Mt Iron Junction Development, Wanaka

WILDFIRE THREAT ASSESSMENT

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Mt Iron Junction, Wanaka - Wildfire Threat Assessment and Mitigation.

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Scope

1. The purpose of this report is to identify wildfire risk and mitigation factors for the proposed Mt Iron Junction residential development below and to the southeast of Mount Iron. The assessment and mitigation factors include:

    1.1. Wildfire Threat Assessment (WTA) to determine the overarching risk of wildfires for this site. Including:

        1.1.1. Identification of potential ignition sources

        1.1.2. Fire behaviour calculations to determine fire intensity, rate of spread and areas potentially affected,

    1.2. Determine setbacks for buildings from existing vegetation by determining the radiant heat flux[1] that the structures may be exposed to. This is calculated from the distance from flammable vegetation to the building, the slope, vegetation type and height, and potential fire weather.

    1.3. Assess existing vegetation and landscape plans to determine if removal/modification is required.

    1.4. Overall property assessment to determine other mitigation factors and strategies.

Additional information

2. To understand the impact of wildfire, clearance zones and other mitigation factors, the following basic fire behaviour principles have been explained.

Fire Spread and Behaviour:

3. A wildfire is influenced by three main elements. These are weather, topography and fuels. Each of these elements has several sub- elements. It is the combination of these elements that determines the fire behaviour.

Weather Factors:

4. Wind, temperature, and relative humidity are the three components that comprise weather.

5. Wind:

    5.1. Wind normally has the greatest effect of all the elements on fire spread and intensity. Wind pushes the flame ahead, resulting in a preheating of the fuel.

    5.2. The wind also assists in drying out vegetation, increasing the ease of ignition.

    5.3. Wind further results in the transport of airborne firebrands that have been carried aloft by the heated convective air column. The accompanying fire wind can blow embers and hot sparks ahead of the main fire to ignite secondary fires in areas of unburned fuel.

[1] In the Australian Standard *AS 5414-2012 Bushfire Water Spray Systems*, this is what is known as calculating the Bushfire Attack Level or BAL.

5.4. Fire moving with the wind burns faster than a fire backing into the wind. After the fire reaches a certain size, it will begin to create its own wind and burn even faster than before.

5.5. Fire Winds. Fire winds are caused by the fire itself. These winds are the result of the rising expanding fire plume.

6. Temperature:

6.1. Temperature influences fire behaviour by the drying and preheating effect it has on fuels.

6.2. The temperature of the ambient air directly influences the temperature of the fuel.

7. Relative humidity:

7.1. Humidity is the measure of water vapour in the air. Humidity is usually expressed as relative humidity, which is the ratio of the amount of moisture in the air to the amount that a known volume of air at that specific temperature can hold, expressed as a percentage.

7.2. The moisture in the air directly affects the amount of fuel moisture and vice versa. Dry air will draw moisture out of the vegetation, making it more susceptible to fire.

7.3. Fine fuels are more responsive to relative humidity than are large fuels. If the air has a high relative humidity, the vegetation will take in some of that moisture, making it less susceptible to ignition, or the moisture may slow the rate of spread of the fire.

7.4. Relative humidity directly affects ignition probability and fire intensity. The relative humidity also controls fine dead fuel moisture.

Topographical Factors:

8. Topography relates to the form of natural or man-made earth surfaces. Topography affects the intensity and spread of a fire. Winds, as well, are greatly affected by the topography of the land. (NFPA921, Guide for Fire and Explosion Investigations, 2017, p. 324) Topography consists of slope, aspect, and terrain.

9. **Slope**:

9.1. Slope allows the fuel on the uphill side to be preheated more rapidly due to heat convection and radiation than if it were on level ground as the distance between the flame and the fuel is decreased. This allows the fire to burn with more intensity and speed.

9.2. Wind currents, which prevalently move uphill during the day, can accelerate the fire uphill. Slope may also result in burning debris rolling down the hill, starting spot fires below the primary fire and across control lines.

10. **Aspect**:

10.1. The aspect of the slope is the compass direction in which the slope faces.

10.2. This is an important consideration because solar heating on the fuel and ground surface raises the potential for ignition and increases the rate of spread.

10.3. Slopes facing the sun are typically drier, and they may have a more combustible fuel type or character of vegetation resulting in a greater ease of ignition and faster spread.

11. **Terrain**:

11.1. Terrain can also affect both intensity and rate of spread, particularly when there are either barriers or natural chimneys present.

11.2. Barriers such as a log, bare dirt, or rocks, can cause a fire to slow down or even go out. Almost any barrier will at least lessen the intensity of the fire as it passes.

11.3. Larger barriers often cause wind eddies which can change the fire's direction, at least for short distances.

11.4. Natural chimneys can increase wind velocity and accelerate fire spread and increase intensity substantially.

Fuel Factors:

12. Fuels are characterized by a variety of factors. These include vertical and horizontal arrangement, type, species, size and fuel moisture, both live and dead. Fires will tend to ignite more easily and spread more rapidly in fine dead fuels with low moisture contents.

Ignition Factors:

13. To have a risk from wildfires a potential ignition source must exist. Without an ignition there is no risk regardless of vegetation fuel load and any other factors.

Site Assessment

Wildfire Threat Assessment

14. The Wildfire Threat Analysis (**WTA**) framework and the Fire and Emergency Risk Assessment processes have been used as a guide to complete this assessment. The following is an outline of both disciplines.

15. **Wildfire Threat Analysis was defined by the National Rural Fire Authority as:**

> *"A systematic method of identifying the level of threat a particular area faces from wildfire. The level of threat is generally related to a combination of ignition potential, potential fire behaviour and the values threatened.*
>
> *These factors may themselves be derived from other combinations of factors, for instance, potential fire behaviour can be determined from a combination of climate, topography, and fuels".*

16. To come up with an overarching "Threat" from wildfires, the Wildfire Threat Analysis (**WTA**) is made up of three layers:

16.1. **Risk –** This is essentially the potential for ignition and the ability for a fire to spread to any given area/location. In New Zealand, fires are mainly caused by people and their activities so areas with higher populations generally have a higher risk. Areas where accessibility brings people into the back country also have a higher risk, i.e., trails, etc.

16.2. **Hazard –** This is the potential fire behaviour and considers fuel load and weather, i.e., areas of high hazard will have a high level of flammable vegetation fuel such as scrub, tussock, wilding pines etc and have a dry and/or windy climate. These factors are used to determine the Rate of Spread (**ROS**) and Head Fire Intensity (**HFI**) for a given area/location.

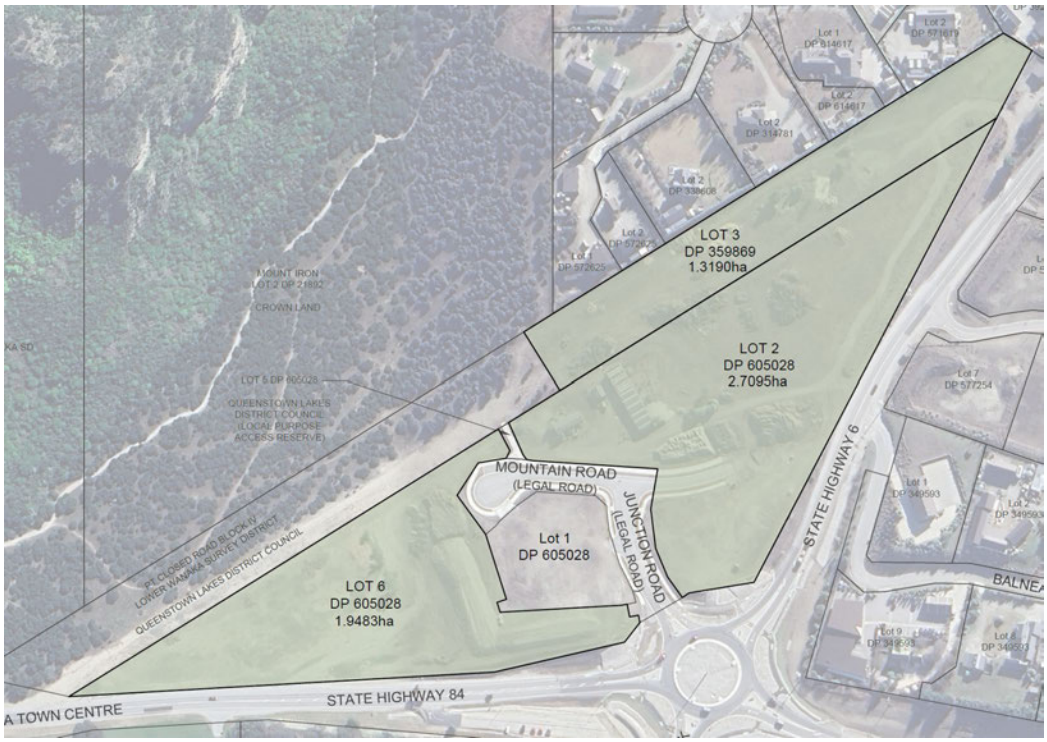
16.3. **Values –** These are the values threatened by a wildfire and include such things as life, property and areas of aesthetic, recreation, conservation, historic or cultural significance.

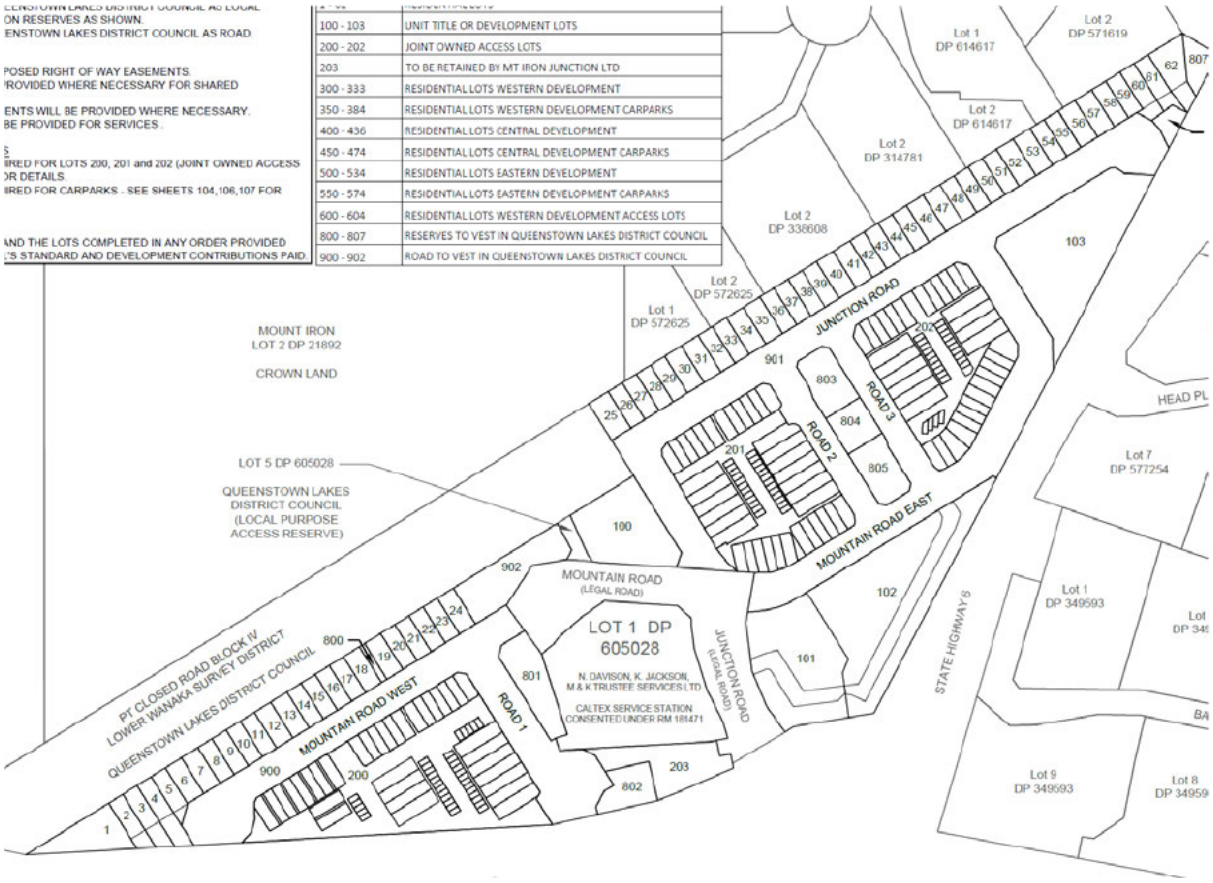
17. The above three layers are then combined to create the "Threat" layer or model. This threat level is generally identified by a numerical value; however, for simplicity I will use the "Low, Moderate, High, Very High, Extreme" NZ fire danger rating scale.

18. The Fire and Emergency NZ Fire Hazard Risk Assessment process identifies the risk of ignition determined by such factors as previous fires, ignition sources and the likelihood of fire occurrence and gives these a rating from 1 to 5, with 1 being "Rare" for a fire to occur and 5 being "Almost certain". This ignition risk is then applied to a matrix against the "likely consequence" to human life, structures, and other values at risk. The final score is used to determine mitigation and actions.

Observations From Site Visits

19. Observations from my site visit on 17th of July 2026 as follows: (Site plans)





19.1. **Risk** – Mount Iron has long been identified as having a significant fire risk and has been the subject of wildfire risk assessments, public meetings and national fire agency interest for close to two decades. Mount Iron is a prohibited fire zone under the Fire and Emergency NZ (FENZ) Act 2017 and has its own high risk response zone within FENZ protocols. A fire off Rob Roy Lane on the western slopes of Mount Iron in 2012 highlighted the risk in this area.

19.2. The proposed development is located below and to the southeast of Mount Iron and sits outside the FENZ prohibited fire zone.

19.3. There is an equal risk of a fire igniting and spreading from the development onto Mt Iron and from Mt Iron into the development.

19.4. The area around the proposed development has potential for a wildfire ignition from the highways, powerlines, nearby residential areas and from embers off any fires on Mt Iron itself.

19.5. **Table 1:** Potential Ignition locations and types. (Greatest likelihood to least likelihood)

Ignition Location	Ignition type
Roadsides (SH6 -Wanaka/Luggate Hwy)	Vehicle accident/breakdown/fault, roadside parking ignition from hot exhaust, cigarette ignition, Ignition related to fireworks or other careless activities, freedom camping, arson.

Neighbouring residential land and houses	General residential/lifestyle activities such as ash dumping, rubbish fires, braziers, fireworks, mowing. House fires, vehicle fires.
Fire on Mount Iron/nearby reserves	Ember transfer from fires anywhere upwind on Mt Iron. Limited potential for a fire to enter the development from off Mt Iron. (Downslope and vegetation clearance)
Powerlines (Running past the development on the eastern side. Minor risk)	Electrical fault, fuse activation, weather related infrastructure failure.

19.6. The most likely sources of a fire that could impact on the Mt Iron Junction development would come from the nearby highways and surrounding residential areas or from a fire and/or embers off any fire upwind on Mt Iron.

19.7. Given the above, I would classify the overall potential for an ignition that could likely impact this property, as **Moderate/Possible.**

20. **Hazard –** There is limited fuel that would drive or spread a fire on this site other than the residential homes within the development themselves. The 3 to 4m tall kanuka on the Mt Iron boundary could carry a fire to parts of the development's northern boundary. Kanuka is one of the most flammable vegetation fuels in NZ.

20.1. The weather on site can get very hot and dry in mid-summer, this combined with strong winds could generate extreme fire behaviour in all vegetation fuels. The prevailing winds are hot, dry from the northern vectors or colder damper winds from the south.

20.2. There are significant barriers to fire spread in and around the development in the form of roads, driveways, lawns and limited vegetation associated with this more urban type of development. It is unlikely that a fire would be able to spread through this development in anything other than very extreme fire danger conditions.

20.3. Any fire approaching from Mt Iron would need to breach the approx. 13m wide strip of cleared vegetation along the northern boundary adjacent to Lots 1 -24. (Apart from a short section behind Lot 25-26 where this is reduced to around 3m.)

20.4. A fire approaching off Mt Iron is very unlikely to spread from the summit down as there are significant areas of rocky bluffs and limited vegetation in this area. This combined with the change in vegetation to less flammable species associated with this wetter, cooler southern aspect. Any fire approaching from Mt Iron proper is more likely to be of lower intensity in the form of ember transfer rather than a wall of flame.

20.5. Any fires approaching from outside the development are more likely to come along the base of Mt Iron from the north or west than directly downslope from the summit area and this is through non continuous areas of kanuka as shown below.

20.6. The area of kanuka shown above along on the northern boundary is somewhat patchy, has limited understory due to rabbit grazing and is bordered on the Mt Iron side by less flammable mixed native and exotic weed vegetation. This strip of kanuka could sustain a run of fire from the north, although it will be of lower intensity than a continuous stand of dense kanuka and would only reach peak intensities if directly aligned with a nor northeasterly wind.

20.7. Any fire starting within the development is unlikely to spread onto Mt Iron except off Lot 25-26 if the current approx. 15m vegetation clearance is maintained along the northern boundary. (It would be beneficial if Lot 25 could have a similar veg clearance as the other Lots; however, as this is only a small area the risk is minimal)

20.8. A significant fire upwind on Mt Iron could rain embers across the development and the surrounding areas.

20.9. In summary the "Hazard" is variable depending on where a fire starts. I have assessed it at as **Low** based on the possible scenarios outlined above.

21. **Values** – Residential homes and occupants.

21.1. This site has multiple escape routes and open area safety zones free of flammable vegetation.

21.2. There are multiple vehicle egress options due to the multiple roads that access this site.

21.3. The Wanaka fire station is close at around 3km away and the development has access to reticulated water supplies for firefighting.

21.4. There is an Attentis fire detection sensor around 600m north from the developments northern corner that was installed by QLDC. This should ensure that any fire in this area is detected quickly.

21.5. I have assessed the values as **High** with a **Low** consequence rating if a fire occurred on an elevated fire danger day.

21.6. The overall value rating is **Low/Moderate**

Wildfire Threat Assessment Summary

22. Given the prevailing winds, potential ignition sources, ignition history and locations, vegetation type and slope factors, the overall Wildfire Threat Assessment and risk rating for this site is assessed as **Low/Moderate.**

23. This rating comes from the **Moderate** chance of an ignition, with a **Low** probability of fire spread at high intensity and the **Low/Moderate** risk to the values on site.

Assessment against the National Policy Statement for Natural Hazards 2025

24. This site has also been assessed against the National Policy Statement for Natural Hazards 2025 (NPS-NH), although this policy does not include wildfire risks, QLDC have required it be used to determine the wildfire risk levels for other sites.

25. Based on the above observations and conclusions, the NPS-NH Likelihood level is assessed as "Possible" and the Consequence Level as "Moderate", resulting in an overall risk level of "Medium". See figure 1 below. (Refer to the NPS-NH policy document for further details[2])

Figure 1: Risk matrix

Consequence Level	Likelihood Level: Almost Certain	Very Likely	Likely	Possible	Unlikely	Rare	Very Rare
ARI (years)	up to 10	10-20	20-50	50-100	100-500	500-5000	> 5000
AEP	10% or more	10% to 5%	5% to 2%	2% to 1%	1% to 0.2%	0.2% to 0.02%	< 0.02%
Catastrophic	Very High	Very High	Very High	High	Medium	Medium	Medium
Major	Very High	Very High	High	High	Medium	Medium	Medium
Moderate	High	High	High	Medium	Medium	Low	Low
Minor	Medium	Medium	Medium	Medium	Low	Low	Low
Negligible	Low	Low	Low	Low	Low	Low	Low

Radiant Heat Flux Assessment

26. Determine the radiant heat flux[3] that the site and future dwellings may be exposed to calculated from the distance from flammable vegetation to any structure, the slope, vegetation type and height and potential fire weather.

    26.1. **Vegetation fuel**- The predominant flammable vegetation leading off Mt Iron and primary driver of risk from this direction is the 3 to 4 m high Kanuka bordering the development to the north. This Kanuka is somewhat patchy, has limited understory and has some other less flammable vegetation above and interspaced on this more southerly aspect of Mt Iron.

    26.2. **Avenues of fire spread**- As discussed above in the hazard assessment, the most likely avenue of greatest risk is fire spread from building to building and from any fire around the base of Mt Iron as per the following image.

[2] https://environment.govt.nz/publications/national-policy-statement-for-natural-hazards/

[3] In the Australian Standard *AS 5414-2012 Bushfire Water Spray Systems*, this is what is known as calculating the Bushfire Attack Level or BAL.

26.3. **Distance between vegetation fuel and the site/potential building platforms** – Apart from a small area to the north of Lot 25-26 the approximate distance from the continuous kanuka to any dwelling is 15m.

26.4. **Slope factor** – This site sits downslope from Mt Iron with the more likely avenues of fire spread being across flat ground.

26.5. **Potential fire weather** – The predominant weather most conducive to a fire on this site is a hot dry north-westerly flow. Calculations are based on EXTREME fire danger, temperature of 25^{0}C, Relative humidity of 35% and a wind speed of 25km/hr. (FFMC 91, DMC 50, DC 500, BUI 80, FWI 40, GC 80)

Radiant Heat Flux Summary

26.6. Based on the above factors, the calculated maximum head fire intensity (HFI) is as follows: Kanuka 3.5m high, patchy, minimal understory, mixed native/exotic weeds with an estimated fuel load of 15t/ha. Fire intensity is estimated using a mix of the manuka/kanuka scrub and hardwood scrub fuel models at 25,000 kW/m.

26.7. To put this into perspective, firefighters with high pressure hoses are only effective up to about 5,000 kw/m and helicopters up to around 10,000kw/m.

26.8. Conversely under the same fire conditions mown or grazed grass could generate fire intensities of 3,000kw. A fire in these conditions is manageable if detected early and suppression resources were available.

26.9. Based on the minimum 15m distance assumed between any building and the flammable vegetation, structures could be exposed to the following radiant heat flux: **25kWm^2.** (This is expressed as a BAL of 25 under the Australian standard) *(Based on RHF = 60*(1-exp(-HFI/(3000*D))) after Leicester 1985)*

26.10. A modern building's survivability threshold is around 25kWm^2 of radiant heat for construction of double-glazed glass, low flammability roofing material and some timber cladding. This can be increased closer to 30kWm^2 by using low flammability building materials and hardened glass. (See Figure 1). The above calculated level aligns with the survivability threshold associated with a building constructed of low flammability materials with minimal timber cladding like those proposed for this development.

26.11. To provide for a safety buffer it is recommended that parts of any buildings that sit less than or equal to (≤) 15m from the kanuka along the northern boundary (lots 1-26) have tempered glass and are constructed of fire-resistant cladding such as brick, stone, metal and/or timber that has a fire-resistant treatment. (Charred timbers such as Sugi ban, treated timbers such as Abodo Vaaro or Woodsafe and timber treatments such as Firesheild, Mirotone Xerofire)

Figure 1- Radiant Heat Flux Thresholds[4].

Radiant Heat Flux thresholds (kW/m^2)	
< 5	Cracking of thin single glazing can occur at 3-5 kW/m^2, although heat fluxes up to 16 kW/m^2 are more typically required to cause cracking but not falling out of windowpanes.
5-13	Piloted ignition of timber (by flame) after a long exposure time occurs at around 13 kW/m^2.
13-25	Non-piloted ignition of timber (from heat without flame) after a long exposure time occurs at about 25 kW/m^2, and peak heat ratings for metal cladding products are around 22-30 kW/m^2 (e.g. Kingspan external cladding, 24 kW/m^2).
25-35	Spontaneous ignition of wood and other flammable materials is only expected at radiation intensities greater than 30 kW/m^2.
> 35	Fluxes of 20-30 kW/m^2 are required to cause fall-out in both panes of double glazing (Cohen & Wilson 1994, in Babrauskas 2016), in fact Babrauskas states 35 kW/m^2.

[4] Scion Heat Flux calculation spreadsheet

Rate of Spread Assessment (How fast could a fire travel)

27. Based on the vegetation fuels and the predominant fire weather outlined above, the maximum Rate of Spread (ROS) calculation is around 3km/hr in the kanuka. The actual ROS is likely lower as fires take time to reach a steady state or equilibrium ROS. The Canadian FBP system uses an acceleration curve that assumes that a fire will reach 80% of its equilibrium within 20 minutes in open fuel types. The NZ Fire Behaviour Prediction system tends to overestimate ROS on steep slopes. I will use 2 km/hr in my calculations.

    27.1. The distance from potential ignition locations (highway, powerlines, neighbours etc) varies greatly and most ignition locations lack continual fuel to allow fire spread. The following is only valid for the areas around the base of Mt Iron. Based on a ROS of 2km/hr, a fire could reach this site within 5 to 10 minutes.

Construction Assessment

28. The application for this development lists the following cladding options- Timber weatherboards and brick veneer with corrugate cladding and roofing.

29. Decking/patios are listed as timber or concrete.

30. As covered above in the radiant heat flux assessment, any part of any structure that sits ≤ 15m of the kanuka scrub along the northern side should be of low flammability construction materials including tempered glass. This only applies to Lots 1-26 and all other structures can be any mix of the above-mentioned cladding options.

31. The decking/patios for Lots 1-26 along the northern side that sit adjacent to the kanuka scrub should be constructed of concrete. All other decking/patios that are constructed of flammable materials should be constructed to ensure that leaves and other flammable material cannot enter the space under the deck. Mesh or other methods that prevent leaves and debris from blowing under the deck are recommended. (Consider using low flammability decking material where concrete is not utilised such as treated timber or other less flammable products such as Biform[5])

32. The following publications provide construction recommendations to mitigate wildfire risk and should be followed with the aim of achieving a survivability rating of as close to 30kWm^2 as possible for any parts of any buildings that sit ≤ 15m of the kanuka on the northern side.

    32.1. The following document published by the Federal Emergency Management Agency in the USA covers all aspects of building in high wildfire risk zones. https://wildfiretoday.com/documents/FEMA_home_builders_guide_wildfire_zones.pdf

    Fire and Emergency NZ has several publications, these are based off international publications such as the FEMA publication referenced above and provide useful advice, https://fireandemergency.nz/assets/Documents/Farms-rural-properties/FENZ-1427-Wildfire-Safer-Housing-Guide-FA_7.pdf

[5] https://biform.co.nz/why-biform/biform-vs-timber/?srsltid=AfmBOoqNx31lHxcexMsfFn_Orw43Qh5qKGoR5DAsu2lfm_pLHYwavmJf

https://fireandemergency.nz/assets/Documents/At-home/Rural-Interface-Brochure.pdf.

32.2. Architects and engineers should be aware of the Australian Standard, AS3959, *Construction of buildings in bushfire prone areas.*

33. The above publications can be summarised as follows:

33.1. **Sidings** – Non-combustible materials such as stone, steel, brick, triple glazed and/or tempered glass on any façade that a fire may approach from. Fire resistant timber could be utilised. (Charred timbers such as Sugi ban, treated timbers such as Abodo Vaaro or Woodsafe and timber treatments such as Firesheild, Mirotone Xerofire)

33.2. **Roof** – Non-combustible roofing materials such as clay tile, fire retardant treated asphalt, corrugated iron and other metal materials, with galvanised steel, copper and aluminium for gutters. (Note, sheet metal is non-combustible, but it readily transfers heat, so must be installed over fire retardant treated battens and roof sheathing.)

33.3. **Form** – Simple sloping roof lines without multiple junctions and building layouts without extra corners/junctions perform better during wildfires.

33.4. **Voids, openings, and ember access**- Fill in eaves with soffits, fill roof peak and other vents and gaps that embers can enter.

33.5. **Decking and other objects attached/adjacent to the home** – Ensure any decking or attached items are of non-combustible construction.

33.6. **Other-** Most houses that burn down due to wildfires are ignited by flying embers. The following video shows how this occurs and how to mitigate it. https://youtu.be/vL_syp1ZScM

Landscape Assessment

34. The following guidelines found in, *Preparing Home Landscaping*, Fire and Emergency NZ and the FEMA Home Builders Guide[6] should be implemented. (Note the guidelines include advice out past 10m from the home, however, due to the more urban design of this development with limited vegetation and multiple barriers to fire spread such as roads, paths and open spaces these are not considered relevant)

34.1. **Zone 0:** In the first 1.5 metres surrounding any structure and attached deck, avoid anything combustible- this includes woody plants, mulch, woodpiles, combustible trellises, and stored items. Zone Zero is an excellent location for walkways, or hardscaping with pavers, rock mulch, or pea gravel. Zone 0 should be coupled with a 150mm non-combustible zone between the ground and the start of the building's exterior siding.

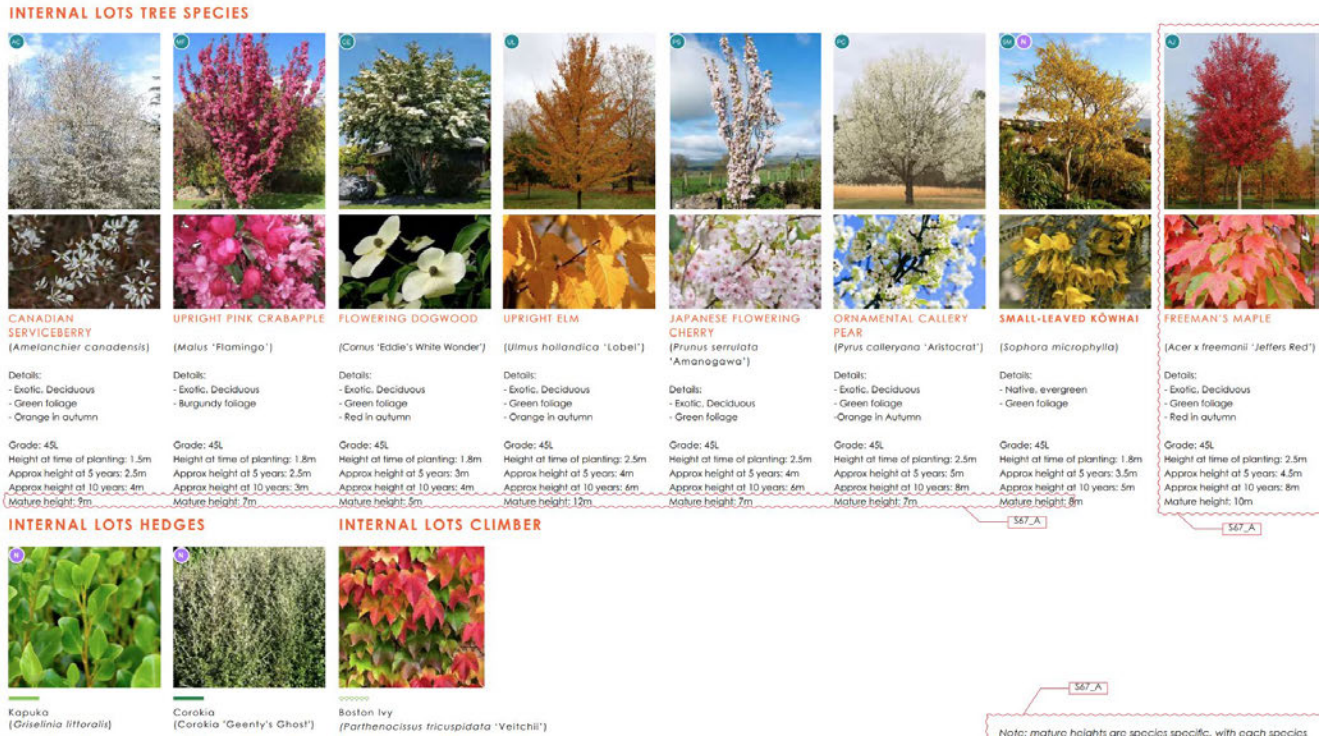
34.2. **Zone 1:** 1.5-10 metres from the structure should be "lean and clean". The goal is to eliminate connectivity between islands of vegetation by increasing the spacing between

[6] https://wildfiretoday.com/documents/FEMA_home_builders_guide_wildfire_zones.pdf

trees, removing lower branches of trees and shrubs, and creating areas of irrigated and mowed grass or hardscape between lush vegetation islands. Plants should be properly irrigated and maintained to remove dead/dry material.

35. **Observations**- The following is an example of the structures situated along the higher risk northern boundary adjacent to the kanuka.

35.1. The requirements for Zone 1 have been met with a mix of low flammability deciduous trees, green lawns and a mix of griselinia hedging and low plantings as per the following image.



35.2. The Zone 0 requirements have largely been met with concrete paths surrounding much of the structures. The following are recommendations to ensure all the Zone 0 requirements are met. (Note the decking is shown at timber in the above image and for these structures along the northern side adjacent to the kanuka these should be concrete. Lots 1-26)

35.2.1. Where concrete patios or concrete paths don't extend right around any structure, the addition of a 150mm non-combustible zone between the ground and the start of the building's exterior siding should be installed. (pea gravel or similar)

35.2.2. Where fences abut the structures, these should be of non-flammable material. (At minimum the 1.5m section that is attached to the structure should be non-flammable)

35.2.3. No high flammability vegetation such as tussock or flax should be present within Zone 0. (Within 1.5 m of structures or timber decking) Plant Species Lists A and B (below) have a small amount of tussock as such these should be moved outside Zone 0 or swapped out for lower flammability species[7].

[7] https://fireandemergency.nz/outdoor-and-rural-fire-safety/protect-your-home-from-outdoor-fires/flammability-of-plant-species/#low

INTERNAL LOTS PLANT MIX A

SHRUBS, GRASSES & GROUNDCOVERS

Ornamental Flax
(*Phormium* 'Black Pepe')

Grade: 2L
Spacing: 400mm

Orange sedge
(*Carex testacea*)

Grade: 1.5L
Spacing: 500mm

Ornamental Flax
(*Phormium* 'Pepe')

Grade: 2L
Spacing: 400mm

Hebe
(*Hebe* 'Emerald Gem')

Grade: 2.5L
Spacing: 400mm

Mat Rush
(Lomandra 'Tanika')

Grade: 1.5L
Spacing: 700mm

Hebe
(Hebe 'Wiri Mist')

Grade: 2.5L
Spacing: 600mm

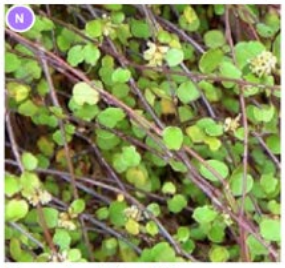
Cushion plant
(*Scleranthus biflorus*)

Grade: 2L
Spacing: 600mm

English Lavender
(Lavendula angustifolia 'Hidcote')
Grade: 1.5L
Spacing: 600mm

Ornamental Flax
(*Phormium* 'Platts Black')

Grade: 2L
Spacing: 800mm



Creeping Wire Vine
(*Muehlenbeckia axillaris*)

Grade: 2L
Spacing: 600mm

Hard Tussock
(*Festuca novae-zelandiae*)

Grade: 1.5L
Spacing: 600mm

Groundcover Coprosma
(Coprosma acerosa 'Red Rocks')
Grade: 2.5L
Spacing: 900mm

Dianella
(*Dianella* 'Little Rev')

Hebe
(*Hebe cupressoides* 'Nana')

KEY

N Native

INTERNAL LOTS PLANT MIX KEY

\+ Plants able to be planted in 300 - 500mm garden beds

INTERNAL LOTS PLANT MIX B

SHRUBS, GRASSES & GROUNDCOVERS

Dwarf Pittosporum
(*Pittosporum* 'Golfball')

Grade: 2.5L
Spacing: 800mm

Dwarf kowhai
(*Sophora prostrata*)

Grade: 2.5L
Spacing: 900mm

Red tussock
(*Chionochloa rubra*)

Grade: 1.5L
Spacing: 900mm

Boxwood hebe
(*Veronica odora*)

Grade: 2.5L
Spacing: 1000mm

Groundcover Coprosma
(Coprosma acerosa 'Red Rocks')
Grade: 2.5L
Spacing: 900mm

Coprosma
(*Coprosma* 'Black Cloud')

Grade: 2.5L
Spacing: 700mm

Shurb pohuehue
(*Muehlenbeckia astonii*)

Grade: 2.5L
Spacing: 1000mm

Hebe
(*Hebe cupressoides* 'Mount Cook')
Grade: 2.5L
Spacing: 900mm

Dwarf Flax
(*Phormium* 'Emerald Green')

Grade: 2L
Spacing: 900mm

Ornamental flax
(*Phormium* 'Platts Black')

Siberian Dogwood
(*Cornus alba* 'Sibirica')

Other Wildfire Risks and Mitigation

36. The following other risk and mitigation strategies have been identified:

    36.1. This development sits outside of the Fire and Emergency Prohibited Fire Zone, as such open fires may be permitted subject to ORC rules. To limit the potential for a fire to spread from the development into Mt Iron all fireworks and open-air fires should be prohibited. (Braziers, fire pits etc)

Summary and Minimum Recommendations

37. The overarching Wildfire Threat Assessment is “Low/Moderate”.

38. The assessment against the Natural Hazards Policy is “Medium”.

39. To provide for a safety buffer against radiant heat from any fire in the kanuka along the northern boundary of Lots 1-26, it is recommended that parts of any buildings that sit less than or equal to (≤) 15m from the kanuka have tempered glass and are constructed of fire-resistant cladding such as brick, stone, metal and/or timber that has a fire-resistant treatment. (Charred timbers such as Sugi ban, treated timbers such as Abodo Vaaro or Woodsafe and timber treatments such as Firesheild, Mirotone Xerofire)

40. The decking/patios for Lots 1-26 along the northern side that sit adjacent to the kanuka scrub should be constructed of concrete. All other decking/patios that are constructed of flammable materials should be constructed to ensure that leaves and other flammable material cannot enter the space under the deck. Mesh or other methods that prevent leaves and debris from blowing under the deck are recommended. (Consider using low flammability decking material where concrete is not utilised such as treated timber or other less flammable products such as Biform[8])

41. Architects and engineers should be made aware of the international publications around building construction in high wildfire risk locations. Such as Australian Standard, AS3959, *Construction of Buildings in Bushfire Prone Areas*.

42. Comply with the recommended landscape zone clearances for Zone 0 as follows:

    42.1. **Zone 0:** In the first 1.5 metres surrounding any structure and attached deck, avoid anything combustible- this includes woody plants, mulch, woodpiles, combustible trellises, and stored items. Zone Zero is an excellent location for walkways, or hardscaping with pavers, rock mulch, or pea gravel. Zone 0 should be coupled with a 150mm non-combustible zone between the ground and the start of the building’s exterior siding.

[8] https://biform.co.nz/why-biform/biform-vs-timber/?srsltid=AfmBOoqNx31lHxcexMsfFn_Orw43Qh5qKGoR5DAsu2lfm_pLHYwavmJf

42.2. To achieve compliance with the recommended Zone 0 mitigations the following additions/modifications to the current plan should be implemented:

42.2.1. Where concrete patios or concrete paths don't extend right around any structure, the addition of a 150mm non-combustible zone between the ground and the start of the building's exterior siding should be installed. (pea gravel or similar)

42.2.2. Where fences abut the structures, these should be of non-flammable material. (At minimum the 1.5m section that is attached to the structure should be non-flammable)

42.2.3. No high flammability vegetation such as tussock or flax should be present within Zone 0. (Within 1.5 m of structures or timber decking) Plant Species Lists A and B have a small amount of tussock as such these should be moved outside Zone 0 or swapped out for lower flammability species.

42.3. This development sits outside of the Fire and Emergency Prohibited Fire Zone, as such open-air fires may be permitted subject to ORC rules. To limit the potential for a fire to spread from the development into Mt Iron all fireworks and open-air fires should be prohibited. (Braziers, fire pits etc)

Disclaimer:

Wildfires are extremely unpredictable events and could start in locations not identified by this report, or in fire weather conditions not considered by this report, thus resulting in wildfires that may breach the identified mitigation strategies resulting in property loss, injury, or death. Wildfire Threat Assessment (WTA) and advice is be based on a fire occurring at Fire Weather Indices less than 40 FWI. (<Very Extreme).
The author is not qualified to comment on construction in wildfire prone areas, building code requirements for wildfire mitigation or external wildfire sprinkler system design in NZ because NZ has no guidelines or standards on these topics. The advice provided is from international research publications and from Wildfire Management's own experience.
Wildfire Management NZ provides recommendations and designs on external wildfire sprinklers under the terms, that it is fully indemnified if any such system or advice damages or fails to protect the property for any reason.
This report is provided in good faith and on the basis that reasonable endeavours have been made to be accurate and not misleading and to exercise reasonable care, skill, and judgment in providing such information and opinions. Neither Wildfire Management NZ, nor any of its employees, contractors, agents, or other persons acting on its behalf or under its control accepts any responsibility or liability in respect of any information or opinions provided in any format or report due to the unpredictable nature of wildfires.

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