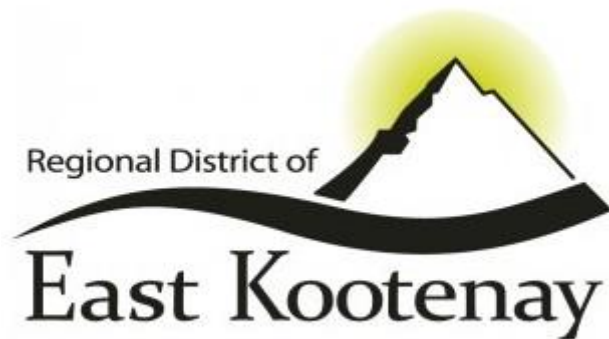




Regional District of East Kootenay

FIRE STATION SITING ANALYSIS

Prepared by Ernie Polsom



FireWise
CONSULTING
LEARNING ACADEMY

Ph: (877) 322-7911

ernie@firewiseconsulting.com

www.FireWiseConsulting.com



1.0 Disclaimer

FireWise Consulting is proud to submit this report for your review and consideration. FireWise Consulting (FWC) makes no representation or warranty to the recipient or readers and shall not be liable for any errors or omissions in the information or the use thereof. The report does not address areas of engineering, architectural design or environmental assessment.

We have relied on the information from the Regional District of East Kootenay (RDEK) Fire Rescue Department to prepare this report. FWC obtained additional information through research, previous project site visits, and data submissions made by the customer. The report combines these information resources to provide the RDEK with a fire station siting assessment to inform the District of replacing the existing Hosmer fire station.

FireWise recognizes and respects the contributions of the Paid-on-Call firefighting personnel who make themselves available to fight fires, train and make their community safer.

FireWise's use of language and names follows standard use and definitions. In order of precedence, definitions follow the legislation of the jurisdiction, referenced standards or accepted Canadian definitions.

FWC has made every effort to ensure that this report reflects gender neutrality.

2.0 Acknowledgement

FireWise would like to thank the RDEK Fire and Rescue Department for their support and cooperation throughout this project. RDEK personnel responded to our requests for access to data with enthusiasm and transparency.

3.0 Use of Standards

The National Fire Protection Association (NFPA) publishes a broad range of standards to define minimum performance objectives for fire protection systems, including fire station siting and design. These standards are accepted industry best practices for most fire protection systems. Sometimes, legislation adopts specific standards or portions thereof as a requirement. FireWise will use these standards and others to anchor our recommendations to facts and accepted industry practice and science.

The reference to any standard illustrates the industry's best practices. Unless expressly indicated otherwise, it should not be considered a recommendation to adopt the referenced standard in whole or part.



Figure 1: Standards form part of the knowledge framework supporting safe and effective services. They reflect industry learnings and best practices.

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4.0 Executive Summary

The selection of an appropriate site for a fire station is the first and most important decision when considering a new one for the Hosmer Fire District and has broad implications for the future. Overall system performance is one of the critical factors in selecting a fire station site. Fire response services must achieve a balance of efficiency, effectiveness and sustainability to meet the fire protection needs of the community.

Building codes and insurance assessments use fire department response time and distance as critical factors in determining the types of construction permitted and insurance costs to protect community risks in the future. Drive time analysis for the existing station area is essential, but so is consideration of the community's future development trends and aspirations. This report focuses on an analysis of various sites identified by the client.

Optimal siting decisions for a new fire station must reflect community risk profiles and the fire department's capacity. For example, the Hosmer fire district is a mix of low-density residential and agricultural occupancies with a major highway and railway bisecting it. The Elk River also runs along the valley, adding to the unique risk profile of the area. The Hosmer Fire Station staff depends on Paid-on-Call firefighters who live and work throughout the District. These unique risks suggest effective risk management strategies should include positioning fire response services close to them, allowing early and rapid intervention on fire-related threats. The report explores these and other considerations that should influence decision-makers as they evaluate potential locations for a new fire station.



Figure 2: The current Hosmer Fire Station has a busy rail line along the rear property line and abuts known high-risk flood and inundation zones.

Finally, many communities are using the construction of a new fire station to leverage opportunities to address other community priorities. Siting decisions will play a significant role in exploring these opportunities. Some have created community spaces within the fire station design, creating meetings, arts, and other areas otherwise unavailable to the community. While the fire department needs to remain the central focus of the fire station elements, including these alternative partnerships can create powerful community impacts. Victoria's new headquarters facility is home to the fire department, British Columbia Ambulance, a dentistry college, and several residential units on several floors. This report focuses on the optimal location of a fire station, exploring these other options outside of FireWise's project scope.

Analysis of the three sites reveals that only one, at the corner of Dicken and Kmiecik Roads, is suitable for a new fire station. It is the only site outside known flood and inundation areas, offers acceptable access for ingress and egress, and is separated from busy transportation corridors. The existing fire station site is unsuitable for several reasons, including proximity to the rail line, limited site space, and the need for alternate facilities during construction. Each analysis includes Pros and Cons for the sites, reflecting a review of GIS mapping, Google Earth and findings from FireWise's 2021 Fire Service Review, which had risk profiles for the area. Over 90% of all residential buildings in the Hosmer response area will be within a 6-minute drive from the fire station, no matter which site is selected.

The RDEK has received excellent value for its Hosmer fire station investments. Careful consideration of the next Hosmer site today will ensure that residents continue to receive similar value in a facility that reflects the department and community's needs for fire protection services.

5.0 Site Selection Considerations

5.1 Site Selection History

Hosmer is a primarily rural area with low population densities, no central residential development and a range of human-caused and natural hazards. The lack of a centralized population centre means Paid-on-Call firefighters serving out of the Hosmer fire station live and work across the service area. The overlay of natural and human-caused hazards like flood plains, rail lines, highways and forest interface zones limits appropriate sites.

5.2 Site Suitability Factors

After the need for a new fire station and functional spaces for a new fire station are established, the facility development process should start with evaluating potential sites. A fire station, particularly in a single-station environment, requires careful consideration and must reflect several important design and performance expectations. A fire station that must provide services through a Paid-on-Call staffing model must be readily accessible and relatively near where the auxiliary and off-shift personnel reside or work. It also must be positioned to support the safe and efficient movement of large fire department vehicles into neighbourhoods and developments when required. Parking for emergency responders becomes a critical element of site design. Wildland and interface fire responses also need suitable staging and support areas close to the fire station to support external responding resources, with space being the most critical factor.

Emergency service buildings and fire station site considerations include:

- The site has to be accessible for Paid-on-Call firefighters to expedite staffing and deployment of fire apparatus
- Located close to major roadways to facilitate response
- Sufficient area to support adequate parking, movement of large vehicles, training, service checks and other departmental functions
- Geotechnically sound
- Away from known community risks like industry, unstable ground and high-hazard industrial occupancies
- The fire station requires water and sewer services, which can be provided through piped systems or using wells, cisterns, and septic fields, adding to the need for an adequate site area.
- Positioned to optimize response range and times
- Consideration of school and park areas on routes to and from the fire station (school zones slow access to the station by off-shift personnel and deployment of emergency vehicles)

Hosmer has its unique challenges. The fire district is located along the Elk River, bisected by Highway 3 and the Canadian Pacific Railway. The railway is a busy freight-only rail line carrying a wide range of products, including ammonia, sulfuric acid, petroleum, and other hazardous materials, through the District. The terrain is mixed, with steep grades along the valley walls. The lack of a central residential area contributes to constraints when selecting a suitable fire station site.

5.3 Fire Department Response Time Influence on Siting Decisions

Fire department response time calculations follow generally accepted methodologies captured in various industry standards. The British Columbia Building Code identifies the fire department response time from receipt of the call to the arrival of the first vehicle on the scene. It requires residential buildings outside of a fire department response time of 10 minutes to be built to higher standards and may need residential sprinkler systems to offset the slower response.

Fire Underwriters Survey uses eight kilometres by road as the maximum distance for coverage for personal lines insured properties. Some insurers specializing in rural risks may extend credit for fire stations with recognized fire insurance grades to distances beyond the recommended maximum.

When evaluating the appropriate siting of the fire station, the following intervals must be considered:

- **Paid-on-Call firefighters response time from home or work location:** Hosmer firefighters must respond from home or work to the fire station to staff the engine.
- **First engine response from the fire station to the incident scene:** Once staffed, the engine responds to the emergency's location.
- **Drive time for additional apparatus from the fire station to the emergency event:** Each additional unit will respond as personnel are available to staff it or mutual aid agencies deploy from their locations.

These times are frequently tracked as benchmarks to support system performance reporting and to inform future improvements, particularly related to the fire station siting and design.

Fire department response times are critical to positive suppression and rescue outcomes. Modern fire behaviour is less driven by building construction than by the things we put in them. Studies by internationally recognized research agencies like Underwriters Laboratories and the National Institute of Science and Technology have revealed that the pace of fire spread and the intensity of the heat these fires develop have changed.¹ Legacy buildings, reflecting interior fuel loads of 30 years

¹ [Impact of Ventilation on Fire Behavior in Legacy and Contemporary Residential Construction | UL Research Institutes](#)

ago, could be expected to achieve flashover temperatures in 25-30 minutes. Modern furnishings have shortened the time from ignition to flashover to less than 5 minutes.

Modern residential fire growth is not related to building construction materials but to the types and amount of furnishings placed in the home. The reports show the importance of a comprehensive fire protection system that combines early notification of residents to self-evacuate and an effective and timely response to contain the fire to the building of origin.

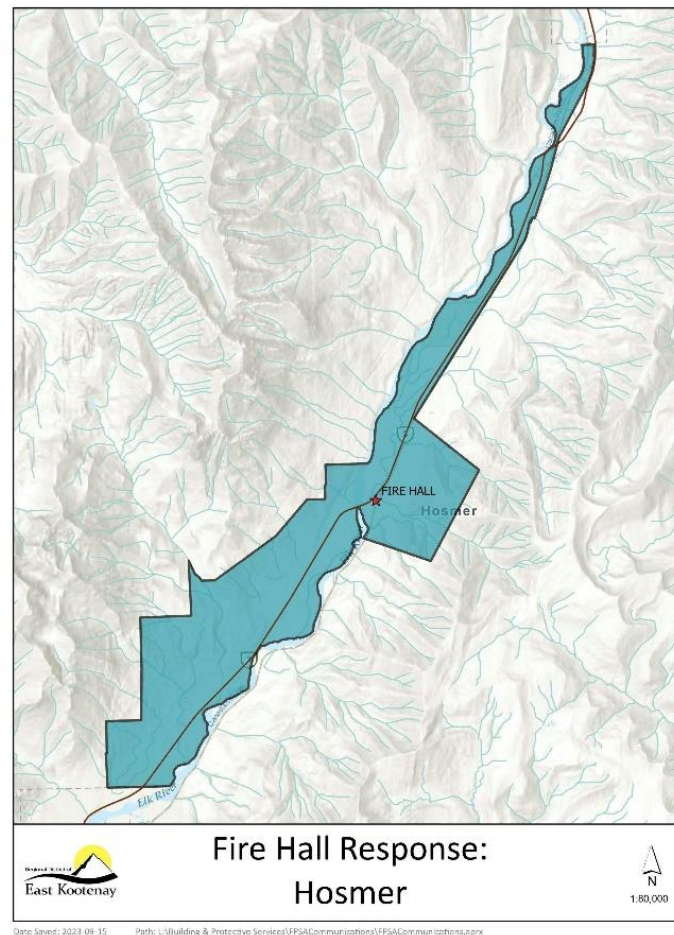


Figure 3: Hosmer reflects a primarily rural response area with low-density residential developments and two high-traffic transportation corridors bisecting it.

5.4 Community Hazard, Risk and Vulnerability Assessment

A 2020 Fire Service Review identified the critical risks for the RDEK relevant to fire station siting decisions, including the Elk Valley and Hosmer Fire Response District. Risks included:

- Climate Change- severe weather, weather extremes including recurring drought cycles, and flooding
- Transportation emergencies- highway
- Transportation emergencies- rail
- Flooding- Elk River, tributaries, and freshet channels

5.5 Community

Most areas along the Elk Valley² are susceptible to flooding events, either from the Elk River or the many tributaries and drainage channels flowing into the river from the surrounding mountains. The narrow valley means that most developable areas have some exposure to flooding, affecting the availability of suitable locations for a fire station and the requirements to build to post-disaster design standards.

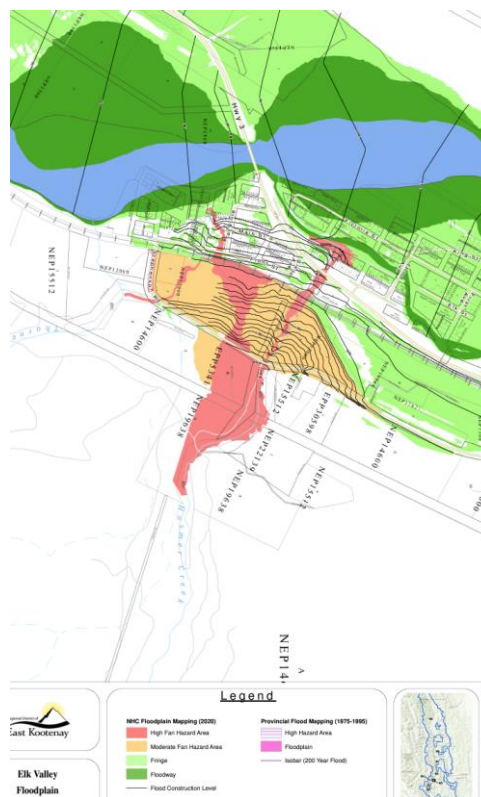


Figure 4: Hosmer flood map showing floodway, high-hazard areas, and inundation zones. Most of the community is at risk of some level of flooding. High-hazard flood areas surround the existing fire station site within the inundation zones identified in the 2021 RDEK Flood Mapping.

² [Elk Valley Floodplain Management Bylaw](#) | [Engage East Kootenay \(rdek.bc.ca\)](#)

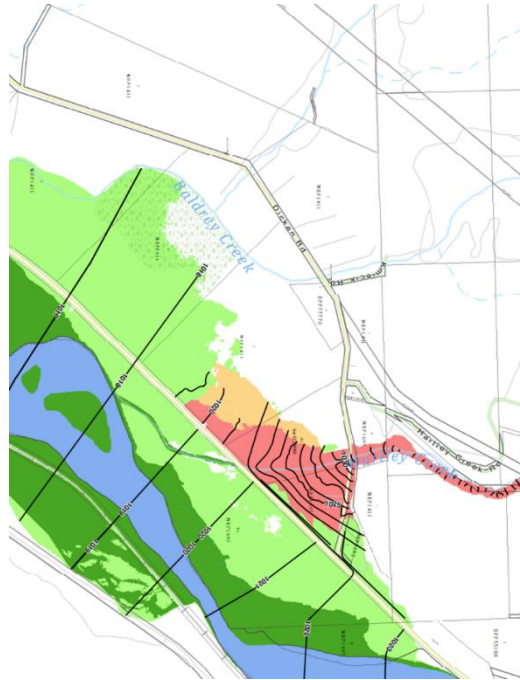


Figure 5: Map shows the two Dicken Road sites. Site 1 along Highway 3 is under a high-hazard flood impact area and is unsuitable for development.

The rain events that affected the Fraser Valley and Coquihalla regions of British Columbia in November 2021 demonstrate the increasing volatility of potential flooding events. Climate change risk assessments conducted by the British Columbia³ and Canadian governments indicate that weather events related to climate change are at the forefront of threats to BC residents and communities. Flood mapping and other traditional analyses of the impacts of flooding and other weather-related events are unlikely to accurately measure ongoing risks, meaning that critical infrastructure like fire stations will need advanced design and placement in areas of the RDEK unlikely to be cut off or directly involved in the emergency event.

Other flood-prone areas are along the creeks that run through the Elk Valley, including alluvial fans of debris at their bases.

Observations:

- Flooding directly or indirectly affects all three proposed fire station locations.
 - The existing Hosmer site backs onto a high-risk flood zone,
 - The proposed site at the corner of Dicken Road and Highway 3 is prone to regular flooding in an area identified as a high-risk flood risk with frequent flooding episodes recorded and
 - The proposed site on the corner of Dicken and Kmiecik Roads is outside the flood and inundation areas. Still, it is at considerable risk of being cut off from the eastern portions of the response area due to

³ <https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/risk-assessment>

road loss at the corner of Dicken and Highway 3. A secondary route exists to the south of this site, which, while not ideal, offers a secondary egress through Cunliffe Road.

5.6 Wildfire and Interface Risks

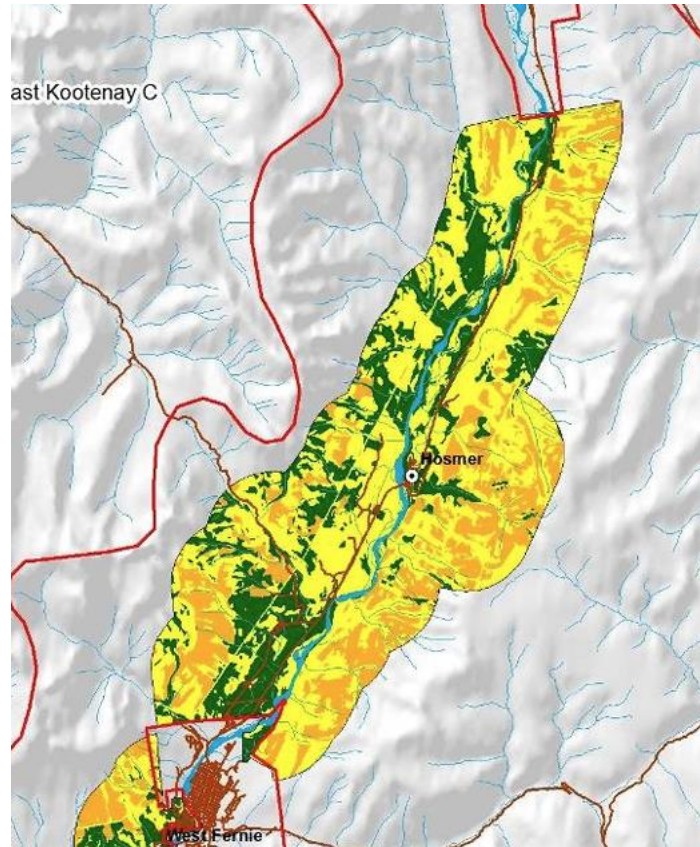


Figure 6: Fire risk map showing varying fire risk levels in the Hosmer response area showing a mix of low to moderate interface threats, increasing on both sides of the river closer to the steeper slopes. RDEK developed the map in 2011, providing a historical perspective that may not reflect current understandings of fire behaviour.

A lack of current information constrains analysis of the wildfire and interface risks of the Hosmer response. The Community Wildfire Protection Plans were completed in 2011 and do not reflect recent experiences across southern BC, particularly fire behaviour and threats in recent fires in and around the RDEK. As part of the design criteria, any fire station must be built with wildfire resilience. An example of the changing nature of wildfire risk is the 2023 McDougall Creek Fire in West Kelowna. The fire jumped Okanagan Lake from west to east, a distance of over 3 kilometres and started fires on the Kelowna side of the lake. Flying brands and the intensity of modern wildfires have increased community and facility vulnerabilities over historical assumptions.

Observations:

- Any new or upgraded fire station in the Elk Valley must be built to fire-resistive standards sufficient to protect it from wildfires, including from flying brands.

- All three sites are remote from coniferous forests and steep slopes, accommodating construction and site design compliance with FireSmart standards.

5.7 Transportation Corridors

Highway 3 and the CP Rail line bisect Hosmer's fire response area. Due to the narrow valley, these corridors are close to the existing fire station and the other built areas throughout the fire district. A wide range of hazardous materials, including ammonia, liquified petroleum gases and sulfuric acid, as known commodities passing through the RDEK along a busy two-lane highway with an extensive history of major vehicular incidents, makes the likelihood of a significant spill a low frequency but high consequence risk are factors influencing siting decisions. In the event of a spill, each product has specific exclusion zones, requiring evacuation of all persons to ensure their safety. Fire stations and other critical infrastructure should be outside potential exclusion zones, where practical and possible. For example, the initial exclusion zone for a sulfuric acid spill with fire is 800 metres (1/2 mile). The footprint of a spill or derailment can be substantial. While these events infrequently occur, switch yards and level crossings increase the risk of incidents and should be included in fire station siting decisions.

Observations:

- Due to the narrowness of the Elk Valley in the Hosmer area, it is impossible to build a fire station remote from all hazards reflected by the two transportation modes.
- The Dicken and Kmiecik site offers a reasonable separation from the highway and rail line.

6.0 Potential Fire Station Sites

The RDEK has limited site choices relating to replacing the Hosmer Fire Station. FireWise assessed three sites: the existing site and two locations on Dicken Road. None of these sites are perfect. However, analyzing available properties, assessing community risks, and carefully balancing operational and community needs have identified the Dicken and Kmiecik roads site as the optimal location for a new fire station. The following assessments take a high-level evaluation of the sites concerning natural and human-induced hazards and overall site size to accommodate vehicular and other fire department operations.

Staffing the first-out fire truck is a critical concern for Paid-on-Call fire departments. Discussions with the RDEK Fire Services indicate a relatively even distribution of firefighters between the Hosmer Fire Station and the proposed Dicken Road locations. Drive time analysis suggests that approximately 90% of residential properties (estimated) will lie within a six (6) minute's drive time of the fire station, whether in the current site or the Dicken and Kmiecik Road site.

6.1 Existing Hosmer Fire Station Site



Observations:

The current fire station site is located in the Hosmer townsite just off the highway and adjacent to the rail line right of way. The building is too small to accommodate new fire apparatus, and the site is too small for all required fire station activities.

Pros:

- It is easily accessible to Paid-on-Call firefighters from wherever they live in the area.
- The site is within 8 kilometres of most residences in the Hosmer fire protection area.
- It is located just off the highway, allowing clear site lines to gain access to the roadway, even in high-traffic periods.
- Existing zoning permits the construction of a new fire station.

Cons:

- Ownership rights of the building are unclear.
- The building layout and design are wholly unsuitable to sustain an effective fire department.
- The fire station backs directly onto a high-risk flood impact area identified in RDEK's 2023 flood planning. The fire station sits in a moderate flood fan area as well. It is unlikely that a building could comply with BC Building Code requirements for post-disaster design on this site.
- The fire station backs onto a busy rail line, a high-priority risk for the RDEK.
- Site space does not accommodate all of the requirements of a modern rural fire station. There is limited space to accommodate training and other department functions, including adding new apparatus.
- Replacing the existing fire station on this site would require temporary facilities for the Hosmer Fire Department, impacting budgets.

6.2 Corner of Highway 3 and Dicken Road



This site along Highway 3 is a large triangular plot of undevelopable land due to the high flood threat assessment completed in the RDEK 2023 flood mapping study and observed flooding events.

Pros:

- The site is centrally located in the inhabited portion of the fire protection area. It is within eight kilometres of the mobile home park on Stephenson Road (NW of the current fire station).
- There is good access for firefighters from Highway 3 and Dickens Road.

Cons:

- The Dickens Road – Highway 3 corner is a minimal-sized site when the triangular shape of the site and required setbacks between any new building and the neighbouring property, Dicken Road and Highway 3, are considered.
- The site assessment and history as a high-hazard flood risk area makes it entirely unsuitable for consideration for any development, particularly for a building required to be built according to BC Building Code post-disaster standards. A secondary route exists to the south of this site, which, while not ideal, offers a secondary egress through Cunliffe Road.
- This lot is a protected Agricultural Land Reserve.

6.3 Corner of Dicken and Kmiecik Roads



Pros:

- The site sits above flood and inundation areas as mapped by the RDEK in 2023.
- Firefighters have suitable access and egress using Dickens Road and Highway 3.
- The site is closer to the areas in the Fire Protection Area that are more likely to see development growth in the future.
- Several Hosmer firefighters reside in the Dickens Road – Fernie area.
- The property is located outside of the Agricultural Land Reserve⁴.
- Adequate size for a fire station and other functions as may be required.
- Could accommodate additional services (provincial, etc)
- The site is located close to any future community growth.

Cons:

- The location is just over 8 kilometres from the mobile home park on Stephenson Road.
- The site is at risk of being cut off from the east end of the Elk Valley due to flooding at the junction of Dicken Road and Highway 3. Special deployment plans would be required to ensure personnel and apparatus are available through floods, including acute flash flooding events and spring freshet. A secondary route exists to the south of this site, which, while not ideal, offers a secondary egress through Cunliffe Road.

⁴ [bl2532_elk_valley_ocp_alr_c.mxd \(rdek.bc.ca\)](#)

7.0 Deployment Analysis

The Hosmer Fire Station is Paid-on-Call-staffed. This staffing model means fire department deployment times must include the drive time for all responding firefighters from their homes or places of work to the fire station. The variability of Paid-on-Call staffing models makes it difficult to position a fire station with a 50-year lifespan close to where firefighters may live with any degree of accuracy. Ideally, careful assessments of long-term development plans for the jurisdiction can help identify where people will live, particularly the demographic that may consider Paid-on-Calling for the fire department.

While every second counts from a life safety perspective, other response time considerations or standards must be considered. For example, the BC Building Code permits relaxed regulations on limiting distances between buildings and permits openings like windows for residential construction if a fire truck can respond to that location within 10 minutes, 90% of the time. Where the fire department cannot meet these requirements, the spatial separation between buildings must be increased, and unprotected openings must be restricted. Increasing limiting distances impacts how close homes may be built together and could increase homeowners' development costs. There are no medium to high-density developments in the Hosmer response area that this requirement would impact.

The Fire Underwriters Survey policy that bases insurance premiums on a residence within 8 kilometres of the fire station is an essential rule for rural residents. While not a legislated standard, residences more than 8 kilometres from the fire station can be assessed as "unprotected" and see significant increases in fire insurance coverage. The Hosmer fire protection area extends to 13 kilometres from the fire station. When evaluating recent fire losses in various areas of fire-prone jurisdictions at risk from wildland and interface fires, some residents may find it challenging to find affordable insurance without a compliant fire station.

Most buildings within the 8-kilometre range from the current Hosmer fire station will remain regardless of the selected site. Much of the east end of the Hosmer fire protection area is unoccupied or in a provincial park, and it will be unaffected by moving the fire station further west. There will be incremental differences in response times, but most residential fire responses will not exceed a six-minute drive time. Most residential properties will see no change or a slight improvement in fire department response times.

The map on the following page provides a basic assessment of the 8-kilometre FUS range from the three assessed sites. While travel times to the east are most affected by the Dicken Road sites, most residential properties will not be affected by the move. Properties on the north side of the river behind the Elk Valley Provincial Park appear outside of the 8-kilometre range due to the location of bridges west of Hosmer.

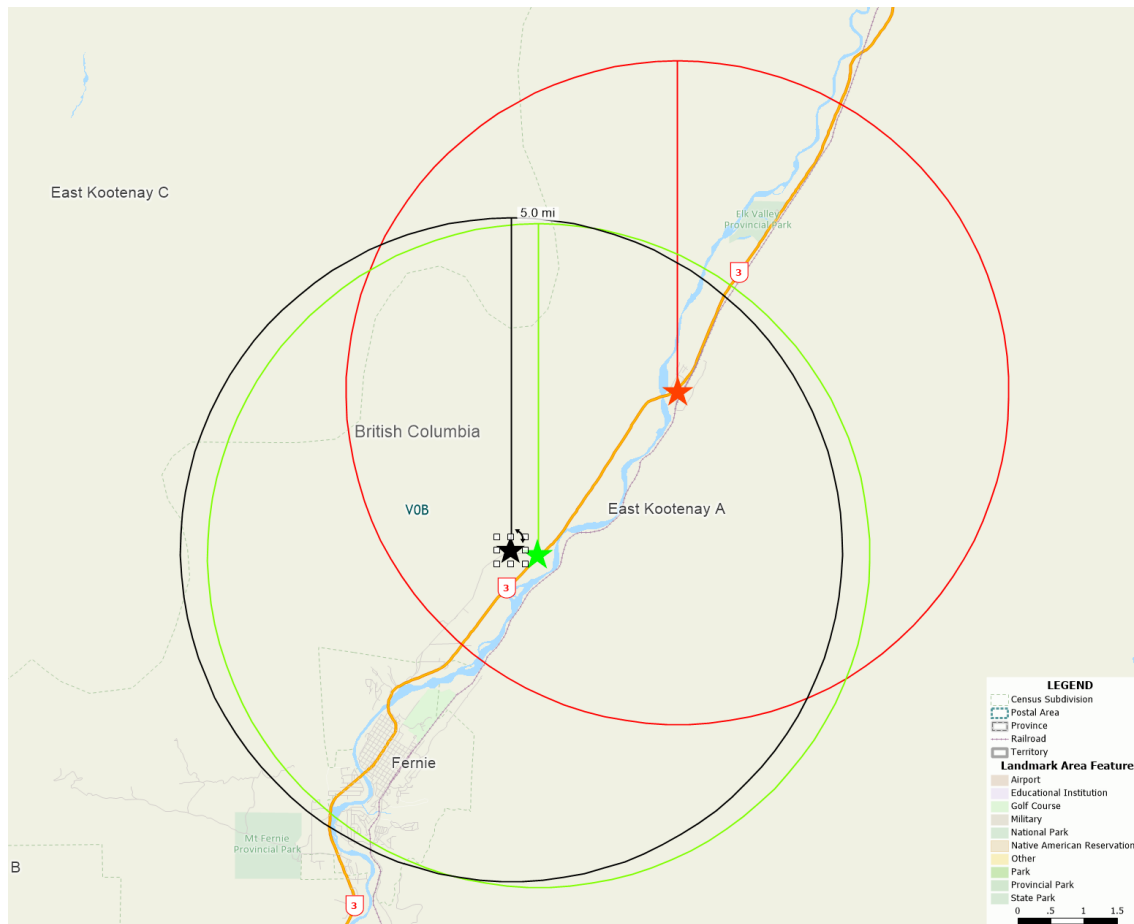


Figure 7: Each circle represents an 8-kilometre radius from each assessed site. The current Hosmer Station is Red, and the Black and Green sites are on Dicken Road. Most residential properties are along Highway 3, making this model relevant to the decision-making process.

8.0 References:

- Whole Building Design Guide: <http://www.wbdg.org/building-types/community-services/firestation> explains some high-level considerations in the design of fire stations and other facilities.
- National Fire Protection Association (NFPA) Standards (various): <https://www.nfpa.org/Codes-and-Standards>
- British Columbia Building Code 2018
- British Columbia Fire Code 2018
- WorkSafeBC Regulations: <https://www.worksafebc.com/en> This site provides comprehensive regulatory and explanatory materials related to safe and healthy workplaces
- The BC Fire Commissioner's Office 2021 fire loss reports: https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/fire-safety/fire-reporting/office_of_the_fire_commissioner_2021_annual_report.pdf
- Regional District of East Kootenay Elk Valley Floodplain Management Bylaw <https://engage.rdek.bc.ca/evfloodplain>
- Ek Valley OCP-ALR: [bl2532 elk_valley_ocp_alr_c.mxd](bl2532_elk_valley_ocp_alr_c.mxd) (rdek.bc.ca)
- 2020 Emergency Response Guidebook <https://tc.canada.ca/en/dangerous-goods/canutec/2020-emergency-response-guidebook>