire Working Group, it was determined that volunteer recruitment and retention, average high age of volunteers, training, and deficiencies in wildland firefighting equipment are challenges for the department. Additional wildland equipment needs identified by the VFD includes additional forestry hose and a new pump tool kit, and a "beach-attack" ATV with a 150-gallon slip-on water tank that can be replaced with stretcher. In communication with the Wildfire Working Group, it was noted that the Tlell VFD rescue pickup truck is insufficient for responding to beach fires or medical events.

Table 20. Fire department capacity and equipment within the AOI.

WUI Area	Fire Department	Number of Stations	Number of Members	Apparatus type and number
Coast/Tlell	Tlell Volunteer Fire Department	1	12 volunteers	1 pumper truck (840/1400/20F)[53] 1 rescue truck 1500 imp. gal. bladder, 5 mobile pumps (Honda, Wajax Mark 5, BMW), 40 feet 6" suction line. Utility trailer w/ pump and hose BCWS cache
Tow Hill	Masset Volunteer Fire Department	1	14 volunteers	1 pumper truck (840/800), 1 rescue/first-aid vehicle No wildland equipment
	Old Massett Volunteer Fire Department	1	8 volunteers	2 pumpers (840/800, ?) 1 rescue/first-aid vehicle No wildland equipment
North Port Clements	Port Clements Volunteer Fire Department	1	20 volunteers	1 pumper (1500/900/30F), 1 rescue pumper 1 tanker (1500 imp. gal.) BCWS cache

Industrial and commercial operators in the AOI also have a role to play in wildfire support and response. Forest tenure holders and utility operators are required under the *Wildfire Act* and *Wildfire Regulation* to have adequate capacity for fire suppression when carrying out high-risk activities on both private and

[53] Apparatus statistics: pumping capacity in imperial gallons per minute/water tank capacity (imp. gal)/foam tank capacity (imp. gal.). From personal communication and https://fire.fandom.com/wiki/

public land. High-risk activities include mechanical land clearing, right-of-way maintenance, and the operation of heavy equipment for forest harvesting. Keeping rights-of-way clear of vegetation is a priority within the AOI due to the fast regrowth of vegetation. There is also an increased possibility that right-of-way vegetation could ignite during an earthquake due to damaged transmission infrastructure.

6.1.1 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).[54]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 supply for fire suppression in the AOI is sourced entirely from natural sources. With the use of the 1500-gallon pumper truck and 40 feet of suction line, the Tlell VFD is able to draft from various ponds and rivers with road access. The Tlell VFD has expressed that they are considering installing a water cistern along Richardson Road where natural water availability is scarce during winter months. Installing the cistern will buy firefighters time to shuttle water with the pumper truck. Despite the lack of a serviced water system and fire hydrants in the AOI, water availability for fire suppression is more resilient to a power outage, which can cause water systems reliant on pump stations to fail in a wildfire event.

In the North Port Clements WUI, the Port Clements VFD also relies on a pumper truck (900 gallon) and tanker (1500 gallon) combined with natural water sources for fire suppression, as there are no hydrants outside of the municipality. The 2021 Port Clements CWPP recommended that the VFD look into obtaining an off-road capable tanker truck to aid in wildland fire response. Many roads outside of population centers are rough forestry roads.

Water availability for fire suppression in the Tow Hill WUI is limited. The Masset and Old Massett VFDs both have moderate-volume pumper trucks (800 imperial gallons) but no tankers, portable pumps, or drafting capacity. As discussed in Section 6.1, it is recommended that the NCRD undertake a review of fire protection in Tow Hill and consider options to improve response and water availability in collaboration with Masset and Old Massett, and/or the Tow Hill Community Association.

Although the Tlell VFD is well-equipped to draft from natural water sources, some of these sources are at risk of drying or experiencing reduced water levels during drought events, which typically coincide with high and extreme fire danger rating days. Furthermore, as drafting is a complicated process, issues can arise that can impact fire suppression efficiency and effectiveness. It is recommended that the NCRD

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

work with BCWS to develop a contract to outsource a water tender/tanker to shuttle water to a wildfire when drafting is infeasible. Fire departments on Haida Gwaii have considered pursuing funding for a shared 4x4 water tender with draft capacity that could be stored centrally in Port Clements.[55]

6.1.2 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, Highway 16 is the arterial route north-south through the AOI. It connects all the communities on Graham Island. At Masset, Highway 16 ends and Tow Hill Road extends east. There is also a series of gravel Forest Service Roads (FSRs) that provide access to areas of commercial harvesting but are not secondary egress options. In the event of an emergency, evacuation would be conducted by first responders, including the Tlell VFD. If a wildfire were to block Highway 16 or Tow Hill Road, evacuation from the AOI would be difficult. Smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

The majority of developments within the AOI are located on single access roads; Tow Hill Road, Andrews Place Rd, Richardson Rd, and Wiggins Rd were identified during the field visit as neighbourhoods of concern. Furthermore, there is a significant portion of land within the AOI which is inaccessible by roads.

The creation of a wildfire access plan that displays the road and trail network available for fire departments, forest licensees, and/or BCWS to use to access a wildfire should be considered. The plan should include georeferenced maps with associated spatial data and ground-truthed locations of non-fuel areas, water bodies, potential firebreaks, roads and trails, and values at risk. Information on gates and ownership would also be helpful. Because of the prevalence of logging in the AOI, both current and historical, many mapped forestry roads are now deactivated. This is a barrier to access in the event of a wildfire. It is recommended that information on current road status and active logging is regularly incorporated into the plan. In addition to providing the safest, quickest, and easiest access routes for emergency crews, a map book 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.

Accurate and visible house numbering is also critical for emergency access and evacuations and is an important part of 911 service provision. Although the NCRD has a house numbering bylaw for rural Graham Island, compliance is generally weak and resources for enforcement are limited. Furthermore, addresses are often unreflective and not adequately visible. As many properties within the area have long driveways, having well-marked addresses is important for effective evacuation and fire response. A complete spatial dataset of civic addresses would also support the delivery of 911 service on Haida

[55] All Island Fire Chiefs Meeting November 21, 2019

Gwaii, consistent with recommendations in the other CWPPs recently developed on Haida Gwaii. Funding is available from UBCM through the Community Emergency Preparedness Fund (CEPF) that the NCRD can apply for to undertake evacuation planning as well as EOC training exercises.

6.1.3 Training

Members of the Tlell VFD undergo training focused on structural firefighting but lack extensive wildfire related training. Nevertheless, some members have S-100 training. All members have twice-annual portable pump training. Some members of the Masset, Old Massett, and Port Clements VFDS have S-100 training.[56] It is recommended that all volunteer firefighters have at a minimum S-100 and/or SPP-WFF-1[57] (or equivalent) training, and that the VFD members continue to engage in yearly practical wildland fire training that covers portable pumps, safety, and wildland suppression tactics. The aforementioned training opportunity could be expanded to include BCWS and/or other fire departments on Haida Gwaii and take the form of a joint wildfire simulation exercise. This level of training would improve wildfire preparedness on Haida Gwaii and aligns with CWPP recommendations made to the Sandspit, Masset/Old Masset, Port Clements, and Queen Charlotte VFDs. The Haida Gwaii fire departments should consider asking BCWS to assist virtually with a training event, given the time and expense for travel to Haida Gwaii. Strong communication and the will to collaborate already exists between fire departments on Haida Gwaii, and annual All-Island Fire Chiefs meetings have taken place since 2018.

It is recommended that the delivery of the OFC WWF-1 Train the Trainer course on Haida Gwaii is prioritized. It is a 6-hour permanent course that can be delivered to selected fire department members in 2-hour blocks to fit into normal training nights. Having local trainers will enable local fire departments to sustain WFF-1 training and meet the baseline training requirements for deployment to wildland fires.[58]

6.2 STRUCTURE PROTECTION

The Tlell VFD is not equipped with a Structural Protection Unit (SPU). 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, and it is recommended that VFDs on Haida Gwaii continue to work collaboratively to obtain a shared SPU.

[56] Masset and Old Masset Community Wildfire Protection Plan (2021); Port Clements Community Wildfire Protection Plan (2021).
[57] SPP-WFF 1 is a new S-100 equivalent course for structural firefighters only. It also replaces S-185 (Fire Entrapment Avoidance) and only takes 6 hours to be delivered.
[58] July 2020 communication with Dakota O'Donovan, BCWS

An important component of structure protection is ensuring homes are as fire-resilient as possible. The application of FireSmart principles in the AOI are described in Section 5.2. Residents and community maintenance staff should be encouraged to take a building envelope – out approach, that is, starting with the home and working their way out. Addressing little projects first can allow for quick, easy, and cost-effective risk reduction efforts to be completed sooner, while larger, more costly projects can be completed as resources and planning allow. For example, prior to the fire season, clearing roofs and gutters of combustible materials (leaves and needles), cleaning out any combustible accumulations or stored materials from under decks, moving large potential heat sources such as firewood, spare building materials or vehicles as far from the structure as possible, maintaining a mowed and watered lawn, removing dead vegetation, and pruning trees are actionable steps that residents can start working on immediately. The following link accesses an excellent four-minute video demonstrating the importance of FireSmart building practices during a simulated ember shower: http://www.youtube.com/watch?v=_Vh4cQdH26g.

Table 21. Summary of Wildfire Response Resource Recommendations

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
22	Moderate	Pursue funding opportunities for wildland specific equipment for the Tlell Fire Department, and/or petition BCWS to augment the Tlell cache. Desired equipment includes more ¾ and 1.5 inch wildland hoses for the cache, and a 'beach attack' ATV for responding to beach fires and medical calls. The ATV should include a slip-on 150 gallon water tank that can be replaced with a stretcher.	Upgrade wildland firefighting suppression resources according to recommendations from the Tlell Fire Department. Existing vehicles not suitable for beach response.	NCRD or grant funding, not eligible through UBCM CRI; BCWS	Tlell VFD initiative; NCRD may support through funding; or BCWS
23	High	Prioritize the delivery of a SPP-WFF1 Train the Trainer course on Haida Gwaii. Select members from each fire department to participate and deliver SPP-WFF1 annually to each fire department.	SPP-WFF1 can be delivered annually to all fire departments. Cost to attend training is prohibitive and not all Tlell fire department members are trained in S-100/SPP-WFF1. Supported by local fire departments	UBCM CRI program funding available	NCRD initiative in collaboration with Haida Gwaii fire departments
24	High	The Tlell fire department should determine funding for and feasibility of installing a water cistern on Richardson Road to increase the availability and distribution of water for wildfire suppression. Water sources should be regularly inspected to ensure they have adequate supply in the event of a fire. Consider other locations as well, such as Lawnhill/Miller Creek.	Richardson Road lacks natural water sources. A cistern would give time to fill pumper from river.	NCRD or grant funding, not eligible through UBCM CRI. 500-gallon steel cistern ~$1,000 plus shipping	Tlell VFD initiative; NCRD may support through funding

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
25	High	The NCRD should work with local governments to update civic address data throughout the island, followed by advocacy for the expansion of a 911 Public Safety Answering Point (PSAP). A feasibility analysis should be conducted in consultation with relevant stakeholders, such as local first responders.	Improve emergency response by enabling 911 on Haida Gwaii. Significant support from local first responders.	~40-80 hours per municipality / community	NCRD initiative in collaboration local governments and with the Province of BC
26	Moderate	Complete and participate in regular testing of, and updates to, the evacuation plan for Electoral Area D. Procedures for evacuation of livestock should be included in the plan.	Lack of cell service and large area complicates evacuation. Testing will help identify any weaknesses	~10-30 hours to plan and stage; 8 hours to complete testing. UBCM CEPF funding available	NCRD initiative
27	High	Develop an Emergency Access Map for the NCRD to inventory trail and road network for strategic fire suppression planning. Ground-truthed locations of existing and potential fuel breaks, water sources, Local Fire Threat and tenure holders contact information should be incorporated within the map. The map should be included in the Emergency Response Plan and shared with fire suppression personnel, BCWS, BC Parks and forest tenure holders to support emergency response in the event of a wildfire. The map should be reviewed as needed to incorporate additions and/or changes, especially as forestry roads are built or deactivated.	Increase knowledge of wildfire suppression access points within parks and forested areas.	~8,000-$10,000 to build plan, map, populate attributes and update (contractor estimate)	NCRD initiative contracted out
28	Moderate	The Tlell VFD should aim to establish formal mutual aid agreements with all Volunteer Fire Departments within Haida Gwaii (Masset, Old Massett, Port Clements, Skidegate, Queen Charlotte and Sandspit). Currently, the only formal agreement is between Skidegate and Queen Charlotte VFDs.	Insurance protection.	Local government funding	Tlell VFD initiative; NCRD may support

Section 6: Wildfire Response Resources					
Item	**Priority**	**Recommendation / Next Steps**	**Rationale**	**Estimated Cost ($) or Person hours**	**Resources**
29	Moderate	The NCRD should undertake a public approval process to determine the feasibility of expanding fire service boundaries to include Tow Hill. In conjunction, water availability should be reviewed. Possible solutions include a local fire brigade/equipment cache, water tanker, or cistern. The Masset/Old Masset VFDs and the Tow Hill Community Association should be involved in the process.	There is no formal fire protection in Tow Hill. Current protection by Masset/Old Masset VFDs is limited: outside of service area, and lack of water availability.	Local government time. Comprehensive fire services reviews may be funded and outsourced to specialized consultants.	NCRD initiative; collaboration with the Village of Masset and Old Masset; Tow Hill Community Association
30	Moderate	Tlell VFD should work with other fire departments on Haida Gwaii to initiate an annual wildland fire training day. As part of the training, it is recommended to conduct annual reviews to ensure PPE and wildland equipment resources are complete, in working order, and the crews are well-versed in their set-up and use. Training should include completion of a joint wildfire simulation exercise and safety training and could leverage the expertise of BCWS through virtual platforms.	Improve ability to respond to wildfires and strengthen relationship with BCWS	Volunteer time; not currently eligible for CRI fund	Tlell VFD initiative
31	Moderate	Consider acquiring a Type 2 SPU trailer to improve wildfire response (provides protection for 25-30 residences) for Graham Island. An SPU could be shared between all fire departments on Haida Gwaii. If an SPU is obtained, pursue funding to train fire members in SPP-115 (the application of SPUs).	Improve available firefighting resources.	$100,000-$150,000 depending on configuration. SPP-115 funded by UBCM CRI	Tlell VFD initiative

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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 A-1).
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-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.
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 (under separate cover), plot locations are summarized in Appendix F, and the field data collection and spatial analysis methodology is detailed in Appendix H.

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.[59] 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.[60] 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.[60] Details regarding fuel typing methodology and limitations are found in Appendix G. There are several implications of the aforementioned limitations, which include: fuel typing further from the developed areas of the study has a lower confidence, generally; and, fuel typing should be used as a starting point for more detailed assessments and as an indicator of overall wildfire threat, not as an operational, or site-level, assessment.

Table 22 summarizes the fuel types by general fire behavior (crown fire and spotting potential). In general, the fuel type that may be considered hazardous in terms of fire behavior and spotting potential in the AOI are C-3 and M-1/2 75%, particularly young conifer plantations and 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.[60] 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-1b fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.[61]. 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.

[59]Forestry Canada Fire Danger Group. 1992. Development and Structure of the Canadian Forest Fire Behavior Prediction System: Information Report ST-X-3.
[60]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.
[61]Ibid.

Table 22. 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, and C-4 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 (Douglas fir, spruce, or lodgepole pine), 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. Little grass or surface fuel accumulation.	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
O-1a/b	Grass	Matted and standing grass communities; sparse or scattered shrubs, trees and down woody debris. Hay fields and seasonal wetlands that have the potential to cure. Areas harvested <7 years ago with good slash management.	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; areas harvested 10-20 years ago	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)	Any conifer slash	Moderate to high rate of spread and high to very high intensity surface fire	Low
W	N/A	Water	N/A	N/A

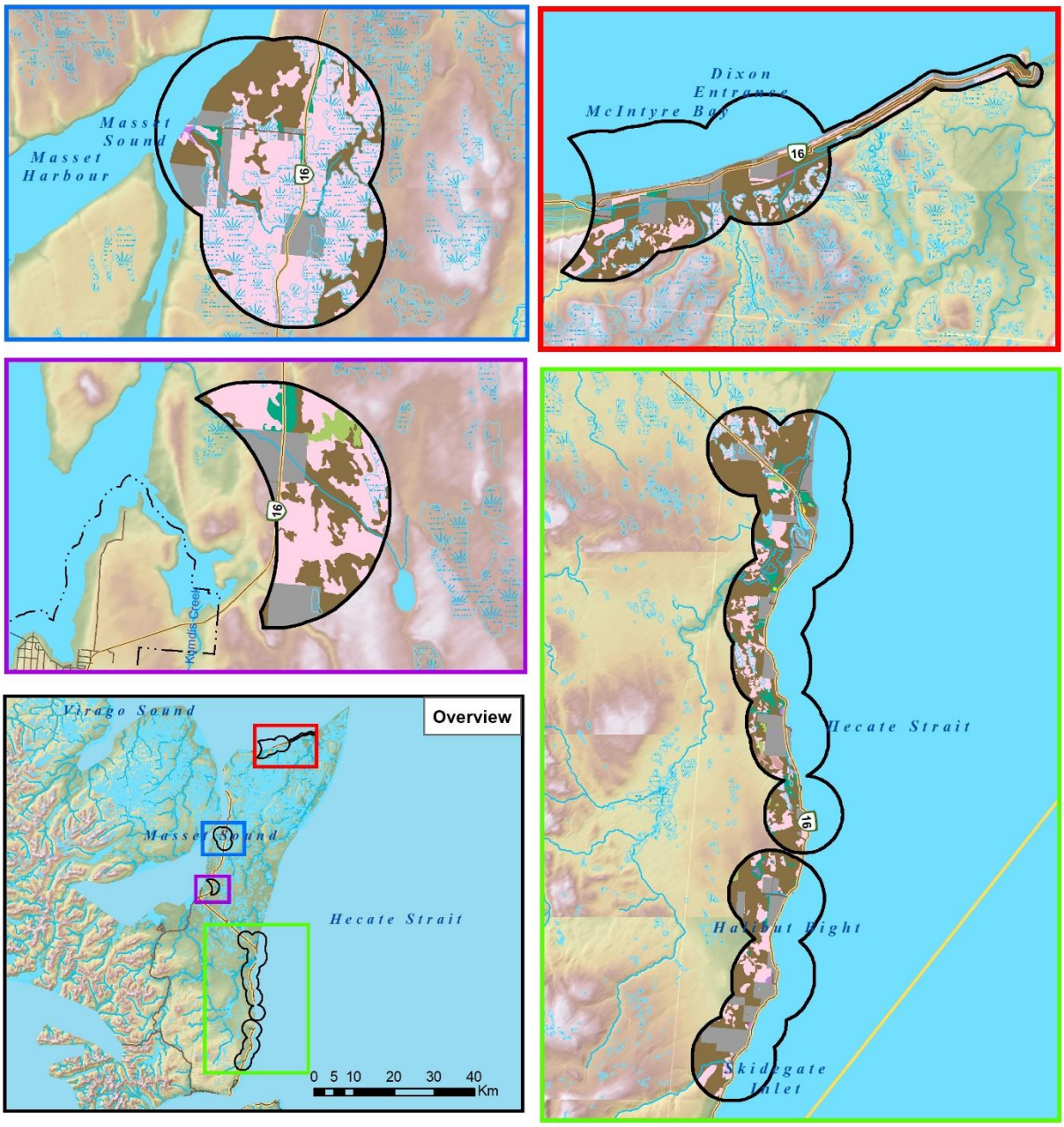
Fuel Type	FBP / CFDDRS Description	AOI Description	Wildfire Behaviour Under High Wildfire Danger Level	Fuel Type – Crown Fire / Spotting Potential
N	N/A	Non-fuel: irrigated agricultural fields, golf courses, alpine areas void or nearly void of vegetation, urban or developed areas void or nearly void of forested vegetation; areas burned <5 years ago	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.*

During field visits, 10 recurring patterns of fuel type errors were found in the provincial dataset. They were:

- C-3 fuel types being incorrectly identified by the PSTA as C-5,
- M-1/2 60% fuel types identified as C-3,
- M-1/2 50% fuel types identified as C-5,
- M-1/2 60% fuel types identified as C-5,
- M-1/2 25% fuel types identified as D-1/2,
- M-1/2 30% fuel types identified as S-1,
- M-1/2 45% fuel types identified as S-1,
- C-5 fuel types identified as D-1/2,
- S-2 fuel types identified as C-5, and
- S-2 fuel types identified as S-1..

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



Fuel Type	Area (ha)		
C-3	415.9	O-1a/b	15.8
C-5	6,213.2	S-1	40.4
D-1/2	41.8	S-2	93.4
M-1/2	3,563.6	S-3	9.8
Non-fuel	2,757.8	Water	6,925.8

Map 8. 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 23 describes the classes associated with proximity of fuels to the interface.

Table 23. 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 behavior near or adjacent to the value. Treatment effectiveness would be increased when the value is FireSmart.
WUI 500	(101-500m)	Treatment would affect wildfire behavior 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

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 behavior 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. 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. 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.

The local representative BCWS weather station for the AOI is Honna. The Honna weather station is located west of Queen Charlotte at an elevation of 100 m. ISI roses depicting the frequency of ISI values by wind direction for Honna are shown below in Figure 5.

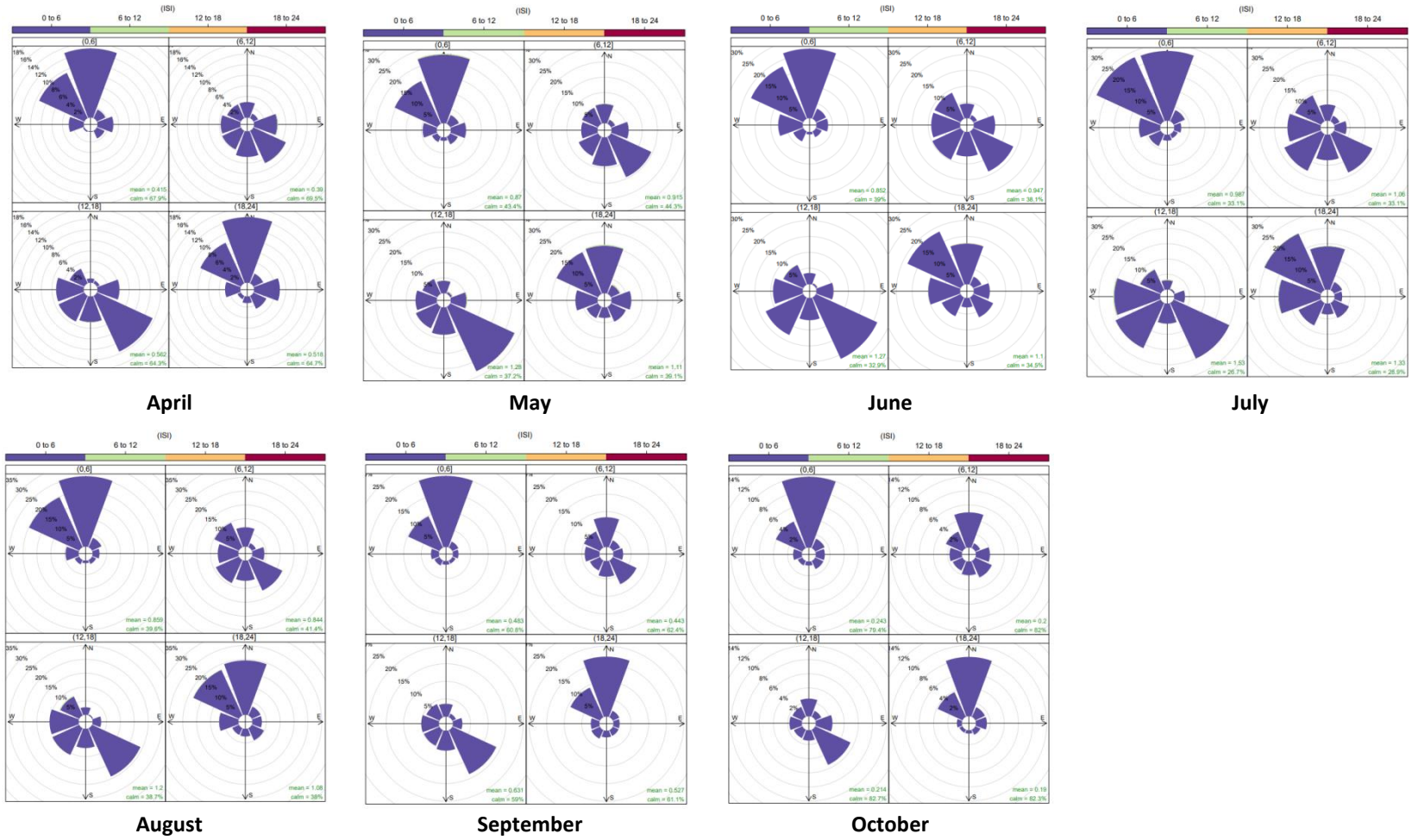


Figure 5. Hourly ISI roses depicting frequency of ISI counts by wind direction for the fire season April – October. Data is an average recorded at the Honna weather station from 1997-2016. Each subplot shows ISI roses for four six-hour time periods: from top left proceeding left to right and top to bottom: 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 behavior. 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 behavior 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 24 summarizes the fire behavior 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 25. A value placed at the bottom of the slope is equivalent to a value on flat ground (see Table 24). A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread (Table 25). The majority of the AOI (97.9%) is on less than 20% slope and will likely not experience accelerated rates of spread due to slope class. Less than 0.3 % percent of the study area is likely to experience an increased or high rate of spread due to slope (>40% slope). Unincorporated communities and surrounding commercial and residential developments within EA D would be considered bottom of the slope or valley bottom.

Table 24. Slope Percentage and Fire Behaviour Implications.

Slope	Percent of AOI	Fire Behaviour Implications
<20%	97.9%	Very little flame and fuel interaction caused by slope, normal rate of spread.
21-30%	1.4%	Flame tilt begins to preheat fuel, increase rate of spread.
31-40%	0.3%	Flame tilt preheats fuel and begins to bathe flames into fuel, high rate of spread.
40-60%	0.3%	Flame tilt preheats fuel and bathes flames into fuel, very high rate of spread.
>60%	0.0%	Flame tilt preheats fuel and bathes flames into fuel well upslope, extreme rate of spread.

Table 25. Slope Position of Value and Fire Behaviour Implications.

Slope Positionof 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 neighborhoods 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. Illustration of intermix and interface situations..

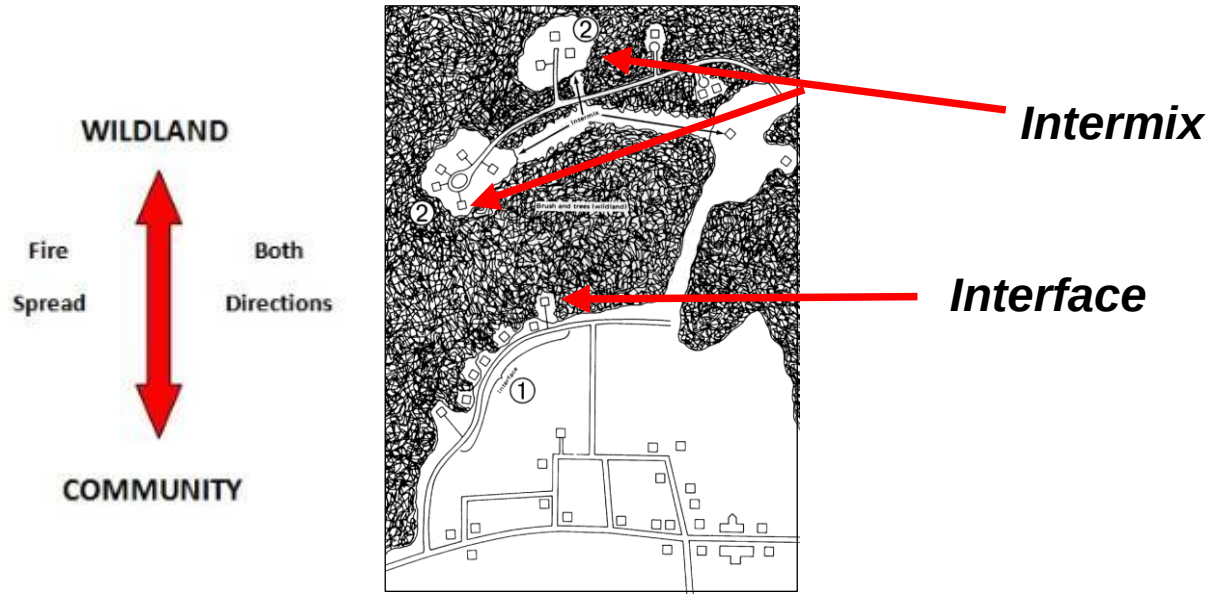


Figure 6. Illustration of intermix and interface situations.

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.

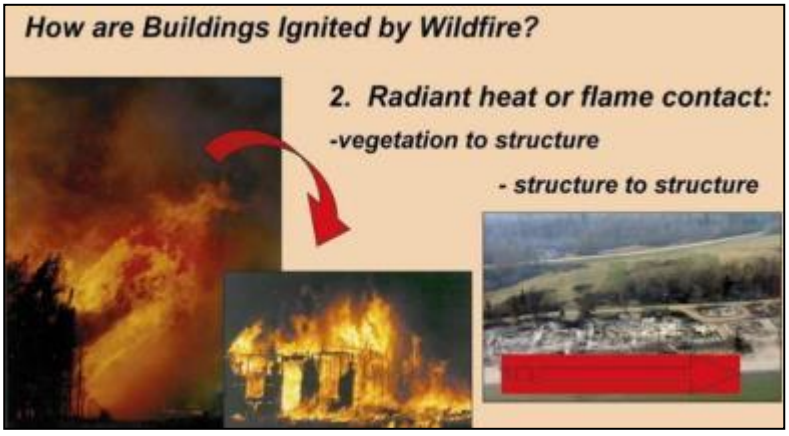


Figure 8. Radiant heat and flame contact allow fire to spread from vegetation to structure or from structure to structure.

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

APPENDIX F – WUI THREAT PLOT LOCATIONS

Table 26 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 26. Summary of WUI Threat Assessment Worksheets.

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
BRANDT-1	West of Brandt Rd, in the Tlell/Coast AOI polygon	High	High
COAST-1	Adjacent to Highway 16, in the Tlell/Coast AOI polygon	Moderate	n/a
GEIKE-1	Northwest of Highway 16 and Beitush Rd intersection	High	Moderate
HALL-1	North of the Tlell Volunteer Fire Department	High	Extreme
HALL-2	South of the Tlell Volunteer Fire Department	High	Extreme
JUN-1	Adjacent to cutblock, west of SKAIGHA 2 IR, in the Tlell/Coast AOI Polygon	Moderate	n/a
LOON-1	Eastern portion of the north Port Clements AOI polygon	High	Moderate
MILL-1	Southern tip of the Tlell/Coast AOI polygon	Moderate	n/a
NADU-1	North of Nadu Rd, in the north Port Clements AOI polygon	High	High
NAIK-1	South of Tow Hill Rd, in Masset/Tow Hill AOI polygon	High	Extreme
NAIK-2	Eastern end of Tow Hill Rd, in Masset/Tow Hill AOI polygon	Moderate	n/a
NAIKS-1	Misty Meadows Campground in Naikoon Provincial Park	High	Moderate
PSEUT-1	South of Andrews Place Road in the Tlell/Coast AOI polygon	High	Extreme
QUAR-1	South of a rock quarry in the Tlell/Coast AOI polygon	Moderate	n/a
ROSS-1	West of Hwy 16 in a forested stand	High	Moderate
SANG-1	Southeast of Sangan Rd, in the Masset/ Tow Hill AOI polygon	High	Moderate
TLELL-1	Southwest of Hwy16 and Brandt Rd intersection	High	Moderate

WUI Plot #	Geographic Location	Wildfire Behaviour Threat Class	WUI Threat Class*
TRANS-1	Southern tip of Tlell/Coast AOI polygon	Moderate	n/a
WIGG-1	Northwest of Wiggins Rd and Richardson Rd intersection, in Tlell/Coast AOI polygon	Moderate	n/a

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

APPENDIX G – FUEL TYPING METHODOLOGY AND LIMITATIONS

The initial starting point for fuel typing for the AOI was the 2020provincial fuel typing layer provided by BCWS as part of the *2020 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 behavior 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 behavior 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 behavior 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.[62]

[62]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

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

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

- AOI
- Fire Threat
- Fuel Type
- 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 126 WUI threat plots on a variety of fuel types, aspects, and slopes and an additional 900+ 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 27 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 27. 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) impacts the threat assessment, as well.