STRATEGIC

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2020 Community Wildfire Protection Plan for The City of Campbell River, BC

Prepared for:
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PROFESSIONALLY RESOURCEFUL

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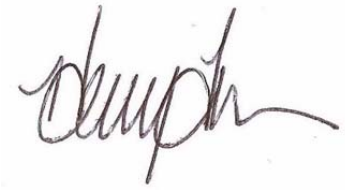

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Executive Summary

This Community Wildfire Protection Plan (CWPP) for the City of Campbell River was developed as an update to the existing CWPP reported by Strategic Natural Resource Consultants Ltd (SNRC) in 2013.

A CWPP is a plan prepared by a qualified forest professional for a community that:

1. Defines risk areas within the community for interface fires;
2. Identifies measures necessary to mitigate those risks;
3. Outlines a plan of action to implement these measures.

The local wildfire threat process involved field verification of fuel characteristics, proximity of fuel to the community, local wildfire spread patterns, topographical considerations and local factors. Provincial data provided for the purposes of this report contained inaccurate fuel type data so extensive work was undertaken to improve this data in order to use it as a foundation in the local wildfire risk analysis. Funding for this project was granted by the Union of BC Municipalities (UBCM) through the 2019 Community Resiliency Investment Program (CRIP). The CRIP program aims to reduce the risk and impact of wildfire to communities in BC through community funding, supports and priority fuel management on crown land. It does not, however, allow any assessments on private land. A very high proportion of private land with the area of interest (AOI) resulted in a modified approach toward the local wildfire threat assessment. The result was a spatial patchwork of threat with no conclusive, landscape level threat delineation. Unfortunately, this is misleading as wildfire does not recognize administrative boundaries. Emphasis was thereby given to a generic understanding that all vegetation in proximity to a structure, be it a home or a critical infrastructure, presents a hazard. Vegetation in a wildfire sense is generally termed as fuel.

The study area encompasses a very large geographic area, within which there are many values at risk, both in terms of natural values and human development: residences, businesses, transmission lines, natural gas pipelines, working forests/commercially valuable timber, transportation corridors, community watersheds and sensitive ecosystems. Although large wildfires are not a frequent occurrence in the area, weather conditions do produce high and extreme fire danger annually, and wildfires do occur every year in the area. Human-caused ignitions are the most common source of wildfire in this region, which means that most wildfires here are preventable.

A multitude of other factors were reviewed and discussed as part of this CWPP, such as wildfire response capacity, adjacent/previous CWPPs, spatial data, relevant bylaws, and a variety of plans (emergency/ evacuation, watershed, parks, official community, comprehensive community). Additionally, discussions with stakeholders and government agencies identified some key areas of concern that have guided this study, notably the limitations of the current fire protection boundary and difficult to access locations within it (McIvor Lake islands and remote areas without roads), a change in demographics leading to an increase in the population that is not aware of FireSmart and wildfire safety, as well as limitations to interest and buy-in from residents regarding FireSmart properties and fuel management.

Relevant recommendations from the report and findings of the BC Flood and Wildfire Review (Abbot and Chapman 2018) were incorporated in to the recommendations of this CWPP in order to align with this independent review which examined the 2017 flood and wildfire seasons. Recommendations are generally categorized by the seven FireSmart principles of education, legislation and planning, development considerations, interagency cooperation, emergency planning, and cross training.

The table below summarizes risk management and mitigation factors for wildfire response recommendations. Items highlighted in red are deemed highly impactful, high priority, and may involve the safety of residents and suppression personnel. Yellow items have a medium impact, may require ongoing attention, may take more time to have a significant result, but are also still very important in bolstering the preparedness of the City of Campbell River in the event of a wildfire. Green

recommendations represent ideological goals, long term plans and difficult to achieve goals. They are still impactful, but require substantial effort and follow-through.

Summary of CWPP Recommendations

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
1. Commit to a CWPP action plan, and appoint a committee to initiate these plans	To ensure the CWPP is put to use, the City should commit to a CWPP action plan, including appointing a committee to table future wildfire management activities.	- Create a CWPP action plan - Appoint members to contribute to a CWPP action plan; - assess progress and barriers in making the City wildfire safe; - Access CRIP funding for Planning and emergency planning.	City of Campbell River, CRFD Prevention Officer **Funding: CRIP**
2. Create a wildfire specific Emergency Response Plan	Wildfires are unpredictable; therefore, it is valuable to have a wildfire specific evacuation plan to streamline emergency situations.	- Create an evacuation plan that addresses several wildfire scenarios; - encourage homeowners to include wildfire evacuation and safety in Home Evacuation Plans; - collaborate with City or BCWS GIS personnel for fire mapping projections and models (e.g. RedApp or Prometheus modeling software); - integrate wildfire specific evacuation routes into existing plans or new revisions; - issue public notification of new evacuation plans. - Access CRIP funding for emergency planning and education.	City of Campbell River Emergency Planning, Strathcona Regional District **Funding: CRIP**
3. Improve and document difficult to access locations within the AOI	Physical obstructions on access routes hinder fire personnel from attending a fire. Poorly maintained roads, undocumented gates and resource roads are problematic.	- Begin an inventory for gates and barriers on private land; - create a gate permitting process for all newly installed gates in the AOI; - assess any vehicle access issues for local fire department and wildfire resources; - Access CRIP funding for planning and development considerations, emergency planning.	CRFD, City of Campbell River **Funding: CRIP**
4. Invest in equipment that will bolster the CRFD ability to access remote locations	Remote and water-access-only locations lie within the CRFD fire protection boundary. Lack of equipment and response vehicles will create huge response delays.	- Commit to purchasing a UTV for CRFD responders attending remote fires within the fire protection boundary; - Invest in a watercraft to access water bound locations (particularly McIvor Lake island	CRFD, City of Campbell River **Funding: Municipal**

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
		residences).	
5. Create a program to distribute wildfire safety information to homeless communities, new residents and tourists	These groups are only exposed to fire safety through signage and passive exposure. Homeless communities often use open fires, however may not be aware of fire safety initiatives. New residents and tourists may not be aware of the wildfire risk in their neighborhood.	- Ensure pamphlets and brochures on fire safety and FireSmart are available in public places; - strategically place wildfire safety information in community centers, healthcare centers and community shelters; - offer training to community shelter staff who actively work with this population to bolster FireSmart knowledge; - reach out to community Welcome Committees to include wildfire safety information in Welcome packages; - provide real-estate agents with FireSmart information, encouraging them to use it as a selling feature for incoming residents; - Access CRIP funding for education and inter-agency cooperation.	City of Campbell River – community outreach, CRFD **Funding: CRIP**
6. CRFD should commit semi-annual meetings with BCWS to discuss wildfire issues and prevention	Often inter agency meetings are overlooked, rescheduled, and inconsistent. By scheduling regular events, the CRFD and BCWS will be able to identify and efficiently tackle recurring issues.	- Commit to quarterly/ semi-annual meetings to identify gaps in knowledge and any conflicts between departments, especially prior to the start of fire season; - conduct and document regular cross training; - regularly discuss new ways to engage the public in wildfire management; - identify specific triggers for mutual aid between BCWS and CRFD; - create more opportunities for structural personnel to be engaged in wildfires; - Access CRIP funding for inter-agency cooperation (FireSmart Planning Tables/ Interagency fuel management Tables).	CRFD, BCWS **Funding: CRIP**
7. Extend the CRFD fire protection boundary to include Race Point and Gordon Road properties	Homes and properties are located on either side of the CRFD Fire Protection Zone. To ensure WUI properties are defensible by the CRFD, the fire protection boundary should be extended to include these structures.	- Extend the fire protection boundary to include residences in Race Point; - Extend the fire protection boundary to include all homes along Gordon Road in the WUI; - Engage with BCWS on their responsibilities in	City of Campbell River, CRFD, BCWS **Funding: CRIP**

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
		these locations, document and discuss the triggers for mutual aid here; - Utilize CRIP funding for planning and development.	
8. Develop a plan to create FireSmart Communities	The FireSmart program relies on local personnel to guide neighborhoods. Residents who are passionate about their community will become engaged in FireSmart methodologies. This can also lead to FireSmart Community Recognition.	- Find a Local FireSmart Representative; - conduct FireSmart Champion Training; - make FireSmart hyperlinks accessible on the City of Campbell River Homepage. - Encourage communities/ neighborhoods access CRIP funding for CWPPs, FireSmart events and educational events.	City of Campbell River, CRFD **Funding: CRIP, FireSmart Canada, FNESS**
9. Find a way to incentivize FireSmart activities and FireSmart Community Recognition	Having an incentive program will increase buy-in.	- Consider property tax reduction; - insurance premium reduction; - additional funding for residents to maintain FireSmart properties; - Utilize CRIP funding and rebate availability.	FireSmart Canada, City of Campbell River **Funding: CRIP**
10. Create a database of all qualified local service providers and available resources for emergency response	Complete documentation of resources will eliminate the need of the City to rely on BCWS to provide resource listings. Up-to-date listings will cut response times and help identify any holes in coverage.	- Request resource listings from BCWS; - add any listings available through mutual aid agreements and volunteer resources; - continually update and revise; - ensure City has administrative mechanisms in place to hire and pay equipment owners or service providers for specialized services on short notice (normal tendering processes will not be adequate in a fire emergency).	City of Campbell River, CRFD, BCWS **Funding: BCWS, Municipal**
11. Invest in assets that will increase firefighting efficiency in several areas (McIvor Lake, Gordon Road)	From the 2013 CWPP, it is important to have unbridled access to water throughout the AOI.	- Identify specific locations that require increased suppression equipment; - install fire hydrant in McIvor lake area; - install additional hydrants in locations that do not meet City Requirements (Gordon Road); - consider investing in additional SPU to stage in high risk locations; - consider local resident training in SPU use; - Access CRIP funding for	City of Campbell River, CRFD **Funding: BCWS, Municipal, CRIP**

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
		resident education on SPU and FireSmart.	
12. Re-Treat Beaver Lodge Forest Lands	Fuel Management is not just a simple, one-time prescription. As trees grow, they increase the fuel load of an area, thus need to be continually managed. It also provides an opportunity to demonstrate fuel management projects to residents.	- Review fuel loading in the Beaver Lodge Forest Lands; - conduct brush removal and selective thinning; - schedule future treatments. - Access CRIP funding for fuel treatment and demonstration projects.	City of Campbell River, Province of BC, CRFD **Funding: CRIP**
13. Develop a plan to increase signage in public high-risk areas, and where fuel treatments have occurred	Educational signage is a passive way to engage recreation users about wildfire safety. Consider including reference to historic wildfires in significant areas, highlight what to do if a fire is encountered, and what the local fire department/ BCWS branch is doing to prevent wildfires.	- Identify high traffic, high risk areas (Beaver Lodge Forest Lands, McIvor Lake, Elk Falls Campground, Willow Creek); - locate visible locations for fire signage; - consider using before/after imagery to highlight FireSmart principles and fuel management techniques; - Access CRIP funding for Education and FireSmart demonstration projects	City of Campbell River, CRFD **Funding: CRIP**
14. Require Interface Development Permit applications have been reviewed by Wildfire Professionals before submitting to the City for approval	Development permit applications include input by professional biologists. WUI development permit applications however are not required to be reviewed by a forestry or wildfire specialist.	- initiate a review process that includes wildfire specialists; - adjust development bylaws to include FireSmart and wildfire mitigation requirements.	City of Campbell River **Funding: Municipal**
15. Ensure Urban Forestry personnel are informed and have access to this CWPP	At this time, there is no direction in the Urban Forestry Management plans toward wildfire prevention; actions are limited to re-vegetation of lands affected by natural disturbance.	- Ensure Urban Forestry Manager is aware of this CWPP - Include the Urban Forestry department in wildfire planning discussions	City of Campbell River **Funding: Municipal, CRIP**
16. Bring awareness to Wildfire as a natural part of the ecosystems we live in	The common view of wildfire is that it is uncommon, unnatural and should be stopped. A paradigm shift in thinking to accept wildfire as an inevitability in our ecosystems will encourage the public to tack action and mitigate fire risk.	- Consider a media campaign during fire season - present Wildfire education and safety at local events; - deliver wildfire safety pamphlets and brochures to high risk properties. - Access CRIP funding for education	City of Campbell River, CRFD, BCWS **Funding: CRIP**
17. Develop and maintain accurate GIS information on Fuel Types, Threat Levels and new structural developments within the AOI and CRFD	Poor and old spatial data on fuel types causes problems when trying to identify risk areas. BCWS PSTA data is coarse, and not useful for making fuel management prescriptions in the City. If the City of Campbell River	- Access and review updated spatial data from 2020 Campbell River CWPP; - adopt a method for continually updating new spatial data from wildfire hazard assessments;	City of Campbell River, BCWS, Province of British Columbia **Funding: Municipal, BCWS**

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
jurisdictional boundary	procures more detailed and up-to-date data, it will reduce wasted time in future CWPPS, wildfire risk planning, and fuel management practices.	- consider external GIS support to provide assistance; - impress upon the provincial government the importance of providing more accurate data; - create incentive for private managed forest landowners to share vegetation inventory data.	
18. Work with BCWS to mitigate the risk at the North Island/ Mid-Coast Fire Zone Base to a lower risk area	The base is currently located in a high-risk area. Fire protection resources are therefore at risk of being damaged or isolated during wildfire.	- Create a fuel management plan for the current base to decrease risk; - consider involving the public in fuel management programs; - consider relocation of the base to a lower risk area. - Access CRIP funding for inter-agency cooperation, training, and fuel treatment	BCWS, City of Campbell River, CRFD **Funding: CRIP**

Contents

1. Introduction

1.1. Purpose

The purpose of a Community Wildfire Protection Plan (CWPP) is to identify wildfire risks within and surrounding a community, to describe the potential consequences of wildfire, and to examine possible ways to reduce the wildfire risk. The goal is to define the threat to human life, property and critical infrastructure from wildfires in an identified area, recommend measures necessary to mitigate those threats, and outline a plan of action to implement the measures.

The City of Campbell River recognizes that the existing CWPP (2013) is outdated and that climate change combined with an increase in community development will result in a new threat of wildfire to human life, property and critical infrastructure. The City is surrounded by and expanding into a forest ecosystem where periodic wildfire is a component. Wildfires have impacted the City in the past, have the potential to do so in the future. Climate change is predicted to increase the frequency and intensity of wildfire in the region.

The CWPP planning process will provide the community with a detailed framework to inform the implementation of recommendations that will result in reduced likelihood of a wildfire entering the community. As a result, residents will experience reduced impacts and losses to property and critical infrastructure, and reduced negative economic and social impacts to the community.

1.2. CWPP Planning Process

Strategic Natural Resource Consultants Inc. (SNRC) was retained to undertake the development of this CWPP, with in-kind support from the City of Campbell River. There are several key stakeholders identified by the City of Campbell River and SNRC. Internal stakeholders included the Campbell River Fire Department (CRFD), the BC Wildfire Service - North Island/ Mid-Coast Fire Zone, planners, bylaw staff and GIS analysts.

Communication through face-to-face meetings, phone calls, emails and questionnaires occurred throughout the CWPP process to identify values at risk, critical infrastructure, wildland urban interface (WUI) areas, and gaps in the City of Campbell River's ability to attend to a wildfire. Information sharing occurred between the City of Campbell River, Nanwakolas Council, Wei Wai Kum First Nation, We Wai Kai First Nation, and Homalco First Nation, as well as BC Wildfire Service (BCWS) personnel. SNRC reviewed critical items such as wildfire response capacity, emergency plans, watershed plans, management plans, regional growth strategies, official community plans, comprehensive community plans, bylaws, adjacent/ previous CWPPs and spatial data. Historical wildfire information and risk (or, "problem areas") were obtained from the CRFD, Private Managed Forest Land (PMFL) landowners and local BCWS personnel. Provincial Strategic Threat Analysis (PSTA) data was obtained by the City of Campbell River through the Union of British Columbia Municipalities (UBCM). Local Wildfire Threat Analysis was performed using the methodologies described in Section 4.

Risk mitigation strategies, community engagement and education strategies have been determined through a thorough review of all of the above information and numerous discussions with various stakeholders. These can be found in Sections 5 and 6.

2. Local Area Description

This section outlines the official Area of Interest and describes community attributes that may affect how the City of Campbell River responds to a wildfire.

2.1. CWPP Area of Interest

The Area of Interest (AOI) for this CWPP captures areas of the City of Campbell River that meet and exceed a minimum structure density of six structures per square kilometer. SNRC created a two-kilometer

buffer around this structure density boundary to fully envelop vegetated areas that may be affected by spot fires and indirect ignition. Once a wildfire approaches within two kilometers of structures, the probability of structural ignitions increases sharply from the ember shower being cast by the wildfire. Also included is a portion of land west of the City limits surrounding the Quinsam Coal Mine at the request of the CRFD, as it lies within the City limits, but outside the fire protection boundary of the CRFD.

The City of Campbell River lies within Strathcona Regional District located on the East Coast of Vancouver Island. The 143.1 square kilometer City is home to approximately 35,141 residents. It is divided into several residential areas; Campbellton, Quinsam Heights, Downtown, Central Campbell River, and Willow Point extending out to Campbell and McIvor Lakes.

Three First Nation Bands have reserves inside the City limits; Wei Wai Kum (Campbell River Indian Band), We Wai Kai (Cape Mudge Indian Band) and the Homalco First Nations. The CWPP is intended to align with wildfire management and emergency plans held by these First Nations.

The City of Campbell River is well known for its proximity to vegetated lands. Of particular note are Elk Falls Provincial Park, McIvor Lake Park and the Beaver Lodge Forest Lands.

Structure data was received from the City of Campbell River and updated using ortho-imagery to verify structure locations and add newly developed areas. This data was used to update the wildland urban interface (WUI) boundary.

Not included as part of this detailed wildfire analysis, are privately owned lands. While it is understood that activities and characteristics of privately owned lands can influence fire incidence and behavior, making recommendations for these lands is not within the scope of this project. Unless otherwise noted, the views and recommendations of this project are limited to the aforementioned boundaries.

Land ownership in the AOI can be broken down into the categories shown in Table 1.

Table 1. Land Ownership in AOI

Owner Type	Area (ha)	Total (%)
Crown Agency	197	1.09%
Crown Provincial	2,351	13.04%
Federal	63	0.35%
First Nation	78	0.43%
Mixed Ownership	31	0.17%
Municipal	579	3.21%
None	3,823	21.20%
Private	10,489	58.16%
Unknown	424	2.35%
Total	**18,035**	**100.00%**

2.2. Community Description

The purpose of this section is to identify community characteristics that might affect the City's ability to respond to a wildfire.

2.2.1. Local Governments

The Strathcona Regional District (SRD) encompasses four Electoral Areas. Most of The City of Campbell River lies in Electoral Area D which covers approximately 1,850 square kilometers. The AOI is also enveloped in the Campbell River Natural Resource District as defined in the Vancouver Island Land Use Plan (2000).

2.2.2. Demographics in Relation to Fire

In 2010, approximately 31,000 residents called The City of Campbell River their home (Statistics Canada 2010). Since then, the population has risen by 1.4% per year (Campbell River 2012). Future increase is expected to be most influenced by new economic developments and an influx of retirees relocating to the

City. As the City grows, it accepts more residents re-locating from relatively low fire risk communities; it is also accepting residents who are not as well informed about living in fire-prone wildland urban interface (WUI). To this end, education of the public and working with incoming residents is paramount. Similarly, the number of tourists in the area is growing, further contributing to the number of people who may lack awareness of fire risks. The overall population is heavily outdoor-oriented and is substantially employed by the natural resource industry. This equates to a higher than average awareness level amongst the population regarding wildfire risk in the forest versus citizens who live in highly urbanized regions.

In April of 2018, 81 individuals were counted as homeless, 51 percent of who identified as being unsheltered. Unfortunately, the presence of homeless individuals residing in vegetated areas and parks poses a threat to wildfire ignition from campfires, portable cooking and heating equipment, and smoking. Additionally, it is difficult to disseminate safety and emergency response information to these individuals (Homelessness Services Association of BC 2018).

2.2.3. First Nations

Homalco First Nation

Homalco people have lived along the Sunshine Coast, Bute Inlet and Discovery Islands throughout their history. Today, there is one reserve within the City of Campbell River and our AOI. The Nation is currently working on land use plans, and is engaged in the forestry industry through Homalco Forestry LP. The Nation also has an emergency preparedness plan.

We Wai Kai First Nation

Administration and Band offices for the We Wai Kai Nation are located in the City of Campbell River on the Quinsam IR#12. The Nation is comprised of 1100 citizens approximately half of whom live on reserves in the City and on Quadra Island. 60 percent of Nation-owned houses are located at the north end of town, on the 121-ha reserve. Also, on the Quinsam reserve are several businesses, a gas station, Quinsam Hall/Centre, Quinsam Wellness Centre, and the Head Start Pre-school. Development of the Quinsam Crossing Economic Development Area can be found in the We Wai Kai First Nation 2012 Land Use Plan. The Nation also has an emergency preparedness plan.

Wei Wai Kum First Nation

The Wei Wai Kum First Nation has extensive economic presence in the City of Campbell River, including CRIBCO Forest Products, Laich-Kwil-Tach Environmental Assessments and substantial commercial development of IR#11. Also located here is the Wei Wai Kum Big House, administrative offices and the Thunderbird Hall. The Wei Wai Kum First Nation has an existing CWPP and emergency preparedness plan.

2.2.4. Wildland Urban Interface

Wildland urban interface (WUI) is an area where structures (most notably private homes), meet wildland vegetation. There are three main classifications of WUI; interface, intermix and occluded. Interface is where there is a clear edge or boundary between developed lands and non-developed lands. Within the AOI, the starkest example of this is the residential community backing onto the Beaver Lodge Forest Lands. Intermix is where dwellings and structures are sprinkled within a vegetated area. In this AOI, homes surrounding the vegetated McIvor Lake area are in the intermix category. These homes are at a significant risk because there is substantial fuel surrounding the structures. This leads to an increased risk of embers and flames come into contact with the building resulting in ignition. Finally, occluded WUI areas refer to vegetated lands imbedded in well-developed lands. In the City of Campbell River, the vegetated portion of Nunn's Creek Park and the north end of the Willow Point Park Sportsplex are classed as occluded WUI polygons.

2.2.5. Transportation

Highways 19 (Inland Island Hwy), 19A (Old Island Hwy) running roughly north-south along the length of Vancouver Island, and 28 (Gold River Hwy) running west to the community of Gold River, are the primary routes in and out of the City of Campbell River. Many commuters use these highways daily, traveling from Gold River, the Comox Valley and Sayward.

Campbell River Airport (YBL) opened in 1959 and lies southwest of the City center. It has a 1981-meter-long, paved airstrip with facilities for regular scheduled and charter flights (fixed-wing and rotary-wing). Several businesses have property in a developed portion of the airport including maintenance bays and hangars. Several aviation companies operate out of the Campbell River Airport. There is aviation fueling, aircraft maintenance, weather, Canada Customs, and other flight services available. It is a critical piece of infrastructure, important to support air operations on wildfire responses as well as supporting potential evacuation and medical emergency flights.

Campbell River Air Tanker Base, located at the south end of the Campbell River Airport, is operated by BCWS. It and all associated aircraft are considered provincial resources, meaning they are made available to support fire operations anywhere in the province. This air tanker base is used for preparing and loading long-term fire retardant into land-based air tankers.

BC Ferries run regular service to Quadra Island via the City of Campbell River to Quathiaski Cove. Coupled with many water taxi services, the ferries could be a useful evacuation tool in emergency situations.

Being an industrial area, the City acts as a hub for commercial transportation, air traffic and a network of forestry roads. In the event of an emergency, residents and emergency responders will be able to make use of amenities linked to industrial transportation.

2.2.6. Critical Infrastructures at Risk

The AOI contains a variety of human and natural values, along with critical infrastructure that could be at risk. It is important to identify these features in the City so they may efficiently distribute their resources, protecting important locations that serve as emergency refuge or response. Critical infrastructure can also include locations of high community importance or be valued environmental resources. Below is a list of significant Critical Infrastructures in the City of Campbell River. This list is not comprehensive and will continue to grow as the City of Campbell River develops. Further details can be found on Map 1.

- Hospital
- Airport
- Critical Evacuation Routes (Hwy 19, 19A, 28)
- Communication Towers (Several within the City)
- Fire Halls (No. 1 and No. 2)
- Ambulance Service
- Discovery Harbour (For evacuation and transportation)
- City of Campbell River Works Yard
- Norm Wood Environmental Centre
- North Island/ Mid-Coast Fire Centre (BCWS)
- RCMP Station
- BC Hydro Power Transmission Lines
- BC Hydro – John Hart Facility
- Campbell River Waste Management Centre
- Municipal pump stations and water treatment facilities

2.2.7. Economic Drivers

The City of Campbell River is recognized for its resource-based industries, mainly mining, forestry, commercial fishing and aquaculture, and hydro-electricity.

Mining

Quinsam Coal Mine is located within the AOI, west of the City Centre. Mining activities such as blasting, land clearing and use of gas-powered tools, pose a high ignition risk. Although the mines themselves are not located in the AOI, the City of Campbell River is the shipping point for ore mined from the Myra Falls copper and zinc mine on Buttle Lake, west of the City.

Forestry

The City of Campbell River is influenced by two Timber Supply Areas; Strathcona and Pacific. Four major forest companies what operate in the Campbell River Natural Resource District: Western Forest Products, Island Timberlands Limited Partnership, Timber West, and Interfor. In addition to tenure and private forest lands, there are 18 timber processing facilities located within the Campbell River Natural Resource District. Timber harvesting is intrinsically linked to the health of the forest; therefore, this resource must be protected from wildfire. As many forestry activities are considered high risk in terms of wildfire ignition (such as blasting, welding, heavy equipment uses and mechanical friction), licensees are required to adhere to the Wildfire Act regulations on wildfire abatement, shutdown procedures and suppression equipment to manage these risks. Of particular note is pile-burning conducted in and adjacent to municipal land. Embers are easily carried by wind; therefore, strict regulations guide these operations (Wildfire Act 2019).

Hydroelectric and Natural Gas

BC Hydro maintains and operates a major hydroelectric generating facility comprised of several reservoirs and the John Hart Generating Facility, and approximately 20 kilometers of major transmission lines through the AOI, with many more kilometers of distribution lines. FortisBC is responsible for natural gas transmission lines spanning the City. These lines service communities outside the AOI, extending to Sayward, Woss and Gold River. Crews are diligent in brushing and removing trees from rights-of-way, however most fires associated with transmission line corridors are caused by trees falling onto energized powerlines from outside the right-of-way. High risk areas are managed for wind throw and oversized trees. John Hart Generating Facility is another piece of critical infrastructure in the AOI, servicing communities outside the greater Campbell River area.

Other

Outdoor and adventure tourism contribute to the influx of people through the City each year. Thrill seekers head to the wilderness on ATVs, dirt bikes and on foot to absorb the outdoors, inherently increasing likelihood of human caused fire starts. Poorly watched campfires, beach fires and barbeques can pose a risk to fire safety.

2.2.8. Municipal Fire Jurisdictions

Currently, there are two municipal fire departments servicing the AOI; the CRFD and the Oyster River Volunteer Fire Rescue Association. Currently the CRFD holds mutual aid agreements with Comox Valley Regional District, CFB Comox base, and Quadra Island, however these departments have significant travel time and delayed response times. At this time, there are no mutual aid agreements with fire departments to the north or west of the AOI (pers. comm. Thomas Doherty 2019). There are several important locations that lie outside the municipal fire protection boundary that can affect the ability of the local fire department to action a fire; Race Point at the northern most tip of the fire protection boundary, and where Gordon Road extends outside of the jurisdictional boundary. While these locations are not within the fire protection boundary, ignitions could occur and fires could eventually move from these zones in to the City of Campbell River fire protection boundary. Preliminary discussion on extending the CRFD fire protection boundary to be more inclusive has occurred among City officials; however formal initiation of extending these boundaries is still in flux.

2.2.9. BC Wildfire Jurisdictions

The City of Campbell River is enclosed in the Coastal Fire Centre. BCWS has several response officers and one available Initial Attack crew at North Island/ Mid-Coast Fire Zone (located at 905 Nursery Road). Additional response officers, initial attack crews and 20-person unit crews are available from the Mid Island Fire Zone – Errington Base. While resources are typically distributed to the closest need, these fire bases are required to provide support province-wide. It is not uncommon to have distant wildfire bases service a fire anywhere in the Coastal Fire Zone.

2.2.10. Existing Evacuation/egress routes

The Strathcona Regional District is responsible for maintaining emergency planning and management within the region. To date there are no wildfire-specific evacuation plans for the Campbell River Area, however in the event of a wildfire emergency, municipal emergency staff look to the Post-Earthquake Dam Failure Inundation routes and evacuation plans (Strathcona Regional District 2020). At the time of this report, the Post-Earthquake Dam Failure Inundation plan is under review, and has the potential to integrate fire specific plans within.

2.3. Past Wildfires, Evacuations and Impacts

While the area surrounding the City of Campbell River has experienced its fair share of wildfire events, none have had the same effects on the community as did the Bloedel Fire in July 1938. Extended dry weather and tinderbox conditions in addition to significant fuel accumulation from poor slash hazard abatement practices, facilitated the growth of a small fire near rail tracks at Boot Lake. It quickly expanded to a raging forest fire consuming 30,147 hectares of land, 20 bridges and countless hectares of merchantable timber (Parminter 1994). The entire region between Headquarters, Courtenay, Bevan and Cumberland was evacuated and residents were unable to return to their homes until Late in July and early August (Parminter 1994).

Since the Bloedel Fire, wildfires in the Campbell River region have been significantly smaller and less of an impact on the community, however they are still present. Since 2017 there have been eight wildfires within the City's jurisdiction that have all occurred near critical infrastructure. The June 2017 fire on Denman Street prompted an evacuation of the surrounding area (pers. Comm. Thomas Doherty 2019).

The fact that the region has not had any catastrophic fires since the Bloedel fire is partially attributed to modern wildfire fighting techniques as well as higher industry standards for prevention (slash hazard abatement and shutdown procedures). Wildfire is still a concern every summer especially for residents in the WUI.

An analysis of historic wildfires and the characteristics of their ignition and spread will be discussed further in Section 4. Ignition points and polygons provided by BCWS can be seen on Map 4.

2.4. Current Community Engagement

The City of Campbell River has hosted several events in an effort to engage the community on the topic of wildfires. Not only have they participated in previous CWPPs, but have also encouraged FireSmart sessions, education events and fuel treatments.

2.4.1. Previous CWPPs

The City of Campbell River (Strathcona Regional District) in conjunction with SNRC completed a CWPP in October of 2013. This CWPP is discussed further in Section 2.5.2. Prior to this, a CWPP was authored in 2005 (Hope, Clark and Quan). Several recommendations were addressed, including the appointment of a Public Fire Safety Educator, updated links on the Strathcona Regional District website for fire safety issues and attention to the Beaver Lodge Forest lands fuel mitigation project (Hope, Clark and Quan, 2005).

2.4.2. FireSmart

The Canada-wide FireSmart program was developed by Partners in Protection, an Alberta-based non-profit organization that aims to address common issues in the WUI. Their goal is to provide information to communities and homeowners so they may decrease their exposure to wildfires. The CRFD has adopted FireSmart initiatives, and has organized several public information sessions directed at WUI residents. Unfortunately, these events have historically poor attendance. An open house at the CRFD in 2018 had roughly 20 individuals present. A public information meeting for McIvor Lake residents was held in August of 2018 however there appeared to be little interest. Residents living in designated “high risk” areas received FireSmart information cards via mail, however there was little to no response or feedback on the usefulness of these pamphlets.

The Strathcona Regional District held several Community FireSmart Presentations around the area during Winter 2018 and Spring of 2019. These small, community focused events were hosted by residents, or at public venue and FireSmart principles and materials were disseminated as well as a presentation by a FireSmart representative. Residents could enter a raffle for a free "FireSmart Property Assessment" on their own property. This entailed a FireSmart representative attending the residence and leading the homeowners through the FireSmart Homeowners Manual and the FireSmart Audit, (contained within the Guide) assessing the residents house for FireSmart adherence. These sessions were leveraged for more attendees as residents were encouraged to invite their neighbors over to observe the process and principles of doing the property audit.

2.4.3. Fire Department Community Involvement

In 2019, the CRFD in conjunction with the North Island/ Mid-Coast Fire Zone was involved in a FireSmart presentation at the Tidemark theatre. The community was invited to learn about the basic FireSmart principles and ask questions about how they may be involved in community events.

A FireSmart community Event Day was organized with the Homalco First Nation in 2019. Members were encouraged to participate in sample vegetation management activities, presentations, and exercises for youth.

While not part of this AOI, the adjacent Oyster River Volunteer Fire Rescue attended a FireSmart Community Meeting at Oyster Bay in 2019. Their participation in FireSmart workshops bolsters their value as a mutual aid community, and serving as an example for community involvement in FireSmart.

2.4.4. BCWS Community Involvement

The BCWS is involved in the community both passively and through direct outreach. It is very common to witness media campaigns by BCWS during fire season, cautioning against stray cigarettes and promoting the use of the wildfire reporting line. Fire risk signage is also actively maintained, and serves as a reminder to the community that they may be experiencing high hazard conditions.

The North Island/ Mid-Coast Fire Zone often attends local public events like markets and parades, to demonstrate equipment and guide residents to look at educational materials on fire safety and using FireSmart principles on their property.

More actively, the North Island/ Mid-Coast Fire Zone regularly attend schools, teaching youth about basic fire safety, and in higher levels, fire ecology and prevention. A FireSmart Education Box is available at the BCWS North Island/ Mid-Coast Fire Zone Base for public demonstration and on loan for FireSmart representatives.

2.4.5. Campbell River Search and Rescue

In October 2019, the Campbell River Search and Rescue (CRSAR) conducted a door-to-door wildfire evacuation order exercise with the aim of visiting every home within the boundary of Harrogate, Erickson, Highway 19A and Hilchey Roads. The purpose of this exercise was to help the CRSAR be prepared to assist the RCMP in the event of an emergency that requires evacuation.

2.4.6. Fuel Treatments

In Winter of 2009/2010, an operational fuel treatment was carried out on 17 hectares of WUI on the western edge of the AOI with properties that back onto Crown forest land known as the Beaver Lodge Forest Lands (Map 3a and 3b) The project was in accordance with the recommendations contained in the City's 2008 CWPP and financially supported by the provincial government "Job Opportunities Program". A 30-meter-wide zone, commensurate with FireSmart principles was treated by reducing overall bulk density of fuels, pruning, pacing and brushing. The project was supported overwhelmingly by residents in this interface area, however will need retreatment in upcoming years.

2.5. Linkages to Other Plans and Policies

The purpose of this subsection is to highlight plans and policies held by local government and how they may affect the City's obligations and limitations to fighting a WUI fire.

2.5.1. Local Authority Emergency Plan

Under the Emergency Program Act (1993), local governments must prepare local emergency plans that include preparation for, response to, and recovery from emergencies and disasters including wildfire. The City of Campbell River does not currently have an independent emergency plan specific to wildfire. Alternative documents such as the Post-Earthquake Dam Failure Inundation plan, and Strathcona Regional District Emergency Response Plan would be initiated in the event of a wildfire emergency at this time.

Wei Wai Kai, We Wai Kum and Homalco First Nations' Emergency Response Plans are intended to integrate with the Strathcona Regional District Emergency Response Plan and the City of Campbell River Evacuation Plans in the event of an evacuation incident.

2.5.2. Affiliated CWPPs

In 2013, Strategic Natural Resource Consultants authored a CWPP and numerous recommendations for the City of Campbell River. Recommendations were broken into three fundamental categories; Education, Engineering and Enforcement. This section aims to break down each of these categories and describe the extent to which these recommendations were met.

Education

Abating fire hazard in any community is fundamentally linked to education of the public, residents, and emergency professionals. Education of the public entails increasing awareness of what is normal in regional ecosystems. Many communities in British Columbia are located in regions where wildfire persists and is beneficial to the ecosystems. In fact, most jurisdictions in North America are realizing that decades of excluding fire from the ecosystem has detrimental effects, both on ecosystem health and on the intensity of wildfires. Raising awareness level in the public is challenged by the "It won't happen here" psychology.

Prior to 2013, efforts to engage the public about FireSmart and wildfire prevention were unsuccessful; challenged by the lack of awareness by residents and lack of funding. Events were inconsistent and poorly attended. Since the 2013 CWPP was issued, there has been more success inviting residents to become more FireSmart however these activities were predominantly under the initiative of Strathcona Regional District, not the City of Campbell River. Regardless of the governing body hosting, interested citizens of were able to and did attend publicly advertised events.

In addition to public education, there was a motion to further educate and inform safety officials. Inventory and documentation of critical infrastructure, accessibility issues, such as locked gates and industrial barricades, and fire suppression assets (equipment and personnel) is ongoing. Local fire department personnel engage in cross training with BCWS; however, this is irregular and tends to be pushed back in favor of more emergent priorities (pers. comm. Thomas Doherty 2019).

Engineering

Improvements to water delivery systems and fire prevention assets around McIvor Lake have yet to be established. There are no fire hydrants to service residences in this area. Access to McIvor Lake is limited therefore constraining the ability of water tenders to action wildfire.

Map 1 identifies critical infrastructure that is important and valuable to the City of Campbell River. Work is being done to keep this information updated and complete.

Funding for fuel management projects is scarce, but there is still significant need to brush and clear fuels in interface areas throughout the City. This funding is available for publicly owned land mainly through the UBCM CRI program. These funds are limited and being shared across British Columbian forest communities, necessitating heavily prioritized allocation. Public funding is limited for fuel hazards located on privately owned land which includes significant portions of private managed forest lands surrounding Campbell River. Operational fuel treatment projects conducted prior to 2013 have regrown and are due for re-brushing (pers. comm. Henry Grierson).

Enforcement

Enforcement involves the creation of rules/guidelines that incorporate and encourage safe use of fire or activities that can ignite a fire with the goal being to reduce or eliminate damages caused by unwanted fire.

Table 2 2013 CWPP Recommendations and Assessment of Completeness

Description	Assessment of Completeness
1. Cooperative approach to public education should take place and involve both fire protection agencies and local government. An approach that is different than previous attempts and incorporates new initiatives and ideas should be a priority.	Shaun Koopman of Strathcona Regional District conducted Community Wildfire Preparation workshops; several FireSmart assessments and community information sessions were carried out throughout the City.
2. Consider strategic placement of signage in high recreational use areas that deter behaviors that contribute to accidental fire starts and instruction on now to report wildfire sightings.	Unknown.
3. Enhance the City of Campbell River's website to include wildfire information in one, clear and easily accessed place.	No.
4. Further develop resident and business owners' understanding of the wildfire hazards on their private properties.	Neighborhood FireSmart Sessions hosted at residents' homes and attended by 12-20 neighborhood residents. Audits of resident's home.
5. Educate appropriate City of Campbell River Staff on FireSmart.	More work can be done – Several FireSmart presentations provided to City planning staff, organized by the Strathcona Regional District Protective Services. Thomas Doherty and other staff attended Local FireSmart Representative workshop (November 2019).
6. CRFD should encourage all staff to undertake the S-100 Basic Fire Suppression and Safety course, committing key individuals to receive more advanced wildfire specific training.	CCR Fire Department conducts internal Wildland Firefighting training, including Cross Training with BCWS.
7. Establish wildfire simulation exercises with Wildfire Management Branch fire crews.	Cross training with BCWS.
8. Improve knowledge and documentation about access (including constraints to) and water sources through effective collaboration between agencies and stakeholders.	Ongoing - Thomas Doherty in discussion with BC Hydro and Forestry about access issues.

9. Improve knowledge and awareness of property, critical infrastructure and values at risk	Critical Infrastructure mapping can be viewed as part of this document (Map 1).
10. Ensure up-to-date listing of qualified local service providers and their capabilities.	Unknown.
11. Encourage FireSmart principles on private properties.	Currently no incentive for FireSmart homes.
12. Improve the City of Campbell River's firefighting capacity and promote FireSmart by: - invest in assets that will increase firefighting; efficiency in the McIvor Lake Area (fire hydrants); - develop a critical infrastructure map that identifies important and valuable features. This should be a collaboration between CCR, Emergency Coordinator, the CRFD and BCWS; - utilize UBCM funding under the CRI Program (formerly SWPI) to develop a Fuel Management Demonstration Project on Crown land within the City of Campbell River municipal boundary.	Still no fire hydrant near McIvor Lake; Critical Infrastructure map included in this document; Accessed UBCM funding for updated CWPP.
13. Revise the Sustainable Official Community Plan (2012) Section 24: Interface Fire Hazard Development Permit Area with updated findings from this study.	2016 SOCP Updated Fire Hazard Development Permit Areas.
14. Consider having interface development permit applications go through applicable external agencies for comment prior to approval.	Permits in particularly sensitive areas are required to be reviewed by a professional biologist prior to submission to the City of Campbell River.
15. City of Campbell River and Strathcona Regional District should work together to clarify jurisdictional boundaries of fire-related bylaws.	Thomas Doherty currently in negotiations with Strathcona Regional District around fire protection boundary (2020).
16. Bylaws pertaining to Fire Department local service areas should be revised to include details of the department's ability to legally respond outside of their area, at the request of the Wildfire Management Branch or not.	Thomas Doherty currently in negotiations with Strathcona Regional District around fire protection boundary (2020).

2.5.3. Local Government and First Nation Policies

City of Campbell River Sustainable Official Community Plan (2016)

City of Campbell River Sustainable Official Community Plan (2016) defines areas that are at high risk of fire within the Interface Fire Hazard Development Permit Area. New developments in this area are required to adhere to the following:

- For new development in high risk interface fire hazard areas, applications must be accompanied by a wildfire hazard assessment and interface mitigation plan prepared by a qualified professional that minimizes the risk associated with the proposed development/ building concept;
- A report, prepared by a Registered Professional Biologist is required with recommendations for minimizing interface fire hazard in a manner that seeks to preserve, where possible, sensitive ecosystems that may occur in close proximity to development. Registration of a restrictive covenant that prohibits any outdoor burning may be required;
- Development will be encouraged to be clustered to accommodate the clustering of residential densities;
- The development of a trail system is encouraged around developments that can accommodate fire vehicle access for fighting wildfire in interface areas;
- Developments shall incorporate fire breaks adjacent to residential areas. These may be in the form of cleared parkland, roads, or trails;

- Landscape plans be prepared in consultation with both a Registered Professional Biologist and a Registered Professional Forester, and provide recommendations for ensuring minimal fuel loading within landscaped areas (Campbell River Sustainable Official Plan 2016).

In addition to their goal to improve interface fire hazard management by 2020, the City of Campbell River SOCP also states that "further subdivision of lands to lot sizes which increase the risk to the watershed, or which cannot be properly serviced for public road access and emergency response (for ambulance and for fire protection) is encouraged" (Section 5.3.3).

Bylaw 2612, Fire Services Bylaw, 1997

Section 4.02 lists types of work that require a permit from the Fire Chief, such as chimneys and also covers "open burning", such as debris burning, which is allowed under permit from the CRFD within the undeveloped portions of the City lands.

Section 5.03 speaks to General Prohibitions such as triggering false alarms, fire hydrant parking and tampering or unauthorized use of fire equipment of facilities. It states that "no person shall interfere with the prevention or suppression of a fire". Wildfire is not specifically mentioned, however is covered under the definition of fire. Practically speaking this subsection would for example make it an offence for an unauthorized person to fly a UAV in such proximity to a fire suppression operation that the operation might be inhibited or shut down, due to conflicting safety concerns.

Section 5.05 of the Fire Services Bylaw authorizes the Fire Chief or Officer-In-Command to initiate an evacuation at their discretion. The section also speaks to situations where a person does not comply with the evacuation and any security implications of the evacuation.

Section 5.09 deals with gates restricting access to private industrial or commercial properties. The section requires the owner or occupier who wishes to install a gate to ensure the Fire Service has unfettered access by use of a Fire Chief approved locking system or lock boxes or provision of keys to the Fire Service. Fire Chief Thomas Doherty expressed concern over recurring instances where Fire Service responses to a call out were delayed when an unknown gate is encountered and the Fire Service has no key and/ or no means of locating or contacting gate owner on short notice. In his opinion this is due to gates being installed and the owner not following the bylaw. The bylaw is quite clear as written but it appears there is a lack of adherence and no consequence (other than delayed response to an emergency incident).

Section 6.00 authorizes the Fire Chief, (or Inspector), to enter property for the purposes of ascertaining compliance to the bylaws, (including Section 5.09). The City of Campbell River also has a Bylaw Enforcement Officer.

Section 6.02 deals with removal or remediation of conditions in a building or premises that constitute a fire hazard, in the opinion of the Fire Chief. The wording is sufficiently broad that it could be interpreted as including wildland type fire hazards, plus "the opinion of the Fire Chief", leaves a lot of discretion. Section 6.02 has three subsections; (a) deals with any building or premises, (b) deals with vacant or fire-damaged building and (c) deals with all buildings that are not private dwellings.

Section 6.03 authorizes the Fire Chief to post notices to address fire hazards within a prescribed time ordering the owner/occupant of buildings that come under 6.02(c), (buildings other than private dwellings). Again, this law uses the word fire, which is sufficiently broad to include "wildfire".

Bylaw 3293, Clean Air Bylaw, 2007

Schedule A of Bylaw 3293 stratifies the City of Campbell River is into Area A and Area B. Area A encompasses the developed portions, Area B is undeveloped areas within the boundaries of the City of Campbell River.

Section 2 of Bylaw 3293 speaks to “open burning”, which is defined the combustion of material without control of combustion air or combustion exhaust.

Section 2.1 prohibits open burning within Area A, except for “recreation” fires, which are defined as outdoor wood fires within a fire pit or permanent outdoor structure, less than 60 centimeters in diameter.

Section 2.2 prohibits open burning within Area B, except under the authority of a City-issued permit or without a permit but under defined conditions, including notifying the Fire Service, detailed in Section 2.2(a) – (i).

Section 7 speaks to recovery of suppression costs incurred by the City of Campbell River, when the Fire Service takes action on incidents of open burning where risk of escape exists or has happened at the discretion of the Fire Chief.

These bylaws are sufficient in managing what type of fire is not allowed or what is allowed and under what conditions.

Bylaw 3293 also appears to be sufficient in terms of authority of the Fire Chief in the administration of fire permits, inspection of open burning, powers of inspection and authority of the Fire Chief to direct persons to remedy open burning related issues.

Legal remedies for these types of situations exist as a civil action; however, if types of damages can be codified in bylaws, it can make cost recovery, for the City, more efficient. Type of damages might include damage to or loss of use of City-owned facilities (such as parks), land, timber, water quality, soil productivity etc. directly from fire or from fire suppression activities (destruction of a private fence in the course of fire control line construction).

This review of fire-related bylaws indicates that for vast majority of situations the current bylaws are adequate to manage wildfire-related issues. As mentioned above, more specific wildfire language might be considered in future revisions of bylaws to make legal proceedings less ambiguous and more defensible.

At this time SNRC is not aware of any formal local government or First Nations plans that are directed specifically at wildfire management.

2.5.4. Higher Level Plans and Relevant Legislation

The BC Wildfire Act and Wildfire Regulations contain rules regarding safe use of fire and designate individuals as fire wardens and officials. These set out sanctions that can be imposed on an individual or corporation who contravenes the regulations on safe fire use. The Wildfire Act also instates authority on officials to mitigate and remove fire hazards, take action on fires and bill responsible persons for unauthorized fire for suppression costs and lost assets. All of these sanctions must be authorized by legislation and the power to act on these sanctions is only given to selected officials. The Wildfire Act has limitations outside Provincial Crown land; therefore, municipal governments need to have legislation that speaks to wildfire prevention and enforcement.

Crown lands are subject to the Forest and Range Practices Act, Forest Planning and Practices Regulation, while private managed forest lands are subject to the Private Managed Forest Land Act and Regulations. Both are subject to the Wildfire Act and Regulations, and the Open Burning Smoke Control Regulation (2019). The latter has upcoming changes due to smoke concerns; particularly to Ventilation Indices and sensitivity zones around gazette communities, areas of rural settlement and near provincial numbered highways.

The Vancouver Island Land Use Plan is established by Higher Level Plan Order. It incorporates Vancouver Island’s settled land, food production as well as natural resource industries (forestry, mining and energy) to establish the Island’s strategic direction and land use designations (Province of BC 2018). It is broken down into three Natural Resource Districts; North Island – Central Coast, South Island,

Clayoquot Sound and Campbell River. The Campbell River Natural Resource District envelops the City of Campbell River and this AOI.

2.5.5. Ministry or Industry Plans

Additional forest management planning activities may be underway in the AOI. Integrating existing planning initiatives is critical to ensuring efficient and effective wildfire risk mitigation activities.

Ministry Plans

Devastation from flood and fires in 2017 and 2018 lead to the creation of the Government's Action Plan: Responding to Wildfire and Flood Risks (2019). The goal of this document was to highlight the successes and room for improvement in the current emergency management procedures, and to make recommendations to improve procedures in the future. Significant points include:

- actions to prepare for climate change;
- engaging in partnerships with individuals, local authorities, the provincial government, First Nations, allied agencies, NGOs and industry;
- actions must take a holistic view and balance multiple values; environmental, economic, cultural and risk mitigation.

Urban Forest Management Plan

The City of Campbell River Urban Forest Management Plan 2015-2035 (2015) does not reference wildfire management planning. In 2019, the City of Campbell River hired a new Urban Forest Manager. It would be prudent to direct the new manager to this CWPP when future planning is conducted.

Elk Falls Provincial Park

The approved management plan for Elk Falls Provincial Park was implemented in 1986. There is no description of wildfire management in this document; however it does prescribe a wildfire management plan. SNRC was unable to locate this plan (approved management plan for Elk Falls Provincial Park 1986).

Community Resiliency Investment Program (CRIP)

In 2004, the British Columbia government initiated the Strategic Wildfire Prevention Initiative (SWPI) collaboration between BCWS, First Nations' Emergency Services Society and the Union of BC Municipalities (Forest Practices Board 2015). This initiative was aimed at supporting communities looking to bolster wildfire protection in their areas. It has newly been named the Community Resiliency Investment Program (CRIP), and provides more detailed, widespread funding for wildfire protection initiatives.

Communities can receive funding through the CRIP to initiate a Community Wildfire Protection Plan, with additional funds available for fuel management prescriptions and operational fuel treatments (all of which must be prepared by forest professionals) we well as a variety of education plans, development considerations, emergency planning and cross training. Further information can be found through the Union of British Columbia Municipalities 2019 Community Resiliency Investment Program – FireSmart Community Funding and Supports Program and Application Guide.

The CRIP has increased general knowledge of Provincial Strategic Threat Analysis (PSTA) data, improved geospatial data standards for wildfire management and been fundamental in directing funds and support where needed.

3. Values at Risk

Values at Risk (VAR) are the human or natural resources that may be impacted by wildfire. This includes human life, property, critical infrastructure, high environmental and cultural values, and resource values. Updating VAR data is critical for effective mitigation planning.

3.1. Human Life and Safety

The intent of this section is to clearly identify and understand where people and structures are located within the AOI in order to effectively determine the wildfire risk and identify and prioritize mitigation activities.

In the event of a wildfire approaching a community, the first priority is human life and safety, including the evacuation of at-risk areas. Wildfire can move quickly and unpredictably. It takes time for people to evacuate an area and safe egress can be blocked by the fire itself or by vehicle congestion leading away from the fire. Understanding population density and regularly updating WUI information is critical to preserving a communities' safety. It is also important to identify locations that can act as temporary shelters such as schools and community centers.

Of particular concern are people who do not have a primary residence within the City. Tourists and outdoor enthusiasts flock to campgrounds and hiking trails, areas without internet access or cell service. Similarly, homelessness is a growing problem within the City; leading increasing numbers of individuals to find temporary residence in intermix and occluded WUI locations. Documenting locations and key attributes like campgrounds and well-known homeless camps is critical to fire response planning.

3.2. Critical Infrastructure

The intent of this section is to clearly identify and understand where critical infrastructure is located in order to effectively determine the wildfire risk and identify mitigation activities.

Critical Infrastructure are those physical resources, services and information technology facilities, networks and assets which, if disrupted or destroyed, would have a serious impact on the operation of an organization, sector, region or government (Province of British Columbia 2019).The City of Campbell River has provided some spatial data on critical infrastructure within the AOI, which can be viewed on Map 1.

3.2.1. Electrical Power

Hydroelectric power produced by the John Hart facility at the east end of John Hart Lake, adjacent to Elk Falls and within the Elk Falls Provincial Park provides electricity for the City of Campbell River, Gold River, Sayward, and the Discovery Islands. One major transmission line bisects the AOI, stretching from the water facility at Casey Creek westward to the John Hart facility turning south toward the Campbell River Airport and continuing south to Highway 19. Water supply that comes from John Hart Lake is gravity fed, with back-up power for distribution during an outage, therefore would not be greatly impeded in the event of an electrical outage.

3.2.2. Communications, Pipelines and Publicly Owned Buildings

On the corner of Westmere Road and South Dogwood Street is a large communication tower serving the City of Campbell River. This tower is relatively well buffered from wildland fuels by developed lands. Other key communication locations are well documented and known by local response agencies.

Campbell River Airport is located at the end of Jubilee Parkway and is surrounded by forest fuels. Smoke from fires near the airport can impede visibility and limit usage. While the airport is located in the WUI, it is buffered by well-maintained grasslands.

North Island Hospital – Campbell River is located at 375 2nd Avenue, between Dogwood and Birch Streets. It serves the greater Campbell River area and is located in a well-developed portion of the City. Smoke drift from fires could limit the usability of the hospital's roof-top helipad and affect ventilation.

Gas pipelines in the City are sub-surface and pose little risk from wildfire. Minor surface infrastructure associated with gas pipelines are maintained in a vegetation free zone surrounding the facility. From a suppression hazard point of view, buried gas and oil pipelines are very low risk from the heat of a wildfire. Buried pipelines can become an issue when suppression operations and heavy equipment can only cross buried lines at specific constructed points in order to not damage the buried pipe.

3.2.3. Water and Sewage Infrastructure

Water

Campbell River receives water from the Campbell River watershed. The source of the Campbell River is a chain of large lakes, namely John Hart, McIvor, Lower and Upper Campbell, and Buttle Lakes. Annually over 8 million cubic meters of water is distributed throughout the City of Campbell River from the Campbell River Watershed, collected from John Hart Lake and treated in a variety of facilities.

Several of these features are of particular concern due to their proximity to the WUI. The Beaver Lodge Forest Reservoir (formerly Holm Reservoir), Beaver Lodge Forest Water Quality Centre (formerly Dogwood Re-chlorination Station) and several water quality stations north of Elk Falls Provincial Park lie directly in the WUI zone. As noted on the City of Campbell River website, water consumption increases threefold during summer months, largely due to garden watering and outdoor water parks, pools and personal water activities (City of Campbell River 2019). The City maintains water restrictions throughout the summer months to ensure there is adequate water supply for both consumption as and fire suppression.

Sewage

The City of Campbell River has a sewage network leading to the Norm Wood Environmental Centre for secondary treatment. Sewage is stored at the facility, treated, and eventually converted to bio solids which can then be utilized as fertilizers and organic soil conditioners (pers. Comm. Glen Ketchum, General Foreman Norm Wood Environmental Centre). Seepage and outfall are regularly monitored to ensure no detrimental effects on the environment are incurred. While the facility is located in the WUI, the grounds are well cleared and vegetated with low grasses. The two dewatering fields are continuously spread with liquid bio solids, keeping the site very moist. Should a wildfire approach the facility, sprinkler systems used for spreading liquid bio solids could be engaged as a fire protection feature.

3.3. High Environmental and Cultural Values

The purpose of this section is to identify locations and values that are important to the community.

3.3.1. Drinking Water Supply Area and Community Watersheds

Communities that depend on surface water from a specific watershed should be aware that wildfire has the potential to cause significant damage to soils, increase rates of sedimentation and/or landslides that can degrade water quality for many years. In worst-case scenarios, the water supply may have to be abandoned (temporarily or permanently) or new water treatment infrastructure may need to be built, which can take several years and substantial funding. There are five major watersheds within the AOI, three of which capture the majority of WUI areas.

The Campbell River watershed (13,431 ha) which includes John Hart, McIvor, Lower Campbell, Upper Campbell and Buttle Lakes, supplies the AOI River with the majority of its drinking water. It also houses seven of the ten water facilities in the area.

A sub-watershed, called the John Hart Watershed, was designated a Community Watershed under the Forest Practices Code in 2001, the same year that the City of Campbell River completed a Watershed Management Plan (City of Campbell River 2019). Just south of the Campbell River Airport lies the Oyster Community Watershed.

Elk Falls Provincial Park overlaps both the Campbell River and Quinsam River (20,359 ha) watersheds, receiving many visitors and recreation throughout the year.

Willow Creek watershed is relatively small at approximately 2,556 hectares; however, it encompasses a significant portion of WUI, including vegetated lands surrounding the airport as well as the Beaver Lodge Forest Lands.

3.3.2. Cultural Values

Indigenous cultural heritage resources include archaeological sites, traditional use sites, historic buildings and artefacts, and heritage trails, or any other objects or places of “historical, cultural or archaeological significance to British Columbia, a community or an aboriginal people" (Archer, CRM. 2009) Archaeological sites in British Columbia that date to 1846 or earlier are protected from alteration of any kind by the Heritage Conservation Act (HCA) (1996). The provisions of the HCA apply to archaeological sites located on both public and private land, known and unknown, and are binding on government. The Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations and Rural Development administers the provisions of the HCA and are responsible for making final decisions concerning the management of archaeological resources. Day-to-day planning, research and fieldwork are conducted by professional consulting archaeologists.

Non-archaeological cultural heritage in BC is generally not protected by statute, but the use of and access to these resources is enshrined as a constitutionally protected Aboriginal right. Locally identified cultural heritage values that may be impacted by wildfire or suppression efforts can be included, if agreed to by the local First Nation.

Various stakeholders were invited to provide knowledge of local culturally significant areas. Aside from those already publicly well known, further knowledge was not provided. Local authorities who may need to respond to emergencies near these sites will have access to this information as needed.

3.3.3. High Environmental Values

The AOI is located in the Coastal Western Hemlock biogeoclimatic zone, in the very dry maritime subzone (CWHxm1). Predominant tree species are western hemlock, amabilis fir and Douglas-fir. Table 3 below shows red listed species within the Strathcona Regional District (BC Species and Ecosystems Explorer, 2019).

Table 3 Red-listed Species found in the Strathcona Regional District

English Name	Scientific Name
Northern Goshawk, *laingi* subspecies	*Accipiter gentilis laingi*
Andreaea rock moss	*Andreaea schofieldiana*
deltoid balsamroot	*Balsamorhiza deltoidea*
Payson's sedge	*Carex paysonis*
Common Wood-nymph, *incana* subspecies	*Cercyonis pegala incana*
Washington springbeauty	*Claytonia washingtoniana*
Evening Fieldslug	*Deroceras hesperium*
salt marsh Philadelphia daisy	*Erigeron philadelphicus* var. *glaber*
Dun Skipper	*Euphyes vestris*
Wolverine, *vancouverensis* subspecies	*Gulo gulo vancouverensis*
Northern Abalone	*Haliotis kamtschatkana*
Vancouver Island Marmot	*Marmota vancouverensis*
Cassin's Auklet	*Ptychoramphus aleuticus*
acuteleaf small limestone moss	*Seligeria acutifolia*
Zerene Fritillary, *bremnerii* subspecies	*Speyeria zerene bremnerii*
Barn Owl	*Tyto alba*

Located in the center of the AOI are the Beaver Lodge Forest Lands, donated to the Province of BC in 1931 by the Elk River Timber Company. The purpose of donating 416 hectares of land to the province was to ensure there was a convenient location to experiment on different reforestation and plantation techniques. Today the area is frequented by locals looking for a quiet walk on the trail, looking to catch sight of deer, bears, cougars, water fowl, beavers and salmon. It is currently managed by the Ministry of Forests, Lands, Natural Resource Operations and Rural Development. Overnight camping and open fires are prohibited within this park; however, day use is very high.

Elk Falls Provincial Park sits northwest of the City center. At 1,807 hectares, it was established in 1940 to protect Deer Falls, Moose Falls and the largest Elk Falls as well as the associated watershed. It now also surrounds the John Hart Hydroelectric facility and receives many visitors each year looking to use the trails for recreation. This park features overnight camping and allows campfires and outdoor cooking. While these activities elevate wildfire risk, the campground is supervised to ensure prudent fire use.

McIvor Lake Municipal Park is located at the north end of McIvor Lake. It is an easily accessible vegetated area just outside the City center where residents of the City of Campbell River can hike, boat and enjoy the outdoors. Buildings, picnic areas and recreation locations are adjacent to heavily vegetated areas. This park has gated access and posted operating hours. It is day-use only and no fires are permitted. This site is known to have often unauthorized access, parties and bonfires (pers. comm. Henry Grierson 2019).

Baikie Island Nature Reserve protects a substantial portion of the Campbell River Estuary, preserving the habitats of fish and riparian species in the area. It was purchased by the Nature Conservancy of Canada and then by the City of Campbell River, undergoing significant restoration completed in 2012. The park is accessible to the public to explore and learn about plant and animal diversity in the Campbell River Estuary. The estuary could be at risk of sedimentation damage should the Campbell River be damaged by wildfire. There is no access control, overnight camping or outdoor fires allowed.

Willow Creek Conservation area was donated to the Nature Trust of BC in 1980 and is comprised of wetlands, salmon bearing waterways, abundant wildlife nesting areas and walkable trails. It is located along Willow Creek, 1.3 km from Willow Creek Estuary at the south end of the AOI and accessible from several parts of Erickson Road. There is no access control, overnight camping or outdoor fires allowed.

3.4. Other Resource Values

The intent of this sub-section is to describe significant additional resource values (such as timber, water or high-value wildlife habitat, etc.) that are present within the AOI and/or values that may constrain fuel treatment opportunities.

Campbell River is located in the North Island Timber Supply Area with crown tenures and private land encircling the AOI. The City thrives on forestry as one of its major industries, and would be hugely affected by the destruction of timber resources as well as associated equipment.

Non-timber forest products may also be considered a significant additional resource value and further consultation with land owners should be contacted if further details are required. Examples of non-timber forest products in the area could be forest-based foods (big leaf maple syrup, berries and mushrooms) and ornamental products (salal, cedar and pine).

The City of Campbell River is well known for its access to world class fishing, both on the Campbell River and on the ocean. The Campbell River as an important resource for recreation and tourism, which is at risk of being impacted should its watershed face wildfire.

3.5. Hazardous Values

The intent of this sub-section is to identify hazardous values that pose a safety hazard to emergency responders.

Campbell River Waste Management Centre is located just southeast of McIvor Lake. It is surrounded on all sides by vegetated areas, with limited access via Argonaut road and the Gold River highway (Hwy 28). The facility manages a garbage dump, recycling area, and a contaminated wood waste area. It does not accept paints, bio-waste, contaminated soils, fuels or solvents.

One major power transmission line that exists west of the City center has been identified as a hazardous value due to the risk it poses to wildfire response. Air tankers and helicopters are unable to drop water loads anywhere near the powerlines as the weight can damage or break transmission lines. Similarly, trees or branches pushed into the right-of-way from water drops can become hung up in powerlines and cause outages, or even pose as an ignition source for a new fire.

The Campbell River Airport not only stores hazardous materials and fuels, but lies completely within the WUI. At the south end of the airport is an air tanker base which operates in the entire are of Vancouver Island and significant portions of the British Columbia south coast. Damage to this facility could seriously hinder wildfire suppression efforts over a wide area if air tankers are damaged or grounded. Additionally, several private helicopter companies store jet fuel onsite.

It is commonplace for industry-based companies to have secure fuel storage for small equipment fuel, marine fuel and vehicle fuel. Industrial operators must conform to WHIMIS/ GHS requirements. It is under the jurisdiction of the local fire department to ensure that commercial fuel storage adheres to these regulations and local codes.

In addition to well documented locations housing hazardous materials, there are inevitably many undocumented hazardous values. The City of Campbell River has a long history of forestry and mining, and it is not uncommon to find cashes of abandoned equipment, including unexploded explosive magazines and fuel storage.

4. Wildfire Threat and Risk

The intent of this section is to summarize the factors that help determine the wildfire risk around the community. These factors include natural fire regime and ecology, Provincial Strategic Threat Analysis, and a local wildfire risk analysis.

A risk-based framework considers the likelihood of an unwanted wildfire event and the consequences to communities and high value resources and assets as the measure of risk, as follows:

- likelihood is the probability of the unwanted wildfire event occurring;
- consequence is the amount of damage occurring as a result;
- risk is measured as the product of likelihood and consequence but multiple inputs are also required in order to effectively quantify risk, including severity, value type, and vulnerability.

Through the identification of risk level, priorities for mitigation as well as opportunities for increasing community resiliency are both enhanced.

4.1. Fire Regime, Fire Weather and Climate Change

This section provides the ecological context of wildfire for the community and to describe the role of fire (frequency and intensity) in the local ecosystem under historical conditions, and the potential implications of future conditions, caused by the interruption of the natural fire cycle and/or climate change. Human activities play a role alongside the natural fire cycle. When humans are active in an ecosystem that regularly experiences wildfire events, the frequency and intensity of fires tends to increase.

4.1.1. Fire Regime and Fire Weather

Wildfire threat exposure to the community will vary throughout the fire season based on the fuels present, the moisture content of fuels, and fire weather conditions. Consequences of a threat may be realized when an ignition occurs during high or extreme wildfire conditions, as represented by Fire Danger Rating.

This section discusses the implications to the community in regards to wildfire threat related to the local fire history, climatology, and fuel conditions around the community.

The Campbell River AOI lies in the CWH xm Biogeoclimatic Ecosystem Classification (BEC) zone, assessed by its topography, vegetation and soils. A brief description of the zone and subzone and their Natural Disturbance Type (NDT) is found below.

Table 4. Features of CWH xm Very Dry Maritime Coastal Western Hemlock Zone.

BEC Zone	CWH xm, Very Dry Maritime Coastal Western Hemlock
Distribution	Low elevations along southeast Vancouver Island
Elevation	Sea Level to 700 m
Climate	Warm, dry summers and moist, mild winters with little snowfall
Tree Cover	Douglas-fir (*Pseudotsuga menziesii*), Western Hemlock (*Tsuga heterophylla*) and minor amounts of Western red cedar (*Thuja plicata*)
Vegetation	Salal (*Gaultheria shallon*), dull Oregon-grape (*Mahonia nervosa*), red huckleberry (*Vaccinium parvifolium*) and Alaskan blueberry (*Vaccinium ovalifolium)*

Natural Disturbance type for the CWH xm is NDT2, where ecosystems are subject to a significant disturbance event every 200 years. As discussed in the Biodiversity Guidebook (Government of BC Forest Practices Code September 1995). “Wildfires [are] often of moderate size (20 to 1,000 ha) with unburned areas resulting from sheltering terrain features, higher site moisture or chance. Many larger fires [occur] after periods of extended drought, but the landscape [is] dominated by extensive areas of mature forest surrounding patches of younger forest”.

Wildfire season severity partially depends on the onset and persistence of drought conditions. Even though the City of Campbell River is classified as a temperate rainforest and receives abundant annual rainfall, wildfires occur every year in this region.

Figure 1 Average Daily Precipitation in the City of Campbell River, 2009-2018below shows that this area receives most of its rain from October to March. April through to September are usually dominated by dry, warm, continental high-pressure ridges. Very little precipitation is received during this time. A review of average daily maximum temperatures over the last decade shows that July and August have the highest temperatures, typically above 20° Celsius (Figure 2). Exacerbating the low precipitation in the summer are the very well-drained soils type predominant around the City of Campbell River, translating into fast percolation of ground water deeper into the soil with lower moisture retention in the upper soil and organic layers.

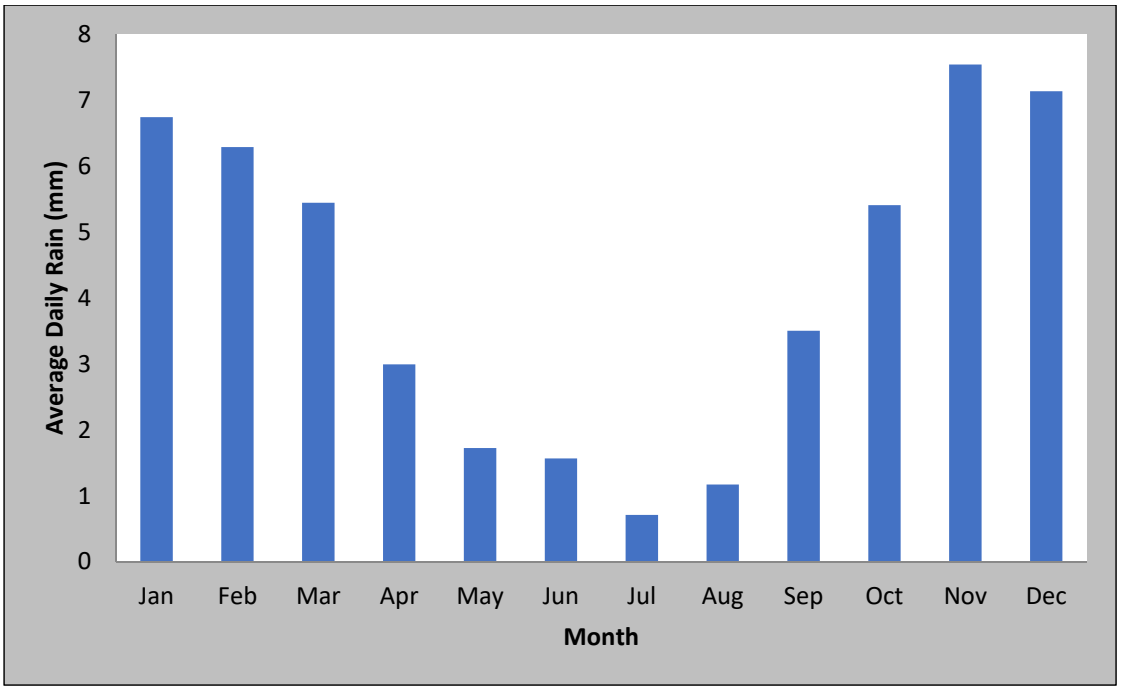

Figure 1 Average Daily Precipitation in the City of Campbell River, 2009-2018

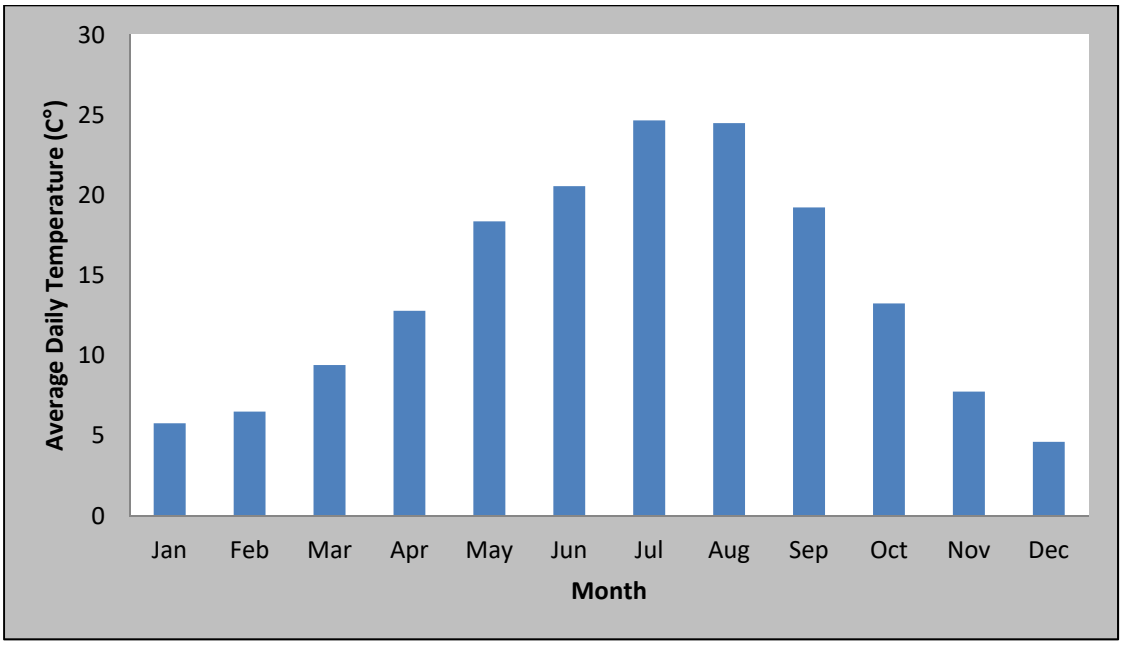

Figure 2 Average Daily Maximum Temperature in the City of Campbell River (2009-2018)

4.1.2. Climate Change

Scientists may debate the full extent of global warming and how much it is responsible for affecting the earth's climate but the world is witnessing ever more regular extremes in weather systems from typhoons and hurricanes to ecosystem destruction (desertification and disappearing glaciers). With projected

increases in temperature, the BC government suggests future impacts such as more frequent and severe droughts which will result in higher risk of wildfires (Province of BC 2018). After experiencing several large-scale fire seasons, 2017 and 2018 held records for most area burned and longest provincial states of emergency. These seasons that seemingly were considered anomalies may now be expected to become the norm as BC experiences an increase in forest fire frequency, fire season longevity and numbers of high and extreme fire danger rating days each year.

According to the Climate Change Adaption Action Plan (Province of BC 2014) based on an increase of 4°C by 2080, the southern interior of BC should expect a dramatic change in fire behavior including:

- increase in fire size, doubling from an average of 7,961 ha to 19,076 ha;
- increased fire severity by 40% in spring, 95% in summer and 30% in the fall;
- increased fire season length and fire frequency by 30%;
- increase in crown ignition and severe fire behavior by 4 to 7%.

While southern regions of the province receive significantly dryer and hotter weather than the coast of BC, it demonstrates how dramatically climate change will affect fire behavior.

The City of Campbell River recognizes that global climate change is having a growing impact on the environment and has taken measures to mitigate and take action. It has signed on to the BC Climate Action Charter, and committed to a Carbon Neutral plan aimed at reducing greenhouse gases to 85% below 2008 levels by 2050. The City of Campbell River has also partnered with the ICLEI Canada (Local Governments for Sustainability) to participate in the “Together for Climate: Managing Risk through Community Collaboration project (completion date in summer 2020) which is aimed at connecting stakeholders with climate change planners to create more meaningful climate change plans for the City of Campbell River. Through the Community Energy & Emissions Plan (City of Campbell River 2016) is aimed at reducing the City’s energy consumption and the resulting emissions. Regular reporting on the City of Campbell River’s website demonstrates progress and setbacks to its overall climate action plan.

4.2. Provincial Strategic Threat Analysis (PSTA)

The Provincial Strategic Threat Analysis (PSTA) is a high-level analysis and is a starting point to assess the relative wildfire threat. It utilizes several layers of GIS data maintained by the provincial government, including fuel types, historical fire data, historic weather data, and fire behavior information data, and interprets these data to represent wildfire threat and risk in a given are of interest. The PSTA data was provided by BCWS to the City of Campbell River as part of the CWPP data package and is shown on Map 5.

4.2.1. PSTA Final Wildfire Threat Rating

The PSTA Wildfire Threat Rating layer provided for the City of Campbell River was covered by over 50 percent private land, meaning PSTA layers are limited within the AOI and drawing meaningful conclusions from this data is challenging. Knowing the model uses fuel type data derived by satellite image classification, and the limitations associated with it, limited conclusions can be drawn from PSTA Final Wildfire Threat Rating. The PSTA shows a majority of the area as Low risk, followed by a significant portion of moderate risk, and finally patches of both High risk and no-risk development areas (Map 2).

4.2.2. Spotting Impact

Research shows that a high percentage of structure losses are caused embers being transported to and igniting structures (Partners in Protection 2003). The Spotting Impact Layer estimates the threat of embers impacting a given point on the landscape from the fuel types surrounding it.

4.2.3. Head Fire Intensity

Head Fire Intensity represents the energy output of the flaming front of a wildfire, measured in kilowatts per meter (kW/m). It changes based on weather conditions and fuel characteristics. Head Fire Intensity (HFI) is the associated potential wildfire intensity during 90th percentile fire weather, and associated

suppression difficulties. HFI is related to flame length and fire spread rate and fuel consumption at the leading edge of a wildfire and has been previously correlated to wildfire suppression difficulty as well as increased ember shower and spotting distance.

4.2.4. Fire History

Although the location of future ignitions is difficult to predict with accuracy, a review of historic fire ignitions and spread can reveal patterns that have a greater likelihood of occurring in the future. Fire history tells the story of the relationships between fire behavior, landscape ecology, management policy (including fire suppression), human development and other land use changes throughout the area. The potential for very large, destructive and landscape altering fires is related to the historical fire and fire response patterns within a given planning unit.

Provincial historical wildfire data attributes were provided to SNRC as part of the CWPP data package. The historical data was incomplete however relevant information was extracted to draw conclusions where possible.

Comparing Provincial and City of Campbell River fire-cause statistics (1919-2018) shows that the City does not fall in line with the provincial pattern of approximately 62% of fire starts in BC caused by lightning and 38% human caused (Figure 3). In comparison, the AOI experienced 95% human caused fires with only 5% caused by lightning (Figure 4). The Campbell River area would not traditionally receive as much lightning as other parts of the province simply due to geography of the area; however, with climate change, this could shift as a one degree increase in temperature generally results in about a 12% increase in lightning occurrence (Duncan 2018). The lack of lightning in local weather means that the high percentage of human ignited fires are preventable, it does not mean that residents are innately more irresponsible with fire.

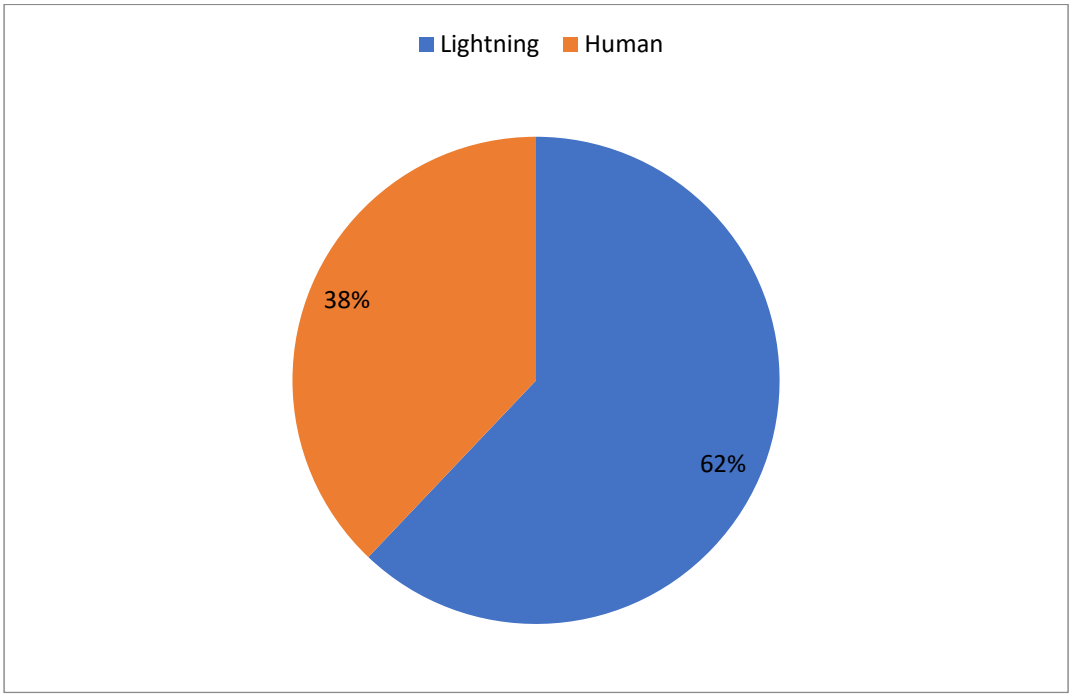

Figure 3 Cause of Ignition in British Columbia (2014 - 2018)

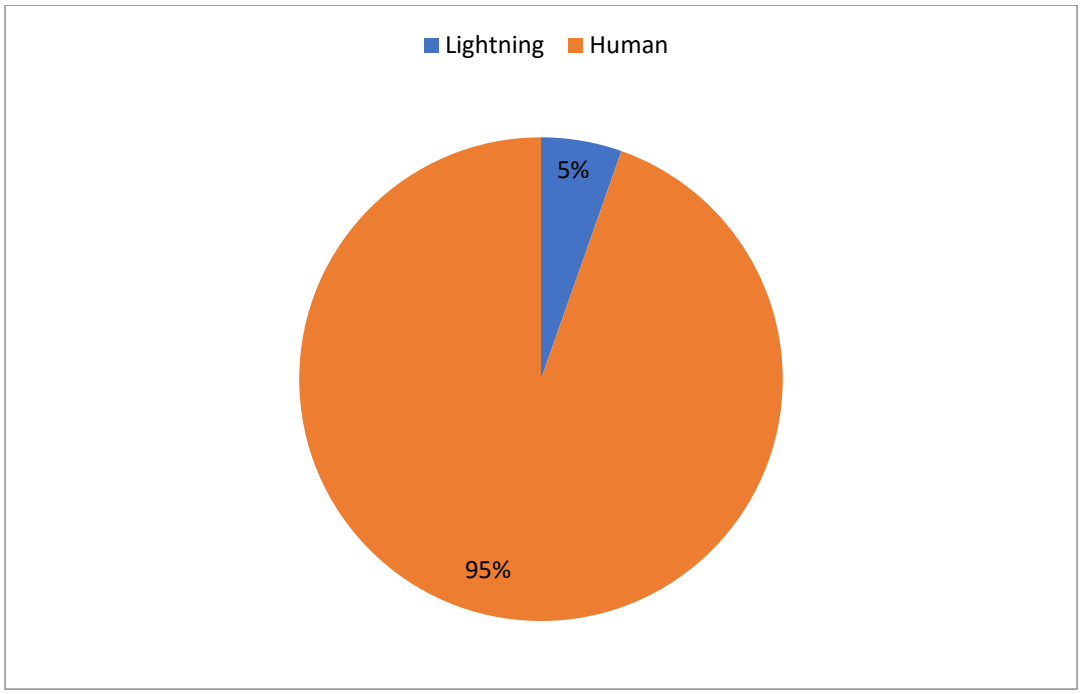

Figure 4 Cause of Ignition in the City of Campbell River AOI (2014 – 2018)

Since 1998, there have been 198 recorded wildfires within a 20 km radius of the boundary. The majority of these fires occurred on occupied private land, and the leading cause of ignition was an abandoned or out of control campfire (22%) (Figure 5). Equipment use is another significant ignition source (15%). This includes heavy equipment and associated activities, welding, chainsaws etc. Further investigation should be pursued to find more specific causes, grouped under “Miscellaneous” categorized fires.

Since 2017, the City of CRFD has been involved in eight WUI fire events. Of these, only one resulted in the tactical evacuation of adjacent homes. Characteristics of these fires varied from simple brush fires, to fast moving grass fires, to a Rank 3 Wildfire (See Appendix 1).

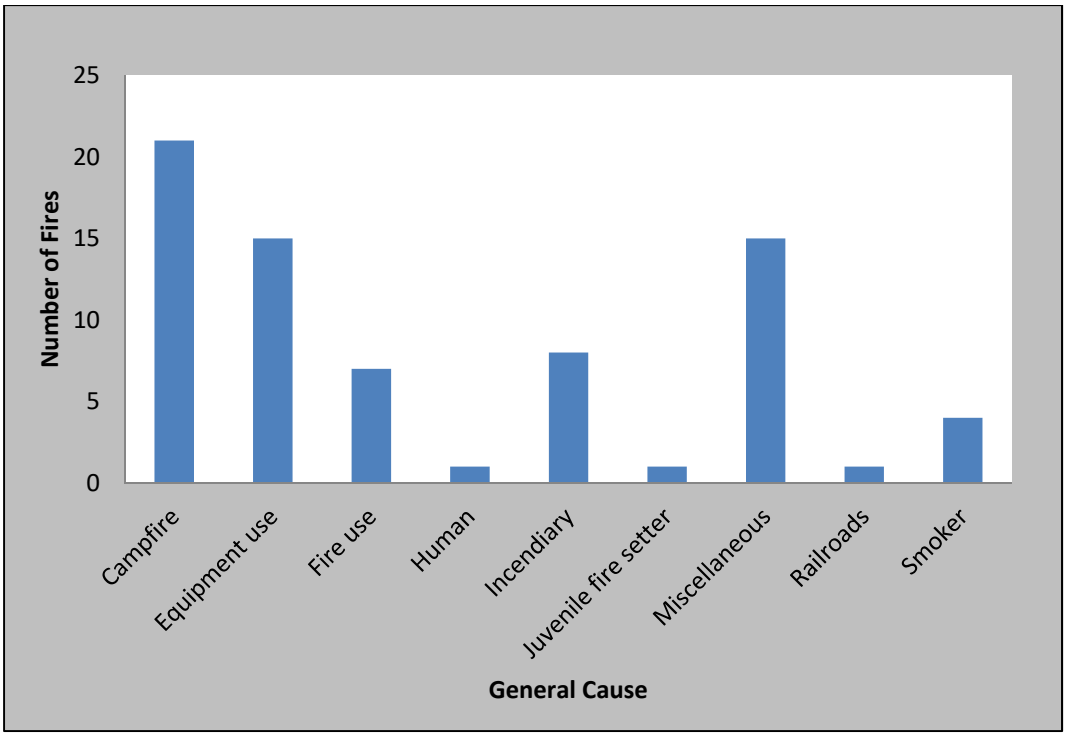

Figure 5 Cause of Human Ignited Fires in Campbell River AOI (2009 – 2018)

4.3. Local Wildfire Threat Assessment

This section explains the local wildfire threat process used for this CWPP, including field reviewed fuel characteristics, proximity of fuel to the community, local fire spread patterns, topographical considerations and local factors. The key steps necessary to complete the local wildfire threat assessment were:

1. develop a local fuel type map;
2. consider the proximity of fuel to the community;
3. consider fire spread patterns;
4. assess topography;
5. stratify the WUI based on relative wildfire threat;
6. consider other local factors.

4.3.1. Fuel Type Verification

The accuracy of the local wildfire threat determination is directly linked to the accuracy of the fuel type information. If the fuel typing is incorrect, to the degree that the associated fire behavior is significantly different, the corresponding threat information will also be incorrect. BCWS annually produces a comprehensive fuel type layer for fire behavior prediction using the Vegetation Resources Inventory (VRI) data.

An office review of Crown land PSTA fuel types took place, using ortho-photos and local knowledge. Field verification then took place in key problematic areas. These areas were selected based on their proximity to the WUI, presence of critical infrastructure and degree of recreational use. A fuel type change methodology was submitted to BCWS and approved in principle. An official Fuel Type Change Rationale was later submitted and approved (see Appendices 2 and 3).

Fuel types were categorized according to The British Columbia Wildfire Fuel Typing and Fuel Type Layer Description (2018). The categories are based on their relevance to a wildfire threat assessment, and

weightings were assigned for the final local wildfire risk classification. Corrected fuel types are shown on Map 6.

There was a tendency for the PSTA fuel type values to over-estimate the amount of deciduous fuels which would produce a lower than actual fire risk rating. Areas that were typed as exclusively deciduous often had well over the required 25% conifer component to be classed as a mixed fuel type. It also became clear that there were many missing developed areas due to the age of the PSTA data provided.

4.3.2. Proximity of Fuel to the Community

Fuel closest to the community usually represents the highest hazard. The closer the fuels are to the structure, the greater the influence will be on the structure. Increased separation between combustible vegetation and the structure results in less risk of structure ignition. If fire safety was the only concern, FireSmart activities would recommend no vegetation within the 30m radius of any structure, however FireSmart vegetation management is a compromise in fire safety for aesthetic, important to home owners. The recommended approach is to treat fuels to achieve a desired level of hazard reduction, from the value or structure outward, ensuring mitigation continuity. Untreated areas between treatment areas and the value or structure may allow a wildfire to build in intensity and rate of spread, which can increase the risk to the value. To capture the importance of fuel proximity in the local wildfire threat assessment, the WUI is weighted more heavily from the value or structure outwards. Fuels adjacent to the values and/or structures at risk receive the highest rating followed by progressively lower ratings moving out.

The local wildfire threat assessment process subdivides the WUI into three areas – the first 100 meters (WUI 100), 101 to 500 meters (WUI 500), and 501 to 2000 meters (WUI 2000). These zones provide guidance for classifying threat levels and subsequent priorities of mitigation activities.

The updated structure layer was used to generate WUI buffers by running a Point Density Analysis on structures and identifying those areas with greater than six structures per square kilometer. WUI zones were assigned a weighting for the final local wildfire risk classification.

4.3.3. Fire Spread Patterns (ISI Roses)

Wind speed, wind direction and fine fuel moisture condition influences wildfire trajectory and the rate of spread, and is summarized in the Initial Spread Index (ISI) roses from the local representative BCWS weather stations throughout the province. Wildfire that occurs upwind of a value poses a much more significant threat to that value than a fire that occurs downwind.

These ISI roses can provide users with a static look at the prevailing wind direction and wind speed for the representative wildfire weather stations. Each ISI rose shows the frequency of counts by wind direction with the frequency of the ISI values during that time period (Province of BC – BC Wildfire Service 2017). The upper limits of the ISI are based on the highest recorded ISI for the station; it should be noted that significant wildfire runs can occur in directions other than predominate spread direction (Province of BC – BC Wildfire Service 2017).

The ISI roses for the selected representative weather stations show the greatest fire spread indices happen under winds from the North, Northeast or East. Areas around the City of Campbell River that have wildland fuels located in this geographic quadrant (North, Northeast, East) would face the greatest statistical risk of a wildfire spreading towards them.

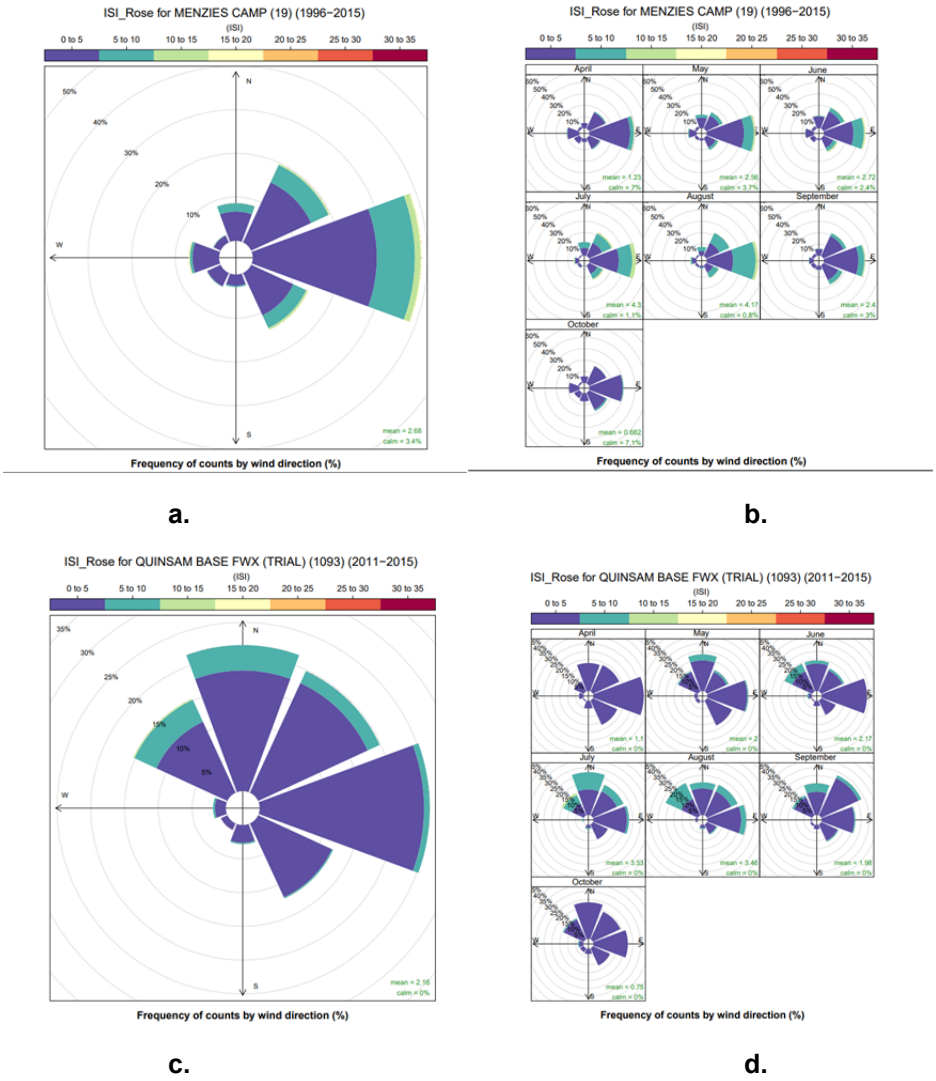

Figure 6 a. ISI Rose for Menzies Camp. b. Monthly ISI Roses for Menzies Camp. c. ISI Rose for Quinsam Base. d. Monthly ISI roses for Quinsam Camp

4.3.4. Topography

Slope percentage and slope position of values were both considered. Slope percentage influence a fire's trajectory and rate of spread. Slope position of the value is the uphill ability of a wildfire to gain momentum moving uphill toward a structure. Buildings and infrastructure uphill of a fire are at an elevated risk as opposed to a structure located downhill from an ignition source because, in the absence of wind, fire will travel uphill.

Slope percent class was determined in a raster analysis 50K TRIM Digital Elevation Model. Percent classes were weighted for the final wildfire risk classification. Slope position of a value was determined using TRIM 20m contours and then digitized at 1:50,000 scale to maintain a view of topography at a landscape level. Slope Position of values were classed and then weighted for the final wildfire risk classification.

4.3.5. Local Wildfire Threat Classification

The WUI was classified into local wildfire threat classes based on the updated fuel type map (Map 6).

4.3.6. Local Wildfire Risk Classification

Local Wildfire Threat Classes from Section 4.3.5 were combined with proximity of fuel to the community, fire spread patterns and topography to produce the Local Wildfire Risk Score.

The wildfire risk assessment process used provides a means to determine the wildfire risk as it applies to forest fuel hazard, proximity of fuel to the community, fire spread patterns and topography. These factors all influence how a wildfire could impact the community if ignition was to occur. Human fire start history (based on BCWS supplied data), high forest fire risk activities, human use, additional local factors as discussed with local Fire Chiefs and other environmental factors that affect wildfire threat and risk within different areas of the WUI were considered in the assessment process.

The City center is deemed mostly "No Risk", as fuels in the developed portion of the City are absent and extremely unlikely to be affected by wildfire.

The majority of the AOI is deemed "Low Risk", largely because there are significant tracts of land with no structures or human occupation. Should a wildfire occur, there would be substantially less damage than in areas of high human occupation.

"Moderate Risk" is the second largest category, capturing wooded areas along the highways, WUI polygons and moderately inhabited portions of the City. Within the "Moderate Risk" polygons are pockets of "High Risk" land, namely the North banks of McIvor Lake, the Elk Falls Provincial Park and John Hart Facility, North-East of the We Wei Kai reserve, and a large pocket of the Beaver Lodge Forest Lands.

4.3.7. Summary of Fire Risk Classes

The relative local wildfire risk scores were input into Table 5 below to determine the Relative Fire Risk Class.

Table 5 Relative Local Wildfire Risk Scores, Classes and Descriptions

Fire Risk Class	Weighting	Description
Low	0 – 3.9	The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it a lower potential for threatening a community. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle in extreme fire weather conditions. Fuel type spot potential is very low.
Moderate	4 – 6.9	The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it possible that a wildfire in this area would threaten the community. Areas of matted grass, slash, conifer plantations, mature conifer stands with a very high crown base height, and deciduous stands with 26 – 49% conifers. These stands will support surface fires, single tree or small groups of conifer trees could torch/ candle. Rates of spread would average between 2 – 5 meters per minute. Forest stands would have potential to impact values in extreme weather conditions. Fuel type spot potential is unlikely to impact values at a long distance (<400m).
High	7 – 8.9	The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it likely that a wildfire in this area would threaten the community. This includes stands with continuous surface/ crown fuel that will support regular torching/ candling, intermittent crown and/or continuous crown fires. Rates of spread would average 6 – 10 meters per minute. Fuel type spot potential is likely to impact values at a long distance (400 – 1,000m).
Extreme	9+	The combination of the local fuel hazard, weather influences, topography, proximity to the community, fuel position in relation to fire spread patterns, and known local wildfire threat factors make it very likely that a wildfire in this area would threaten the community. Stands with continuous surface/ crown fuel and fuel characteristics that tend to support the development of intermittent or continuous crown fires. Rates of spread would average >10 meters per minute. Fuel type spot potential is probable to impact values at a long distance (400- 1,000m or greater). These forest stands have the greater potential to produce extreme fire behavior(long range spotting, fire whirls and other fire behavior phenomena)

5. Risk Management and Mitigation Factors

Mitigating wildfire risk is a proactive approach to reducing potential impacts and subsequent losses from devastating wildfires, and is best conducted in a coordinated fashion amongst applicable land managers/owners that may include provincial and federal governments, local governments, First Nations, and private landowners.

Understanding and assessing all of the risks that apply to a given community is a key consideration when determining actions that local governments or First Nations can undertake to mitigate and manage the wildfire risk within and adjacent to their respective jurisdictions.

There are many different risk mitigation options available. Three have been identified for this section:

1. Fuel Management – reduce fire behavior potential;
2. FireSmart – reduce fire spread into community and impacts to values;
3. Communication and Education – reduce fire occurrence.

Forest professionals must look beyond forest fuels when assessing the risk and threat. High risk activities, human use and other environmental factors should also be included in risk assessment. Such factors allow the professional to design fuel treatments and other recommendations that meet the needs of the community and build resilience to the potential impacts of wildfire.

On Map 2, the weighted analysis may be found. Locations highlighted by red are deemed high risk. Mitigation activities for several of these locations are touched on later in the report.

5.1. Fuel Management

As noted in section 4, a very high proportion of private land within the AOI resulted in a modified approach toward the local wildfire threat assessment; the result was a spatial patchwork of threat with no conclusive, landscape level threat delineation. Wildfire does not recognize administrative boundaries. This scenario presents substantial limitations to effective Crown land fuel management. Emphasis was thereby given to the generic understanding that any vegetation in proximity to a structure, be it a home or critical infrastructure, presents a hazard; therefore, FireSmart fuel management at an individual property or neighborhood level will be the most effective at this time. Appropriate and timely fuel hazard abatement as per the Wildfire Act and Regulations should be occurring on neighboring private managed forest lands.

Beaver Lodge Forest Land is the only reasonably large piece of Crown Land that would benefit from a fuel re-treatment. While originally treated in 2009, the Beaver Lodge Forest Lands do, and will require consistent re-treatment. Fuels constantly accumulate, therefore regular maintenance is needed. Fuel re-treatment in a public, well known area is a positive and visible example of what good fuel management looks like (Recommendation 12).

Develop a plan for signage in public high-risk areas where fuel treatments and FireSmart activities have occurred. Educational signage is a passive way to engage recreation users about wildfire safety and prevention. Consider including reference to historic wildfires in significant areas and highlight how these historic fires could have been prevented. Also provide information for users on what to do if a fire was to occur in the area and who to contact for more information about wildfire protection in the City of Campbell River (Recommendation 13).

There is no one-size fits all fix to fuel management. *Firestorm 2003: Provincial Review* (2004) explains that the best way to tackle fuel management is to delegate the responsibility of fuel management to the community, private land owners and neighborhoods. Not only will it educate people on fire behavior, it will

also avoid huge blanket prescriptions that are costly, time consuming and ineffective. It is most effective to encourage fuel management as regular activity - a way to continually keep their property FireSmart.

5.2. FireSmart Planning & Activities

The Abbott and Chapman Review (2018) made several comments and recommendations with respect to FireSmart, notably:

- "Fund and foster a revitalized FireSmart program and encourage dynamic partnerships with local and First Nations governments as well as the participation of large private landholders" (critical elements for a new and more successful approach since the *Firestorm 2003: Provincial Review,* or Filmon report);
- "Within wildland urban interface areas, mandate building code and/or development permit requirements for use of fireproof building materials and promote expanded use of sprinkler technology (critical elements for a new and more successful approach since the *Firestorm 2003: Provincial Review,* or Filmon report);
- "Property losses stemming from wildland urban interface fires remain a major vulnerability in BC communities. We must find ways to reward those who follow FireSmart principles and take steps to fireproof their homes and properties"; and
- "Canada, BC, and First Nations and local government collaborate to reduce vulnerability and incentivize the building of more resilient structures by adjusting building codes, regulations, bylaws and development permit requirements to encourage the use of fire-resilient building materials. In keeping with FireSmart Principles, we believe governments need to encourage and/or mandate proactive use of such materials.

5.2.1. FireSmart Goals & Objectives

The goal of FireSmart is to encourage homeowners to conduct FireSmart practices on their property to reduce damages and minimize the hazards associated with wildfire. These practices should aim to:

- Reduce the potential for an active crown fire to move through private land;
- reduce the potential for ember transport through private land and structures;
- create landscape conditions around properties where fire suppression efforts can be effective and safe for responders and resources;
- treat fuel adjacent and nearby to structures to reduce the probability of ignition from radiant heat, direct flame contact and ember transport; and
- implement measures to structures and assets that reduce the probability of ignition and loss.

Research has shown that a value that has been treated in accordance with FireSmart principles has a much higher chance of survival in a wildfire situation (Partners in Protection 2003). Treatment of adjacent fuels further enhances survival probability.

5.2.2. Key Aspects of FireSmart for Local Governments and First Nations

There are many different ways that members of the community and stakeholders can provide options to mitigate the risk (Partners in Protection 2003). The recommendations below target ways that the City of Campbell River should approach FireSmart principles and encourage their communities to do so as well.

The success of a CWPP is linked to follow-through. The City of Campbell River should initiate a CWPP action plan, and designate representatives to form a fuel management/ wildfire prevention planning table. These representatives would be responsible for creating and implementing the plan. There is funding available through CRIP for planning and emergency planning to support such committees and plans (Recommendation 1).

There are several opportunities to incentivize FireSmart activities outside of just FireSmart Community Recognition. The City of Campbell River will likely receive more buy-in from residents if there is an opportunity for rebate for FireSmart developments (funding directly available from CRIP), funding to maintain FireSmarting of community common areas, and potential property tax or insurance rebates for maintaining FireSmart activities on private properties (Recommendation 9).

Ensure that Urban Forestry Management staff is well aware of this CWPP, we well as FireSmart principles. At this time, there is no reference to wildfire mitigation and management activities in City plans outside of suggestions for revegetation following a natural disturbance event. Urban Forestry staff should be well versed in fire resistant tree species, fuel mitigation activities and be involved in future vegetation management planning (Recommendation 15).

5.2.3. Priority Areas within the Area of Interest for FireSmart

The intent of this sub-section is to use of the information gathered on local wildfire threat and risk assessments (Section 4) to best understand the priority areas for FireSmart planning and activities. These homes were selected because they lie in the High-Risk classification. Some locations are very public, and we believe would respond well to FireSmart engagement with City officials. Finally, it is vital that areas that lack appropriate water delivery systems or are difficult to access by the local fire department should be given more focus. Residents who take part in FireSmart activities on their properties significantly reduce the risk of lost property, particularly when the benefits of connection to City infrastructure are absent.

The City of Campbell River should create a plan to create FireSmart communities. The FireSmart program relies on local personnel to guide neighborhoods toward their FireSmart Goals. It is also important to identify locations within the City of Campbell River that would be a priority to encourage into FireSmart Activities. The following communities would benefit significantly from FireSmart support from the City of Campbell River (Recommendation 8);

Homes adjacent to Beaver Lodge Forest Lands – Interface: These homes are directly adjacent to vegetated areas. Many large trees have overhanging branches into backyards, abundant accumulation of vegetative debris, and many homes have flammable yard ornaments and furniture. Homes in this area should be targeted by the City to encourage FireSmart principles; clearing debris and fuel from their yards, updating structures with fire-resistant materials and moving towards fire-resistant landscaping.

McIvor Lake Road and adjacent structures– Intermix: Numerous homes dot the vegetated lands around McIvor Lake. These homes would benefit from FireSmart assessments and mitigation activities because of their proximity to vegetated areas. This neighborhood also has limited access and egress, therefore concentration of FireSmart activities should be around evacuation routes as well as homes. These communities should be invited to FireSmart meetings and be provided with FireSmart resources. Limited access to water delivery systems also increases this community's need for fire prevention. Sessions for setting up home sprinkler systems could also be offered. For larger properties, owners should conduct thinning and brushing to reduce the risk of fire moving into the tree canopy and traveling through tree crowns.

Homes on Quinsam River and Quinsam Road – Intermix: These homes border Elk Falls Provincial Park and campground. These homes would benefit from Fire Smarting predominately because of their proximity to a high-risk area, but also because of the proximity to the Elk Falls Provincial campground; a location that has many tourists, campers, and campfires. Quinsam community members should be provided with FireSmart materials, and have the opportunity to connect directly with the local fire department and BCWS North Island/ Mid-Coast Zone staff. This location's proximity to heavily used public

recreation sites where open fires are common, increase risk of accidental ignition. Community members should be trained to recognize out-of-control campfires, and should be encouraged to prevent potential ignition on their properties through FireSmart preparation.

Race Point – Interface: Similar to Beaver Lodge, these homes back against heavily vegetated lands. In addition to their proximity to forest fuels, there is very limited access; therefore, FireSmart activities should be concentrated on evacuation routes. Homes in this area should be targeted by the City to encourage FireSmart principles; clearing debris and fuel from their yards, updating structures with fire-resistant materials and moving towards fire-resistant landscaping. Additionally, local fire personnel should discuss maintenance of egress routes with the community; these areas must be kept free and clear of fuels and well maintained so as not to impede access.

Gordon Road – Intermix: These homes are well mixed with vegetated fuels, and would benefit from FireSmart fuel management strategies. Further bolstering the need for FireSmart is this neighborhood's access to City water. To date, the distribution of fire hydrants along Gordon Road does not meet City of Campbell River guidelines. With limited access to water, the City of Campbell River should directly engage this community by providing FireSmart seminars, and guiding them to become a recognized FireSmart community, and encourage thinning and brushing activities in adjacent areas.

5.3. Community, Communication and Education

The CWPP will only be successful if the community is engaged, informed and supportive of the process and the recommendations. Moving from the CWPP to implementation of specific activities requires that the community is well informed of the reasons for, and the benefits of, specific mitigation activities.

This CWPPs communication and education recommendations can be aligned with the Abbott and Chapman Review (2018) key themes that emerged from their engagement process: Partnerships and participation, knowledge and tools, communication and awareness and to some extent, investment. Stand-out recommendations can be aligned with the Abbott and Chapman Review as shared below. Specific recommendations however, are summarized in Section 5.5.

Partnership and Participation

> "Given the sheer scale of extreme weather events in the 21st century, partnerships between and among governments, local first nations, communities, regional districts, organizations, stakeholders and others are vital to more effectively, and quickly, responding to events. Participation is an important part of this equation: it also extends to families and individuals and what proactive actions they might take such as adopting FireSmart principles to better protect their properties from wildfires. Engaging citizens and communities happen continually, not just when a weather event is occurring (Abbott and Chapman 2018)."

The Abbott and Chapman Review (2018) heard that local citizens brought not only energy and resources, but also an intimate knowledge of their lands. Abbott and Chapman believe that enhanced, on-the-ground partnerships could prove extraordinary valuable in a range of emergency events.

Recommendation #1 in the Abbott and Chapman review is to establish Indigenous Peoples as true partners and leaders in emergency management by including First Nations from the beginning and all levels of planning, decision making and implementation. Recommendation #2 is to provide support to First Nations governments and communities to enhance their role and capacity through the development and, where necessary, adaptation of emergency plans with consider the impacts of potential changes in their internal governments.

Knowledge and Tools

> "Tapping into Indigenous and local knowledge of roads, watercourses, weather patterns and other criteria, is a must if government hopes to be more effective in responding to extreme weather events going forward (Abbott and Chapman 2018)."

The Abbott and Chapman Report (2018) presented a 'strategic shift' in Recommendation #64 rationalizing that an active partnership among all those who work on the land or regulate land uses contribute to better overall land stewardship: undertake a portfolio approach to prevention where all possible partners are identified, collaborate to reduce the risk, and assess performance and success at the portfolio level, including Federal, First Nations and local governments, private land owners, BC Wildfire Service, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, and BC Parks.

Communication and Awareness

> "Our world has changed in many ways since the Filmon report was published in 2004. Among them is the power and reach of social media. In an emergency, effective communication involves using all relevant communication channels – including social media – to provide reliable information generated by credible sources so that misinformation does not create additional challenges during a time of crisis. Equally, effective communication is about ensuring citizens, communities and organizations understand what they should be during and the resource available to them during a disaster and its aftermath (Abbott and Chapman 2018)."

Recommendations in the Abbott and Chapman Report (2018) are aimed at seeing more effective strategies developed for information-sharing between response authorities and the public. This also extends to improving communication between and among levels and agencies of government during an emergency. Social media is a powerful tool in distributing information quickly. What it gains in its speed of transmission, it often lacks in its legitimacy. Emergency response personnel and City staff must be careful in their use of social media, and ensure that associated links are referenced.

Investment

Abbott and Chapman (2018) noted that in an era of climate change and extreme weather events, residents cannot afford *not* to make necessary investments to prevent or, at the very least, mitigate disaster; planning in advance of disaster if vital. Greater investment should be made in the first to pillars of emergency management; planning/preparedness, and prevention/mitigation. The Provincial government has taken steps in this regard most recently with the transition to a new Community Resilience Investment Program from the previous Strategic Wildfire Prevention Initiative. Both programs are administered by the Union of British Columbia Municipalities. The transition is intended to fund a broader suite of eligible activities that align with the seven FireSmart disciplines of education, fuels management, legislation and planning, development considerations, interagency cooperation, emergency planning and cross-training (Union of BC Municipalities 2018).

The City of Campbell River should create a program to distribute wildfire safety and FireSmart information to homeless communities, new residents and tourists. These groups are only exposed to fire safety through signage and passive exposure. Homeless individuals, tourists and campers often use open fires however may not be aware of fire safety initiatives. Similarly, new residents to the City of Campbell River may not be aware of wildfire risk, therefore are not conscious of available FireSmart materials (Recommendation 5).

5.4. Other Prevention Measures

Reducing the occurrence of wildfire ignitions and impacts from wildfires can be achieved through additional measures such as community planning, development restrictions and/or guidelines, danger class rating signs, access restriction and public communication.

Bring awareness to wildfire as a natural part of the ecosystems we live in. The common view of wildfire is that is irregular, unnatural and should be stopped at all costs. A paradigm shift in thinking to accept wildfire as an inevitability in our ecosystems will encourage the public to take action and mitigate fire risk on their own properties. The City of Campbell River should consider some activities like: media campaigns during high fire season educating the public on the natural aspects of wildfire; presenting wildfire education and safety information at local events; and including a wildfire presentation in school curriculums to bring awareness to the purpose of wildfire in our ecosystems (Recommendation 16).

6. Wildfire Response Resources

The intent of this section is to provide a high-level overview of the resources that are available to local governments in the case of a wildfire.

Interface fires are complex incidents that typically involve both wildland and structural fires. During times when many fires are burning in the Province and threatening multiple communities at the same time, resource requests can exceed the resources available. In B.C. these resources are deployed according to B.C. Provincial Coordination Plan for Wildland Urban Interface Fires (2016).

The City of Campbell River does not currently have a wildfire specific emergency response plan. As wildfires are unpredictable and do not behave the same way as flooding or earthquakes, it is prudent to have an emergency response plan specific to wildfire. This proposed plan should address several wildfire scenarios, should integrate with existing plans throughout the City, and should be presented to the public. Funding is available through CRIP for such activities (Recommendation 2).

6.1. Local Government and First Nation Firefighting Resources

The intent of this sub-section is to identify implications of wildfire that impact firefighting efforts (e.g. loss of electrical power and water pressure and supply), the contingencies that have been put in place, and any recommended measures that would help to make community firefighting more effective.

6.1.1. Fire Departments and Equipment

Equipment and staffing of the CRFD is adequate for the size and requirements of the City. A full listing of equipment is available in Appendix 4. Items of note are the Structural Protection Unit trailer, as well as a Wildland Pump and Tank truck for interface fires.

To date, the Campbell River Fire Department has mutual aid agreements with the Comox Valley Regional District fire departments, CFB Comox Base, and Quadra Island. No mutual aid agreements have been made with municipalities north or west of the City (no agreements with Sayward or Gold River), nor does an agreement exist between Campbell River and communities in the Strathcona Regional District regarding sharing of firefighting resources. Unfortunately, the physical distance between each of these regions limits response times and availability of resources (pers. comm Thomas Doherty 2019).

There are currently properties and homes located on either side of the CRFD fire protection zone. To ensure WUI properties are defensible by the CRFD, the fire protection boundary should be extended to include all structures in Race Point and along Gordon Road. It is also recommended that the CRFD and the North Island/ Mid-Coast Fire Zone staff discuss triggers for mutual aid and suppression support in these locations (Recommendation 7).

BC Wildfire Service (BCWS) works closely with the local fire departments, and have in place an interagency agreement outlining resource sharing. They also endeavor to conduct cross training events with the City of Campbell River Fire Department to ensure staff is up-to-date on all wildfire fighting techniques and technologies. Scheduling and staff availability restrict how often these activities occur. While simulations can't fully represent the intensity of a large uncontrolled wildfire, they help prepare firefighters for the actual event.

The CRFD should commit to regular semi-annual meetings with BCWS to discuss wildfire prevention activities and conduct cross training and emergency simulations. Often inter-agency meetings are overlooked, rescheduled and inconsistent. This creates gaps in training, knowledge and prevention initiatives. Funding is available through CRIP for interagency co-operation, emergency planning and cross training (Recommendation 6).

The BCWS North Island/ Mid-Coast Fire Zone is home to several 3-5-person initial attack crews as well as senior wildfire response officers (site-level incident managers and operation center coordinators). It includes a heli-base and a moderate-sized wildfire equipment warehouse. North Island/ Mid-Coast Zone has access to sustained action 20-person unit crews from bases in Port Alberni and on the BC mainland can be brought in times of need.

Firefighting capacity is limited to Local Government – Campbell River Fire Department has agreements with First Nations to provide firefighting resources. BCWS has similar agreements.

6.1.2. Contract Resources and Local Service Providers

During largescale emergency events, municipalities draw on numerous resources to support protection efforts. When this even is wildfire, these local service providers can include heavy equipment operators, water truck drivers, caterers, temporary shelter for firefighters, camp equipment, and additional firefighting personnel.

The City of Campbell River and the CRFD should create a database of all qualified local service providers and available resources for emergency response. Complete documentation of these resources will eliminate the need to rely on BCWS and the North Island/Mid-Coast Fire Zone to provide the City with resource listings. Up-to-date documentation will cut response times and help identify any gaps in coverage. To accomplish this, CRFD can contact BCWS and request their current resource listings. The City should add any listings available through local mutual aid agreements. The City of Campbell River should ensure the appropriate administrative mechanisms are in place to hire and pay equipment owners or service providers for specialized services on short notice, for example procure confirmed rate listings and pre-standing contracts (Recommendation 10).

6.1.3. Water Availability for Wildfire Suppression

Campbell River has abundant sources of surface water suitable for wildfire suppression in the form of lakes, rivers, creeks, and the ocean. Water sources are accessible to portable fire pumps, water tender trucks and aircraft water delivery systems.

Fire hydrants are concentrated in areas of high structure density. Only one hydrant is situated within one kilometer of John Hart Lake. None exist in the McIvor Lake area, and hydrants are limited to the eastern interface side of the Beaver Lodge Forest Lands. There is also a lack of hydrants within the Campbell River First Nation Reserve near Tyee Spit, hydrants restricted to the outskirts of the reserve. There are no fire hydrants between Middle Point and Race Point at the northern most section of our AOI. Hydrant spacing along Gordon Road & Duncan Bay Road does not meet City guidelines.

Locations missing fire hydrants tend to be areas we have defined as WUI. This makes it difficult for City fire crews to access water directly from municipal infrastructure. During WUI wildfires, crews will need to have portable pumps and pump accessories to collect and distribute water from natural sources.

The City of Campbell River and CRFD should invest in assets that will increase firefighting efficiency and capacity in several areas, including McIvor Lake and Gordon Road. From the 2013 CWPP, it is important to have unbridled access to water throughout the AOI. The City should identify specific locations that require increased suppression equipment; install additional fire hydrants in the McIvor Lake and Gordon Road areas. Additionally, consider investing in additional Structural Protection Units to stage in high risk locations should new installations of hydrants and infrastructure not be feasible (Recommendation 11).

In the summer months, water consumption in the City increases threefold (City of Campbell River 2019). To this end, watering restrictions are in place to avoid a complete drought and a lack of wildfire suppression resources. Should an electrical failure occur, backup generators and gravity fed water distribution lines ensure that what water is available will successfully travel to the needed site.

6.1.4. Access and Evacuation

Areas that are accessible through a single corridor are a liability for suppression operations during a wildfire. Single access roads create pinch points for resources accessing a wildfire as well as residents egressing out of an area, creating congestion and hazards. Areas having singular access roads are at elevated vulnerability should the road itself become threatened or blocked by a wildfire or by a traffic incident blocking or restricting the road.

The City of Campbell River and the CRFD should improve and document difficult to access locations within the AOI. Physical obstructions on access routes hinder fire personnel from attending a fire. Poorly maintained roads, undocumented gates and resource roads are common issues. Create an inventory for gates and barriers on private lands; create a gate permitting process for all newly installed gates in the AOI; assess any vehicle access issues for local fire department and wildfire resources (machinery, truck turn-arounds and terrain limitations) (Recommendation 3).

Additionally, various locations within the CRFD fire protection boundary are immensely difficult to access without off road vehicles. The CRFD has experienced extended response times due to the need to hike in several kilometers to structures located in remote areas. Similarly, small islands and water-access only properties pose a unique barrier to response.

The CRFD should invest in equipment that will bolster their ability to access remote locations. Remote and water-access only locations lie within the CRFD fire protection boundary. Lack of equipment and response vehicles will create huge response delays. The CRFD should commit to purchasing a UTV and a water craft to attend fires inaccessible to conventional fire vehicles and properties only accessible by water (McIvor Lake Island residences) (Recommendation 4).

Table 6 below lists problematic access and evacuation areas we identified through our research.

Table 6 Problematic Access and Evacuation Areas

Location	Constraints
Forest Service Roads (i.e. Duncan Bay Main, Airport Main, ERT)	- Gates blocking entrances; - poorly maintained road; - overgrown roads.
Beaver Lodge (Trask Road Entrance, Elk River Timber Road, McPhedran Road)	- Gates blocking access; - access limited to trails; - ATV access only for some portions.
McIvor Lake	- Argonaut and Gold River Hwy are the only evacuation routes leading away from the lake; - ATV access only for some portions. - McIvor Lake Island, requires boat access
Race Point	- Difficult to access; - one way in, one way out., - outside jurisdictional boundary for CRFD
Elk Falls Provincial Park	- Single road access; - limited access; - ATV access only for some locations; - some locked gates, blocked roads.
Homewood Rd.	- Private Bridges.
Homalco First Nation	- One way in- one way out.
BC Hydro Rights of Way	- CR Fire Chief currently acquiring keys from BC Hydro.

6.1.5. Training

Some cross training has occurred between the Campbell River Fire Department and The North Island/ Mid-Coast Fire Zone; however, it has been inconsistent due to staffing and scheduling issues. There are various courses offered by BCWS that are geared towards structural fire crews looking for more experience in wildland fire tactics. We have compiled a list of relevant S (Suppression) Series courses that would benefit local fire suppression crews who may be exposed to wildfire in the WUI.

- S-100 Basic Fire Suppression and Safety
- S-211 The Fire Environment for Firefighters and Dispatchers
- S-212 Fireline Communications
- S-213 Use of Bulldozers and Heavy Equipment
- S-215 Fire Operations in the WUI
- S-232 Portable Pumps and Water Delivery Systems
- S-235 Burning-off and Backfiring
- S-241 Fire Assessment
- S-270 Helicopter Use and Safety
- S-275 Air Tanker Use and Safety

6.2. Structure Protection

Campbell River Fire Department has a Structural Protection Unit (SPU) trailer. These trailers were assembled to permit fast deployment of large numbers of sprinklers and pumps specifically set up for values protection in a WUI situation. BCWS and have additional SPU trailers located strategically throughout the Province which can be requested under Mutual Aid agreements to provide structural protection where needed.

During interface wildfire events, fire fighters are required to make quick decisions about which structures are worth protecting. Fire suppression resources are quickly overwhelmed during significant WUI incidents. Rather than tying up precious resources, structures requiring large amounts of work to protect may be overlooked in favor of structures that can be protected from ignition with less resource commitment. SPUs are more likely to be deployed on properties that are visibly FireSmart, because there is a higher likelihood of saving these properties. It is not useful to try and protect a property with an SPU when the house is condemned to burn.

7. Recommendations and Funding

This section summarizes the list of recommendations, and identifies possible sources for funding the recommendation activities.

7.1. Summary of Recommendations

Below is a summary table of recommendations, previously highlighted in Sections 5 and 6. Items highlighted in red are deemed highly impactful, high priority, and may involve the safety of residents and suppression personnel. Yellow items have a medium impact, may require ongoing attention, may take more time to have a significant result, but are also still very important in bolstering the preparedness of the City of Campbell River in the event of a wildfire. Green recommendations represent ideological goals, long term plans and difficult to achieve goals. They are still impactful, but require substantial effort and follow-through.

Table 7 Summary of Recommendations and Funding

Recommendation	Justification	Examples and Suggestions	Responsibility and Funding
1. Commit to a CWPP action plan, and appoint a committee to initiate these plans	To ensure the CWPP is put to use, the City should commit to a CWPP action plan, including appointing a committee to table future wildfire management	- Create a CWPP action plan - Appoint members to contribute to a CWPP action plan; - assess progress and	City of Campbell River, CRFD Prevention Officer **Funding: CRIP**

	activities.	barriers in making the City wildfire safe; - Access CRIP funding for Planning and emergency planning.	
2. Create a wildfire specific Emergency Response Plan	Wildfires are unpredictable; therefore, it is valuable to have a wildfire specific evacuation plan to streamline emergency situations.	- Create an evacuation plan that addresses several wildfire scenarios; - encourage homeowners to include wildfire evacuation and safety in Home Evacuation Plans; - collaborate with City or BCWS GIS personnel for fire mapping projections and models (e.g. RedApp or Prometheus modeling software); - integrate wildfire specific evacuation routes into existing plans or new revisions; - issue public notification of new evacuation plans. - Access CRIP funding for emergency planning and education.	City of Campbell River Emergency Planning, Strathcona Regional District **Funding: CRIP**
3. Improve and document difficult to access locations within the AOI	Physical obstructions on access routes hinder fire personnel from attending a fire. Poorly maintained roads, undocumented gates and resource roads are problematic.	- Begin an inventory for gates and barriers on private land; - create a gate permitting process for all newly installed gates in the AOI; - assess any vehicle access issues for local fire department and wildfire resources; - Access CRIP funding for planning and development considerations, emergency planning.	CRFD, City of Campbell River **Funding: CRIP**
4. Invest in equipment that will bolster the CRFD ability to access remote locations	Remote and water-access-only locations lie within the CRFD fire protection boundary. Lack of equipment and response vehicles will create huge response delays.	- Commit to purchasing a UTV for CRFD responders attending remote fires within the fire protection boundary; - Invest in a watercraft to access water bound locations (particularly McIvor Lake island residences).	CRFD, City of Campbell River **Funding: Municipal**
5. Create a program to distribute wildfire safety information to homeless communities, new residents and tourists	These groups are only exposed to fire safety through signage and passive exposure. Homeless communities often use open fires, however may not be aware of fire safety initiatives. New residents and tourists may not be aware of the wildfire risk in their neighborhood.	- Ensure pamphlets and brochures on fire safety and FireSmart are available in public places; - strategically place wildfire safety information in community centers, healthcare centers and community shelters; - offer training to community shelter staff who actively	City of Campbell River – community outreach, CRFD **Funding: CRIP**

		work with this population to bolster FireSmart knowledge; - reach out to community Welcome Committees to include wildfire safety information in Welcome packages; - provide real-estate agents with FireSmart information, encouraging them to use it as a selling feature for incoming residents; - Access CRIP funding for education and inter-agency cooperation.	
6. CRFD should commit semi-annual meetings with BCWS to discuss wildfire issues and prevention	Often inter agency meetings are overlooked, rescheduled, and inconsistent. By scheduling regular events, the CRFD and BCWS will be able to identify and efficiently tackle recurring issues.	- Commit to quarterly/ semi-annual meetings to identify gaps in knowledge and any conflicts between departments, especially prior to the start of fire season; - conduct and document regular cross training; - regularly discuss new ways to engage the public in wildfire management; - identify specific triggers for mutual aid between BCWS and CRFD; - create more opportunities for structural personnel to be engaged in wildfires; - Access CRIP funding for inter-agency cooperation (FireSmart Planning Tables/ Interagency fuel management Tables).	CRFD, BCWS **Funding: CRIP**
7. Extend the CRFD fire protection boundary to include Race Point and Gordon Road properties	Homes and properties are located on either side of the CRFD Fire Protection Zone. To ensure WUI properties are defensible by the CRFD, the fire protection boundary should be extended to include these structures.	- Extend the fire protection boundary to include residences in Race Point; - Extend the fire protection boundary to include all homes along Gordon Road in the WUI; - Engage with BCWS on their responsibilities in these locations, document and discuss the triggers for mutual aid here; - Utilize CRIP funding for planning and development.	City of Campbell River, CRFD, BCWS **Funding: CRIP**
8. Develop a plan to create FireSmart Communities	The FireSmart program relies on local personnel to guide neighborhoods. Residents who are passionate about their community will become engaged in FireSmart methodologies. This can also lead to FireSmart	- Find a Local FireSmart Representative; - conduct FireSmart Champion Training; - make FireSmart hyperlinks accessible on the City of Campbell River Homepage. - Encourage communities/	City of Campbell River, CRFD **Funding: CRIP, FireSmart Canada, FNESS**

	Community Recognition.	neighborhoods access CRIP funding for CWPPs, FireSmart events and educational events.	
9. Find a way to incentivize FireSmart activities and FireSmart Community Recognition	Having an incentive program will increase buy-in.	- Consider property tax reduction; - insurance premium reduction; - additional funding for residents to maintain FireSmart properties; - Utilize CRIP funding and rebate availability.	FireSmart Canada, City of Campbell River **Funding: CRIP**
10. Create a database of all qualified local service providers and available resources for emergency response	Complete documentation of resources will eliminate the need of the City to rely on BCWS to provide resource listings. Up-to-date listings will cut response times and help identify any holes in coverage.	- Request resource listings from BCWS; - add any listings available through mutual aid agreements and volunteer resources; - continually update and revise; - ensure City has administrative mechanisms in place to hire and pay equipment owners or service providers for specialized services on short notice (normal tendering processes will not be adequate in a fire emergency).	City of Campbell River, CRFD, BCWS **Funding: BCWS, Municipal**
11. Invest in assets that will increase firefighting efficiency in several areas (McIvor Lake, Gordon Road)	From the 2013 CWPP, it is important to have unbridled access to water throughout the AOI.	- Identify specific locations that require increased suppression equipment; - install fire hydrant in McIvor lake area; - install additional hydrants in locations that do not meet City Requirements (Gordon Road); - consider investing in additional SPU to stage in high risk locations; - consider local resident training in SPU use; - Access CRIP funding for resident education on SPU and FireSmart.	City of Campbell River, CRFD **Funding: BCWS, Municipal, CRIP**
12. Re-Treat Beaver Lodge Forest Lands	Fuel Management is not just a simple, one-time prescription. As trees grow, they increase the fuel load of an area, thus need to be continually managed. It also provides an opportunity to demonstrate fuel management projects to residents.	- Review fuel loading in the Beaver Lodge Forest Lands; - conduct brush removal and selective thinning; - schedule future treatments. - Access CRIP funding for fuel treatment and demonstration projects.	City of Campbell River, Province of BC, CRFD **Funding: CRIP**
13. Develop a plan to increase signage in public high-risk areas, and where	Educational signage is a passive way to engage recreation users about wildfire safety. Consider	- Identify high traffic, high risk areas (Beaver Lodge Forest Lands, McIvor Lake, Elk Falls Campground,	City of Campbell River, CRFD **Funding: CRIP**

fuel treatments have occurred	including reference to historic wildfires in significant areas, highlight what to do if a fire is encountered, and what the local fire department/ BCWS branch is doing to prevent wildfires.	Willow Creek); - locate visible locations for fire signage; - consider using before/after imagery to highlight FireSmart principles and fuel management techniques; - Access CRIP funding for Education and FireSmart demonstration projects	
14. Require Interface Development Permit applications have been reviewed by Wildfire Professionals before submitting to the City for approval	Development permit applications include input by professional biologists. WUI development permit applications however are not required to be reviewed by a forestry or wildfire specialist.	- initiate a review process that includes wildfire specialists; - adjust development bylaws to include FireSmart and wildfire mitigation requirements.	City of Campbell River **Funding: Municipal**
15. Ensure Urban Forestry personnel are informed and have access to this CWPP	At this time, there is no direction in the Urban Forestry Management plans toward wildfire prevention; actions are limited to re-vegetation of lands affected by natural disturbance.	- Ensure Urban Forestry Manager is aware of this CWPP - Include the Urban Forestry department in wildfire planning discussions	City of Campbell River **Funding: Municipal, CRIP**
16. Bring awareness to Wildfire as a natural part of the ecosystems we live in	The common view of wildfire is that it is uncommon, unnatural and should be stopped. A paradigm shift in thinking to accept wildfire as an inevitability in our ecosystems will encourage the public to tack action and mitigate fire risk.	- Consider a media campaign during fire season - present Wildfire education and safety at local events; - deliver wildfire safety pamphlets and brochures to high risk properties. - Access CRIP funding for education	City of Campbell River, CRFD, BCWS **Funding: CRIP**
17. Develop and maintain accurate GIS information on Fuel Types, Threat Levels and new structural developments within the AOI and CRFD jurisdictional boundary	Poor and old spatial data on fuel types causes problems when trying to identify risk areas. BCWS PSTA data is coarse, and not useful for making fuel management prescriptions in the City. If the City of Campbell River procures more detailed and up-to-date data, it will reduce wasted time in future CWPPS, wildfire risk planning, and fuel management practices.	- Access and review updated spatial data from 2020 Campbell River CWPP; - adopt a method for continually updating new spatial data from wildfire hazard assessments; - consider external GIS support to provide assistance; - impress upon the provincial government the importance of providing more accurate data; - create incentive for private managed forest landowners to share vegetation inventory data.	City of Campbell River, BCWS, Province of British Columbia **Funding: Municipal, BCWS**
18. Work with BCWS to mitigate the risk at the North Island/ Mid-Coast Fire Zone Base to a lower risk area	The base is currently located in a high-risk area. Fire protection resources are therefore at risk of being damaged or isolated during wildfire.	- Create a fuel management plan for the current base to decrease risk; - consider involving the public in fuel management programs; - consider relocation of the	BCWS, City of Campbell River, CRFD **Funding: CRIP**

		base to a lower risk area. - Access CRIP funding for inter-agency cooperation, training, and fuel treatment	

7.2. Community Resiliency Investment Program (CRIP)

Table 8 below describes the topics and associated eligible activities for CRIP funding. The City of Campbell River should try and access these funds wherever possible.

Table 8 Community Resiliency Investment Program Eligible Activities

Topic	Eligible Activities
Education	- Develop and/or promote local FireSmart educational activities and tools. Refer to BC FireSmart Resources for FireSmart materials that are currently available; - develop and/or promote education for the reduction of human-caused fires; - encourage active participation in Wildfire Community Preparedness Day; - organize and host a community FireSmart day, FireSmart events and workshops, and wildfire season open houses; - apply for FireSmart Canada Community Recognition.
Planning	- Update CWPP; - develop policies and practices for design and maintenance of FireSmart publicly owned land and First Nations land, such as parks and open spaces; - develop policies and practices for design and maintenance of FireSmart publicly owned buildings; - conduct site visits and FireSmart and/or risk assessments for publicly owned lands, First Nation lands and publicly owned buildings.
Development considerations	- Amend Official Community Plans, Comprehensive Community Plans and/or land use, engineering and public works bylaws to incorporate FireSmart policies; - revise landscaping requirements in zoning and development permit documents to require fire resistant landscaping; - establish Development Permit Areas for Wildfire Hazard in order to establish requirements for the exterior design and finish of buildings (Local governments should refer to Changes for Local Governments Under Section 5 of the Building Act: Appendix to Section B1 of the Building Act Guide (Revised February 2017) for information on the use of development permits for wildfire hazard); - include wildfire prevention and suppression considerations in the design of subdivisions (e.g. road widths, turning radius for emergency vehicles, and access and egress points); - amend referral processes for new developments to ensure multiple departments, including the fire department and/or emergency management staff, are included; - incorporate defensible space in new WUI subdivisions within the design and layout of the development.
Interagency co-operation	- Develop and/or participate in regional or local FireSmart planning tables; - participate in multi-agency fire and/or fuel management tables.
Emergency planning	- Develop and/or participate in cross-jurisdictional meetings and tabletop exercises, including seasonal readiness meetings; Review structural protection capacity (i.e. Fire safety assessments)
Cross training	- Cross-train fire departments to include structural fire and interface wildfire training; - provide or attend training for Local FireSmart Representatives and community champions; - support professional development to increase capacity for FireSmart activities.
FireSmart Demonstration Projects	- Undertake FireSmart Demonstration Projects for publicly owned buildings or publicly and provincially owned critical infrastructure; - replace building materials (i.e. siding or roofing) with fire-resistant materials; - replace landscaping with fire-resistant plants as outlined in the FireSmart Guide to

Topic	Eligible Activities
	Landscaping.
FireSmart Activities for Private Land	- Planning for private land (only with private property owners' consent); - develop FireSmart Community Plans for specific areas; - conduct FireSmart home and property assessments; - offer local rebate programs to home owners on private land and First Nations land that complete eligible FireSmart activities on their own properties; - provide off-site debris disposal for private land owners who have undertaken their own vegetation management.

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Appendix 1: Past Wildfire Incidents Actioned by the CRFD (2017- 2019)

Date of Ignition	Location	Evacuation (yes/no)	Impact/ Extent of Involvement
May 27, 2017	Snowden Road	NO	Brush fire; outside of jurisdiction; assisted BC Wildfire.
July 25, 2017	Denman Street	YES	Fast moving grass fire; Tactical Evac on adjacent homes.
Aug 27, 2017	Cranberry Lane	NO	Brush fire; outside of jurisdiction; did not action; BC Wildfire & Oyster River FD attended.
Sept 10, 2017	Duncan Bay Road	NO	Close to critical communications tower; Outside of jurisdiction; BC Wildfire did not require assistance.
May 23, 2018	Near Quinsam Coal	NO	Wildfire; Rank 2-3 Outside of jurisdiction; BC Wildfire did not require assistance;
June 3, 2018	North of 6000 Island Hwy	NO	Wildfire; Outside of jurisdiction; BC Wildfire did not require assistance.
July 25, 2018	Hydro Transmission Line – Duncan Bay Road	NO	Wildfire; Rank 2 Approximately 2 hectares.
May 23, 2019	Hydro Transmission Line – Argonaut Road	NO	Wildfire; Rank 2-3 Approximately 3 hectares

Appendix 2: Wildfire Threat Assessment Worksheets and Photos

March 2017

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3] | Plot #

Location: Beaverlodge 1 | Date: 23/10/19 | Assessor/ Professional Designation: Kaitlin Fader, IFT

Coordinates (Lat/Long – Degrees/Decimal Minute: -125.26213, 49.9999 deg

Crown Species Composition (species %): Fdc 80, Dr/Mb 20

Ladder Fuel Species Composition (species %): Fdc 100

ORIGINAL FBP Type: D-1/2

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 (1)	2- < 5 3	5- < 10 5	10 - 20 3	> 20 2
		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent 0	Scattered < 10 coverage (4)	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous 0	Mixwood 3	Other conifer (5)	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent 0	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage (8)	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10
		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) 0	Mixwood (% conifer) 25% 50% 75% 2 5 (7)	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% 0	20-40% 1	41-60% (2)	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 0	6-9 3	3-6 7	< 3 (10)
10	Stems/ha (overstory)[7]	< 400 0	401-600 2	601-900 3	901- 1,200 4	> 1,200 (5)
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	50
Eco Province:	CWHxm 1 - COAST
Fuel Assessment Rating:	Moderate

Algorithm Fuel Type C-5

[3] *This sheet is used to summarize and score the completed plot tallies*

[4] *Leaves, needles or fine branch material*

[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*

[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*

[7] *Overstory is dominant and co-dominant stems (Green/Living)*

[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Beaver Lodge 1 Photos:

March 2017

Wildfire Threat Assessment Worksheet – Fuel Assessment (Site Level)[3] | Plot #

Location: Beaverlodge 2 | Date: 23/10/19 | Assessor/ Professional Designation: Kaitlin Fades. TFT

Coordinates (Lat/Long – Degrees/Decimal Minutes): -125.27018, 49.98152

Crown Species Composition (species %): Fdc 80, Dr/Mb 20

Ladder Fuel Species Composition (species %): Fdc 100

ORIGINAL FRP TYPE D-1/2

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 1	2- < 5 (3)	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent 0	Scattered < 10 coverage (4)	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous 0	Mixwood 3	Other conifer (5)	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent 0	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage (8)	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10

		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) 0	Mixwood (% conifer) 25% 50% 75% 2 5 (7)	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% 0	20-40% 1	41-60% (2)	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 0	6-9 (3)	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 0	401-600 2	601-900 (3)	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	43
Eco Province:	CWH xm 1 - COAST
Fuel Assessment Rating:	LOW

Algorithm Fuel type C-5

[3] *This sheet is used to summarize and score the completed plot tallies*

[4] *Leaves, needles or fine branch material*

[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*

[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*

[7] *Overstory is dominant and co-dominant stems (Green/Living)*

[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Beaver Lodge 2 Photos:

March 2017

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3]	Plot #

Location: Airport 3 Date: 23/10/19 Assessor/ Professional Designation: Kaitlin Facet TFT

Coordinates (Lat/Long – Degrees/Decimal Min -125.24591, 49.93479

Crown Species Composition (species %): Fdc 90, Dr 10

Ladder Fuel Species Composition (species %): Fdc 80 GaultSha (salal) 20

ORIGINAL Type - D1/2,

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 1	2- < 5 (3)	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent 0	Scattered < 10 coverage (4)	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous 0	Mixwood 3	Other conifer (5)	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent 0	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage (8)	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 2	901- 1,500 4	1 501- 2,500 (6)	2 501- 4,000 8	> 4,000 10

		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) 0	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) (15)
8	Crown Closure (CC)	< 20% 0	20-40% 1	41-60% 2	61-80% (5)	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 0	6-9 3	3-6 7	< 3 (10)
10	Stems/ha (overstory)[7]	< 400 0	401-600 2	601-900 3	901- 1,200 4	> 1,200 (5)
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	67
Eco Province:	CWHxm1 - COAST
Fuel Assessment Rating:	HIGH

Algorithm Fuel type C-5

[3] *This sheet is used to summarize and score the completed plot tallies*
[4] *Leaves, needles or fine branch material*
[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*
[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*
[7] *Overstory is dominant and co-dominant stems (Green/Living)*
[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Airport 3 Photos:

Wildfire Threat Assessment Worksheet – Fuel Assessment (Site Level)[3] | Plot #

Location: SPIT | Date: 29/10/19 | Assessor/ Professional Designation: Kaitlin Fadar TFT

Coordinates (Lat/Long – Degrees/Decimal Minutes): -125.24942, 50.04181

Crown Species Composition (species %): NONE

Ladder Fuel Species Composition (species %): NONE ORIGINAL FBP TYPE - M-1/2

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 (1)	2- < 5 3	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition Manicured Lawns / trails	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent (0)	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10

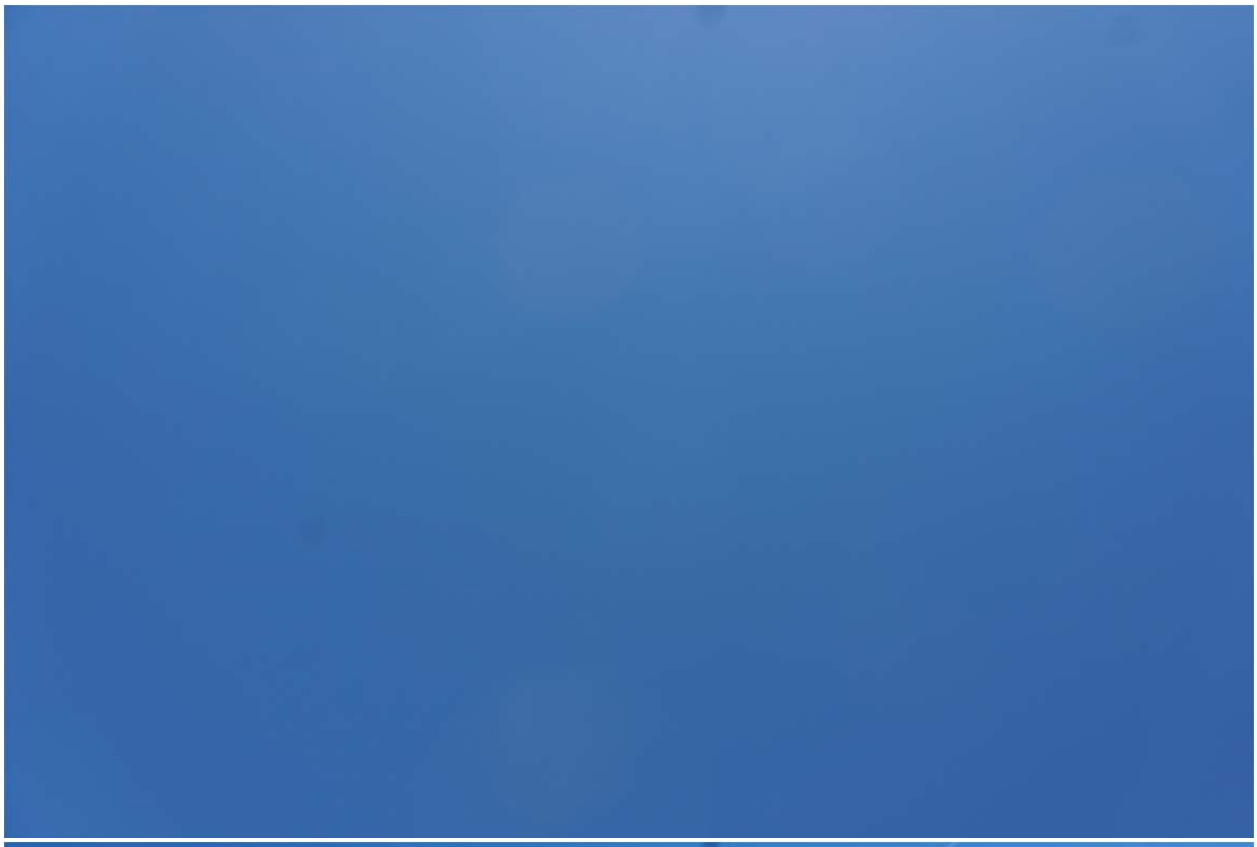
		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) (0)	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% (0)	20-40% 1	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% 2	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	7
Eco Province:	CWHXM1 - COAST
Fuel Assessment Rating:	LOW

Algorithm Fuel type N

[3] *This sheet is used to summarize and score the completed plot tallies*
[4] *Leaves, needles or fine branch material*
[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*
[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*
[7] *Overstory is dominant and co-dominant stems (Green/Living)*
[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Spit Photos:



Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3]	Plot #

Location: NORTH WOODENVIRO. CENTRE Date: 08/11/2019 Assessor/ Professional Designation: Kaitlin Fader TFT

Coordinates (Lat/Long – Degrees/Decimal Minutes) -125.29279, 50.05436. Deg.

Crown Species Composition (species %): GRASS / Hay Seed, curled dock.

Ladder Fuel Species Composition (species %): well Maintained, ORIGINAL FBP Type: M-1/2

	Component/ Sub-Component	Levels/Classes				
	Forest Floor and Organic Layer					
1	Depth of organic layer (cm)	1- < 2 1	2- < 5 3	5- < 10 5	10 - 20 3	> 20 (2)
	Surface and Ladder Fuel (0.1 – 3.0 meters in height)					
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent (0)	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10
	Stand Structure and Composition (Dominant and co-dominant stems)					
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) (0)	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% (0)	20-40% 1	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Glen.ketchum@CampbellRiver.ca

Total Score[8]:	10
Eco Province:	CWHxm – Coast
Fuel Assessment Rating:	low.

Algorithm Type: O-1a/b.
- note regular maintenance.

[3] *This sheet is used to summarize and score the completed plot tallies*
[4] *Leaves, needles or fine branch material*
[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*
[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*
[7] *Overstory is dominant and co-dominant stems (Green/Living)*
[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Norman Wood Environmental Centre Photos:

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3]		Plot #
Location: Airport 1.	Date: 23/10/19	Assessor/ Professional Designation: Kaitlin Fader TFT
Coordinates (Lat/Long – Degrees/Decimal Minutes): -125. 27092, 49 95259		
Crown Species Composition (species %): NONE		
Ladder Fuel Species Composition (species %): NONE		ORIGINAL Fuel Type. O-1a/b.

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 (1)	2- < 5 3	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition NONE-PAVED	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent (0)	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10

		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) (0)	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% (0)	20-40% 1	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	9
Eco Province:	CWH xm 1: COAST
Fuel Assessment Rating:	Low

Algorithm Fuel type N

[3] *This sheet is used to summarize and score the completed plot tallies*
[4] *Leaves, needles or fine branch material*
[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*
[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*
[7] *Overstory is dominant and co-dominant stems (Green/Living)*
[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Airport 1 Photos:


M9
V12

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3] | Plot #

Location: AIRPORT 2 | Date: 23/10/19. | Assessor/ Professional Designation: Kaitlin Facleff TFT

Coordinates (Lat/Long – Degrees/Decimal Minutes): -125.28364, 49.96013

Crown Species Composition (species %): N/A

Ladder Fuel Species Composition (species %): N/A (Grass, lawn.)

ORIGINAL TYPE: M-1/2, D-1/2

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 (1)	2- < 5 3	5- < 10 5	10 - 20 3	> 20 2
		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition Mowed lawn	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent (0)	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10
		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) (0)	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% (0)	20-40% 1	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)	NONE	Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	7
Eco Province:	CWH xm1 - COAST
Fuel Assessment Rating:	LOW

Algorithm Fuel type O 1a/b

[3] *This sheet is used to summarize and score the completed plot tallies*

[4] *Leaves, needles or fine branch material*

[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*

[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*

[7] *Overstory is dominant and co-dominant stems (Green/Living)*

[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Airport 2 Photos:

March 2017

Wildfire Threat Assessment Worksheet – Fuel Assessment (Site Level)[3] | Plot #

Location: DAM 1. Date: 29/10/19 Assessor/ Professional Designation: Kaitlin Fadet TFT

Coordinates (Lat/Long – Degrees/Decimal Minutes): -125,33623 , 50.04139.

Crown Species Composition (species %): N/A

Ladder Fuel Species Composition (species %): N/A - Almost No veg, RipRap and dirt

ORIGINAL FBP FT - C-2

	Component/ Sub-Component	Levels/Classes				
	Forest Floor and Organic Layer					
1	Depth of organic layer (cm)	1- < 2 (1)	2- < 5 3	5- < 10 5	10 - 20 3	> 20 2
	Surface and Ladder Fuel (0.1 – 3.0 meters in height)					
2	Surface fuel composition ALMOST NONE	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent (0)	Sparse < 10% coverage 2	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10
	Stand Structure and Composition (Dominant and co-dominant stems)					
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) (0)	Mixwood (% conifer) 25% 50% 75% 2 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% (0)	20-40% 1	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	9
Eco Province:	CWH xm 1 - COAST
Fuel Assessment Rating:	LOW

Algorithm Fuel type N

[3] *This sheet is used to summarize and score the completed plot tallies*

[4] *Leaves, needles or fine branch material*

[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*

[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*

[7] *Overstory is dominant and co-dominant stems (Green/Living)*

[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Dam 1 Photos:

March 2017

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3]	Plot #

Location: Airport 4 Date: 23/10/19 Assessor/ Professional Designation: Kaitlin Fadet

Coordinates (Lat/Long – Degrees/Decimal Minutes): -125.25047, 49.94443

Crown Species Composition (species %): Dr 35 Act 35 Fdc 30

Ladder Fuel Species Composition (species %): Dr 80, Other 20 (mixed)

ORIGINAL Type - D-1/2

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 1	2- < 5 (3)	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 – 3.0 meters in height)				
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent 0	Scattered < 10 coverage (4)	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent 0	Sparse < 10% coverage 2	Scattered 10-39% coverage (5)	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10

		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) 0	Mixwood (% conifer) 25% 50% 75% (2) 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% 0	20-40% (1)	41-60% 2	61-80% 5	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 0	6-9 3	3-6 7	< 3 (10)
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	33
Eco Province:	CWHXM 1 - COAST
Fuel Assessment Rating:	Low

Algorithm Fuel type M1/2

[3] *This sheet is used to summarize and score the completed plot tallies*

[4] *Leaves, needles or fine branch material*

[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*

[6] *Fuel Strata Gap – Distance from top of ladder fuel to live crown base height of overstory*

[7] *Overstory is dominant and co-dominant stems (Green/Living)*

[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Airport 4 Photos:

March 2017

Wildfire Threat Assessment Worksheet - Fuel Assessment (Site Level)[3]		Plot #	
Location: Argonaut 1	Date: 29/10/19	Assessor/ Professional Designation:	Kaitlin Fader TFT
Coordinates (Lat/Long -- Degrees/Decimal Minutes) - 125.32796, 50.015885			
Crown Species Composition (species %): Dr 40 Mb 35 Fdc 25			
Ladder Fuel Species Composition (species %): N/A		ORIGINAL FBP Type: D-1/2	

	Component/ Sub-Component	Levels/Classes				
		Forest Floor and Organic Layer				
1	Depth of organic layer (cm)	1- < 2 1	2- < 5 (3)	5- < 10 5	10 - 20 3	> 20 2

		Surface and Ladder Fuel (0.1 - 3.0 meters in height)				
2	Surface fuel composition	Moss, herbs, deciduous shrubs (4)	Lichen, conifer shrubs 6	Dead fines fuel[4] (<1 cm) 8	Pinegrass 10	Sagebrush, Bunch grass, Juniper, Scotch broom 15
3	Dead and down material continuity (< 7cm)	Absent (0)	Scattered < 10 coverage 4	10-25% coverage 8	26-50% coverage 12	> 50% coverage 15
4	Ladder fuel composition	Deciduous (0)	Mixwood 3	Other conifer 5	Elevated dead fuel 7	Spruce, Fir, Pine 10
5	Ladder fuel horizontal continuity	Absent 0	Sparse < 10% coverage (2)	Scattered 10-39% coverage 5	Patchy 40-60% coverage 8	Uniform > 60% coverage 10
6	Stem/ha (understory)[5]	< 900 (2)	901- 1,500 4	1 501- 2,500 6	2 501- 4,000 8	> 4,000 10

		Stand Structure and Composition (Dominant and co-dominant stems)				
7	Overstory composition/ Crown Base Height (CBH)	Deciduous (< 25% conifer) 0	Mixwood (% conifer) 25% 50% 75% (2) 5 7	Conifer with high CBH (> 10m) 10	Conifer with moderate CBH (6-9m) 12	Conifer with low CBH (< 5m) 15
8	Crown Closure (CC)	< 20% 0	20-40% 1	41-60% 2	61-80% (5)	> 80% 4
9	Fuel Strata Gap[6] (m)		> 10 (0)	6-9 3	3-6 7	< 3 10
10	Stems/ha (overstory)[7]	< 400 (0)	401-600 2	601-900 3	901- 1,200 4	> 1,200 5
11	Dead and dying (% of dominant and co-dominant stems)		Standing dead/ Partial down < 20% (2)	Standing dead/ Partial down 21-50% 5	Standing dead/ Partial down 51-75% 8	Standing dead/ Partial down > 75% 10

Total Score[8]:	20
Eco Province:	COASTAL 1
Fuel Assessment Rating:	Low

Algorithm Fuel type M1/2

[3] *This sheet is used to summarize and score the completed plot tallies*
[4] *Leaves, needles or fine branch material*
[5] *Understory is considered ladder and suppressed stems in this category (distinct break between these stems and overstory)*
[6] *Fuel Strata Gap -- Distance from top of ladder fuel to live crown base height of overstory*
[7] *Overstory is dominant and co-dominant stems (Green/Living)*
[8] *110 points based on 65 points on ground, surface and ladder fuel, and 45 points on overstory*

Argonaut 1 Photos:

Appendix 3: Fuel Type Change Rationale for Campbell River AOI

STRATEGIC

Kaitlin Fader <kaitlin.fader@snrc.ca>

Campbell River CWPP Fuel Type Change Rationale

Hicks, Dana T FLNR:EX <Dana.Hicks@gov.bc.ca> Thu, Jan 9, 2020 at 6:54 AM
To: Kaitlin Fader <kaitlin.fader@snrc.ca>, "BCWS Prevention FLNR:EX" <BCWSPrevention@gov.bc.ca>

Happy New Year Kaitlin,

I agree to all changes within the fuel type change rationale document.

Thanks,

Dana

From: Kaitlin Fader <kaitlin.fader@snrc.ca>
Sent: January 6, 2020 7:41 AM
To: BCWS Prevention FLNR:EX <BCWSPrevention@gov.bc.ca>; Hicks, Dana T FLNR:EX <Dana.Hicks@gov.bc.ca>; Duncan, Jessica FLNR:EX <Jessica.Duncan@gov.bc.ca>; Botica, Tony FLNR:EX <Tony.Botica@gov.bc.ca>
Cc: Aaron Fujikawa <aaron.fujikawa@snrc.ca>; Henry Grierson <henry.grierson@snrc.ca>; Evan Ross <evan.ross@snrc.ca>; Kate Roth <kate.roth@snrc.ca>
Subject: Re: Campbell River CWPP Fuel Type Change Rationale

I have not yet received any confirmation that our change rationale has been received.

As our timeline for this project is coming to a close, **if I do not receive notice of required changes before end of the day Friday, January 10, 2020, I will assume all Fuel type changes have been approved.**

Thank-you,

Kaitlin Fader

On Fri, Dec 20, 2019 at 7:58 AM Kaitlin Fader <kaitlin.fader@snrc.ca> wrote:

> Hello,
>
> I have not received confirmation of receipt for our Change Rationale. Would you kindly confirm receipt and provide a timeline for approval?
>
> Thank-you
>
> Kaitlin Fader

On Thu, Dec 12, 2019 at 9:48 AM Kaitlin Fader <kaitlin.fader@snrc.ca> wrote:

> Good morning.
>
> Attached is our rationale for fuel type changes in the Campbell River CWPP AOI. Should you have any questions please don't hesitate to contact me by e-mail or phone, details below.
>
> Thank-you,
>
> Kaitlin Fader
>
> --
>
> **Kaitlin Fader** TFT
>
> Assistant Forester
> Integrated Environmental Management
> South Island - Sunshine Coast
>
> **Strategic Natural Resource Consultants Inc.**
> p: 250.287.2246 ext.233
> w: snrc.ca
>
> 
>
>
> 
>

--

Kaitlin Fader TFT

Assistant Forester
Integrated Environmental Management
South Island - Sunshine Coast

Strategic Natural Resource Consultants Inc.
p: 250.287.2246 ext.233
w: snrc.ca

STRATEGIC
NATURAL RESOURCE CONSULTANTS

Thursday, December 12, 2019
Strategic Natural Resource Consultants Inc.
301-1180 Ironwood St
Campbell River, BC V9W 5P7

Ministry of Forests, Lands, Natural Resources Operations and Rural Development
Fuel Management, BC Wildfire Service

To Whom It May Concern,

Re: Fuel type change rationale – proposed methodology.

Strategic Natural Resource Consultants Inc. (SNRC) was retained to complete a Union of BC Municipalities – Community Resiliency Investment Program ("UBCM-CRI Program") funded Community Wildfire Protection Plan (CWPP) for the City of Campbell River. SNRC received spatial data, including Provincial Strategic Threat Analysis (PSTA) data, from the BC Wildfire Service in August of 2019. The City of Campbell River has requested a final report by February 2020.

The majority of the Area of Interest (AOI) is designated as private land. Because the AOI is large and somewhat complex for the City of Campbell River, we focused our study on public locations that were in or close to the Wildland Urban Interface (WUI). Additionally, polygons that received high recreation traffic or included critical infrastructure were given increased consideration. Time and budgetary constraints restricted our project scope, therefore professional judgement guided decisions on precision and detail.

This memo presents SNRC's approach to dealing with these uncertainties and known data gaps which is required to extract useful information out of fuel types. It is also meant to satisfy the requirement to use the "Wildfire Threat Assessment – FBP Fuel Type Change Rationale" document, required as part of the CWPP process.

STRATEGIC
NATURAL RESOURCE CONSULTANTS

Due to incorrect VRI, SNRC will be amending a large number of fuel type polygons to match actual on-the-ground fuel types. At this point in time, if one rationale is required per polygon change, many rationales would be needed; this is neither practical nor efficient.

In order to reduce the burden on whomever is reviewing and approving the rationales and to create efficiencies within SNRC's own analysis, SNRC has developed a methodology to deal with the excessive number of inaccurate PSTA Fuel Type polygons. SNRC believes this methodology is sound and reasonable within the time and cost budgets presented. The original PSTA Fuel, updated CWPP Fuel Type, and Ortho-imagery layer within the Campbell River AOI are attached for your convenience.

2018 PSTA Fuel Types were overlain and compared to 2016 aerial ortho-photos. Both VRI and national satellite derived PSTA Fuel Types were desktop verified, and the use of the BC Wildfire Fuel Typing and Fuel Type Layer Working Paper. The algorithm/parameters in this paper were used to guide all fuel type verification deletions and/or creations. An updated CWPP Fuel Type layer was then created. Discussion between GIS Analysts and Forest Professionals further refined the fuel types, first with a desktop review and then field visits took place to field verify the fuel types. At which point, the Wildfire Threat Assessment – FBP Fuel Type Change Rationales have been completed and submitted with this letter.

If you have any questions or require any further information, please do not hesitate to contact the undersigned.

Sincerely,

Kaitlin Fader TFT
Assistant Forester
Integrated Environmental Management
South Island - Sunshine Coast

Strategic Natural Resource Consultants Inc.
p: 250.287.2246 ext.233
w: snrc.ca

STRATEGIC

December 12, 2019

Fuel Type Change Rationale City of Campbell River CWPP

Kaitlin Fader, TFT

PROFESSIONALLY RESOURCEFUL

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Airport 4 Argonaut 1	 125.25047, 49.94443 125.32796, 50.01885	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	D-1/2
Assessor's FBP Fuel Type:	M-1/2	Ownership:	Crown

Assessor's Fuel Type Rationale:

2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

Both plots have a crown closure over 30%, fewer than 900 stems per hectare in the understory, and have over 25 to 30% Fdc. This leads us to conclude that these polygons should be designated **M-1/2.**

The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.
*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

Figure 1. Airport 4, original fuel type D-1/2

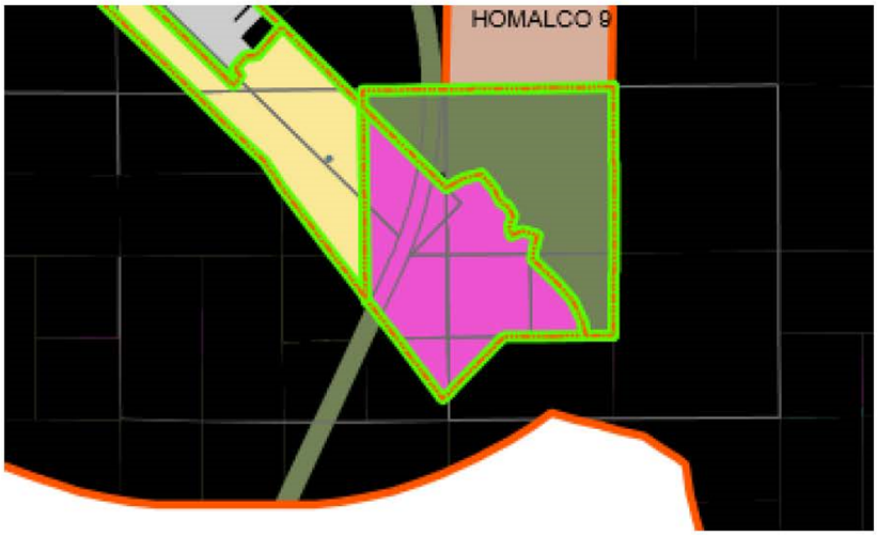


Figure 2. Airport 4, New fuel type M-1/2

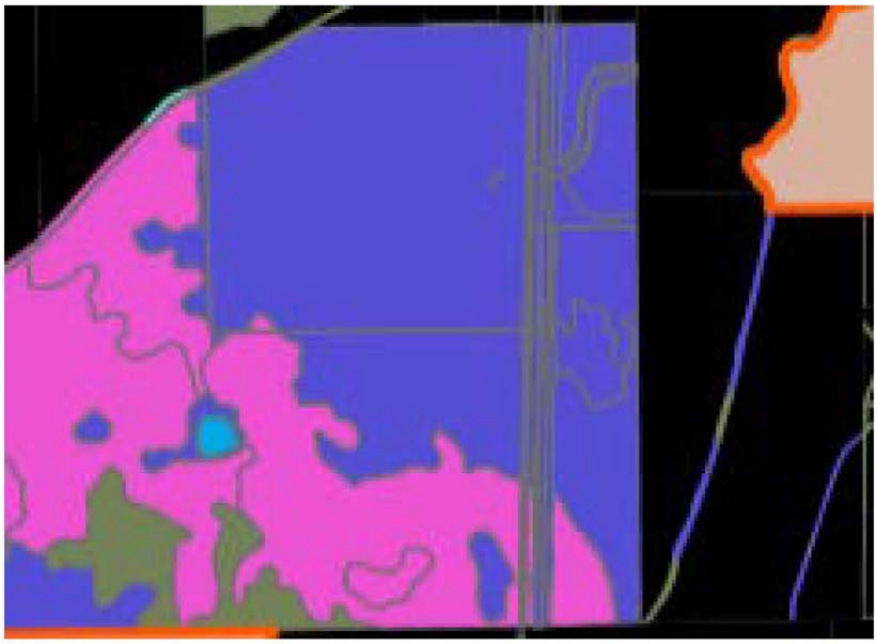


Figure 3. Argonaut 1, original fuel type D-1/2

Figure 4. Argonaut 1, new fuel type M-1/2

Figure 5. Argonaut 1, Crown Closure

Figure 6. Argonaut 1, Vegetation and Ladder fuels.

Figure 7. Argonaut 1, Surface Material

Figure 8. Argonaut 1, Orthophoto

Figure 9. Airport 4, Crown Closure

Figure 10. Airport 4, Vegetation and Ladder Fuels

Figure 11. Airport 4, Surface Material

Figure 12. Airport 4, Orthophoto

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Beaver Lodge 1 Beaver Lodge 2 Airport 3	 -125.26213, 49.99999 -125.27018, 49.98152 -125.24591, 19.93478	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low-High	FBP Fuel Type:	D-1/2
Assessor's FBP Fuel Type:	C-5	Ownership:	Crown Provincial

Assessor's Fuel Type Rationale:

2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

All three plots have equal to or greater than 80% Fdc component, with crown closure of 41-80%. This leads us to conclude that these locations should be designated C-5.

The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.

*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

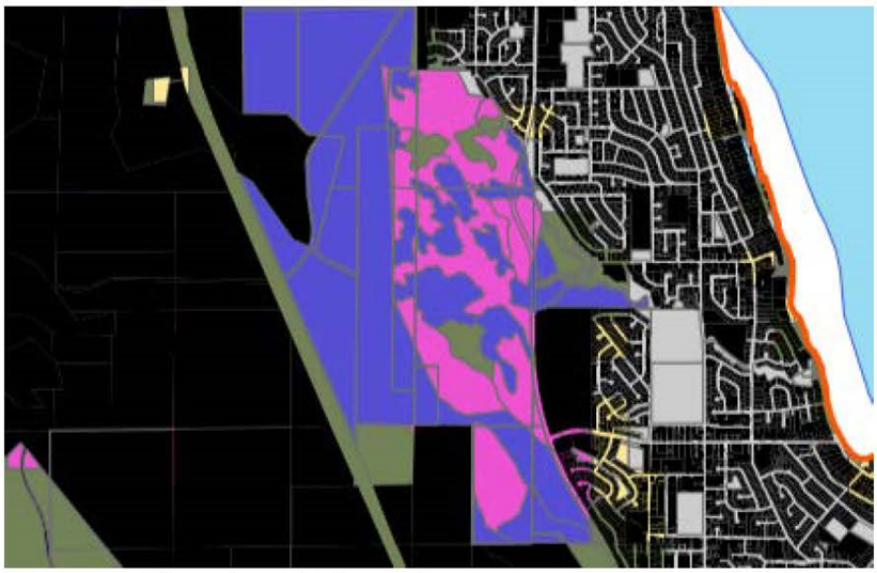


Figure 23. Beaver lodge 1 and 2 original fuel type D-1/2

Figure 34. Beaver Lodge 1 and 2, new fuel type C-5

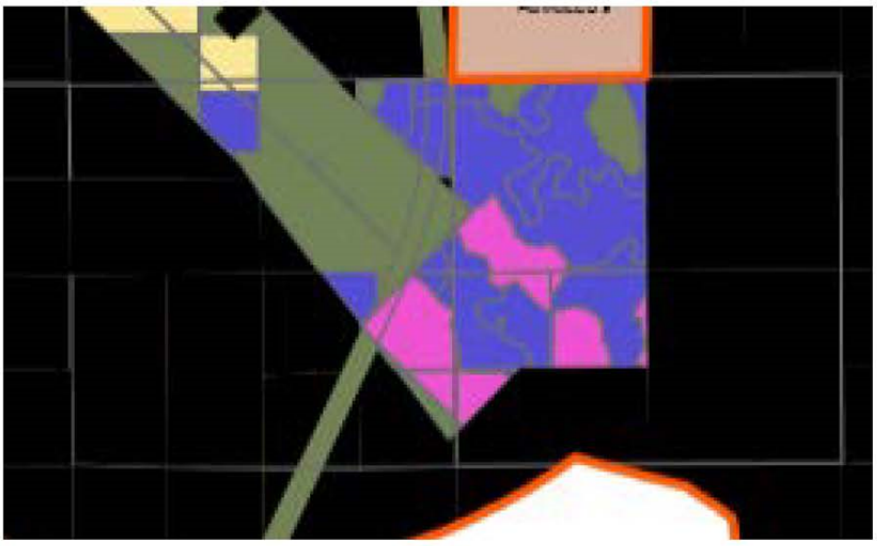


Figure 45. Airport 3, original fuel type D-1/2

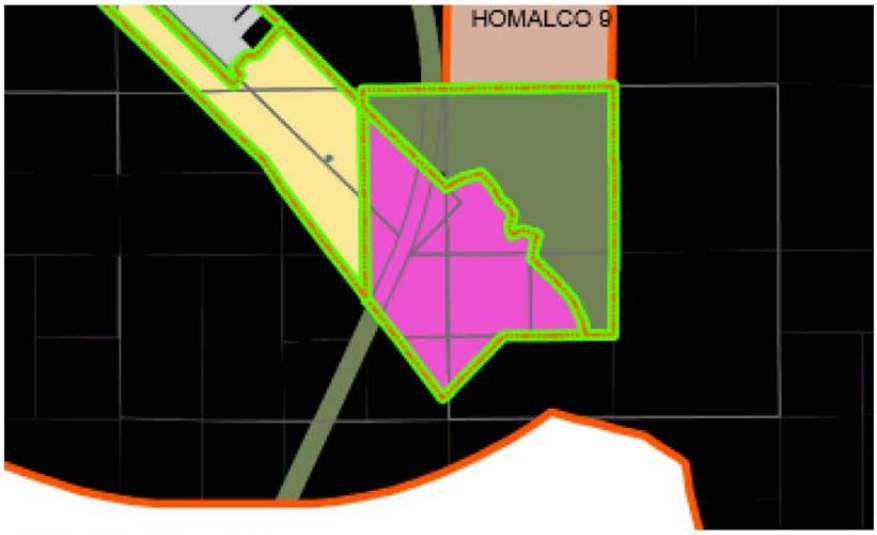


Figure 56. Airport 3, new fuel type C-5

Figure 17. Beaver Lodge 1, Surface Materials

Figure 18. Beaver Lodge 1, Crown Closure

Figure 19 Beaver Lodge 1, Surface Material

Figure 20 Beaver Lodge 1, Vegetation and Ladder fuels

Figure 21 Beaver Lodge 2, Vegetation and Ladder fuels.

Figure 22 Beaver Lodge 2, Surface Material

Figure 23 Airport 3, Crown Closure

Figure 24 Airport 3, Surface Fuels

Figure 25 Airport 3, Vegetation and Ladder Fuels

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Norm Wood Environmental Centre	-125.28279, 50.05436	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	M-1/2
Assessor's FBP Fuel Type:	O-1a/b	Ownership:	Municipal
Assessor's Fuel Type Rationale: 2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field. This location has no trees. Vegetation cover is dominated by grass, hay and herbaceous weeds. Because this is the site of bio solid management, the fields are regularly maintained, dug, mowed and re-seeded with hay and grasses to assist in de-watering of bio solids. The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type. *Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019			

Figure 26 Norm Wood Environmental Centre

Figure 27 Norm Wood Environmental Centre, Vegetation

Figure 28 Norm Wood Environmental Centre, Surface Materials

Figure 29 Norm Wood Environmental Centre, Orthophoto

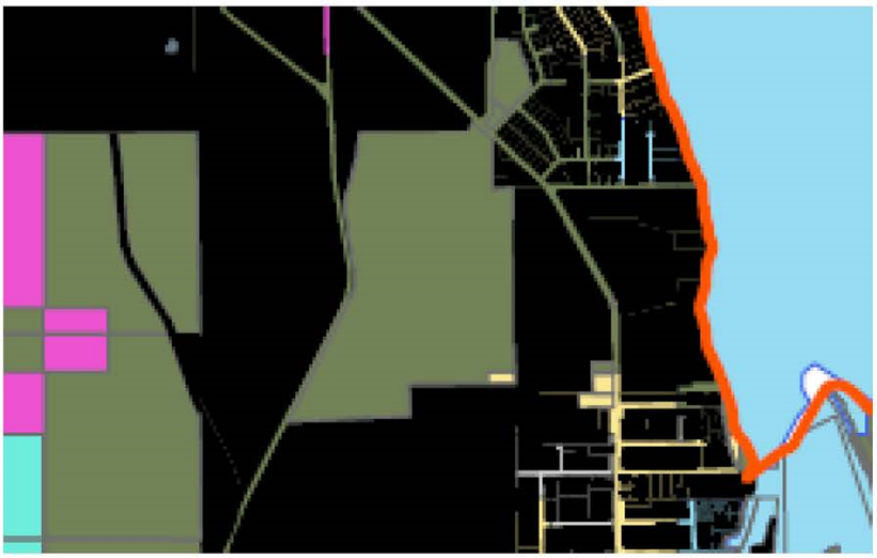


Figure 30 Norm Wood Environmental Centre, original fuel type M1/2

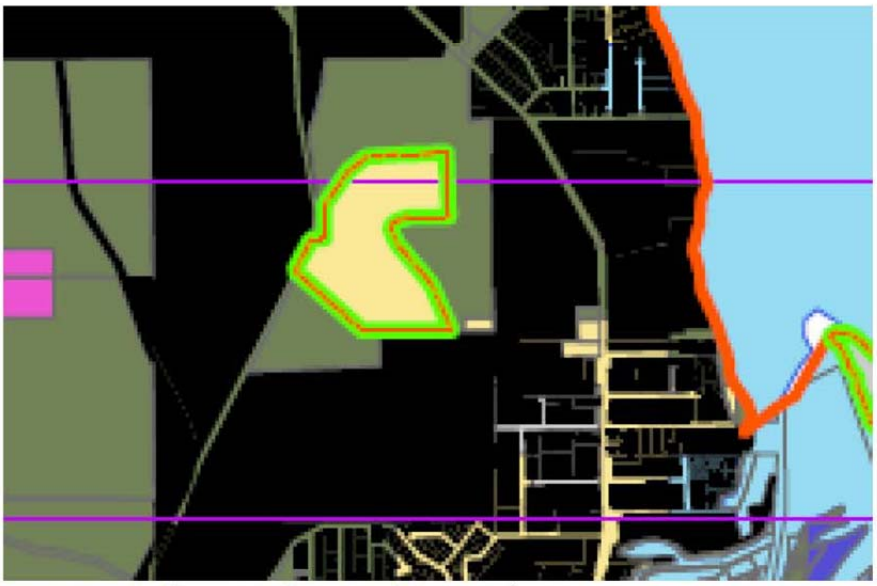


Figure 31 Norm Wood Environmental Centre, new fuel type O-1A/B

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Airport 2	-125.28364, 49.96013	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	M-1/2, D-1/2,
Assessor's FBP Fuel Type:	O-1a/b	Ownership:	Municipal

Assessor's Fuel Type Rationale:
2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

Vegetation surrounding the developed and paved portion of the Campbell River Airport consists of maintained lawns, brushed grasses and low shrubs. Trees are absent as are downed and dead materials as well as any kind of ladder fuels.

The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.
*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

Figure 32. Airport 2, original fuel type M-1/2, D-1/2

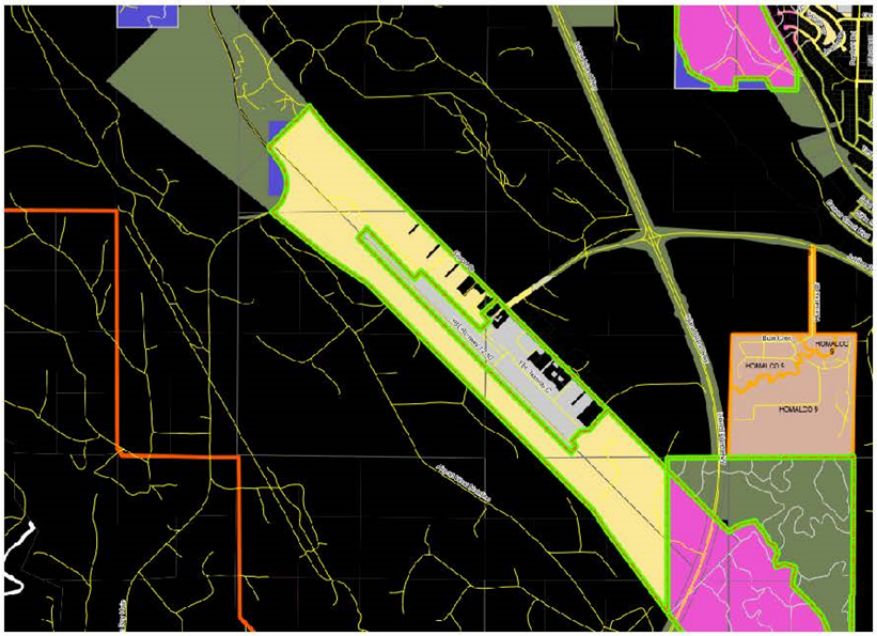


Figure 33. Airport 2, new fuel type O-1a/b

Figure 34 Airport 2, Surface Fuels

Figure 35 Airport 2, Surface Fuels

Figure 36 Airport 2, Orthophoto

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Airport 1	-125.27092, 49.95259	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	O-1a/b
Assessor's FBP Fuel Type:	N	Ownership:	Municipal

Assessor's Fuel Type Rationale:
2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

This area has no vegetation. There is both pavement and metal hanger-style buildings surrounded by pavement and gravel parking lots. A portion of this polygon includes the paved runway.

The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.
*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

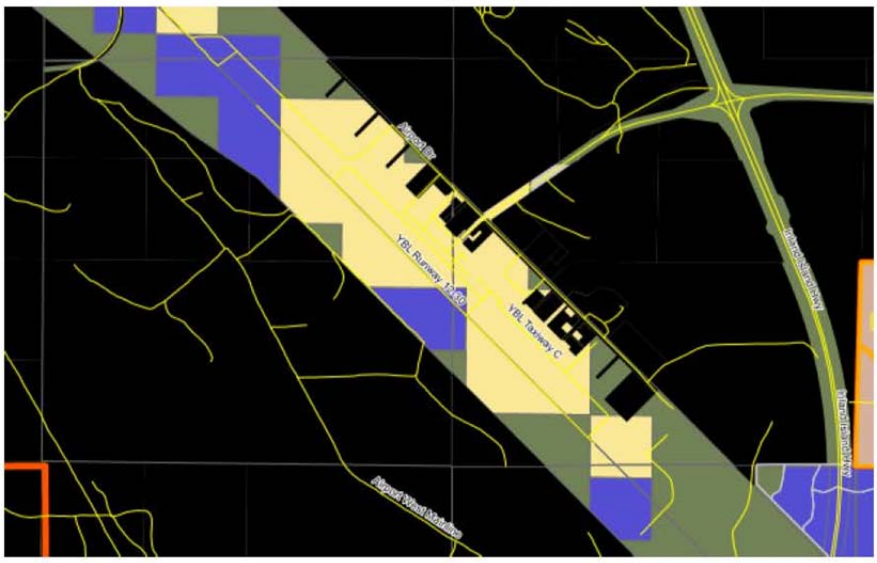


Figure 37. Airport 1, original fuel type O1-a/b

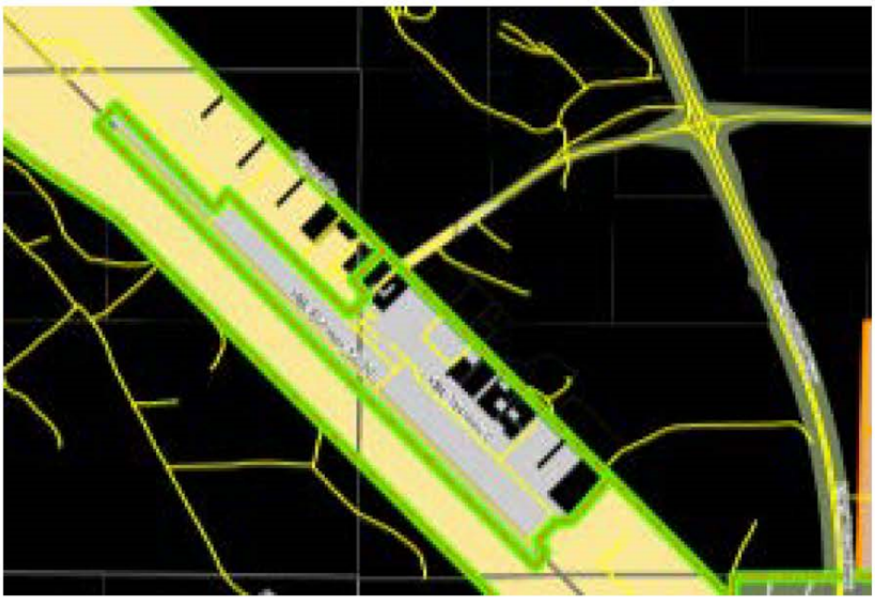


Figure 38. Airport 1, new fuel type N

Figure 39 Airport 1, Developed Area

Figure 40 Airport 1, Buildings and Developed Area

Figure 41 Airport 1, Developed Area

Figure 42 Airport 1, Orthophoto

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Dam 1	-125.33623, 50.40139	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	C-2
Assessor's FBP Fuel Type:	N	Ownership:	Crown
Assessor's Fuel Type Rationale: 2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field. This polygon has no vegetation. It is a developed section of the dam complex and has no surface fuels. The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type. *Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019			

Figure 43 Dam 1, original fuel type C-2

Figure 44. Dam 1, new fuel type N

Figure 45 Dam 1, Developed Area

Figure 46 Dam 1, Surface Material

Figure 47 Dam 1, Developed Area

Figure 48 Dam 1, Orthophoto

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: Spit 1	-125.24942, 50.04181	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	M-1/2
Assessor's FBP Fuel Type:	N	Ownership:	Crown

Assessor's Fuel Type Rationale:
2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

This polygon has few fuels. It is largely developed with paved walkways and manicured lawns. There are small patches of low shrubs in some locations, however it is out of the scope of our project to type out these polygons more precisely.

The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.
*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

Figure 49 Spit 1, Developed Area

Figure 50 Spit 1, Developed Area

Figure 51 Spit 1, Orthophoto

Figure 52 Spit 1, Orthophoto

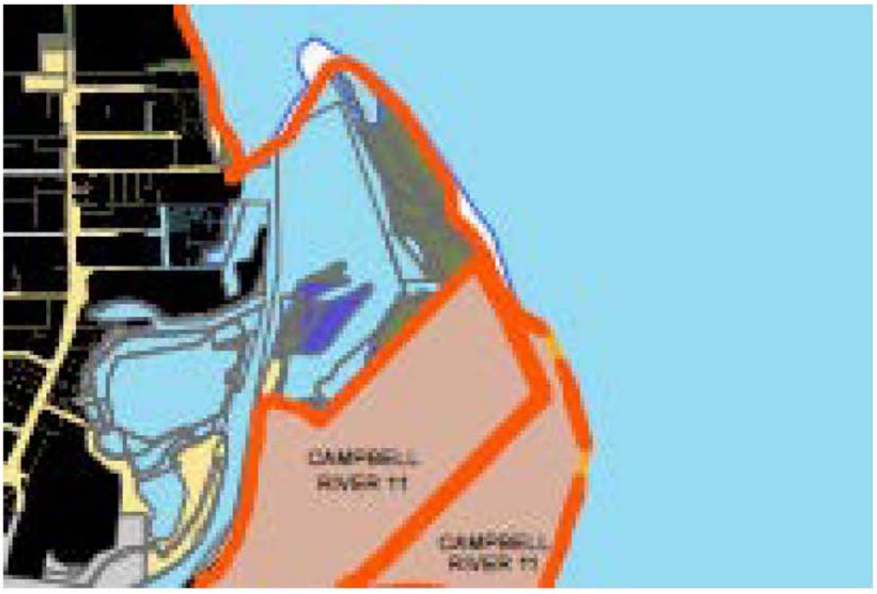


Figure 53 Spit 1, original fuel type M 1/2

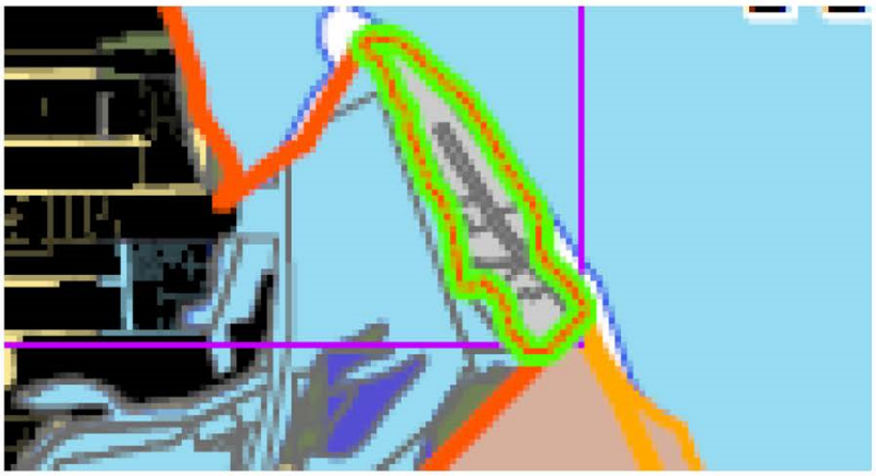


Figure 54 Spit 1, updated fuel type N

Location: Campbell River	Date: December 12, 2019	Assessor/ Professional Designation:	Kaitlin Fader TFT Henry Grierson RFT
Coordinates: John Hart Lake North	-125.351323, 50.047152	Coordinate System used and format:	NAD 83 BC Environment Albers
PSTA Threat:	Low	FBP Fuel Type	W
Assessor's FBP Fuel Type:	C-5	Ownership:	Provincial Park

Assessor's Fuel Type Rationale:
2018 PSTA Fuel Types were overlain and compared to 2019 ortho-imagry of the Campbell River CWPP AOI. Plot locations were selected for their representation of their respective polygons as well as accessibility. Plots were assessed on October 23 and 29, 2019 to ground truth and provide feedback to the GIS analyst to ensure proper representation of what exists in the field.

As seen on the attached maps, the water fuel type overlaps a significant portion of wooded land at the north side of John Hart lake. Given the history of the lake and analysis of ortho-imagry, this fuel type discretion is unlikely due to flooding of the lake, and more likely due to the precision of the data provided to us by BCWS. To this end, we have assigned the mistyped water type polygons to represent their surrounding fuel types, C-5.

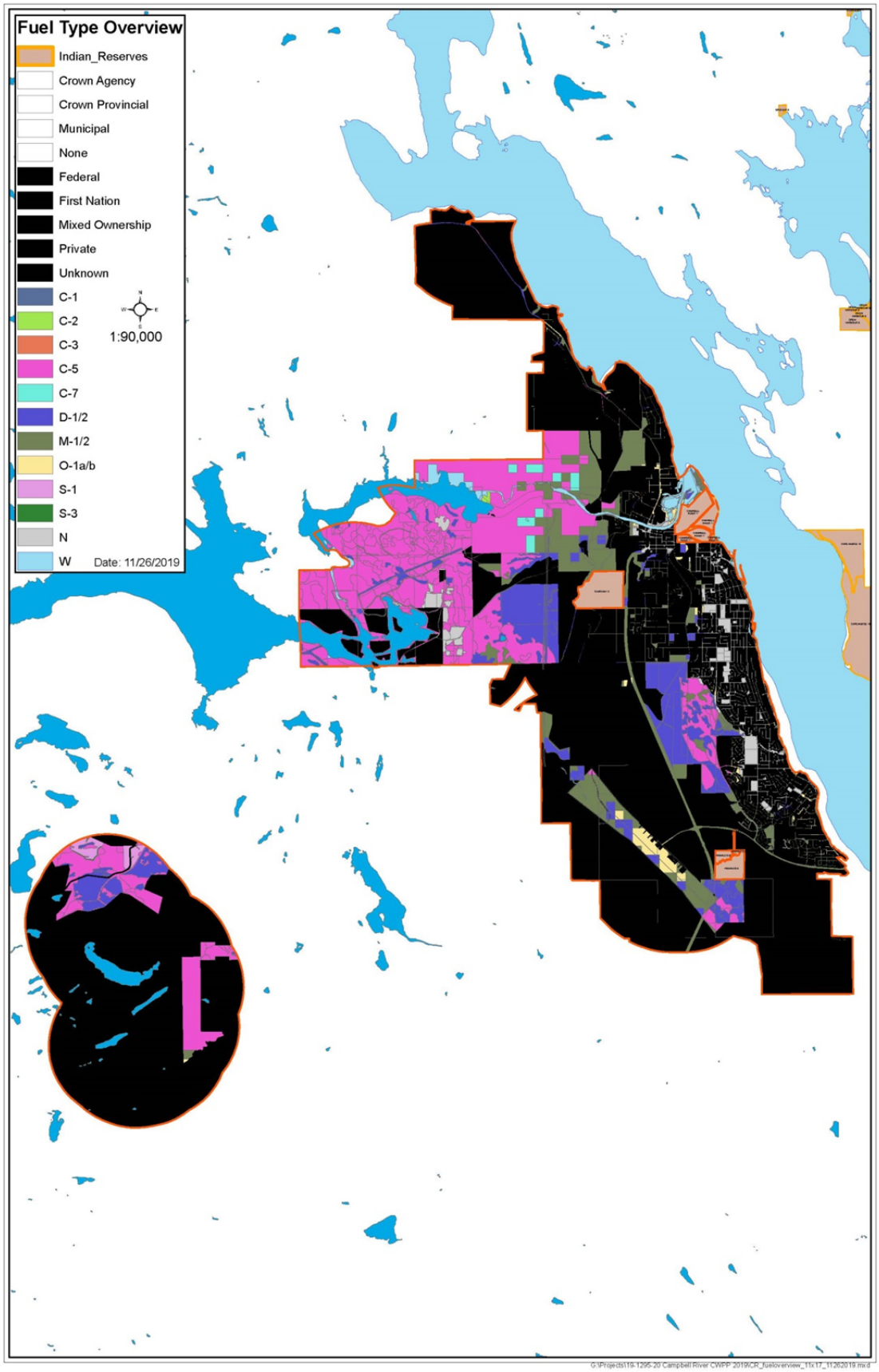
(E-mail communication with Dana Hicks is provided in the appendix of this document. November 8, 2019)
The field data was compared to the "British Columbia Fuel Typing Layer and Fuel Type Layer Description, 2017"* to determine the updated fuel type.
*Perrakis, D.B., Ease, G., Hicks, D. 2017. British Columbia Wildfire Fuel Typing and Fuel Type Layer Description. Http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/39432.pdf. Accessed October 18, 2019

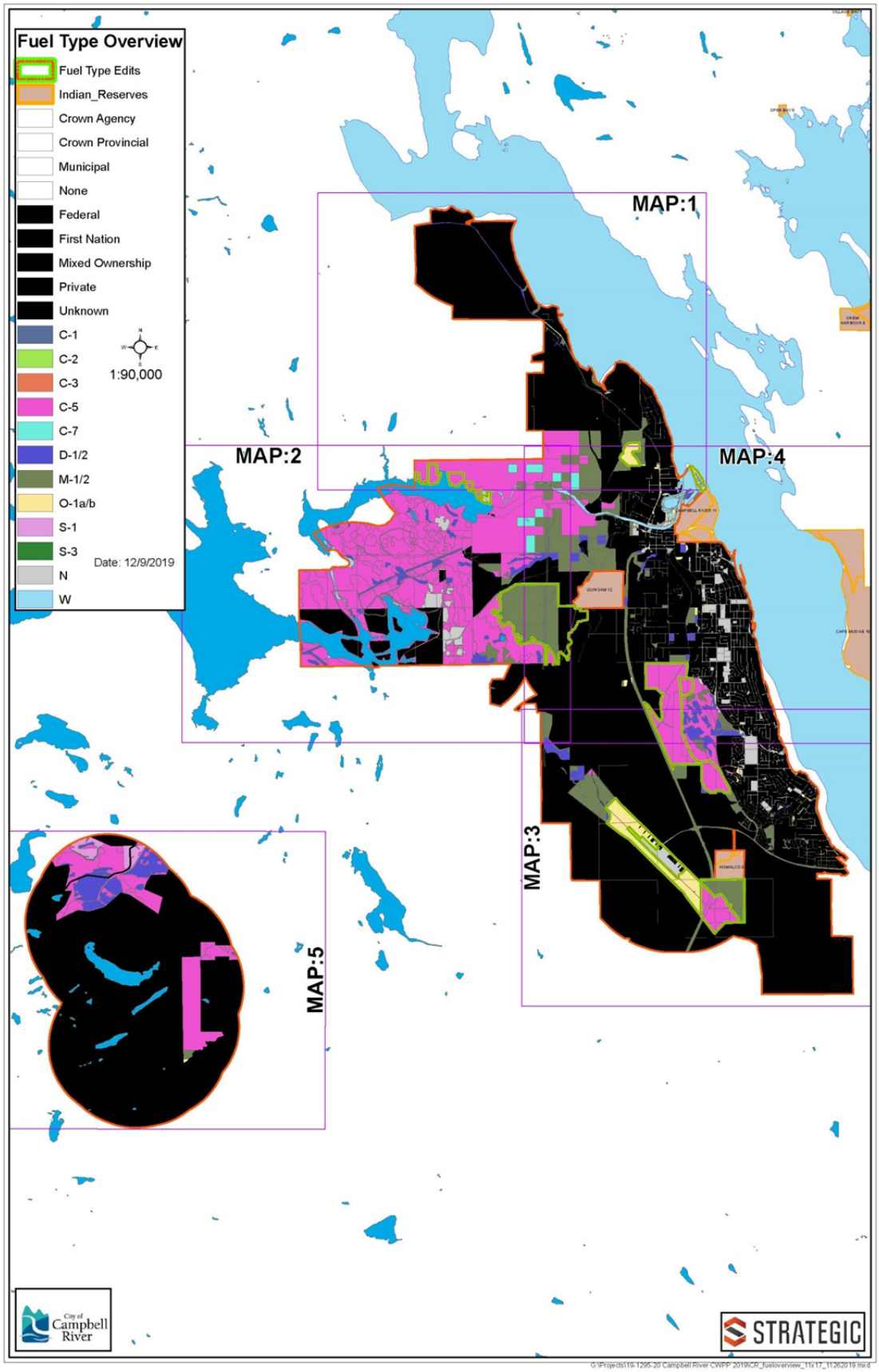
Figure 55 John Hart Lake North, Orthophoto

Figure 56 John Hart Lake North, Orthophoto

Figure 57 John Hart Lake North, original fuel type W

Figure 58 John Hart Lake North, new fuel type C-5


Fuel Type Overview
Indian_Reserves
Crown Agency
Crown Provincial
Municipal
None
Federal
First Nation
Mixed Ownership
Private
Unknown
C-1
C-2
C-3
C-5
C-7
D-1/2
M-1/2
O-1a/b
S-1
S-3
N
W
1:90,000
Date: 11/26/2019


Fuel Type Overview
Fuel Type Edits
Indian_Reserves
Crown Agency
Crown Provincial
Municipal
None
Federal
First Nation
Mixed Ownership
Private
Unknown
C-1
C-2
C-3
C-5
C-7
D-1/2
M-1/2
O-1a/b
S-1
S-3
N
W
1:90,000
Date: 12/9/2019
MAP:1
MAP:2
MAP:3
MAP:4
MAP:5
City of Campbell River
STRATEGIC

Appendix 4: CRFD Staff and Equipment

3.2 Core Services

Fire suppression covers a wide range of tactics for the control and extinguishment of fires originating from a number of sources. CRFD is equipped and properly trained to respond to fires that originate within or outside a structure, allowing safe and effective rescue and suppression tactics for the control and extinguishment of fires.

CRFD maintains a modern fleet of emergency response vehicles and equipment along with a complement of off-duty career and paid-on-call firefighters to be available for emergency response. These firefighters may be called upon anytime during the day or night seven days a week. Currently, CRFD has two (2) Chief Officers, 1 Dispatch Manager/EPC, twenty-three (23) Career Firefighters, 1 Fire Prevention Officer, 1 Part-Time Admin Assistant, 51 POC Firefighters, and 10 Dispatchers.

Currently, CRFD operates a 4 career firefighter engine/pumper company at Fire Hall No. 1 on a 24/7 basis. Fire Hall No. 2 operates a 2 career firefighter engine/pumper company during weekdays from 8:00 am to 6:00 pm. On evenings and weekends, paid-on-call members will respond from home as required to staff the station.

3.3 Department Infrastructure and Equipment

3.3.1 Fire Hall No. 1

Address:		675 13th Avenue	
Year Built		1978	
Square Metres:		1100 m2 (office facility & apparatus floor)	
Use:		Fire and Rescue Deployment, Fire Headquarters and Regional Fire Dispatch	
Bays:	3 drive thru, 1 back-in only, 1 drive thru shop	Units:	12
Comments:		This Fire Hall serves as the hub for all apparatus and light-duty units and response personnel.	



3.3.1.1 Fire Hall No. 1 Apparatus

Vehicle Description		
Unit Number:	**B818 E1**	
Year/Make:	2018 Spartan Gladiator	
Type:	Pumper	
Pump Capacity:	8,000 LPM	
Tank Capacity:	2273 L water, 227 L foam	
Usage:	First out Engine on all emergencies	
Unit Number:	**B826 T1**	
Year/Make:	2015 Rosenbauer Commander	
Type:	101' Elevated Platform	
Pump Capacity:	8,055 LPM	
Tank Capacity:	2227 L water	
Usage:	Second out apparatus on emergencies	

Vehicle Description		
Unit Number:	**B804 P1**	
Year/Make:	2009 Spartan Gladiator	
Type:	Pumper	
Pump Capacity:	8,064 LPM	
Tank Capacity:	2314 L water, 190 L foam	
Usage:	Third out apparatus on all emergencies	
Unit Number:	**B822 R1**	
Year/Make:	2004 Freightliner Rosenbauer	
Type:	Rescue	
Pump Capacity:	NA	
Tank Capacity:	NA	
Usage:	Confined Space and Hazmat incidents	
Unit Number:	**B821 WT 1**	
Year/Make:	2004 Freightliner Sterling	
Type:	Water Tender	
Pump Capacity:	1135 LPM	
Tank Capacity:	13,627 L water	
Usage:	Water Tender	
Unit Number:	**B802 C1**	
Year/Make:	2004 Chevrolet Tahoe	
Type:	Fire Chief Vehicle	
Unit Number:	**B805 C2**	
Year/Make:	Ford Escape	
Type:	Deputy Chief Vehicle	
Unit Number:	**B816 C3**	
Year/Make:	1999 Ford F150	
Type:	Duty Chief Vehicle	

Vehicle Description		
Unit Number:	**B809 C4**	
Year/Make:	2013 Toyota Highlander	
Type:	911 Dispatch Manager	
Unit Number:	**B829 FPO1**	
Year/Make:	2018 Dodge Ram 2500	
Type:	Fire Prevention Officer	
Unit Number:	**B850 Fire Safety House**	
Year/Make:	1988 U-built	
Type:	Fire Safety Public Education Training	
Unit Number:	**B900**	
Year/Make:	2009 Type II Structure Protection Unit	
Type:	N/A	

3.3.2 Fire Hall No. 2

Address:	261 Larwood Road		
Year Built	1968		
Use:	Fire and Rescue Deployment		
Bays:	4 Back in bays	Units:	4
Comments:	This is the secondary Fire Hall in Campbell River. There are 2 offices for administration staff one of which can accommodate a 15-person meeting.		

3.3.2.1 Fire Hall No. 2 Apparatus

Vehicle Description		
Unit Number:	**B820 E2**	
Year/Make:	1999 Spartan Gladiator	
Type:	Pumper	
Pump Capacity:	7950 LPM	
Tank Capacity:	2273 L water, 188 L foam	
Usage:	First out Engine, weekdays career-afterhours POC coverage	
Unit Number:	**B806 L2**	
Year/Make:	1993 Spartan Gladiator	
Type:	75' Ladder	
Pump Capacity:	5675 LPM	
Tank Capacity:	2273 L water	
Usage:	Reserve Ladder/ Second out of Fire Hall	
Unit Number:	**B811 S2**	
Year/Make:	2018 Dodge Ram 5500	
Type:	Wildland	
Pump Capacity:	719 LPM	
Tank Capacity:	1136 L water, 38 L foam	
Usage:	Wildland and Interface fires	

Vehicle Description		
Unit Number:	**B803 U2**	
Year/Make:	1993 GMC Suburban	
Type:	Personnel Mover	

Appendix 5: Maps

See CWPP submission attachments for large format maps.