Smethurst/Arawana Neighbourhoods FireSmart Community Assessment Report

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EXECUTIVE SUMMARY

Wildfire seasons in British Columbia (BC), over the past two decades, have increased in numbers and the area burned across the province. Large expenditures in wildfire suppression and forest resource losses have occurred in 2003, 2004, 2009, 2010, 2014, 2015, 2017 and 2018. This is the result of two significant factors: 1) increases in fuel loads associated with long-term fire suppression and insects and disease; and 2) a period of increasing drought during the fire season.

The community of Smethurst/Arawana situated in the Okanagan valley in south central BC, occurs in a wildfire prone environment, and near the 2003 Okanagan Mountain Park wildfire which resulted in significant structural losses and damage to the city of Kelowna. The fuel, weather and topography conditions that created the 2003 wildfire still exist in the Okanagan valley, making them vulnerable to the risk of wildfires. Conditions that exacerbate the wildfire risk include the development of vulnerable homes and properties in the wildland urban interface (WUI) zone, and the ingrowth of flammable conifer vegetation in areas previously occupied by low density forests, grass and shrub communities as a result of decades of fire suppression. Because the community of Smethurst/Arawana is embedded within a matrix of communities settled in the Okanagan valley, a wildfire event occurring in or near these neighbourhoods could also impact the area as a whole including its significant agricultural and tourist economies, by disrupting the delivery of infrastructure services (*i.e.* power, water), while putting the safety and well-being of residents, tourists and visitors of the region at risk. These consequences to values at risk from wildfire exist irrespective of fire size because damages caused from any fire have the potential to ripple throughout the region. Smethurst/Arawana is situated in a landscape that supports higher levels of extreme fire behavior, meaning the historical intensity of fires may not match the current and evolving state of fire behaviour.

In recognition of this risk, residents of Naramata's Smethurst and Arawana neighborhoods with support from the Regional District of Okanagan-Similkameen (RDOS) are seeking FireSmart Canada Community recognition status to incrementally transition their community through homeowner action and collaboration with partners to a wildfire resilient community that effectively addresses the wildfire risk of the environment they reside in.

In support of this initiative, B.A. Blackwell and Associates (Blackwell) are assisting in the development of a Community Assessment Report for the Smethurst and Arawana neighborhoods, which is the first step in being recognized as a FireSmart Canada Community.

Nineteen recommendations have been developed for the neighborhoods and are found in Table 1.

Table 1: Summary of Recommendations

Priority Rating	High	Moderate	Low
	A	B	C
	Within 6 months	Within 2 years	Within five years

Item	Recommendation	Priority Rating	Responsibility
Structure Protection (Section 5.1)			
1	Identify the hazardous components on the home and develop short and long-term strategies to convert them over time to fire-resistive materials with roof replacements as a first priority, followed by replacement of exterior siding and decking with fire resistant materials. Consider a program for granting rebates for roof replacements.	**A**	Residents / RDOS
2	Apply for funding from the UBCM's (Union of BC Municipalities) Community Resilience Investment (CRI) program to coordinate exterior rooftop sprinkler kits to community residents (at a cost). Sprinkler kits must be installed and tested at the beginning of every wildfire season (generally May – September) and are effective only for homes and properties which have been modified to FireSmart standards (rated roof, minimal wood siding, no open eaves, no coniferous vegetation within 10m of the home).	**B**	Residents / NVFD
Vegetation Management – Ornamental Landscaping (Section 5.2.1)			
3	Incorporate FireSmart landscaping principles within residential lots by removing all flammable coniferous shrubs and hedges (*i.e.* juniper, cedar) in a 10 m radius around the home footprint. Larger size coniferous trees may be retained if no more than 35% of its live foliage is removed. If larger trees are capable of being pruned raise the crown base height to a minimum of 3 m above the ground surface. All coniferous foliage above and to the sides of the home must have a separation distance of 5m.	**A**	Residents
4	Remove flammable ground cover materials such as bark mulch, wood chips from a 2m radius around the home, outbuildings, decks and stairs. These materials represent ignition sources which often result in fire spread into the home. This area pertains to the new FireSmart Priority Zone 1a.	**A**	Residents

Item	Recommendation	Priority Rating	Responsibility
5	Encourage individual homeowner participation in removing excess and flammable vegetation from their property by organizing a neighbourhood chipping program, free yard waste drop-off, a scheduled garden debris burning weekend with neighbourhood representatives. Also include distribution of additional educational materials, such as FireSmart landscaping design and FireSmart plant selection information.	**A**	Residents / RDOS
6	Develop an outreach plan to residents to raise public awareness around fire hazard on their property and within their neighbourhood and the actions they can do to significantly reduce the risk. This plan should incorporate public awareness around hazard on their property and within their neighbourhood, and landscaping covenants triggered by re-builds or major renovations which must install FireSmart landscaping.Some initial resistance may be able to be overcome by public education regarding the opportunities for affordable, aesthetic, low flammability landscaping options that are adapted to the climate. One such format could be a FireSmart preparedness information day held at the beginning of each fire season in a local venue	**B**	Residents
7	Consider developing an alternative plant species list to assist homeowners and businesses seeking choices to juniper and cedar landscaping for their property and for choosing affordable, aesthetic, low flammability landscaping options that are adapted to the South Okanagan climate. This list need not be comprehensive, but instead should be seen as a starting point or example for landscaping standards to be followed up with local nursery growers who can confirm their regular availability in stores.	**B**	Residents
Vegetation Management – Fuel Management (Section 5.2.2)			
8	In order to ensure that evacuation routes extend to all homes and structures within neighbourhoods, along designated evacuation routes, remove antelope bush and conifer regeneration along roads which can colonize these edges and form dense hazardous fuel types in the following areas: 1. along the upper (eastern end) of Smethhurst Rd; 2. along Debeck Rd; and 3. in Creek Park and along Naramata and Arawana creeks. Thin small stems (<12.5cm diameter), prune the lower branches of individual trees up to a height of 2m, and remove needles / surface litter.	**B**	RDOS / Residents / MoTI

Item	Recommendation	Priority Rating	Responsibility
9	Apply to the UBCM's Community Resilience Investment (CRI) through the FireSmart Community Funding & Supports program to increase community resiliency by undertaking community-based FireSmart planning and activities that reduce the community's risk from wildfire. Consider rebate programs on private land to assist homeowners who complete eligible FireSmart activities on their property.	**B**	RDOS / Residents / NVFD
Access and Evacuation (Section 5.3)			
10	Identify and map the existing three access points into the community and the main roads for evacuation routes. Install clearly visible signage to assist navigation during an emergency. Assess designated evacuation routes for road side thinning fuel treatments to reduce potential entrapment scenarios.	**A**	RDOS / MoTI / NVFD
11	Locate additional access points into the northern part of Smethurst/Arawana. Consider whether the dead-end cul-de-sac road terminus at Upper Debeck Rd can be connected directly to N. Naramata Rd to provide an additional evacuation route for residents with homes along Debeck Rd, Juniper Rd, and Slate Pl sandwiched between two creek ravines (Naramata and Arawana) with highly hazardous fuels.	**B**	RDOS / MoTI / NFD
12	Conduct mock evacuation exercises in the dark to mimic smoky conditions causing poor visibility and disorientation. These exercises should be organized, coordinated and conducted with the NFD and RDOS.	**B**	RDOS / NVFD / residents
13	Develop a notification warning / communication system between residents to facilitate efforts to ensure the safety of everyone's neighbours. Assign key people who facilitate the communication between agencies and who distribute information to area residents and businesses.	**A**	Residents / RDOS
14	Develop a communication strategy targeting tourists and visitors unfamiliar with the area on emergency evacuation procedures during and emergency. Install signage at designated evacuation routes, travel hubs, local businesses, etc. and communicate to residents, tourists, agricultural producers and wineries.	**C**	RDOS
15	Consider the Kettle Valley Rail trail (KVR) as an alternative evacuation route for the upland (eastern) portion of Smethurst/Arawana. Assess the KVR's advantages, disadvantages, and challenges to assess the feasibility of using it to evacuate people during an emergency.	**C**	Residents / RDOS
16	Determine if there are property owners in the neighbourhood with livestock or horses, in order to pre-plan protocols for the safe transport of animals during an interface fire.	**B**	Residents

Item	Recommendation	Priority Rating	Responsibility
17	Investigate if the Forest Service roads exiting the neighbourhood in the northeast corner are potential alternative evacuation routes.	C	RDOS / Residents
Critical Infrastructure (Section 5.4)			
18	Confirm that the water system's current capacity and pressure is adequate for the suppression of multiple house fires during an interface wildfire. RDOS Public Works should document and maintain these records. Investigate the vulnerability of system components to damage from wildfire, such as pump stations and any other above-ground structures; In addition, identify alternative water sources; and work to achieve incremental improvements over the system's life cycle. Build a plan to fund improved supply when capital upgrades are needed.	B	RDOS / NVFD
19	Identify and map in a GIS database the critical infrastructure the community depends upon in an emergency (reservoirs, water and sewer pump stations, communications, BC Hydro and FortisBC alignments, etc).	C	RDOS

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COMMONLY USED ACRONYMS

BCWS	British Columbia Wildfire Service
BEC	Biogeoclimatic Ecosystem Classification
CAR	Community Assessment Report
CFFDRS	Canadian Forest Fire Danger Rating System
DPA	Development Permit Area
FBP	Fire Behaviour Prediction System
FCP	FireSmart Community Plan
FSCCRP	FireSmart Canada Community Recognition Program
HIZ	Home Ignition Zone
LFR	Local FireSmart Representative
MFLNRORD	Ministry of Forests, Lands, Natural Resource Operations, and Rural Development
MoTI	Ministry of Transportation and Infrastructure
NFPA	National Fire Protection Agency
NVFD	Naramata Volunteer Fire Department
RDOS	Regional District of Okanagan Similkameen
SWPI	Strategic Wildfire Prevention Initiative
UBCM	Union of British Columbian Municipalities
WUI	Wildland Urban Interface

1.0 INTRODUCTION

The FireSmart Canada Community Recognition Program (FSCCRP) is designed to provide an effective management approach for preserving wildland living aesthetics while reducing community ignition potential and subsequent spread of fire through the community during a wildland urban interface fire. The program can be tailored for adoption by any community and/or neighbourhood association that is committed to ensuring its citizens maximum protection from wildland fire. An effective way for communities to address wildfire hazards, coalesce resident's concerns, and gather momentum for action is by achieving FSCCRP status. The first step on the path towards gaining FSCCRP is the preparation of a community assessment report prepared by a Local Fire Smart Representative (LFR) to assess the overall wildfire risk conditions within and adjacent to the community.

The purpose of this report is to assess the study area's (Smethurst and Arawana neighborhood) wildfire hazard and the components which contribute to the community's wildfire risk. Once the hazard and risks are defined, the community will move forward in developing a FireSmart Community Plan that will outline the actionable items the community can implement over time in a collaborative manner, and updated and modified as needed over time.

The development of a FireSmart Community Plan is not within the scope of the Community Assessment Report (CAR), but rather is intended to be a resource to be used by residents of Naramata's Smethurst/Arawana neighbourhoods to guide and support a gradual transition towards becoming a wildfire resilient community. Whereas Community Wildfire Protection Plans (CWPP) are larger scale wildfire management analyses, there are common elements shared with FireSmart Community Assessments that are usually conducted at the neighbourhood, strata or municipal scale.

In this report, the term 'community' refers to the general area of human settlement in the Okanagan Similkameen around Okanagan Lake; and the term 'neighbourhood' refers to the Smethurst/Arawana FireSmart study area that is embedded with the larger community of the Okanagan-Similkameen.

The CAR has been developed by B.A. Blackwell and Associates, holding qualified Local FireSmart Representative (LFR) status, and with more than 30 years' experience in wildfire management, in consultation with the RDOS and neighbourhood steering committees. The process involved dialogue with interested citizens through two open house presentations. This CAR is considered a first step to achieving FSCCRP status, the development of a FireSmart Community Plan and subsequent incremental build out and implementation of recommendations over the next 5-15 years. The longer time frame to implement some wildfire mitigation recommendations acknowledges that many properties are involved and that some elements are costly and only implementable when the lifecycle of assets (i.e. roofs) require replacement, therefore allowing sufficient time for the neighbourhood and individual property owners to prepare and plan.

This CAR builds on the template required by FireSmart Canada and contains additional elements including a description of and spatial analysis of the South Okanagan fire environment. The associated

maps show head-fire intensity, rate of spread, and ignition potential as these are important elements in defining risk to the neighbourhoods from wildfire. In order to engage with residents effectively it is important to describe the fire environment so a complete picture and rationale for recommendations are a practical approach to solving interface fire risks. That way, recommendations can be more meaningful, and therefore successful.

Funding for the Smethurst/Arawana FireSmart project was provided by UBCM Community Resiliency Investment Program (2019) in the form of a FireSmart Planning Grant to the RDOS.

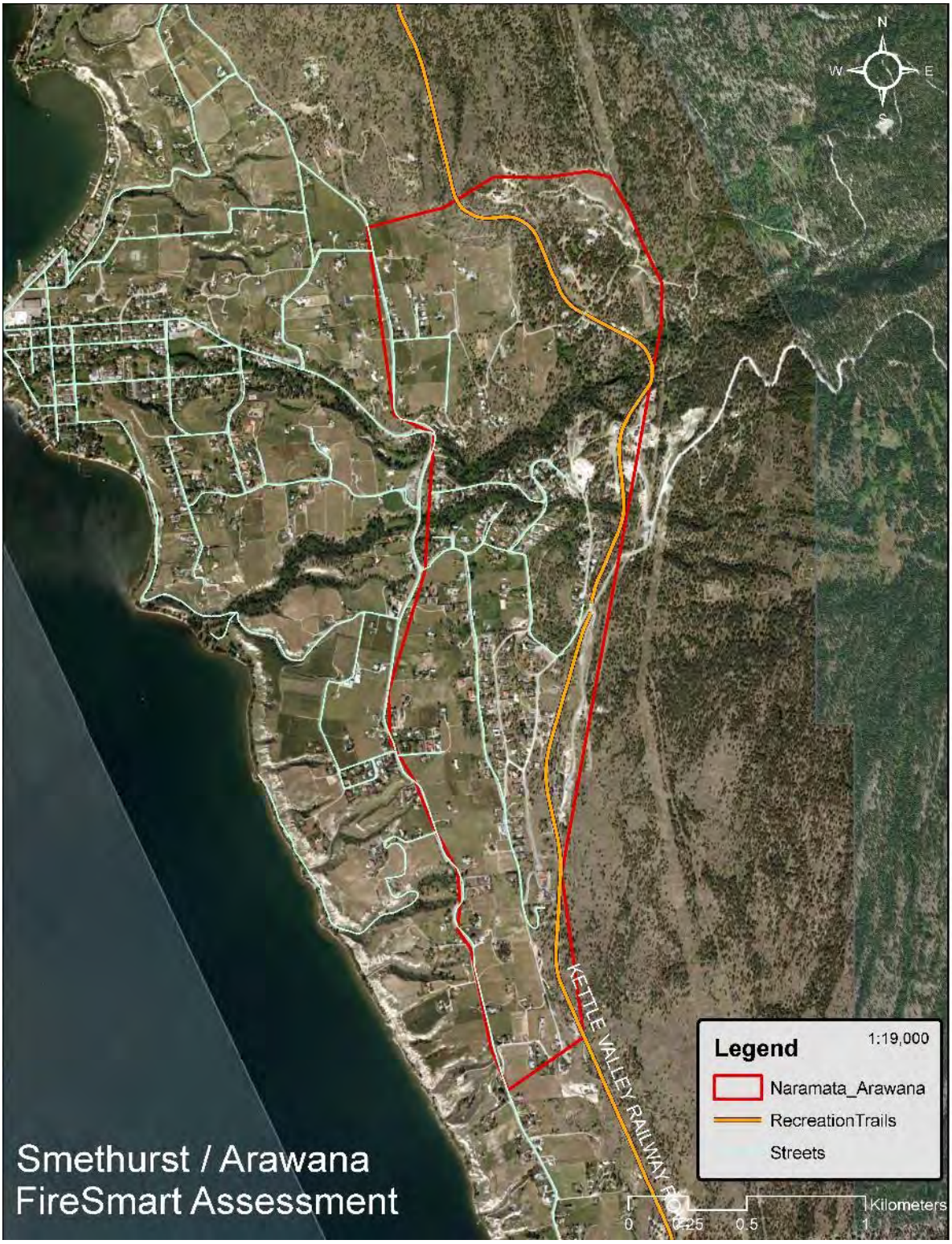
Doug Reeve RFT, ASct (project manager) and Ryan Periana (GIS programmer) of the RDOS who were key in conducting outreach to citizens, building community momentum and preparing spatial data including ortho-imagery of the neighbourhood and surrounding context. Fire Chief Tony Travao of the Naramata Fire Department provided the use of the Naramata Fire Department (NFD) as a meeting space and provided valuable insights of the NFD's emergency response and fire suppression capacity. And finally, the participation of key residents including Dennis Smith, Ted Smith, Maureen Ketcheson, Dough Mathias and Chris Sutton among others coalesced neighbourhood concern the participation of in meetings and workshops, development of a preliminary neighbourhood subcommittee. All members provided invaluable information and insights into their community which can only be provided by those who live in the neighbourhood and experience first-hand the reality of living in a wildfire prone environment.

2.0 BACKGROUND

2.1 SITE DESCRIPTION AND PROJECT AREA

The Arawana / Smethurst project area (Map 1) is encompassed within the RDOS Electoral Area E – Naramata and is situated in the Okanagan valley within the southern interior of British Columbia on the eastern shore of Okanagan Lake, to the north of the city of Penticton. Classed as an Unincorporated Settlement in BC, The Smethurst/Arawana study area has a relatively small population within an area of approximately 9 sq. km.

The climate of the South Okanagan and Naramata supports a vibrant agricultural economy (including the wineries of the 'Naramata Bench') which in turn contributes to a burgeoning tourist economy making it a popular tourist destination. Due to the amenities and attractions of the area especially during the warm summer months, high tourism rates swells the population density coinciding with the peak times of the fire season. The combination of drought conditions and an increased local population increases the potential of human ignitions from visitors and residents and the risk from wildfire.



Map 1: The Smethurst/Arawana FireSmart project area is outlined in red.

2.1.1 LAND STATUS

The RDOS is spilt between two provincial fire zones – Penticton and Merritt. The Regional District oversees seven volunteer fire departments: Anarchist Mountain, Kaleden, Keremeos, Naramata, Okanagan Falls, Tulameen and Willowbrook, which provide local fire protection to specific rural areas within Electoral Areas "A," "B," "C," "D," "E," "G" "H", and "I."

Information supplied by the RDOS indicates approximately 283 properties exist within the Smethurst/Arawana study area. The majority of land within the Naramata Fire District (Figure 1) is private property with zoning designations of Rural, Agricultural, and interspersed with Parks and Recreation zones, and Conservation Areas. A variety of Crown tenures (including grazing tenures) occur throughout the Naramata Fire District boundary.

Smethurst/Arawana is serviced by the Naramata Fire Department [1095 Lower Debeck Rd, Naramata], which provides local fire protection services to specific rural areas within Electoral Area E.

9-1-1 fire calls for the South Okanagan-Similkameen are relayed to a secondary dispatch centre at the Kelowna Fire Hall. At that location, Regional Fire Dispatchers handle a multitude of calls from fire, marine, motor vehicle accidents, and medical first response

- BCWS
- RDOS
- RCMP
- EMBC
- Neighbourhood residents
- Business owners (wine and agriculture producers)

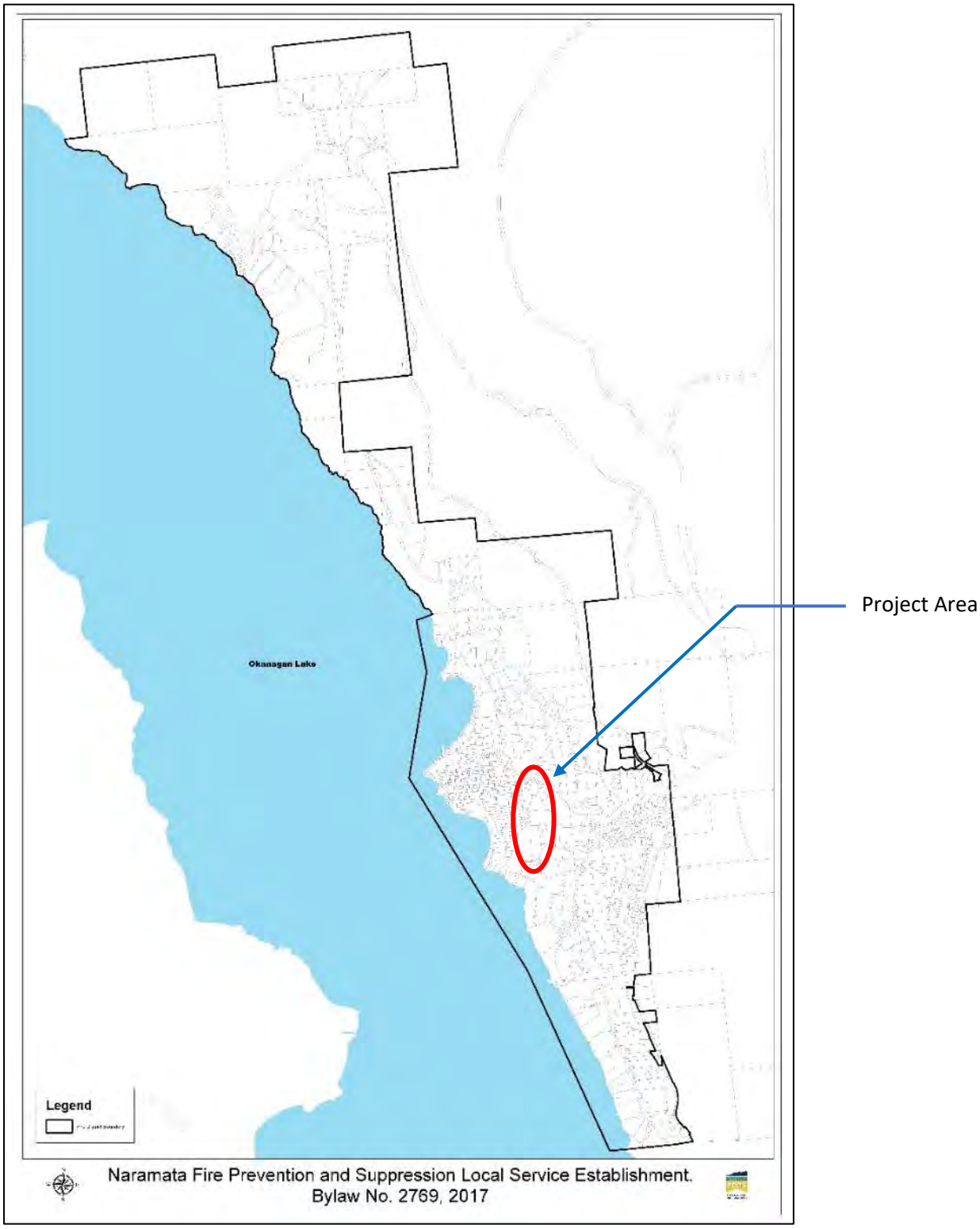


Figure 1: Fire District boundary for Naramata.

2.2 ECOLOGY

Ecosystems of BC are stratified by climate, soils, vegetation and topography in the Biogeoclimatic Ecosystem Classification (BEC) system of British Columbia. Smethurst/Arawana is within the Ponderosa Pine Zone which occurs as a thin band in the bottoms or lower slopes of valleys and falls between the Bunchgrass and Interior Douglas-fir Zones. The Ponderosa Pine Zone is characterized by warm to very warm summers and cool winters with light snow cover (Meidinger and Pojar, 1991). More specifically, Smethurst/Arawana is within the Very Dry Hot Ponderosa Pine Okanagan Variant (PPxh1). The natural disturbance pattern for the PPxh1 and adjacent Interior Douglas fire and Bunchgrass zones historically experienced frequent, low intensity fires prior to the fire-return interval being interrupted by contemporary forest management practices including forest fire suppression. Frequent stand-maintaining fires consume understory fuels and the lower limbs of overstory conifers leaving the overstory canopy layer relatively intact. These frequent fires kept ladder fuels to a minimum and typically resulted in an open, park-like stand structure.

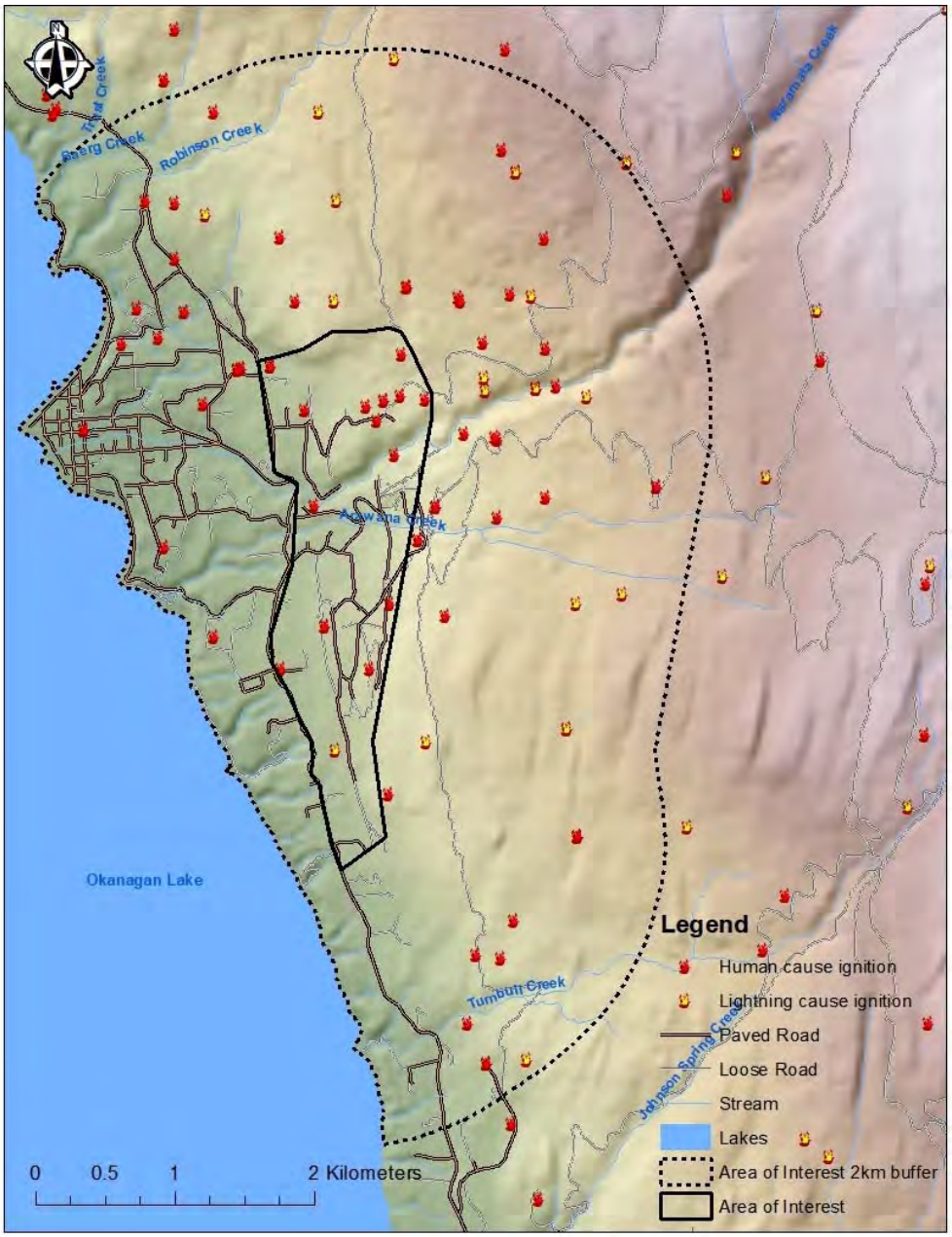
In the absence of frequent low-intensity fire regimes in the Smethurst/Arawana neighbourhoods, small trees that would have typically been killed have established and the benchlands have steadily become ingrown with conifers over the last century as the Okanagan communities have settled and expanded in size along with the advent of routine wildland fire suppression activities. Over time, tree densities have increased forming thickets of even-aged stands with interlocking crowns which have the ability to spread fire through tree crowns, especially if it is wind-driven. Ponderosa pine needles and cones have accumulated on the ground which has resulted in higher fine fuel loading that are capable of transforming into from surface fires into to more dangerous crown fires.

A mitigating factor of these baseline ecological conditions and fire history activity are the tracts of forest/grassland that have been converted to agricultural use which now typically host commercial crops (vineyards and fruit trees) sustained by means of irrigation. These tracts are comprised generally of small agricultural holdings (approximately 2-4 hectares) with a single detached dwelling, sometimes a winery. The coverage of maintained cropland in the study area is estimated at approximately 40% (pers. comm. Doug Reeve, RDOS), consequently modifying vegetation type and foliar moisture content in comparison to native, non-irrigated vegetation which reduces the potential fire behaviour.

Therefore, agricultural areas (*i.e.* high-density fruit orchards) can be considered Non-Fuel fuel type if they are irrigated weekly during the fire season, which allows plants to retain a higher foliar moisture content (i.e. broadleaf-deciduous leaves as opposed to grass). If maintained in this state, the likelihood of fire spread or ignition from spotting is reduced. However, vineyards may contribute to fire spread despite frequent irrigation due to the common practice of using vine clippings from pruning as groundcover mulching placed between rows. The rate of drying during the fire season quickly cures and turns this material into flashy fuels which can (and have) contributed to surface fire spread. Best practices for vineyard owners would be to avoid placing mulch from pruning in between rows during the fire season.

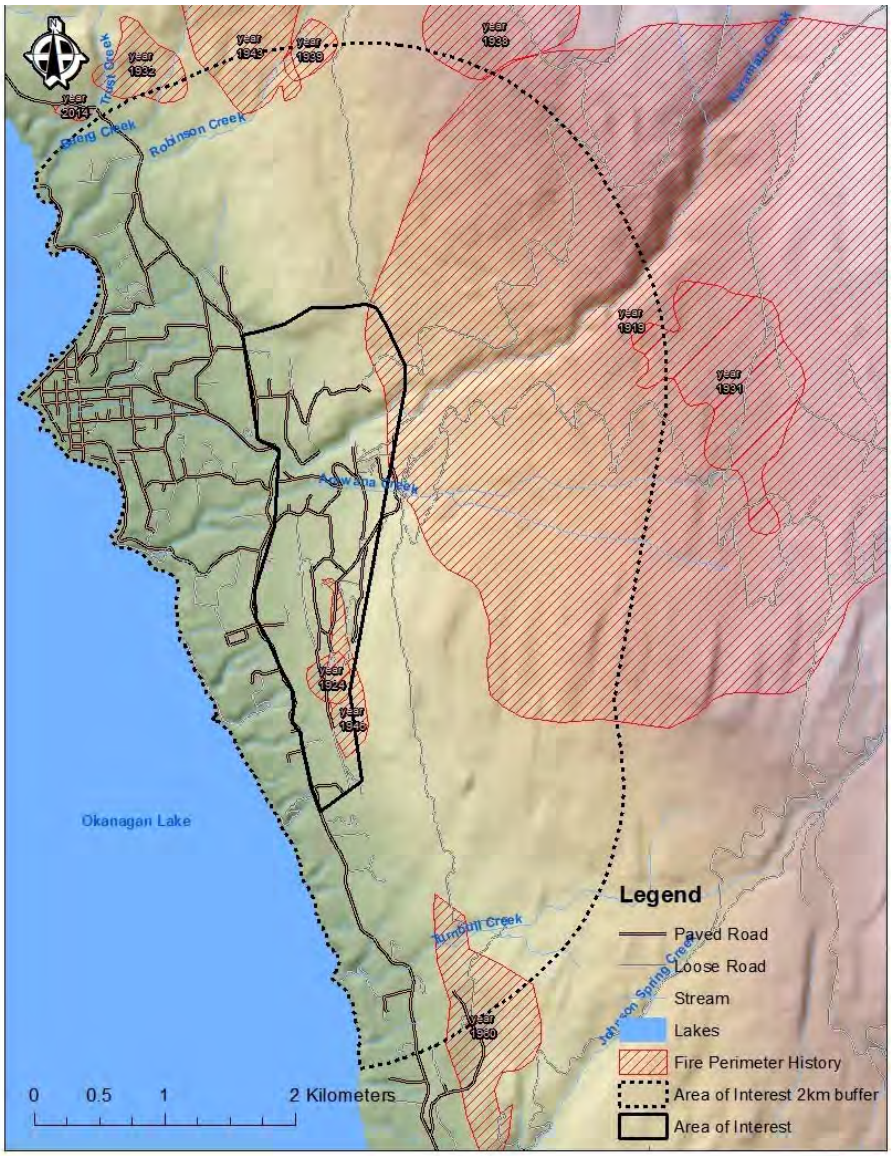
2.3 FIRE HISTORY

Map 2 shows the spatial distribution of ignitions (both human and lightning caused) within the study area and inclusive of a 2 km buffer area. This map highlights the concentration of ignitions (largely human) within the developed areas, recreation areas, and along the highway and road networks. Whereas only one lightning ignition is displayed in the study area proper, the density of lightning ignitions increases significantly within the 2 km buffer area, along with a correspondingly steady rate of human ignitions into the backcountry. This illustrates the vulnerability of Smethurst/Arawana to wildfire risk at a landscape level beyond the limits of the study area.



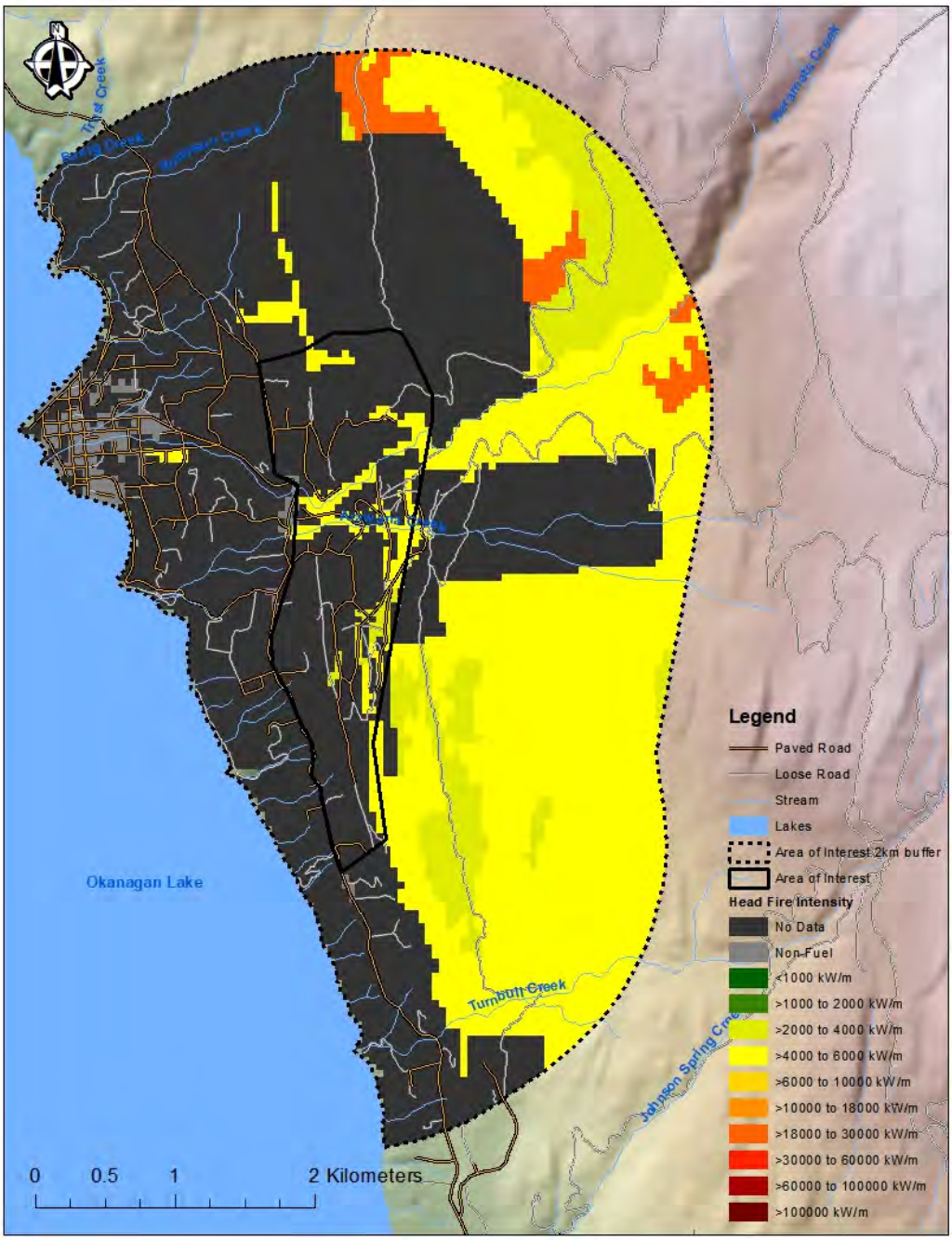
Map 2: Spatial ignition history (human and lightning) for the Naramata area (1950 – 2018).

Map 3 below shows that historically a number of wildfires prior to 1960 have impacted and intersected the study area and 2 km buffer, and highlights that the footprint of historic fires surrounds Smethurst/Arawana and will likely continue into the future. The largest footprint of area burned in 1919 (800 ha) directly east of Smethurst/Arawana. This could be related to topography, climate and the location of both human and lightning ignitions. Subsequent fires have been smaller; corresponding with the advent of advanced fire suppression. While fire suppression has been effective at reducing the incidence of frequent, low-intensity surface fires that burned in the settled areas around Okanagan Lake, two fires in 1960 (25 ha) and 2014 (2 ha, just outside the northwest edge of the 2 km buffer) have burned in developed areas beside arterial and one-way access routes. These recent fires, combined with a steady rate of human ignitions that have occurred in recent decades (since 1975), illustrate that the risk from ignitions is still prevalent despite the efficacy of fire suppression when they do occur.



Map 3: Spatial history, by decade, of fires that have occurred between 1919 and 2018.

With regards to wildfire risk, the most important consideration in protection of the Smethurst/Arawana neighbourhoods is fire behaviour potential. There are three elements to fire behaviour including crown fraction burned, rate of spread, and head fire intensity that make up the overall fire behaviour analysis. The rate of spread describes how fast a fire can spread under specific fire weather conditions, and the crown fraction burned describes where the fire is expected to move into the tree crowns. These are important measures specifically for fire suppression. The head fire intensity (HFI) describes the energy output of the fire, and is also important for fire suppression. However, the head fire intensity can also be used to assess where there is significant potential for fire related damage to buildings and structures within the Smethurst/Arawana study area. The only way residents can directly affect the fire behaviour potential under their control is through the application of FireSmart principles which creates a separation, or defensible space, where radiant heat produced by wildfires is dissipated. Map 4 shows the 90th percentile head fire intensity for Smethurst/Arawana. The analysis shows that houses and structures adjacent to the steep sided creek canyons and the upland sections along the east boundary would be impacted by moderate head fire intensity that could support the spread of fire through structure to structure contact and by igniting flammable vegetation around homes. Since head fire intensity mapping only uses data for lands with public ownership, the 'No Data' class (coloured black) covers the Study Area meaning that no data was available.



Map 4: Head fire intensity classes for the Smethurst/Arawana study area.

The more recent Terrace Mountain (2009) and Okanagan Mountain Park (2003) wildfires located on either side of Okanagan Lake near the study area, are examples of the changing wildfire conditions and illustrate the potential for damaging wildfires.

3.0 SMETHURST/ARAWANA FIRE ENVIRONMENT

Fire intensity and spread rate depend on the fuel type and fuel conditions, the weather conditions prior to and during ignition, and the topography. Generally, the following relationships hold between the fire behavior and the fuel, weather and topography:

- Fine fuels ignite more easily and spread fire faster with higher intensities than coarser fuels. For a given fuel, the more there I and the more continuous it is, the faster the fire spreads and the higher the intensities. Fine fuels take a shorter time to burn out than coarser fuels;
- The weather conditions affect the moisture content pf the dead and live vegetative fuels. Dead fine fuel moisture content is highly dependent on the relative humidity and the degree of sun exposure. The lower the relative humidity and the greater the sun exposure, the lower will be the fuel moisture content. Lower fuel moistures produce higher fire spread rates and fire intensities;
- Wind speed significantly influences the rate of fire spread and fire intensity. The higher the wind, the greater the spread rate, intensity and ember transport distances (spotting); and
- Topography influences fire behavior principally by the steepness of the slope. However, the configuration of the terrain such as narrow draws, ravines and saddles can influence fire spread and intensity. In general, the steeper the slope, the higher the uphill fire spread and intensity.

Smethurst/Arawana is historically (prior to the advent of regular wildfire suppression) situated in a fire environment characterized by fuel (ingrowth of conifers in areas historically colonized by grasses), weather (very warm summers with extended drought periods and long fire seasons), and topography (structures built on slopes facing parallel to Okanagan Lake and exposed to prevailing winds from the south. These conditions, and the region's fire history could lead to home losses in the WUI and beyond through direct flame contact and ember showers. The coverage of irrigated agricultural land in the study area may mitigate these conditions (see Section 2.2 – Ecology).

A mitigating factor of these baseline ecological conditions and fire history activity are the tracts of forest/grassland that have been converted to agricultural use which now typically host commercial crops (vineyards and fruit trees) sustained by means of irrigation. These tracts are comprised generally of small agricultural holdings (approximately 2-4 hectares) with a single detached dwelling, sometimes a winery. The coverage of maintained cropland in the study area is estimated at approximately 40% (pers. comm. Doug Reeve, RDOS), consequently modifying vegetation type and foliar moisture content in comparison to native, non-irrigated vegetation which reduces the potential fire behaviour.

3.1 FIRE REGIME

Historically, the study area has been exposed to high frequency, low severity surface fires and more recently high severity stand replacement fires (fires that kill larger groups of trees) which occur every 20-120 years (Lloyd *et al.,* 1990) and have the potential to significantly alter the forests.

There are no supporting fire history publications that reference this specific study area. Regional fire history studies publish a return interval of 20-120-year range. However, the southern and central portions of B.C. are expected to become warmer and drier and hence experience more frequent, severe and more extensive area burned. The southern interior, in which Smethurst/Arawana is located, is expected to experience the most significant increases in fire-related weather indices including fire frequency, mean fire size, and fire severity (Spittlehouse, 2008). Given these projections and fire behaviour patterns in recent seasons, it is likely to result in the increased potential for high-severity wildfires to occur more frequently, well below the 20-120-year range. In fact, a review of this specific study area shows a lower area burned in recent years, including 2018, in comparison to other locations in the region and it can be surmised from this that there is a significant probability of large fires in this study area in the near future.

The probability of large wildfires within these Interior forest ecosystems is generally considered high, and in many areas the consequences associated with a large wildfire would be very high to extreme.

3.2 FIRE WEATHER RATING

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

Smethurst/Arawana is in one of the highest wildfire risk areas of the province and it is expected that the fire season is expanding. An awareness of these conditions is key to focusing resources on the critical elements of hazard mitigation at the site and stand levels

Fire Weather refers to weather conditions that are conducive to fire. These conditions determine the fire season, which is the annual period(s) of the year during which fires are likely to start, spread, and cause sufficient damage to warrant organized fire suppression. Fire weather influences the intensity and duration of summer drought periods as displayed in Figure 2 and danger class days in Figure 3.

Fire weather data was obtained from the Environment Canada weather station at Penticton BC (Penticton RS). The weather record for the station extends from 2008 to 2019. The daily historical record of temperature, precipitation, relative humidity, wind speed and all Canadian Fire Weather Codes and Indices were obtained. The digital file for the station was imported into an Excel spreadsheet where variables could be summarized by month and year. The total number of days in which recorded fire weather conditions would promote ignition and spread of fires were compiled by year during the fire season which generally occurs between May and September.

For each of the key parameters, summary graphs (Figure 2 and Figure 3) were produced. It is apparent from the summary graphs that fire weather conditions are of greatest concern in July and August where the fire danger class, number of danger class 4 (High) and 5 (Extreme) days are indicative of significant periods where high to extreme fire behavior are possible. The month of greatest concern is August where historically the drought code has exceeded 500 in most years (in 2017 it reached a level of 1200 and since 2008 every year has exceeded the 500 threshold) and the number of danger class 4 days has been exceeded 20. Under these conditions fire behavior potential would be considered high to extreme where much of the current forest structure would be capable of supporting a damaging fire.

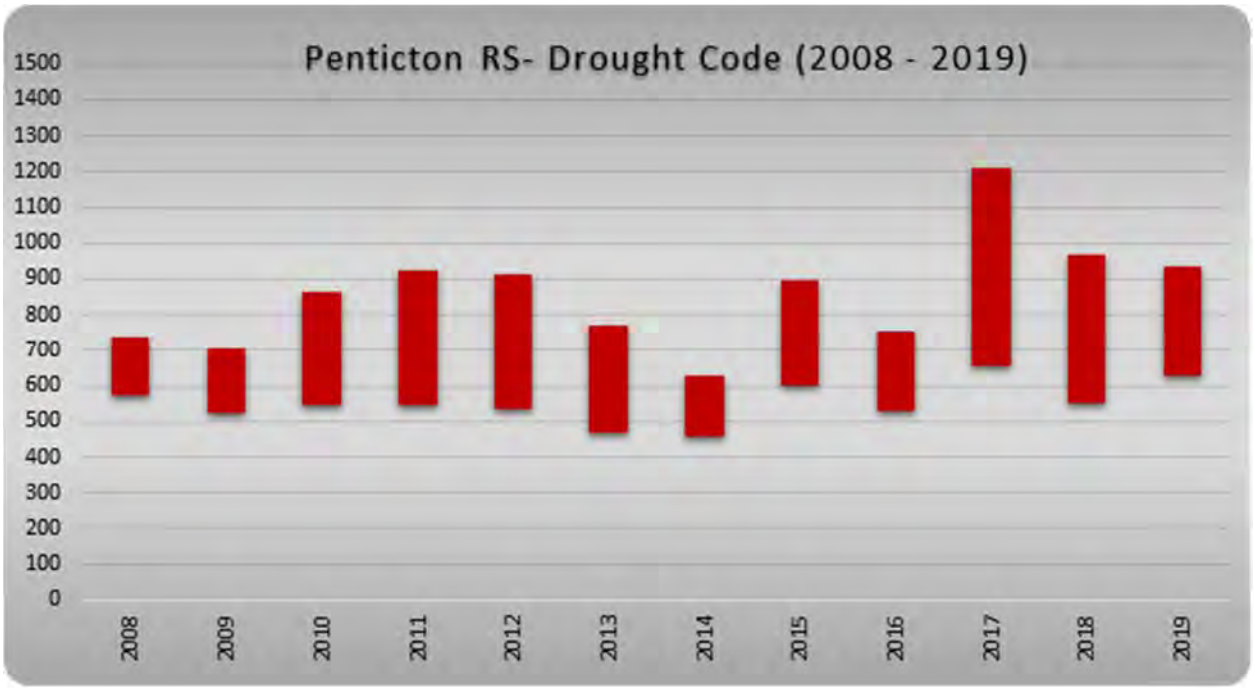


Figure 2: Drought codes for the Penticton area.

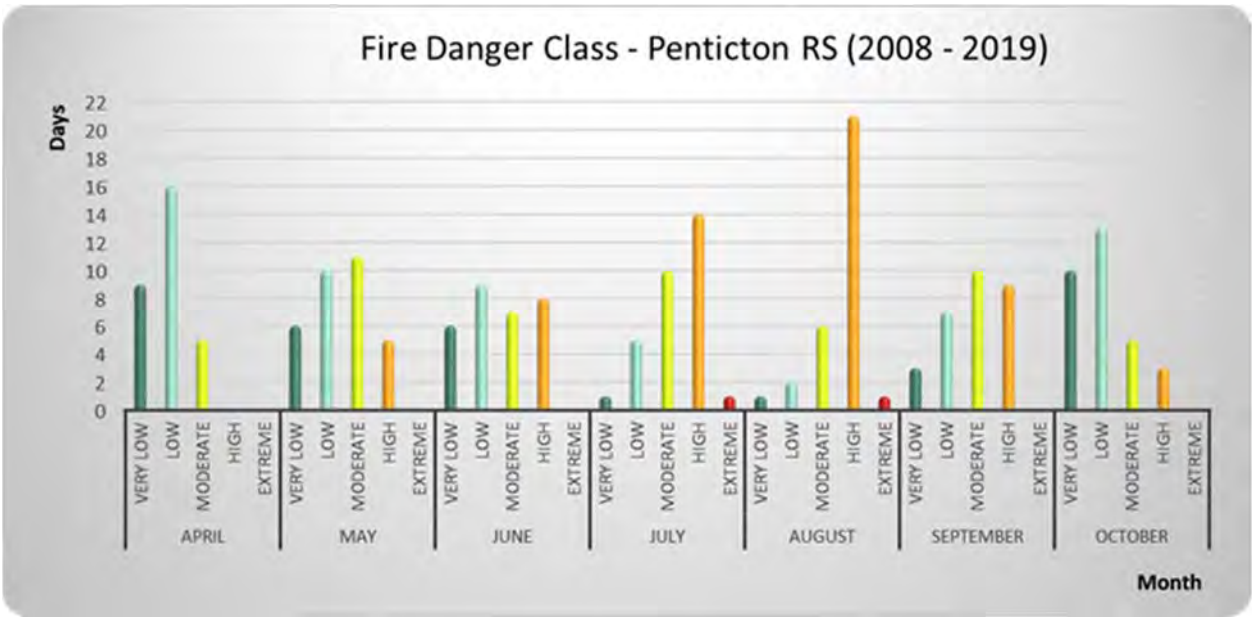


Figure 3: Fire Danger Class for the Penticton area.

3.3 FUEL TYPES

The Canadian Forest Fire Behaviour Prediction (FBP) System outlines five major fuel groups and sixteen fuel types based on characteristic fire behaviour under defined conditions. In the Smethurst/Arawana study area, the fuel types observed in the area during site assessment are C-3, C-7, and O-1a/b as summarized by general fire behaviour in Table 2. In general, the fuel type that may be considered hazardous in terms of fire behaviour and spotting potential in the Smethurst/Arawana area is the C-3 fuel type, particularly if there are large amounts of woody fuel accumulations or denser understory ingrowth. It must be noted that many areas classified as C-7 have been affected by ingrowth and are transitioning more closely to C-3 fuel types (e.g., along the Kettle Valley Trail system in the study area). An O-1b (standing dead grass) fuel type often can support a rapidly spreading grass or surface fire capable of damage or destruction of property, and jeopardizing human life, although it is recognized as a highly variable fuel type dependent upon level of curing.

Table 2. A summary of fuel types, associated hazard and areas within the study area.

Fuel Type	Description	Wildfire Behaviour Under High Wildfire Danger Level
C-3	Fully stocked, young forests, uniform and interconnected ladder fuels	Surface and crown fire, low to very high fire intensity and rate of spread
C-7	Open, uneven-aged forest, crowns separated from the ground except in conifer thickets, understorey of discontinuous grasses, herbs	Surface fire spread, torching of individual trees, rarely crowning (usually limited to slopes > 30%), moderate to high intensity and rate of spread
O-1a/b	Short grass/ Sparse or scattered shrubs, long grass, and down woody fuels.	Rapid spreading, intense surface fire
NF	Non-fuel	Examples: water, rock, irrigated fields

Figure 4: Flammable coniferous vegetation with cured grass surface fuels.

3.4 CLIMATE AND WEATHER

The climatic conditions of southern interior British Columbia are broadly characterized by warm, dry summers and cool winters and the south Okanagan is classified as a cold and semi-arid climate with July and August holding the peak temperatures and lowest relative humidity. Relative humidity values in the teens or even lower do occur in the Okanagan during the peak fire season (July-August). Occasions when the temperature value is higher than the relative humidity value are critical fire weather conditions that can lead to fast-spreading, intense wildfire behavior typically occurring in the hazardous fuel types in Smethurst/Arawana. Wind direction is general from the south/southeast funneled up the Okanagan Valley, and the South Okanagan has a high lightning profile (50%), and human ignitions account for the other 50%. In contrast the lightning profile of the coast is approximately 10% lightning and 90% human ignitions.

3.5 TOPOGRAPHICAL FACTORS RELATED TO BUILDING SITES

The topography of the South Okanagan and Naramata is characterized by a series of benches ideal for agricultural production as well as for siting homes for capturing views of the Okanagan Valley and Okanagan Lake. The pattern of development has capitalized on building single family residences in an area zoned as rural which contributes to the incremental construction of residential neighbourhoods into the WUI.

Topography is an important environmental component that influences fire behaviour. Considerations include slope percentage (steepness) and slope position. Slope percentage affects solar radiation intensity, fuel moisture (influenced by radiation intensity) and influences flame length and rate of spread of surface fires (the steeper the slope the faster the spread). Slope position relates to the ability of a fire to gain momentum during an uphill run. A value placed at the bottom of the slope is equivalent to a value on flat ground. A value on the upper 1/3 of the slope would be impacted by preheating and faster rates of spread Compounded with topographical factors is the impact from 1) nearly a century of active and successful fire suppression which has resulted in tree colonization and woody debris build-up in areas where historically surface fires maintained grass cover; and 2) continued residential development into interface areas where homes, structures, livestock and critical infrastructure are at risk from fires exhibiting high and extreme fire behavior.

Properties and structures in the neighbourhoods occupy the entire bench land slope with structures situated at bottom, mid-slope, and top slope positions.

4.0 THE WILDLAND URBAN INTERFACE

The WUI is generally defined as the place where the forest meets the community. There are different WUI conditions, which are variations on 'perimeter interface' and 'intermix'. A perimeter interface condition is generally where there is a clean transition from urban development to forest lands. Smaller, more isolated developments that are embedded within the forest are referred to as intermixed areas. An example of interface and intermixed areas is illustrated in Figure 5.

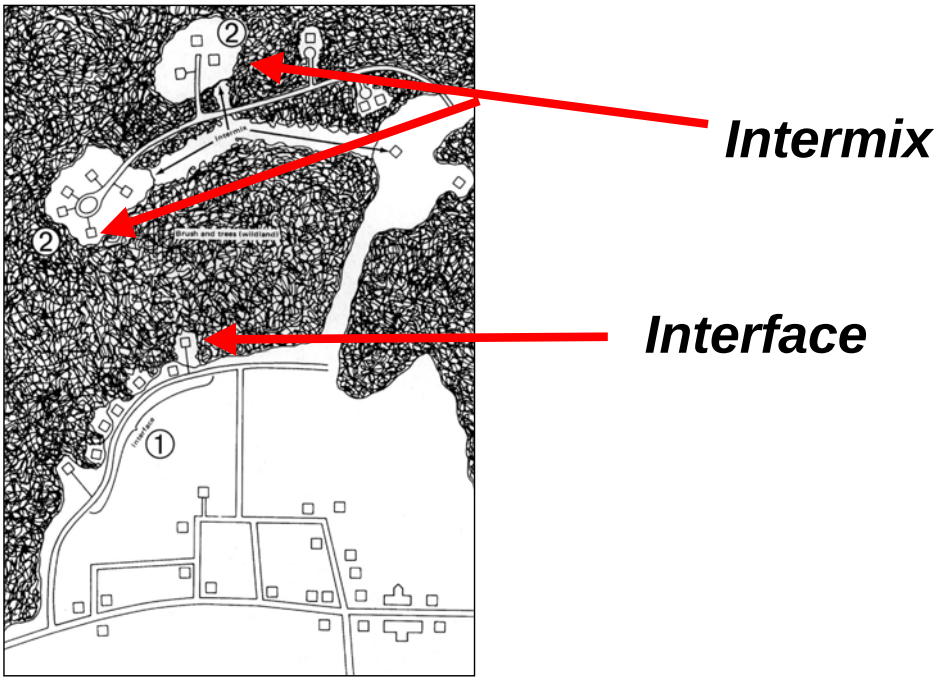


Figure 5: Illustration of intermix and interface areas in the WUI.

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

4.1 SPOTTING

Spotting is the ability of embers or firebrands from a burning fire to be sent aloft and start new fires in advance of the firefront, or outside of the fire perimeter as illustrated in Figure 6. It has been found that, during extreme wildfire events, most home destruction has been a result of low-intensity surface fire flame exposures, usually ignited by embers in advance of the fire front.

During the 2003 Okanagan Mountain Park fire, ember density was calculated at 1,000 – 1,700 ignition spots per square metre (m^2). Spotting distance varied, ranging between 2 – 7 km and was highly dependent on relative humidity, and wind speed and direction (prevailing winds for the area are from the south/southeast).

Spotting is a risk to homes on the middle and lower benches of the study area. The bench lands are classified as high wildfire threat and due to the valuable agriculture and tourism economy, and a growing population with ongoing residential construction into the WUI, the ensuing damages and consequences to the community will be extreme. This situation signals the urgent need for Smethurst/Arawana to begin addressing the risk from wildfire with a multi-pronged pro-active approach that includes homeowners, businesses, and local and provincial levels of government to find and implement mitigation solutions.

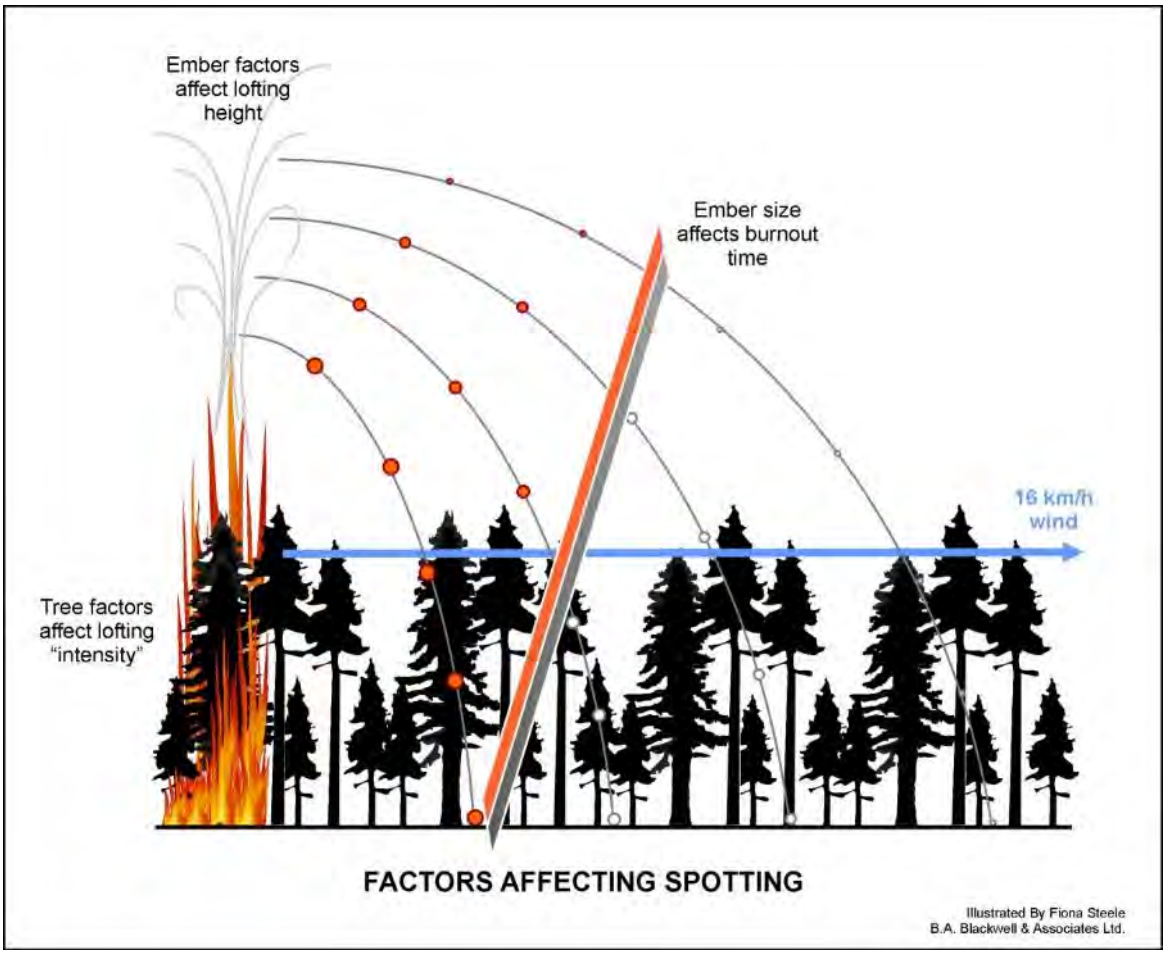


Figure 6: Illustration of embers lofted ahead of a fire front (spotting).

4.2 VULNERABILITY OF THE WILDLAND URBAN INTERFACE (WUI) TO FIRE

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

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

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

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

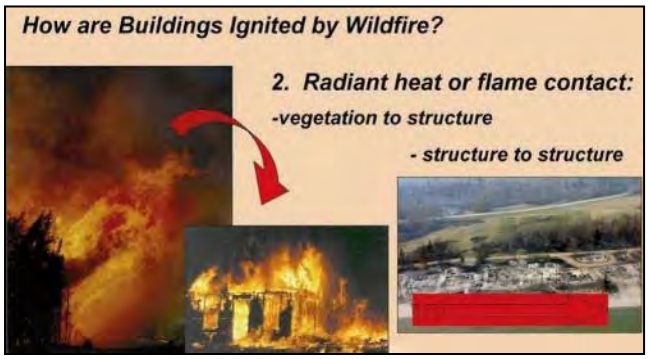


Figure 8: Radiant heat and flame contact allows fire to spread from vegetation to structure or from structure to structure.

4.3 DEFINITION OF THE HOME IGNITION ZONE (HIZ)

Smethurst/Arawana is located in a wildfire environment. Wildfires will happen – exclusion is not a choice. The variables in a wildfire scenario are when the fire will occur, and where. This assessment addresses the wildfire-related characteristics of Smethurst/Arawana and examines the area's exposure to wildfire as it relates to ignition potential. The assessment does not focus on specific homes, but examines the community as a whole.

A house burns because of its relationship with everything in its surrounding ignition zone – the house and its immediate surroundings. To avoid a home ignition, a homeowner must eliminate the wildfire's potential relationship with their house. This can be accomplished by interrupting the natural path a fire takes. Changing a fire's path by clearing the ignition zone is an easy to accomplish task that can prevent home loss. To accomplish this, flammable items such as excessive vegetation must be removed from the area immediately around the structure to prevent flames from contacting it. Also, reducing the volume of live vegetation will affect the intensity of the wildfire as it nears the home.

Included in this assessment are observations made while Blackwell visited the two neighbouhoods. The assessment addresses the ease with which home ignitions can occur under severe wildfire conditions and how these ignitions might be avoided within the ignition zones of affected residents. Residents of Smethurst/Arawana can reduce the risk of structure loss during a wildfire by taking actions within their ignition zones. This zone principally determines the potential for home ignitions during a wildland fire; it includes a house and its immediate surroundings within 100 meters. Given the extent of this zone, the

ignition zones of several homes sometimes overlap, and often spill over onto adjacent public or community land where the homeowner has no control or authority over. Then it becomes important to consult and collaborate with public agencies or other private land owners to mitigate ignition potential.

The results of the assessment show (under current conditions) that wildfire behavior and subsequent losses will be dominated by the residential characteristics of this area. The good news is that residents will be able to substantially reduce their exposure to loss by addressing neighbourhood vulnerabilities. This relatively small investments of time and effort will improve wildfire safety.

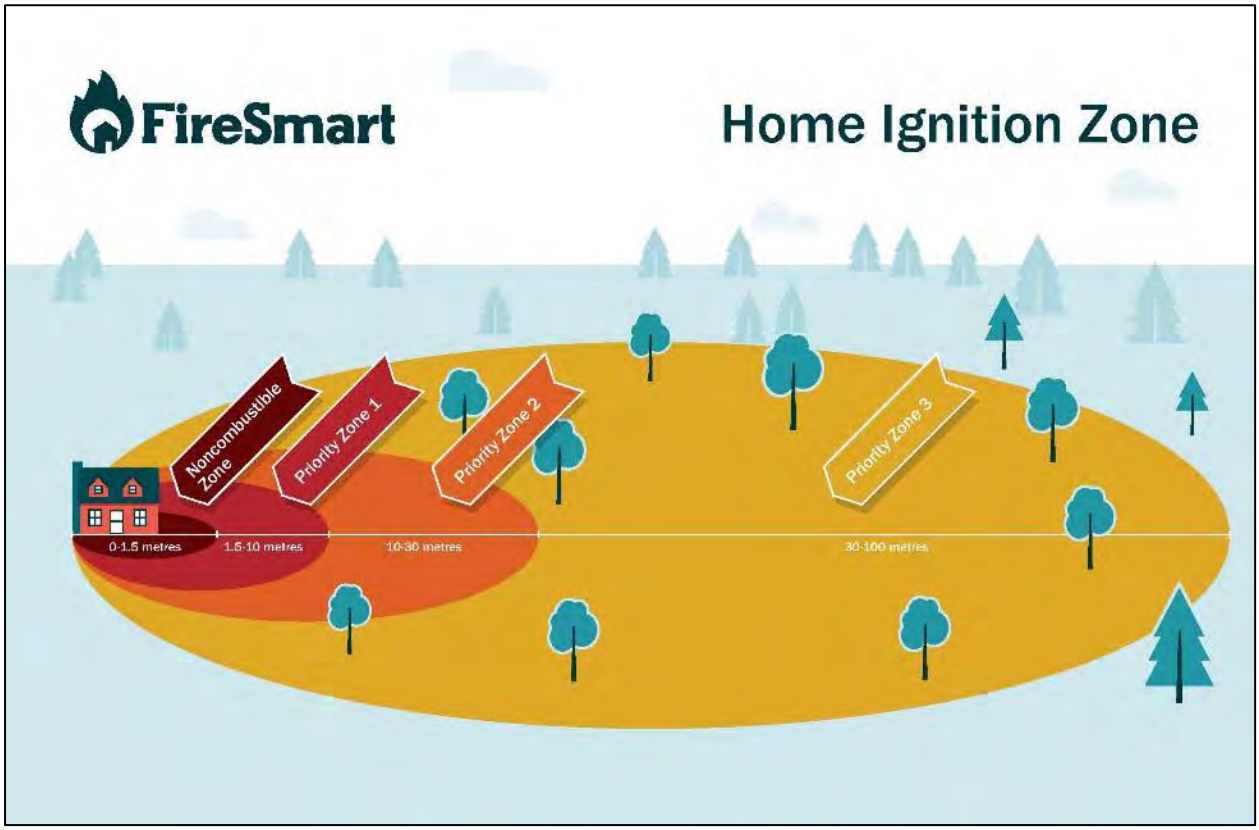


Figure 9: Fire Priority Zones 1a, 1, 2, and 3 collectively comprise the 100m home ignition zone (HIZ).

5.0 OBSERVATIONS FROM FIELD ASSESSMENT

A field review of the Smethurst/Arawana study area was conducted by Bruce Blackwell RPF, RPBio and Judith Cowan, RPF on August 29, 2019. The intent of the field assessment was to assess the level of wildfire risk to the community and to furthermore identify specific vulnerabilities which the community and the RDOS could address to assist in bolstering the resilience of the two neighbourhoods to future interface fire events.

To this end, complete coverage of the neighbourhoods was needed during the field assessment and focused especially on subdivisions or homes occurring immediately adjacent to forested vegetation, as well as building construction typologies and materials, remnant forest patches and green corridors

embedded within the neighbourhood, landscaping around homes, one-way access routes and dead end roads, and the location of water delivery (fire hydrants) and electrical power supply.

The following data was collected as part of the field review:

- The location of access points into the Smethurst/Arawana neighbourhood;
- Evacuation routes;
- Exterior building materials commonly used on homes;
- Forest / grassland vegetation in the WUI;
- Ornamental landscaping around homes and along roads;
- Critical infrastructure including water systems and power supply;
- The pattern of existing and new development within the WUI; and
- Topographical factors influencing the spread of, or barrier to wildfire.

Photographs and notes of the neighbourhoods were taken for documentation.

5.1 BUILDING CONSTRUCTION

Some homeowners have cedar shakes and non-rated roofing. Many homes back directly up to forest / natural area / ravine edges.

Individual interface homes in Smethurst/Arawana are in various states of FireSmart conditions. The majority of homes have rated roofing (Class A or B which is rated as fire-resistive), though there are still a considerable number of homes with unrated cedar shake roofs (

Figure 10) and other non-rated roofing. In addition, many of these homes back directly up to forest, natural area, or ravine edges. Cladding, soffits, and eaves throughout the study areas are constructed of a range of materials, from unrated vinyl to non-combustible materials, such as stone and stucco. The majority of newer homes are, in general, constructed of materials which are compliant with FireSmart standards (Figure 11).

Figure 10. Non-compliant homes with cedar shakes and wood cladding

Figure 11: New homes are generally built to FireSmart building construction standards.

The key building elements which should be constructed to FireSmart standards are outlined below.

Roofing Material:

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

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

Building Exterior - Siding Material:

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

Balconies and Decking:

Open balconies and decks increase fire vulnerability through their ability to trap rising heat, by permitting the entry of sparks and embers, and by enabling fire access to these areas. Closing these structures off limits ember access to these areas and reduces fire vulnerability.

Combustible Materials:

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

Other Factors:

In addition to the vulnerability of roofing materials, adjacent vegetation may be in contact with roofs, or roof surfaces may be covered with litter fall from adjacent trees. This increases the hazard by increasing the ignitable surfaces and potentially enabling direct flame contact between vegetation and structures.

Although non-combustible exterior materials are often chosen for new developments and structures and are therefore generally compatible with FireSmart principles, a 2016 investigation by Westhaver[1] after the Fort McMurray wildfire revealed that the leading contributor to hazard and hence home survivability were vegetation and fuel conditions surrounding the home. This highlights that these factors need to be addressed in tandem in order for a structure to be in FireSmart compliance.

[1]Westhaver, A. 2017. Why some homes survived: Learning from the Fort McMurray wildland/urban interface fire disaster. Retrieved from: https://issuu.com/iclr/docs/westhaver_fort_mcmurray_final_2017

5.2 VEGETATION ISSUES

Landscaping on private property within the study area is generally not compliant with FireSmart standards and represents a considerable hazard to individual properties and the entire neighbourhood. Most properties are largely landscaped with shrubby, juniper ground cover, and tall cedar privacy hedges. Some also have coniferous trees with interconnected crowns (

Figure 12). Juniper, cedar, and other coniferous hedging are highly flammable. Coniferous overstory, such as ponderosa pine, deposit dry and flammable needles onto roofing and can accumulate on roof corners and in gutters.

Newer developments, while generally complying with FireSmart building standards, are not FireSmart compliant in regards to landscaping. Site visits to new developments along the upper reaches of Smethhurst Rd and Arawana Rd show juniper and cedar hedging are still the predominant selection for landscaping vegetation within Smethurst/Arawana. The majority of hazard to individual homes across the study area can be attributed to vegetation/ fuel, much of which are planted and part of the landscape.

Figure 12: Homes surrounded by hazardous vegetation.

5.2.1 PARKS AND NATURAL AREAS

In addition to these observed vegetation issues on private properties, some structures are built proximal to hazardous fuels in ravines which make them vulnerable to wildfire moving up slope through these corridors (*i.e.* Naramata Creek and Arawana Creek). Creek Park has a moist environment in the main creek draw but edges and sides of the canyon are dry with flammable vegetation (Figure 13). Houses beside these banks and sandwiched between the two creek/canyon draws are at risk for the following reasons:

- Creek ravines with flammable vegetation on their slopes are capable of wicking and concentrating heat, contributing to fast spread rates in a limited amount of time;
- Evacuation would be complicated;
- The draws would funnel smoke;
- Currently homes are not FireSmart;
- There are no adequate setbacks from slopes; and
- A fire could quickly run up slope, gathering heat and energy as it races uphill.

Figure 13: Creek Park ravine corridor surrounded by residential structures (outlined in red).

5.2.2 LANDSCAPING AND HAZARDOUS FUELS

The middle and lower benches of Smethurst/Arawana are at risk from spotting, and all the coniferous hedging and landscaping have the potential to act as conduits for houses to catch on fire. Cedar hedging and juniper shrubs were evident throughout the study area and were the typical landscaping choices observed on numerous properties. Conifers have volatile extracts and combined with low foliar moisture content during the dry summer months the overall flammability is magnified.

With respect to mulching materials, chips do not carry flaming combustion if they are no more than 5-10cm deep. Bark mulch; however, comes in larger piece sizes (7.5-10 cm or 3 / 4" in length), and furthermore is drier and therefore more hazardous. The piece size of mulch materials to be concerned with is $\leq$ 12.5 cm / 5" in length.

There are considerable challenges to achieving FireSmart landscaping throughout Smethurst/Arawana. In older neighbourhoods where the landscaping is mature, there is little incentive to replace landscaping. Additionally, FireSmart landscaping is seen by some as not aesthetically pleasing, costly, or high-maintenance.

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

5.3 ACCESS AND EVACUATION

The evacuation of residents during an interface fire along with the possibility of entrapment scenarios is a significant problem for Smethurst/Arawana and will require discussion and the preparation of a coordinated plan between the RDOS, residents, the business community, Emergency Management BC, and first responders. There is an inadequate network of secondary access throughout the neighbourhoods and a number of dead-end roads that may be inaccessible / unsafe during a wildfire and lead to entrapment issues (Upper Debeck Rd, Juniper Dr, Arawana Rd, Smethhurst Rd, Winifred Pl, among others). In addition, the major roads which would be used during an evacuation have hazards which compromise safe evacuation. These major evacuation routes are:

- Gammon Rd, with its access point at the intersection of N. Naramata Rd and Gawne Rd in the southern part of the neighbourhood;
- Arawana Rd, with its access point at the intersection with N. Naramata Rd in the central part of the neighbourhood; and

- Smethhurst Rd, with its access point at the intersection with N. Naramata Rd in the northern part of the neighbourhood

These routes have been identified by Blackwell as logical choices because they traverse larger portions of both neighbourhoods (as opposed to shorter street sections). These roads are circuitous and narrow with swathes of flammable vegetation on roadside edges in some areas. In addition, the three routes outlined above each have only one access point into the study area and are not connected to one another at any point (Figure 14).

Access (for first responders) and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. The subdivisions and lots within Smethurst/Arawana which are accessed by cul-de-sac or dead-end roads are of particular concern for fire suppression, emergency response, and evacuation. These areas should be reviewed for secondary access options.

Figure 14: The Gawn Road access and point to Smethhurst/Arawana will be used as an evacuation during an interface fire.

5.4 CRITICAL INFRASTRUCTURE

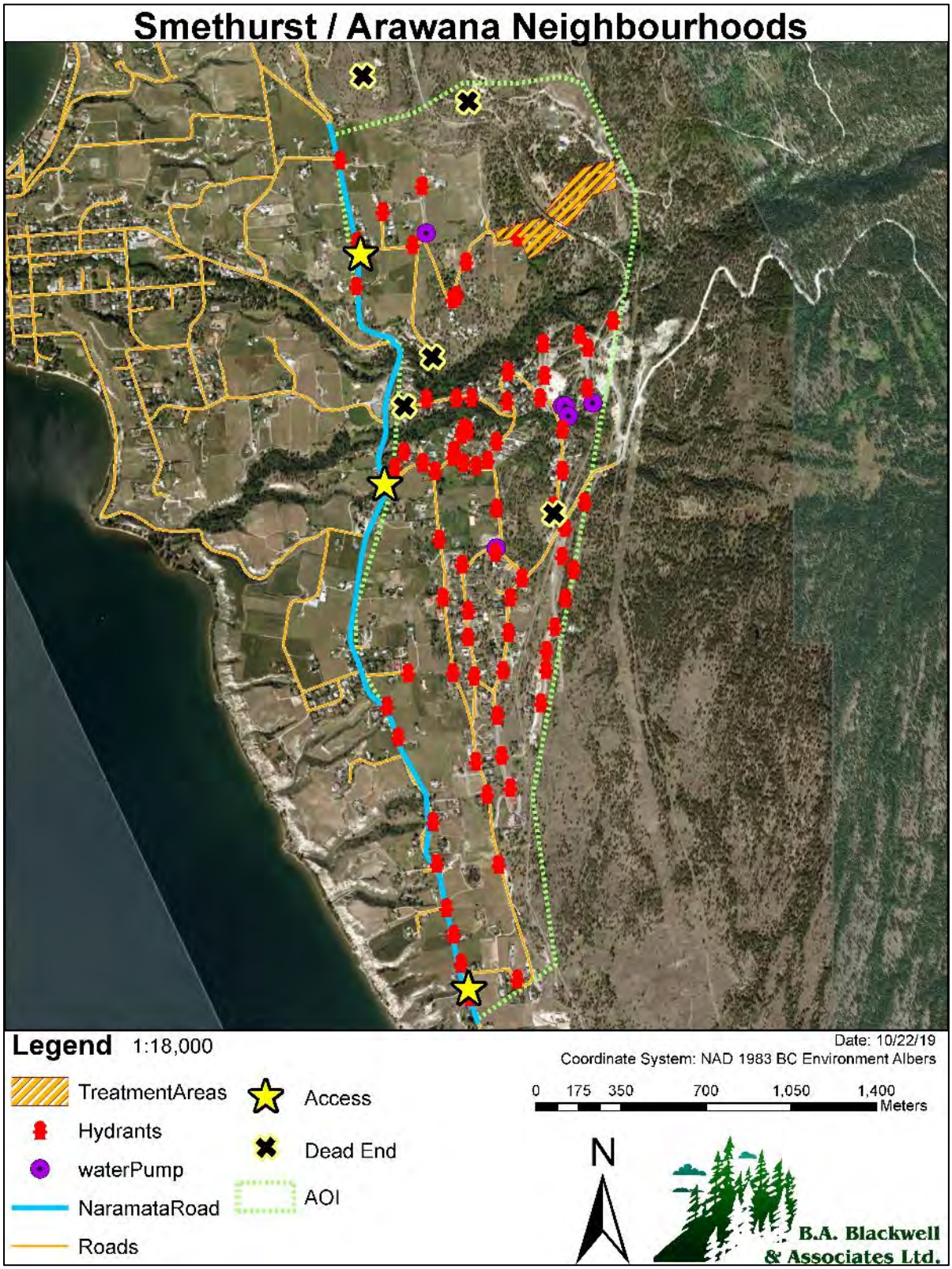
Protection of infrastructure during a wildfire event is important to ensure that emergency response is as effective as possible, coordinated evacuation can occur if necessary, and essential services in the study area can be maintained and/or restored quickly. Critical infrastructure includes emergency and medical

services, water, electrical service, transportation, major water infrastructure, and communications infrastructure.

It is recognized that there are many other physical structures, systems, and facilities that are extremely valuable to the RDOS and Smethurst/Arawana and are required for the healthy, efficient functioning of the local economy and the livability of the community.

Emergency services within the study area include the Naramata Fire Department. Electrical service for most of the study area is received through a network of wood pole transmission and underground distribution infrastructure supplied through BC Hydro and Fortis BC. Those neighbourhoods that depend on wood pole distribution lines (small, street-side poles) to connect homes and subdivisions would be vulnerable to fire, which could disrupt service to portions of the community.

The RDOS owns, operates and maintains the water infrastructure system. Map 5 shows the locations of important water infrastructure (hydrants and water pump stations).



Map 5: Critical infrastructure locations for Smethurst/Arawana.

6.0 FIRESMART RECOMMENDATIONS

A fire originating in, or spreading from the forested hills and bluffs surrounding Smethurst/Arawana has the potential to spread into the neighbourhoods under high or extreme fire danger by means of radiant or convective heat transfer or through spotting. With FireSmart building materials, FireSmart landscaping, and executing fuel management, evacuation, and water / power supply recommendations in this report, the risk to the neighbourhoods from spotting and/or an ember shower should be sufficiently mitigated and the likelihood of fire spread reduced.

Furthermore, FireSmart mitigation activities should be approached as a multi-year (> 10-year) project with incremental build-out as new development or re-development land use changes occur. It has two levels of modification: the site (individual lot or parcel) and community or neighbourhood.

Establishing a FireSmart community will reduce losses and impacts related to wildfire. For this Plan two classes of structures were considered: critical infrastructure; and residential or commercial infrastructure. Critical infrastructure is distinct as it provides important services that may be required during a wildfire event or may require additional considerations or protection. As outlined in Section 4.3, FireSmart principles are important when reducing wildfire risk to both classes of structure and are reflected in the outlined recommendations. The RDOS and Smethurst/Arawana neighbourhoods should aim to:

- Enhance protection of critical infrastructure from wildfire; and
- Encourage private homeowners to voluntarily adopt FireSmart principles on their properties.

The two main avenues for implementing FireSmart include:

- Change the vegetation type, density and setback from the structure; and
- Change the structure (where feasible) to reduce vulnerability to fire and reduce the potential for fire to spread to or from a structure.

6.1 STRUCTURE PROTECTION

Ensuring that homes can withstand an interface fire event is a key consideration in protecting the wildland urban interface zone from fire. Often, it is a burning ember traveling some distance (spotting) and landing on vulnerable housing materials, rather than direct fire/flame (vegetation to house) contact, that ignites a structure. Alternatively, the convective or radiant heating produced by one structure may ignite an adjacent structure if it is within close proximity. Structure protection is focused on ensuring that building materials and construction standards are appropriate to protect individual homes from interface fire. Materials and construction standards used in roofing, exterior siding, window and door glazing, eaves, vents, openings, balconies, decks and porches are primary considerations in developing FireSmart neighbourhoods. Housing built using appropriate construction techniques and materials is less likely to be impacted by interface fires.

While many communities established to date in the Okanagan were built without significant consideration with regard to interface fire, there are still ways to reduce home vulnerability. Changes to roofing materials, siding, and decking can ultimately be achieved through long-term changes in bylaws and building codes.

The FireSmart approach a recognized template for reducing and managing fire risk in the wildland urban interface. The most important components of the FireSmart approach are the adoption of the hazard assessment systems for wildfire, site and structure hazard assessment, and the proposed solutions and mitigation outlined for vegetation management, structure protection, and infrastructure. Where fire risk is unacceptable, the FireSmart standard should, at a minimum, be applied to new developments and, wherever possible, the standard should be integrated into changes to, and new construction within, existing residential structures within WUI areas.

Recommendation 1: Identify the hazardous components on the home and develop short and long-term strategies to convert them over time to fire-resistive materials with roof replacements as a first priority, followed by replacement of exterior siding and decking with fire resistant materials. For exterior siding materials (cladding) cement fibre, brick, stucco, or heavy timber materials offer much better resistance to fire. While wood may not be the best choice for use in the WUI, new treatments and paints are now available for wood that increase its resistance to fire and they should be considered for use. In addition, propane tanks and wood piles should be containerized, sealed and located 10m away from the home and outbuildings should not abut the primary residence but have a minimum separation of 5 m.

To encourage the retrofitting of existing homes, create incentives such as granting rebates for roof replacement or developing a life-cycle replacement plan that can be incrementally implemented over time (*i.e.* 1 roof replaced every 2-5 years).

Recommendation 2: Apply for funding from the UBCM's (Union of BC Municipalities) Community Resilience Investment (CRI) program and work with the NFD to coordinate exterior rooftop sprinkler kits to community residents (at a cost).

Recognizing that bringing a structure in compliance with FireSmart standards is an incremental process, exterior sprinklers afford additional protection measures. Sprinklers can be effective at increasing a structure's resistance to ignition by elevating moisture levels and relative humidity in the atmosphere on and around the home, including surface and fine fuels (conifer needles and small twigs) within 10 m of the home footprint. Because of this, sprinklers are effective at slowing fire spread and extinguishing wind-carried embers that may ignite portions of the home, or leaf litter that has accumulated around the home. Sprinklers used for structure protection should follow the United States' National Fire Protection Association (NFPA) standards[23].

[2] NFPA 1144 Standard for Reducing Structure Ignition Hazards from Wildland Fire. 2013 Edition.
[3] NFPA 1141 Standard for Fire Protection Infrastructure for Land Development in Wildland, Rural, and Suburban Areas. 2012 Edition.

Necessary to the proper functioning of sprinklers during and emergency situation is the acquisition of a secure water source that is able to maintain enough water pressure during the two-hour period. This would involve tapping into the existing water pump system and associated infrastructure. Alternatively, individual homeowners can increase their own water supply by installing back-up systems such as cisterns / pumps, but unless the system and water supply pressure and capacity is designed by a civil engineer with experience designing and implementing water supply systems at the residential scale, these back-up water sources cannot replace the capacity of the regional water infrastructure.

Exterior rooftop sprinkler kits must be installed and tested at the beginning of every wildfire season (generally May – September) and are only effective only on those homes and properties which have been modified to FireSmart standards (rated roof, minimal wood siding, no open eaves, no coniferous vegetation within 10m of the home).

6.2 VEGETATION MANAGEMENT

Vegetation management, also referred to as fuel management is considered a key element of the of the FireSmart approach.

Vegetation management should be strategically focused on minimizing impact while maximizing value to neighbourhoods. For example, understory thinning or surface fine woody debris removal may suffice to lower fire risk. In situations where the risk is high, a more aggressive vegetation management strategy may be necessary. Vegetation management must be evaluated against the other elements outlined above to determine its necessity. Its effectiveness depends on the longevity of treatment (vegetation grows back), cost, and the resultant effect on fire behaviour. Some of the concerns encountered by both approving authorities (local government) and residents:

- Challenges with adjacent private / crown land
- Challenges with debris disposal: opportunity is a community chipping program
- Surface fuel accumulation and loading

Yet of all the actions that homeowners can perform, landscaping is the least expensive element and totally within their control and does not need input, collaboration or discussion with other agencies for more complicated issues such as roads, water delivery and supply or a greater outlay of expenditure such as roof replacement. The types of vegetation can be classified into ornamental landscaping (plantings by homeowners) and native vegetation.

6.2.1 ORNAMENTAL LANDSCAPING

Recommendation 3: Individual homeowners should incorporate FireSmart landscaping principles within their property and remove all flammable coniferous shrubs and hedges (*i.e.* juniper, cedar hedging) in a 10 m radius around the home footprint. Larger size coniferous trees may be retained depending upon size and proximity to the home. A larger tree can generally be pruned if no more than 35% of its live foliage is removed. If larger trees are capable of being pruned raise the crown base height to a minimum

of 3 m above the ground surface. All coniferous foliage above and to the sides of the home must have a separation distance of 5m.

Recommendation 4: Homeowners should remove bark mulch, wood chips, and other flammable surface ground coverings in a 2m radius around the home, outbuildings, decks and stairs. These flammable materials are significant ignition sources which often result in fire spread into the home and represent FireSmart Priority Zone 1a.

Recommendation 5: Encourage individual homeowner participation in removing excess and flammable vegetation from their property by organizing a neighbourhood chipping program, free yard waste drop-off, a scheduled garden debris burning weekend with neighbourhood representatives. Also include distribution of additional educational materials, such as FireSmart landscaping design and FireSmart plant selection information.

Recommendation 6: Develop an outreach plan to residents to raise public awareness around fire hazard on their property and within their neighbourhood and the actions they can do to significantly reduce the risk. This plan should incorporate public awareness around hazard on their property and within their neighbourhood, and landscaping covenants triggered by re-builds or major renovations which must install FireSmart landscaping. Some initial resistance may be able to be overcome by public education regarding the opportunities for affordable, aesthetic, low flammability landscaping options that are adapted to the climate. One such format could be a FireSmart preparedness information day held at the beginning of each fire season in a local venue.

Recommendation 7: Consider developing an alternative plant species list to assist homeowners and businesses seeking alternate choices to juniper and cedar landscaping for their property. There are a number of broadleaved deciduous and evergreen plants with low flammability which can be used for landscaping within FireSmart PZ 1 (within 10 m of structures) and for the appropriate Canadian Plant Hardiness Zone for the Okanagan Valley (Zone 7a). This list need not be comprehensive, but instead should be seen as a starting point or example for landscaping standards to be followed up with local nursery growers who can confirm their regular availability in stores. Plants that are fire resistant/ have low flammability generally have the following characteristics:

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

Hedge and shrub examples which thrive in Zone 7 and are low flammability include, but are not limited to: boxwood, wolf willow, Oregon grape, mock orange, euonymus, cranberry cotoneaster, firethorn, Cheyenne privet, and rose. Table 3 displays a list of low flammability or fire-resistant landscaping options for the Okanagan valley area. This list is not comprehensive, but instead should be seen as a starting point or example for landscaping standards.

Table 3: Low flammability landscaping options for the Okanagan area.

Zone	Latin Name	Common name
Ornamental species		
4	*Berberis thunbergii*	Japanese Barberry
5	*Euonymus japonicus 'Green Spire'*	Green Spire Euonymus
5	*Leucothoe fontanesiana 'Rainbow'*	Rainbow Leucothoe
4	*Ligustrum vulgare 'Cheyenne'*	Cheyenne Privet
5	*Pieris japonicum cultivars*	Japanese Pieris
5a	*Pyracantha coccinea 'Teton'*	Firethorn
4	*Rosa rugosa 'Hansa' or 'Mediland'*	Rose
Species native to the Okanagan		
3	*Ceanothus sanguineus*	Red-stemmed ceanothus
4	*Elaeagnus commutata*	wolf willow
3	*Mahonia aquifolium*	Oregon grape
2	*Sorbus sitchensis*	Mountain ash

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

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

Depending solely on irrigation to maintain landscaping in a low flammability state can be limiting, and may actually increase the fire hazard on the parcel, particularly in times of drought and watering restrictions. Lack of irrigation in times of watering restrictions may create a landscape which is unhealthy, unsightly, as well as dead, dry, and highly flammable. There are a number of resources available to aid in development of FireSmart compliant landscaping, and for a list of fire resistant plants, refer to the FireSmart Guide to Landscaping at https://www.firesmartcanada.ca/resources-library/firesmart-guide-to-landscaping. [9]

Other helpful links for finding fire resistant landscaping options can be found at:

- http://www.wacdpmc.org/images/Fire-Resistant-Plants.pdf[4]
- http://www.firefree.org/wp-content/uploads/2016/02/Fire-Resistant-Plants.pdf [5]

[9] Government of Alberta "FireSmart Guide to Landscaping"
[4] Washington Association of Conservation Districts (WACD) Plant Material Center
[5] A Pacific Northwest Extension Publication: Oregon State University, Washington State University, University of Idaho. August 2006.

- https://www2.gov.bc.ca/gov/content/safety/wildfire-status/prevention/for-your-home-community[6]
- http://articles.extension.org/pages/32729/selecting-firewise-plants[7]

6.2.2 FUEL MANAGEMENT

Vegetation management is the planned manipulation and/or reduction of living and dead forest fuels for land management objectives (*e.g.*, hazard reduction). Fuels can be effectively manipulated to reduce fire hazard by mechanical means, such as tree removal or modification, or abiotic means, such as prescribed fire. The goal of fuel management is to lessen potential fire behaviour proactively, thereby increasing the probability of successful containment and minimizing adverse impacts to values at risk. More specifically, the goal is to decrease the rate of fire spread, and in turn reduce fire size and intensity, as well as crowning and spotting potential (Alexander, 2003).

Recommendation 8: In order to ensure that evacuation routes extend to all homes and structures within neighbourhoods, along designated evacuation routes, remove antelope bush and conifer regeneration along roads which can colonize these edges and form dense hazardous fuel types in the following areas:

-along the upper (eastern end) of Smethurst Rd;
-Along Debeck Rd; and
-In Creek Park and along Naramata and Arawana creek drainages.

In particular, there has been conifer regeneration along the upper (eastern end) of Smethhurst Rd which has grown into dense hazardous fuel types. Fuel treatments should consist of thinning smaller stems (<12.5cm diameter at breast height [DBH]), raising the crown base heights of individual trees by pruning the lower branches up to a height of 2m, and removing needles / surface litter and disposing offsite (no dumping). The hazardous fuels are ingrown Ponderosa pine and Douglas fir on the dry upper slopes of Naramata and Arawana creeks flanking Debeck Rd. The objective of fuel treatment is to reduce crown bulk density and ladder fuels an either side of the road to improve its safety as an evacuation route. A qualified professional (QP) should be hired to develop a fuel management prescription.

Varying ownership of, and responsibility for these areas include Ministry of Transportation and Infrastructure (road right-of-ways), RDOS (parkland associated with Naramata and Arawana Creeks) while the remainder is private. Owners and responsible agencies must be consulted with prior to proposed fuel treatments, and the RDOS should facilitate communication between all parties.

Recommendation 9: Apply to the provincial Community Resilience Investment (CRI) program through the FireSmart Community Funding & Supports program to increase community resiliency by undertaking community-based FireSmart planning and activities that reduce the community's risk from wildfire. For homeowners on private land local rebate programs are available to those who complete eligible FireSmart activities on their own properties.

[6] BC Wildfire Service: Wildfire Prevention for Your Home & Community from Wildfire.
[7] Cooperative extension "Selecting Firewise Plants"

6.3 ACCESS AND EVACUATION

Emergency access and evacuation planning is of particular importance in the event of a wildfire event or other large-scale emergency. Road networks in a community serve several purposes including providing access for emergency vehicles, providing escape/evacuation routes for residents, and creating fuel breaks. Access and evacuation during a wildfire emergency often must happen simultaneously and road networks should have the capacity to handle both. If a wildfire were to impact these roads or any of the major evacuation routes described above, smoke and poor visibility, car accidents, wildlife, and other unforeseen circumstances can further complicate evacuations and hinder safe passage.

The main egress route from the neighbourhoods is North Naramata Rd, with three internal roads (Gammon, Smethhurst and Arawana) serving as feeder routes connecting homes to access/egress locations. Within the neighbourhoods, some of the access points are reached only via narrow roads with switchbacks, which may impede suppression efforts and response times. Furthermore, there is a significant portion of properties which are accessible by private driveways and narrow, local dead-end roads. As such, a review of accessibility issues within the fire protection area is suggested.

Recommendation 10: In consultation with the RDOS and the Naramata Fire Department, identify and map the existing three access points into the community. In addition, identify the main roads which will act as the safe evacuation routes for the majority of residents (main routes are Smethhurst Rd, Arawana Rd, and Gammon Rd). Entry points and access routes should have clearly visible signage so routes can be navigated safely during a wildfire to residents and visitors /tourists who may be unfamiliar with the area. Access points and evacuation routes should be mapped and shared with the NFD, businesses, Emergency Management BC, and residents alike. All designated evacuation routes should be assessed for road side thinning to reduce potential entrapment scenarios.

Recommendation 11: Locate additional access points to the north along N. Naramata Rd. An excellent candidate is the cul-de-sac road terminus adjacent at Upper Debeck Rd (directly across N. Naramata Rd) that could be re-engineered and re-configured to provide an evacuation route for residents in the northern portion of the neighbourhood. This is a critical access point as it is the only route available for property owners along Debeck Rd, Juniper Rd, and Slate Pl who are sandwiched between two creek ravines (Naramata and Arawana) with highly hazardous fuels.

Recommendation 12: in order to test the efficacy and safety of evacuation routes before an actual emergency occurs, conduct mock evacuation exercises in the dark to mimic smokey conditions causing poor visibility and disorientation. These exercises should be organized, coordinated and conducted with the NFD and RDOS.

Recommendation 13: It is typical that during emergency situations the RDOS (and possibly the BCWS) will be involved in coordinating and issuing Evacuation Alerts and Orders. However, Smethurst/Arawana residents can be proactive and develop a notification warning / communication system amongst one another to facilitate efforts to ensure the safety of everyone. This could involve select individuals who

would be responsible and willing to be the key person who mediates between other jurisdictions and distributes information to area residents and businesses.

Recommendation 14: Since the population of Smethurst/Arawana includes many tourists visiting the region during the fire season who are likely unfamiliar with the area and the wildfire hazard, signage of all designated evacuation routes should be installed in recognized places where tourists congregate and travel (wineries, KVR Trail, etc.) and communicated to residents, tourists, agricultural producers and wineries.

Recommendation 15: Because existing evacuation routes all travel downslope to Naramata Rd for egress options north and south along Okanagan Lake and that roads are narrow, and in some locations circuitous and heavily vegetated, the Kettle Valley Rail trail (KVR) should be considered as an alternative evacuation route for the upland (eastern) portion of the neighbourhood. The KVR has obvious advantages of being an accessible, flat, and popular, well-signed trail system that leads south to Penticton and could capture tourists unfamiliar with the area. The challenges of using the KVR as an alternative include the distance to Penticton (~15-20 km), unsuitable for people with mobility issues or who require mobility devices, and the removal of boulders which have been strategically placed to deter motorized (*i.e.* All-Terrain Vehicles [ATVs]) use of the trail. To explore this option discussions should commence with FLNRORD's (Ministry of Forest, Lands and Natural Resources Operations and Rural Development) Recreation Sites and Trails division, who manage the KVR and public consultation process.

Recommendation 16: Determine if there are property owners in either neighbourhood with livestock or horses, in order to pre-plan protocols for the safe transport of animals during an interface fire.

Recommendation 17: Investigate where the Forest Service roads lead to that exit the neighbourhood in from the northeast corner of the neighbourhood boundary as they may provide alternative evacuation routes or could be considered designated safe zones. As these roads travel away from the developed part of the community and into the backcountry, their use must be considered with caution and would furthermore be dependent on the location and intensity of an interface wildfire.

6.4 CRITICAL INFRASTRUCTURE

Smethurst/Arawana has a transmission line running through the eastern end of the AOI and has wooden distribution poles.

6.4.1 POWER SUPPLY AND DELIVERY (BC HYDRO) WATER SUPPLY AND DELIVERY (RDOS SYSTEM)

Water is the single most important suppression resource. Recommendations include: installing reservoir or hydrant systems in areas of poor water availability, identifying and mapping alternative water sources, and ensuring new developments have sufficient hydrant coverage. Improving water availability in identified areas and mapping alternative water sources is ongoing and should continue.

Back-up power sources should be installed for all critical infrastructure, including pump-supplied water systems, to ensure the RDOS can continue to operate at an acceptable level during a wildfire event. It is recommended that the RDOS complete a Fire Flow/ Water Supply Vulnerability Assessment across its water delivery and supply system to identify those areas which may have insufficient/ unreliable water supplies and to provide recommendations to reduce the RDOS's water supply vulnerability.

Recommendation 18: The Naramata Fire Protection Area, including the water system, was last assessed by Fire Underwriters in 2006. Since then, substantial upgrades to the water system have since been completed by RDOS Public Works. Confirm that the water system's current capacity and pressure is adequate for the suppression of multiple house fires during an interface wildfire. RDOS Public Works should document and maintain these records. Investigate the vulnerability of system components to damage from wildfire, such as pump stations and any other above-ground structures; In addition, identify alternative water sources; and work to achieve incremental improvements over the system's life cycle. Build a plan to fund improved supply when capital upgrades are needed.

Recommendation 19: Identify and map in a GIS database (in collaboration with the RDOS) the critical infrastructure the community depends upon in an emergency situation (reservoirs, water and sewer pump stations, communications, BC Hydro transmission and distribution lines, FortisBC alignments, etc).

7.0 ROLES AND RESPONSIBILITIES

There are a range of hierarchies and relationship between all the different players involved in moving the Smethurst/Arawana neighbourhoods to more wildfire resilient communities, and include:

- All neighbourhood residents;
- The FireSmart neighbourhood committee group (Smethurst/Arawana FireSmart Board);
- Communication between individual residents, in particular neighbours that are directly adjacent to one another;
- Collaboration with the RDOS;
- Interaction with emergency responders (RCMP, NFD, Emergency Management BC, BCWS) during emergency response situations;
- The cultivation of FireSmart initiatives with the agricultural and wine producers, and the local business community; and
- Part-time residents and tourists.

Smethurst/Arawana is serviced by the Naramata Volunteer Fire Department [1095 Lower Debeck Rd, Naramata], which provides local fire protection services to specific rural areas within Electoral Area E.

9-1-1 fire calls for the South Okanagan-Similkameen are relayed to a secondary dispatch centre at the Kelowna Fire Hall. At that location, Regional Fire Dispatchers handle a multitude of calls from fire, marine, motor vehicle accidents, and medical first response

- BCWS
- RDOS

- RCMP
- EMBC
- Neighbourhood residents
- Business owners (wine and agriculture producers)

8.0 NEXT STEPS

This Community Assessment Report contains the necessary information and forms the basis from which a FireSmart Community Plan can be developed. The recommendations contained within this report should be implemented in a collaborative manner amongst residents, the RDOS, and outside agencies as necessary, and should be updated and modified as needed over time. A multiplicity of groups and agencies with varied jurisdictions over land use in the Regional District of Okanagan Similkameen (RDOS) including municipal, regional and provincial authorities, First Nations, utility providers, agricultural producers and businesses will be important partners throughout the implementation of this report and the development of an actionable FireSmart Community Plan. Ultimately, this FireSmart initiative, and subsequent wildfire mitigation actions have been and will be created by the community of Smethurst/Arawana, for the community of Smethurst/Arawana.

After reviewing the content of this assessment and its recommendations, the Smethurst/Arawana FireSmart Board will be created, and in consultation with its advisors will determine whether or not it wishes to pursue seeking FireSmart Community recognition status.

If the report and recommendations are accepted and recognition sought, the Smethurst/Arawana FireSmart Board will create agree-upon, area-specific solutions to the FireSmart Community Assessment Report recommendation and prepare a FireSmart Community Plan in cooperation with their LFR, the RDOS and Naramata Fire Department personnel who may be acting as advisors.

Assuming Smethurst/Arawana seeks to achieve national recognition as a FireSmart Community, it will integrate the following standards into its FireSmart Community Plan:

- Sponsor a local FireSmart Board that maintains the FireSmart Community program and recognition status;
- Continue to work with the LFR or enlist the assistance of a WUI specialist to complete a FireSmart Community Plan which identifies agreed-upon, achievable local solutions;
- Invest a minimum of $2.00 annually per capita in its local FireSmart events and activities (work done by volunteers, as can provincial grants dedicated for that purpose);
- Hold a FireSmart event (*e.g.* FireSmart Day, community chipping and disposal day) each year that is dedicated to a local FireSmart project; and
- Submit an application form with supporting information to FireSmart Canada. This application process documents continuing participation in the FireSmart Communities Program with respect to the above criteria.

9.0 REFERENCES

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10.0 SIGNATURE OF LOCAL FIRESMART REPRESENTATIVE

Project Forester

Judith Cowan PN-7314 A
B.A. Blackwell & Associates Ltd

November 15, 2019

Reviewing Professional

Bruce Blackwell, MSc, RPF, RPBio
B.A. Blackwell & Associates Ltd

November 15, 2019

11.0 APPENDIX 1

FCCRP COMMUNITY WILDFIRE HAZARD ASSESSMENT FORM

This Community Wildfire Hazard Assessment form provides a written evaluation of the overall community wildfire hazard – the prevailing condition of structures, adjacent vegetation and other factors affecting the FireSmart status of a small community or neighbourhood. This hazardis based on the **hazard factors** and **FireSmart recommended guidelines** found in **FireSmart: Protecting Your Community from Wildfire** (Partners in Protection, 2003) and will assist the Local FireSmart Representative in preparing the FireSmart Community Assessment Report. NOTE: Mitigation comments refer to the degree to which the overall community complies or fails to comply with FireSmart recommended guidelines with respect to each hazard factor

Community Name: Naramata		**Date: (mm/dd/yyyy)** OCTOBER 31, 2019
Assessor Name: BRUCE BLACKWELL / JUDITH COWAN		**Accompanying Community Member(s):** NA
Hazard Factor	**Ref**	**Mitigation Comments**
1. Roof Assemblies		
a. Type of roofs ULC rated (metal, tile, asphalt, rated wood shakes) unrated (unrated wood shakes)	2-5 3-21	There is a mix of roofing materials - mainly asphalt composition shingles. A few homes have cedar shake or metal roofing.
b. Roof cleanliness and condition * *Debris accumulation on roofs/in gutters; curled damaged or missing roofing material; or any gaps that will allow ember entry or fire impingement beneath the roof covering*	2-6	The accumulation of Ponderosa pine needles on roofs and in gutters was common for those homes which have mature trees close to the home.
2. Building Exteriors		
2.1 Materials		
a. Siding, deck and eaves	2-7 2-8 2-9	Broad range of siding materials - primarily stucco and Hardie-board (cement composite) with minor components of houses with wood cladding, and a few log homes
b. Window and door glazings (single pane, sealed double pane)	2-10	It can be assumed that all newer homes built after 1970 have double-paned windows, older homes may have single-paned glazing
c. Ember Accumulator Features (scarce to abundant) * *Structural features such as open eaves, gutters, unscreened soffits and vents, roof valleys and unsheathed crawlspaces and under-deck areas*		Moderate to abundant. Decks, roof valleys, overhanging projections (second storey balconies or stairs), and open gutters were most frequently observed. Open eaves and soffits are uncommon.
d. Nearby Combustibles – firewood, fences, outbuildings	2-11	Sporadic occurrences of stacked firewood in carports and against the home. Some outbuildings had non-rated roofing and wood siding. Most fences were built of wood.

FCCRP COMMUNITY WILDFIRE HAZARD ASSESSMENT FORM

Hazard Factor	Ref	Mitigation Comments
3. Vegetation		
3.1 **PZ-1:** Vegetation - 0 - 10m from structure **Page Reference 3-5**		
a. Overstory forest vegetation (treated vs. untreated)	2-14	Consists primarily of Ponderosa pine and Douglas fir adjacent to homes to creek ravines (Naramata and Arawana), or, as small clusters or individual specimens on private lots. Ornamental conifer trees on lots in PZ-1 are common
b. Ladder fuels (treated vs untreated)	2-17	Many lots had tall cedar hedging planted to form dense, linear privacy screens. They are surface, ladder and canopy fuels combined into a single plant and highly capable of spreading fire and igniting structures.
c. Surface fuels - includes landscaping mulches and flammable plants (treated vs untreated)	2-16	The most hazardous surface fuel were large expanses of ornamental juniper ground cover that grows horizontally and has a low height profile. It is very flammable and capable of spreading high-intensity surface fire.
3.2 **PZ-2:** Vegetation - 10 - 30m from structures **Page Reference 3-9**		
a. Forest vegetation (overstory) treated vs untreated	2-14	Consists primarily of Ponderosa pine and Douglas fir adjacent to homes at the furthest extent of the WUI (Arawana Rd).
b. Ladder fuels treated vs untreated	2-17	Most ladder fuels are young to mature Ponderosa pine and Douglas fire, as well as some ornamental conifers
c. Surface fuels treated vs untreated	2-16	Beyond 30m is where ornamental landscaping transitions to native vegetation composed of Ponderosa pine, Douglas fir, bluebunch wheatgrass, antelope brush. Surface layer of pine needles or cured grasses often present
3.3 **PZ-3:** Vegetation - 30 - 100m from structures **Page Reference 3-13** Provide mitigation comments on the prevailing PZ3 fuel type		
a. Light fuel - deciduous – grass, shrubs	2-16	Expanses of cured grasses which over easily ignitable fuel

FCCRP COMMUNITY WILDFIRE HAZARD ASSESSMENT FORM

Hazard Factor	Ref	Mitigation Comments
b. Moderate fuel - mixed wood – light to moderate surface and ladder fuels, shrubs	2-17	antelope brush and big sagebrush
c. Heavy fuel - coniferous - moderate to heavy surface and ladder fuels, shrubs	2-14	Dense C-3 stands of young Ponderosa pine are encroaching into the WUI in areas formerly occupied by grasslands, and is a result of active fire suppression over the last century
d. Logging slash, dead/down fuel accumulations	2-16	No slash or dead/down fuel accumulations
e. Diseased forest – without foliage vs with foliage		No significant forest health factors observed
f. Fuel islands within community - treated vs untreated		the Arawana creek and Naramata creek drainages extend across the neighbourhood and are capable of acting like wicks for fire spread
4. Topography		
4.1 Slope (within 100m of structures)		
a. Slope - Flat or < 10 %, 10 – 30% or >30%	2-19	The Naramata neighbourhood is composed of a series of benchlands between 10-30% slope. However the creek ravines have steeper slopes in some sections exceeding 40%
4.2 Buildings setback on slopes >30 %, position on slope Provide mitigation comments on items a – c as applicable		
a. Setback from top of slope > 10m, or bottom of slope – valley bottom. b. Buildings located mid-slope c. Setback from top of slope <10m, or upper slope	2-12	Homes are evenly distributed over the landscape, meaning some slopes are at the bottom, some mid-slope, and others at the top. New development sits at the top of the slope (Arawana Rd). Many homes are positioned at the top of slope along the creek drainages

FCCRP COMMUNITY WILDFIRE HAZARD ASSESSMENT FORM

Hazard Factor	Ref	Mitigation Comments
5. Infrastructure – Access / Egress, Roads, Driveways and Signage		
5.1 Access Routes – Road Layout To FireSmart Recommended Guideline?		
a. Single Road or Looped Road	3-28	Single road access only. There are no looped roads or secondary access points and three entry points into the neighbourhood along North Naramata Rd.
5.2 Roads- width, grade, curves, bridges and turnarounds		
a. To FireSmart Recommended Guideline?	3-30	Primarily paved, but are circuitous and narrow in some sections in order to negotiate grade changes. Many roads end in dead-end cul-de-sacs
5.4 Fire Service Access / Driveways - Grade, Width/Length, Turnarounds		
a. To FireSmart Recommended Guideline?	3-30	Highly variable. Newer developments have ample turn-around space in cul-de-sacs, older neighbourhoods have roads leading into a single lane driveway with no turn-around
5.5 Street Signs / House Numbers		
a. To FireSmart Recommended Guideline?	3-30	Yes
6. Fire Suppression - Water Supply, Fire Service, Homeowner Capability		
6.1 Water Supply		
a. Fire Service water supply – hydrants, static source, tender or no water supply	3-32	Naramata has an even distribution of hydrant placement. A review by the Naramata Fire Department should be conducted to verify if distances betweeen hydrants is adequate.
6.2 Fire Service		
a. Fire Service < 10 minutes or > 10 minutes, no fire service	2-25	Naramata Fire Department drive time is <10 min (does not include muster time), although windy and circuitous sections may increase travel time.
6.3 Homeowners Suppression Equipment		
a. Shovel, grubbing tool, water supply, sprinklers, roof-top access ladder	3-28	Assessment did not go to this detail

FCCRP COMMUNITY WILDFIRE HAZARD ASSESSMENT FORM

Hazard Factor	Ref	Mitigation Comments
7. Fire Ignition and Prevention – Utilities, Chimneys, Burn Barrel / Fire Pit, Ignition Potential		
7.1 Utilities		
a. To FireSmart Recommended Guideline?	2-24	Yes. Naramata has BC Hydro transmission and distribution lines.
7.2 Chimneys, Burn Barrel / Fire Pit		
a. To FireSmart Recommended Guideline?	2-22	Not assessed
7.3 Ignition Potential Provide mitigation comments on items a – d as applicable		
a. Topographic features adversely affect fire behaviour b. Elevated probability of human or natural ignitions c. Periodic exposure to extreme fire weather or winds d. Other	2-21	a. Because the lower benchlands are at risk of fire starts from embers, homes at the top of slope should remove all flammable coniferous foliage to create defensible space. b. Continued development into the WUI and high public use of the KVR trail increase incidence of human-caused ignitions. Increase education and signage along KVR trail. c. The Okanagan valley experiences elevated fire weather conditions during the summer and increased wildfire risk. Beyond individual homeowners FireSmarting their property, evacuation planning and training exercises should occur.

General Comments

- Evacuation is the primary wildfire risk the RDOS, businesses and residents should address, as entrapment would likely occur during a wildfire event. Advance planning with first responders and coordination of mock evacuation exercises should occur

- Evacuation routes should be formalized and mapped. Adequate signage along the routes should be installed taking into consideration poor visibility from smoky conditions. Evacuation signage should be installed along the KVR trail to inform non-residents

- conduct fuel treatments along sections of evacuation routes where dense and hazardous flammable vegetation grows (Smethhurst Rd)

- Homes at the top of slopes, creek ravines, or adjacent to intact forest land should remove all the flammable, hazardous, juniper shrubs and cedar hedging in Priority Zone 1 (10m), as well as remove all bark mulch and combustibles within a 2m zone around the footprint of the home (the footprint also includes exterior decks and stairs, or attached structures such as wood retaining walls). This will create defensible space reduce the ignition potential of structures.