

# AFAC INDEPENDENT OPERATIONAL REVIEW

A review of the management of the Tasman fires  
of February 2019



Prepared for Fire and Emergency New Zealand

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## ACKNOWLEDGEMENTS

The following conducted this Review on behalf of the Australasian Fire and Emergency Service Authorities Council (AFAC):

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Overall direction was provided by the AFAC office.

The Review team would like to thank those individuals who gave freely of their time and spoke openly with the Review members. The Review benefitted from the input of representatives of Fire and Emergency New Zealand, officials from local and national government, and representatives from the forest industry and the community.

The Review spoke to over 70 individuals as well as reading operational debriefs and other written materials relating to the management of the Tasman fires. We have not attempted to respond in this report to each point that was made to us, but we have had regard to the major themes that emerged.

The input of all participants in preparing this document was of great benefit to the Review. However the content of this report and its conclusions remain the joint responsibility of the Review team.

AFAC, September 2019

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# 1 INTRODUCTION

- 1.1 On 5 February 2019, a fire started in the Pigeon Valley near Nelson, New Zealand, which went on to burn over 2300 ha, including significant areas of mature pine plantation. In the days and weeks that followed, other fires broke out at Rabbit Island, Atawhai, Moutere Hill and Dovedale Hill, that added to the complexity of the fire managers' task. These fires have collectively been termed 'the Tasman fires'.
- 1.2 While it is reassuring to be able to report that no human life was lost as a result of this event, the physical and economic damage to property and the environment in the region was extensive. One dwelling and one shed were lost, but there was also major damage to fencing, pasture, plantation, stock and native flora and fauna.
- 1.3 There are precedents for this event in recorded New Zealand history, but not many. Observers of the fire regime in New Zealand may note with some concern that this fire comes only two years after the Port Hills fire near Christchurch, which itself had many severe impacts and cost a firefighting helicopter pilot his life.
- 1.4 The science of climate change is too well-rehearsed to need repeating in this publication. The implications for New Zealand in terms of the incidence of fire are potentially profound. It is for that reason that New Zealanders should see it as a real positive that Fire and Emergency New Zealand has commissioned this report into the fires of February 2019, with the aim of achieving continuous improvement in rural fire management when – not if – there is a recurrence.
- 1.5 The way in which the Tasman fires were handled is evidence that Fire and Emergency New Zealand has the capability and capacity to manage emergency incidents of this nature. The purpose of a Review is to identify lessons and this can inevitably give an impression of negativity to the reader. The Review team collectively think that the reader of this report should be reassured both by the demonstration of Fire and Emergency New Zealand's capability in this area, and its refusal to be complacent and ambition to do even better next time.
- 1.6 This Review recommends as follows:

## Recommendation 1

Fire and Emergency New Zealand should develop and implement a nationally consistent framework for strategic and tactical fire planning, community education and risk reduction activity that engages all stakeholders including the New Zealand public as a whole.

## Recommendation 2

2a. Fire and Emergency New Zealand should establish and promote a set of risk reduction guidelines/requirements around permitted heat and spark activities that relate to the community as a whole and not just Forestry.

2b. Fire and Emergency New Zealand should work to promote any changes required to legislation or regulations to develop a mandatory system of 24 hour Total Fire Ban days applicable to the whole community, to be declared by Fire and Emergency New Zealand based on predicted fire weather and associated risk.

## Recommendation 3

Fire and Emergency New Zealand should introduce a policy that each region develops a matrix of air, ground, incident management team and machinery resources that will be on stand-by at given forecast levels of fire danger, to include business rules about response times.

## Recommendation 4

Fire and Emergency New Zealand should develop a national aviation management function.

## Recommendation 5

Fire and Emergency New Zealand should develop national guidelines for pre-season data sharing between stakeholders, and Regions should be responsible for ensuring that they have identified key data sources to support operations and verifying that they will be readily available in the event of an incident occurring.

#### Recommendation 6

Fire and Emergency New Zealand should develop guidelines for proposed ICC locations, functionality and connectivity, to include a single ICT system to be used across all locations. ICC locations should be tested and endorsed prior to each season.

#### Recommendation 7

Fire and Emergency New Zealand should undertake a comprehensive review of the National Incident Management Teams and their processes, operating policies, training and membership including an increased focus on predictive services capacity to support fire suppression and consequence management.

#### Recommendation 8

Fire and Emergency New Zealand should review wildfire related training requirements across Fire and Emergency New Zealand and key partner agencies, and identify national requirements for standard wildfire training for personnel in all roles (including fireground support roles such as plant manager).

#### Recommendation 9

Fire and Emergency New Zealand should embed AIIMS as the preferred internal incident control system for the management of its incidents. Personnel who interface outside of Fire and Emergency New Zealand with one or more agencies including the broader emergency management arrangements should retain an understanding of CIMS management structures and liaison and reporting requirements so they can operate in that capacity when required.

#### Recommendation 10

Fire and Emergency New Zealand should develop systems and standard operating procedures to support a national resource ordering, tracking and availability system, to include developing a cadre of trained staging area managers.

#### Recommendation 11

Fire and Emergency New Zealand should review, clarify and document the roles of the NCC, RCC and IMT in Fire and Emergency New Zealand managed incidents, to include reporting lines for NIMTs.

#### Recommendation 12

Fire and Emergency New Zealand should develop doctrine to formally integrate iwi into local and national IMTs.

## 2 ABOUT THE REVIEW

### INTRODUCTION

- 2.1 This Review was requested by Fire and Emergency New Zealand. It has been conducted on a non-statutory basis, with no formal powers of compulsion of witnesses or documents.
- 2.2 New Zealand fire and emergency management agencies have a history of proactively seeking external Reviews of significant events, most recently after the Port Hills fire in 2017. This is a demonstration of their wish to be learning organisations, and we hope that this Review supports that wish. Responsibility for tracking and implementation of the Review rests with the agencies and is ultimately a matter for their judgement within the parameters of their capacity and budget.
- 2.3 The Review was conducted by a team with broad and varied experience of urban fire, rural fire, forestry, land management and aviation operations from both Australia and New Zealand. A deliberate decision was taken to include two Fire and Emergency New Zealand personnel with rural and urban backgrounds in order to provide local knowledge and expertise to the Review: the conclusions of the Review are however independent of Fire and Emergency New Zealand and have been endorsed by all members of the Review team. The Review has had regard to other publications<sup>1</sup> in compiling this report. The result is intended as an independent review, at a strategic level, of the management of the Tasman fires of February 2019.

### TERMS OF REFERENCE

- 2.4 The terms of reference for this Review were as follows:

#### *Risk Reduction*

- risk reduction activity during that fire season and whether that activity was adequate
- any learnings, that arise, from risk reduction activity prior to that fire season where it is believed that, that activity mitigated the fires

#### *Readiness*

- pre-planning undertaken regarding that fire season and whether that activity was adequate

#### *Response*

- firefighting operations and performance on-the-ground (including: the initial and extended responses; the attraction, deployment and support of surge capacity; the effectiveness of handovers; the effectiveness of aerial operations; and the capability and capacity of Fire and Emergency New Zealand to respond to other incidents)
- on-the-ground communication, coordination and collaboration between Fire and Emergency New Zealand and other response partners (such as: contractors; the Nelson and Tasman Councils; Civil Defence, New Zealand Police); from the perspective of Fire and Emergency New Zealand<sup>2</sup>
- connection with, and co-ordination between the on-the-ground firefighting operations (IMT) and the Fire and Emergency Regional Co-ordination Centre (RCC) and National Co-ordination Centre (NCC) – both within the incident response framework, and more broadly across Fire and Emergency New Zealand
- connection with, and co-ordination between the NCC and the National Crisis Management Centre (NCMC)
- connection with, and use of, other functions and teams within Fire and Emergency New Zealand's National Headquarters (NHQ)
- welfare of staff (including the response to any safety concerns, such as fatigue management)
- financial effectiveness and financial processes including the remuneration and reward of Fire and Emergency New Zealand personnel, but only to the extent that it may have affected their availability to participate in the response
- reporting mechanisms and engagement with key stakeholders (including the public, the Board, the United Fire Brigades' Association, the New Zealand Professional Firefighters Union, the Forest and Rural Fire Association of New Zealand, the Ministers of Internal Affairs and Civil Defence and Emergency Management, the Ministry of Civil Defence and Emergency Management, Department of Prime Minister and Cabinet, and the Department of Internal Affairs (as Fire and Emergency New Zealand's monitoring agency))

1 Conducting AFAC Independent Operational Reviews, AFAC, April 2018; What is Operational Success for Fire and Emergency Services, AFAC, 2014

2 It was out of scope for this review to consider the perspective or actions of other agencies; a separate review being led by the Nelson Tasman Civil Defence and Emergency Management Group considered the interagency response.

## Recovery

- learnings available; noting that the Fire and Emergency New Zealand Act 2017 does not contain recovery function obligations, and that policy issues regarding remediation of damage caused to uninsured land while fighting the fires is out of scope.

The following were explicitly out of scope:

- the circumstances of the helicopter accident
- the conduct or behaviour of any individuals involved in terms of performance-related purposes
- the regulatory framework per se (e.g. Fire and Emergency New Zealand's statutory functions or the civil defence statutory framework)
- policy and legal issues, such as the remediation of property damaged during the firefighting process, any potential fault or liability in connection with the fires, and the reward and remuneration of staff involved
- the wider Civil Defence operation, including the overall interagency response to the fires
- the operations and/or performance of agencies other than Fire and Emergency New Zealand.

## RELATIONSHIP TO OTHER REVIEW ACTIVITIES

- 2.5 The Review was advised that other after action reviews were also being undertaken independently by the agencies involved. They include debriefing and after action review exercises being undertaken internally within Fire and Emergency New Zealand. These internal exercises will not necessarily be designed to be put into the public domain.
- 2.6 This report is free-standing and based on the evidence that the Review team gathered during the fieldwork phase of the Review. It deliberately does not deal with the detailed operational issues that will have been addressed in internal after-action reviews, and our intent has been to maintain the discussion and conclusions of this report at a more strategic level.

## METHODOLOGY

- 2.7 The Review team carried out field work in New Zealand between 5 and 14 June 2019 and met with Fire and Emergency New Zealand personnel, staff from other agencies, government and representative bodies. The team had the opportunity to visit the fireground and discuss the strategies used there. We considered documentation relevant to emergency management risk reduction, readiness, response and recovery. We also contacted some stakeholders by telephone to obtain feedback on their experience of the management of the fires.
- 2.8 The Review has intentionally adopted the following principles:
- We have not tried to read and digest every document produced in relation to the management of the fires. We have been provided with a significant amount of documentation by participating agencies and we have reviewed key documents that have assisted our understanding of the circumstances of the fires.
  - We have not acted as a fact-finding body to resolve disputes. Where we have identified concerns about the management of the fires we have discussed these with the people involved and we have reached conclusions based on the available evidence and our professional judgment. We have not gone about this exercise in the same way as a court or legal inquiry would, and our conclusions should not be relied upon to prove that one party or another is right about a particular issue.
- 2.9 We may use language in this report such as 'we were told', which sets the context for the conclusions that follow, but does not imply that we investigated and confirmed the truth of the statement. If we use phrases such as 'we found' or 'we conclude' these should be taken as conveying our opinion on the matter based on the best evidence available to us.
- 2.10 Arising out of our Review we have identified certain recommendations for Fire and Emergency New Zealand: we invite them to have regard to our recommendations while acknowledging that it is a matter for them to prioritise these as they see fit. In places in this report, we have made comments or suggestions that we have not wished to elevate to the status of recommendations, but which, again, we invite Fire and Emergency New Zealand to take account of in their future business planning.

### 3 THE CAUSES, CHRONOLOGY AND RESPONSE OF THE TASMAN FIRES OF FEBRUARY 2019

The Review wishes particularly to acknowledge the work of Veronica Clifford, Scion Rural Fire Research Group, New Zealand, who prepared a report on the Pigeon Valley fire on which this section of our report is based.

#### CHRONOLOGY FOR THE 2019 TASMAN FIRES

- 3.1 On the afternoon of Tuesday 5 February 2019, the Pigeon Valley fire ignited and quickly developed on farmland in Pigeon Valley, near Wakefield in the Tasman District, 20 km south-west of Nelson. The fire's area of origin was located on flat ground, adjacent to a steep slope that had gorse and a five year-old forestry stand that had been planted in cut-over slash. At the time of ignition, approximately 14:10, a tractor was discing a rocky paddock that had 90-100% cured<sup>3</sup> grass fuels. The alarm was raised by 14:15 when the tractor driver and a passing motorist had noticed smoke and fire coming from the paddock. Following the 111 emergency call, the fire grew quickly in the dry conditions. The fire was advancing into adjacent forestry blocks under a moderate westerly wind.
- 3.2 Two fire crews were dispatched from Wakefield and Brightwater at 14:16. Wakefield were first to arrive (14:26); by this stage the fire was well established and had crested the slope, spreading into pine compartments of various ages. The Deputy Principal Rural Fire Officer (DPRFO) was on scene soon after at 14:28. The second crew to arrive was Brightwater at 14:34; they advised that the fire's size was 10 acres (4 ha) in size and approaching established forestry on the eastern side. At this stage, recollections of first responders were of a single smoke plume and the fire spreading rapidly uphill. Once the fire had reached the top of the slope, it was driven by a south-west wind.
- 3.3 Smoke drifting around the Moutere hill and valleys (including Redwood) triggered additional fire reports from the public by 14:49. At 15:27, command was formally transitioned to the DPRFO. Recollections upon arrival were of a brown/bronze vertical smoke column. Spot fires were also observed approximately 100 m ahead of the main fire front. At 15:33 a situation report (sitrep) from the DPRFO advised that the fire was 15 ha in size, burning in approximately three year old radiata pine trees. Aerial attack with three helicopters had commenced.
- 3.4 A further situation report (sitrep) was provided at 16:52. The fire was travelling in a north-easterly direction from its origin. It had travelled approximately 2 km and was 700 m wide. The fire had crossed the main ridge and was burning towards a large native gully. Properties in the Eves Valley and the ridge of Teapot Valley were at risk, and police were handling evacuations. Extreme fire activity was observed, with flames of 20 to 30 m tall reported. Spot fires 500 m ahead of the main fire front were also seen. It was advised that ground attack would be ineffective at this stage. Three helicopters were bucketing by then, with a fourth acting as an aerial platform.
- 3.5 At 18:40 the fire was travelling in a northerly direction, heading directly for Eves Valley road. The head of the fire was threatening the saw mill near Eves Valley at 18:59. Evacuations of Eves and Teapot Valley were still underway. Five helicopters were bucketing on site with tankers providing structure protection. The fire's behaviour was reported as fast moving with 20-30 m flames. By 20:16, ground resources had to pull out of Eves Valley due to dangerous fire activity. By 22:09, the next sitrep reported the fire had moved north west and away from the sawmill. At this stage the fire had crossed over roads and was impacting houses, with a house potentially lost in Eves Valley. The fire was reported as threatening Redwood Valley residents, with evacuations required. The fire was reported to have reached Redwood Valley ridge by 23:00. At this stage, the fire remained uncontained, and continued to creep in and around homes overnight.
- 3.6 There were several slight wind changes within the first six hours that drove the fire towards and away from structures. The combination of flammable scrub, dry grass, dry forest fuels, moderate winds, warm temperatures and low humidity resulted in extreme fire behaviour. During the main fire run, crown fires, surface fires and short- to medium-range spotting were observed by both ground and aerial observers. Spotting distances of up to 500 m and flame heights of 20 - 30 m in the trees were reported. By the time the fire had broken out into Redwood Valley (at 23:00), the fire's behaviour became less extreme due to burning into grass vegetation and a reduction in fire weather overnight.
- 3.7 Due to the fire's extreme behaviour, aerial attack and heavy machinery installing containment lines was the preferred suppression strategy used. Heavy fuel loadings, steep terrain and extreme fire behaviour meant that it was judged too dangerous to undertake initial ground attack, and crews were initially tasked with structure protection. Quick aerial suppression during the early stages was considered necessary to protect life and property in the path of the fire. In addition to forestry, several values were at threat, including the Eves Valley sawmill and numerous rural and lifestyle properties. Smoke was seen filling the Waimea basin and hugging the neighbouring ranges for days.

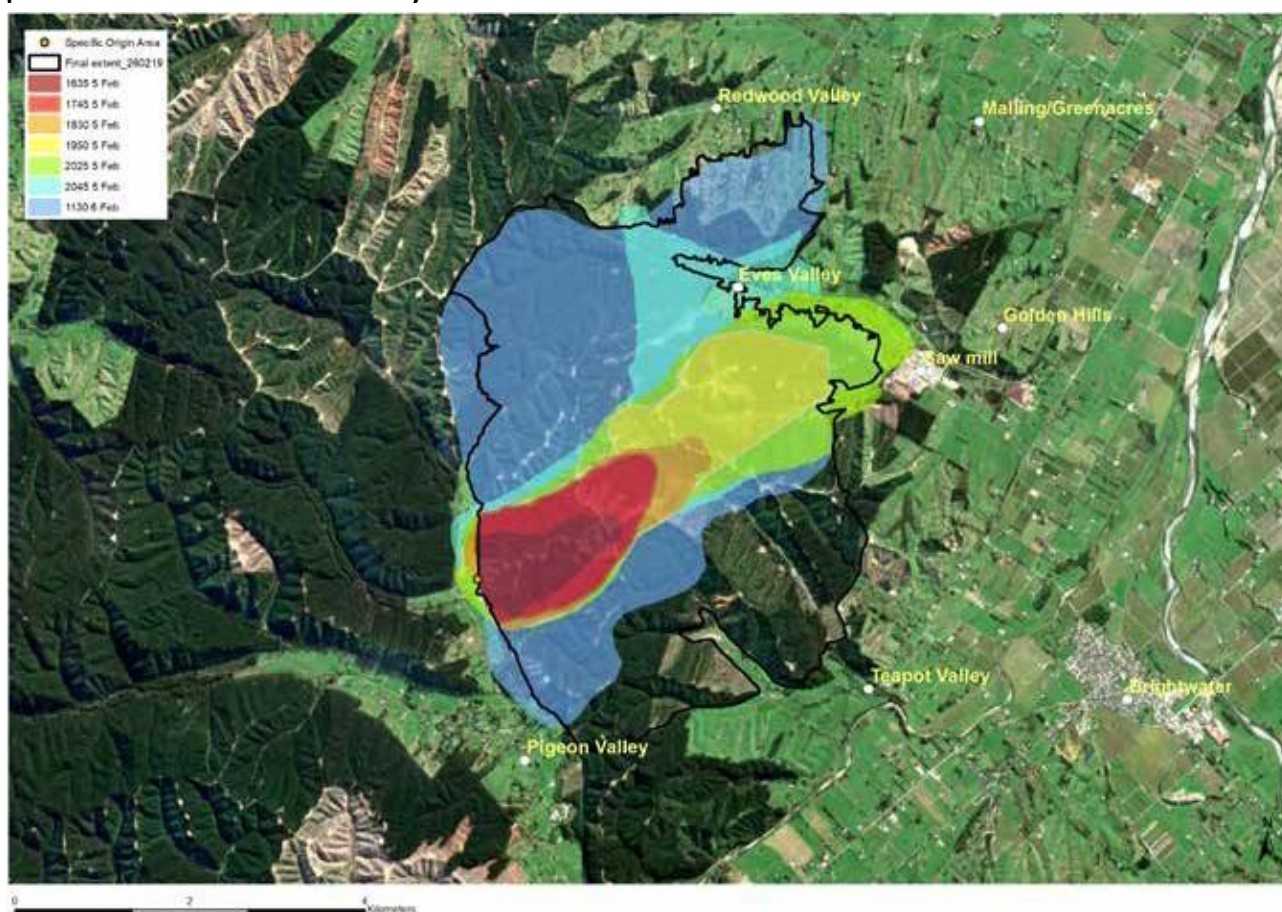
3 Curing is the process of drying out and browning off of fuels such as grass



Image 1: Aerial view of the final area burnt and surrounding curing level of grasslands in the Redwood Valley area. Source: Scion.

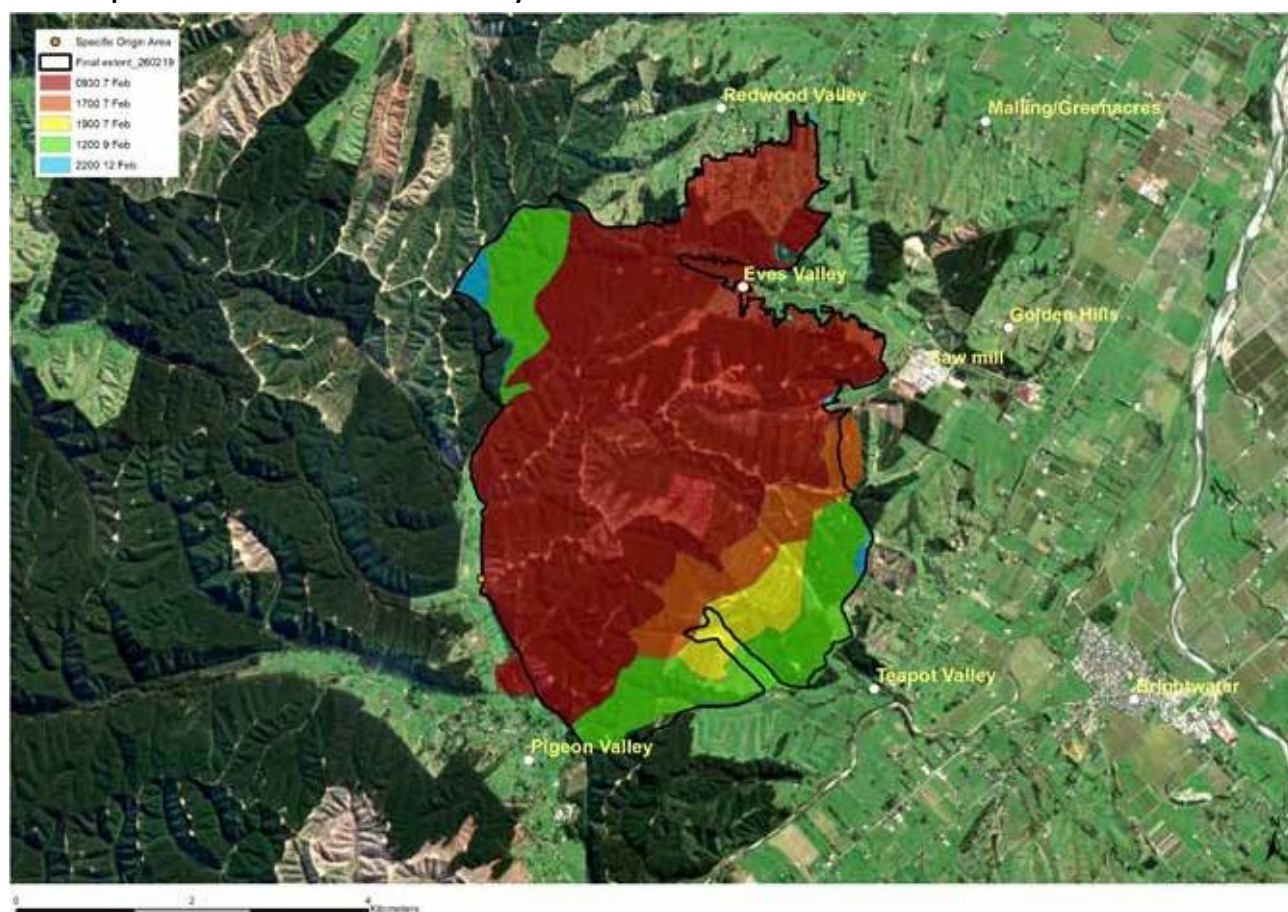
- 3.8** The combination of light grass fuels and a change in wind direction during the early hours of day 2 (Wednesday 6 February) allowed for safer and easier control of the spreading fire by ground crews. The fire was still active in the internal forested compartments, burning with intensity due to the highly flammable fuels present. A state of local emergency was declared for the Nelson Tasman Civil Defence Emergency Management (CDEM) Group at 08:00 that would expire seven days after it came into force. Light winds and higher humidity prevailed throughout the day allowing ground crews to undertake direct attack. Crews were initially tasked with structure protection and blacking out. Construction of fire breaks also commenced in key locations around the perimeter. Retardant lines were laid to protect the Eves Valley Sawmill and Wakefield cell tower.
- 3.9** At 14:36 on 6 February, the alarm was raised for a new fire start in a forestry block on Rabbit Island. The Rabbit Island fire was reported by multiple callers including aircraft from the Nelson Airport. The fire's spread was slow under a mild north-east wind. Helicopters responded within 20 minutes of the first 111 call, and the fire was quickly contained, with mop-up beginning shortly after. The Rabbit Island fire area was considered contained by 20:00. Its final area was 3 ha of pine forest. A total of five aircraft and four crews were diverted to fight this separate blaze.
- 3.10** Favourable weather overnight continued into the early hours of day 3 (Thursday 7 February), with no change in the fire size reported. The focus was on continuing to work towards containing the fire in critical areas – along Sharp Road and Pigeon Valley South Rd, as well as the top end of Eves Valley Rd. The Pigeon Valley fire continued to smoulder away during the morning under a light south-east wind. From 09:00 until 14:00, there was a change in the wind speed and direction, with the onset of a north-east to northerly sea breeze dominating the fire ground. The wind speed increased from 5 km/h to 15 km/h. The 15 km/h wind from the north continued until a wind change to light winds back to the south/southwest at 21:00.
- 3.11** A new fire breakout in the Teapot Valley area was reported by the Richmond lookout tower and a field observer hearing crackling noises in the forest. The fire made a run in young pine stands, burning towards the south-west under a 12 km/h north-easterly wind (the sea breeze). Aerial attack was assigned to Teapot Valley and observed several spot fires being generated 100 - 500 m ahead of the advancing flame front (between 15:15 – 19:00). Aerial suppression was ineffective in containing this new fire run initially. Residents in the Teapot Valley were evacuated at 17:00 as a precaution due to the increased intensity of the fire. By the end of the afternoon, local crews supported by aircraft and heavy machinery successfully protected nearby residential properties.

**Map 1: Estimated progression of the Pigeon Valley fire on 5 and 6 February 2019. Black outline is the final fire perimeter re-estimated 26 February 2019.**



- 3.12 The fire activity overnight was mainly within the boundaries of the burned area, with continued expansion in size overnight Thursday and into Friday (8 February) morning from sideways spread (flanking) due to the dry conditions and undergrowth (gorse) along the eastern edge of the fire perimeter (in the vicinity of Teapot Valley). By 13:00 residents from Wakefield were being evacuated based on forecasted weather conditions. The fire breakout on day 3 had burnt an additional area of approximately 515 ha of pine forest before being contained.
- 3.13 At 15:00 on 8 February, an alarm was raised for a new fire start at Walter's Bluff in Atawhai, on the northern side of Nelson city. This new fire had significant potential to break out to the south and east and do major damage. But due to the rapid deployment of aircraft from Pigeon Valley, including fixed-wing retardant drops, this fire was quickly contained. Resources deployed to this fire included five helicopters, four urban and one rural appliance. Mopping-up operations began with two crew and a field observer patrolling on site overnight. Residents affected by the Walters Bluff fire were able to return home at 21:30.
- 3.14 Over the first three days of fire activity, the fire burned over a range of plantation forest fuel complexes (from recently harvested, to newly established, immature pine and mature pine forests). A small but successful controlled burn (2.5 km x 50 m) was conducted on Sunday 10 February (day 5) to remove the unburnt litter and light vegetation under mature forests where flareups had been occurring in the previous two days. This was carried out to prevent new spot fires starting and threatening further forestry and residents of Sunrise Valley. The state of local emergency was re-evaluated on 12 February and extended for seven days from its expiry until 20 February (and subsequently 27 February) due to additional severe weather forecast for the coming days.
- 3.15 Local, regional and national resources assisted in the control of the Pigeon Valley fire. At its peak, a total of 23 helicopters, two fixed wing aircraft, 150 firefighters and 23 heavy machines fought to contain the blaze. As the smoke and cloud cover decreased over the week, more accurate measurements of the fire ground were carried out from digitally enhanced satellite images. The final extent of the fire's area was 2,316 ha with a perimeter of 36.4 km. During the Pigeon Valley fire response, several other suspicious fires also occurred in the region (at Rabbit Island, 6 February; Atawhai, 8 February; Moutere Hill, 27 February; and Dovedale Hill, 6 March). Fortunately, these new fire starts were attacked early with resources responding from the Pigeon Valley fire, allowing for rapid initial attack and quick containment of the fire.

**Map 2: Estimated progression of the Pigeon Valley Fire perimeter on 7-12 February 2019. Black outline is the final fire perimeter re-estimated 26 February 2019.**



- 3.16 The mop-up and management of this fire was prolonged. The area had been without rain for 22 days (3.8 mm on 14 January), and the dry conditions leading up to and during the blaze combined with second and third rotation forest fuels created high fuel loadings and a highly combustible fuel load, resulting in deep-seated burning within the fire area. Patches of unburnt or fire-cured vegetation within the fire area posed a risk of re-ignition. Mop-up to extinguish numerous hotspots and on-going monitoring using UAVs equipped with infra-red cameras occurred over the following weeks.
- 3.17 The first significant rain fell on day 20 (24 February), which reduced the re-ignition potential of heat-scorched fuels. By this stage, the fire was considered controlled with a 10 m containment line achieved around the fire perimeter. Ground crews continued to work towards expanding the black-out zone from 30 m to 50 m to provide extra security. The extinguishment of remaining hotspots around the control lines finished up on Saturday 2 March, which allowed for a staged demobilisation of fire crews and resources.
- 3.18 Further significant rainfall occurred between days 32 and 40 (8 - 16 March). Remaining crews continued to monitor and dampen down until the 29 March. The incident was formally handed over to forest owners on the 29 March. The site continued to be managed and monitored, and a few remaining hotspots were encouraged to burn out over winter.
- 3.19 In addition to commercial forest loss (Tasman Pine Ltd and a mix of private land owners), the fire also destroyed one home, multiple outbuildings, plastic water tanks and lines, fences, shelter belts, native forest and pastures. This fire also resulted in the evacuation and self-evacuation of approximately 3000 people and 700 livestock and pets from the surrounding valleys. Fortunately, no lives were lost during the fire or evacuations. Conditional re-entry of affected residences occurred on 22 February, and all cordons were lifted by 25 February. This blaze also affected several planned festivals and events in the area, threatened a communications tower, and closed the main state highway.

## DETAILS OF THE FIRE ENVIRONMENT

- 3.20** The fire environment is defined as “the surrounding conditions, influences, and modifying forces of topography, fuel and fire weather that determine fire behaviour”.

### *Topographical Factors*

- 3.21** The Pigeon Valley fire occurred within the Tasman District, which is located in the north western end of the South Island of New Zealand. The nearest communities at threat were Pigeon Valley, Wakefield, Brightwater, Redwood Valley, Golden Hills, Teapot Valley, Eves Valley and Sunrise Valley. The area of origin is located on a flat piece of ground adjacent to forested slopes (Image 1). The topography of the fire area can be characterised as undulating, with moderate to steep slopes. Elevation of the fire ground ranged from 50 to 280 m above sea level. Slope steepness for the first day’s fire runs within the forested compartments ranged from 2 to 30 degrees.
- 3.22** The fire area is also situated in a convergence zone, where the north-east and south-west winds were observed almost daily to meet and swirl over the fire site, until one eventually dominated. Slope, combined with the wind and fuel type, also helped contribute to spotting and spreading the fire faster, over-riding the effects of down-hill slopes and gullies that would typically slow a fire’s spread. Surrounding valleys also contributed to funnelling of the winds and therefore the fire spread direction.

There were few barriers to fire spread during the fire’s initial run through forestry fuels. This included a few forestry roads, but these were not necessarily well aligned with the fire’s spread. The forestry roads were also easily breached by high intensity crown fires and spotting. There were no significant natural barriers to halt or slow the fires spread either.

### *Fuel Factors*

- 3.23** The fuels within the area of the Pigeon Valley fire can be divided into three main fuel types: grassland; native forest; and forestry plantation of various stages (including cutover, skid and bark sites) (Map 3).

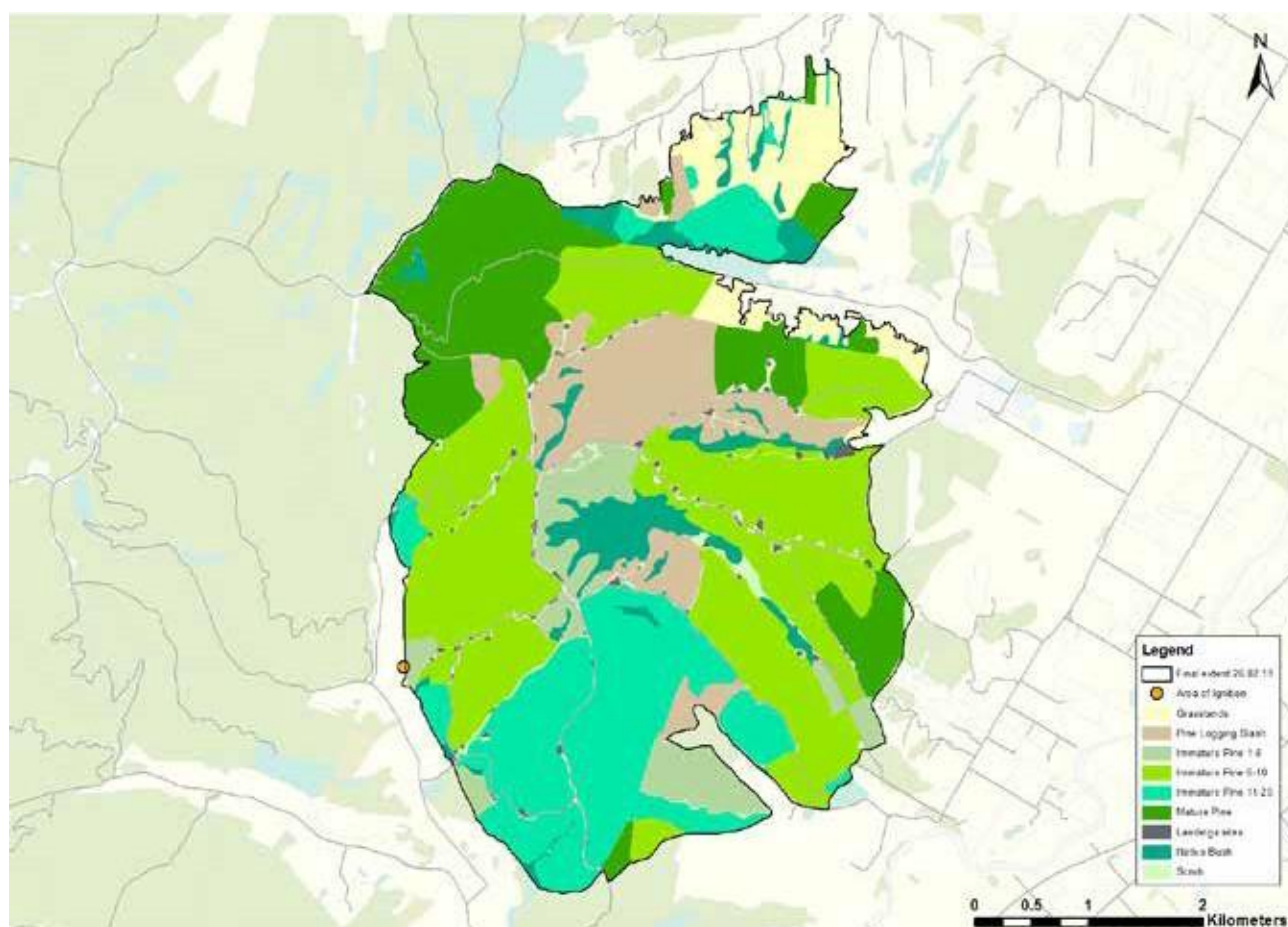
### *Pine Plantations*

- 3.24** Plantation forests were the main fire-carrying fuel type and accounted for 84% of the total area burned.
- 3.25** Cut-over areas had high volumes of woody residues left on site post harvesting. The forest cut-over areas contained flammable weeds (one to two years following planting) and high volumes of light, medium and heavy woody materials that were very dry. While flame heights may not have been as impressive as the forested stands, these areas burned very hot, and smouldered for days. These areas were also sites of more complete combustion.



Image 2: Area of origin (red circle) in open grassland, adjacent steep slope and forestry compartments. Source: Scion.

**Map 3: Distribution forest age classes within the area based on forest inventory data sourced from Tasman Pine Forest Ltd.**



At the time of the fire: Fuel loads were estimated to be about 70 - 80 t/ha (BUI of 125); Forward rates of spread were calculated at 750 m/h (assuming 10 km/h wind); Flame lengths approx. 8 - 9 m; Head fire intensities of 25,000 - 30,000 kW/m.

- 3.26** By the age of three years, much of the younger forest stands were overwhelmed by a thick continuous gorse understorey up until ages 10 years. The highly flammable gorse fuel that were present contributed to the severe fire behaviour and spread of the fire. These sites were also areas of complete combustion, although in some locations there were remaining stems present. At the time of the fire: Fuel loads ranged between 35 - 90 t/ha (BUI of 125 & gorse heights 0.5 - 2 m); Forward rates of spread were calculated at 1,000 m/h - 1,950 m/h (10 km/h wind, without & with gorse); Flame lengths approx. 6 - 10 m; Head fire intensities of 16,000 - 35,000 kW/m.
- 3.27** After canopy closure (forest ages of 11 - 20 + years), a layer of dead needles is suspended on the lower branches, providing ladder fuels to link the surface and crown fuel layers. Some areas had trial millennium stands, where the trees are tightly stocked and could also have the presence of regenerating pine trees from previous rotations, resulting in high stockings of over 1000 stems/ha. The dry, elevated fuel loads contribute to easy fire ignition and spread, and to high fire intensities including crown fires that are very difficult, if not impossible to control, especially in steeper terrain. Spotting, ground, surface and crown fire activity were all observed in these forest fuel types. Flame heights of 20 - 30m and spot fires up to 500 m away from the head of the fire were observed from the air.
- 3.28** On the ground, assessments showed that areas of mature pine were more subjected to surface fires, with complete removal of the litter and duff layers, and trunk burn patterns indicating flames up to one metre high. Trees that were scorched were showing signs of needle drop which was beginning to repopulate the forest floor by 18 February, presenting re-burn potential. Areas where deep underground smouldering of stumps and root material was occurring were identified early in the mop-up phase. These were typically sites of second and third rotation forests where there was more understorey fuel available, and therefore higher fire intensities. At the time of the fire: Fuel loads ranged between 25 - 35 t/ha (BUI 125; 11-20 to 20+ yr old pine forest), Forward rates of spread were estimated at 200 m/h (10 km/h winds, no slope); Flame lengths approx. 2.5 - 3.5 m; Fire type: surface and crown; Head fire intensities of 2,500 - 3,200 kW/m.

### *Native forest*

- 3.29** There were several pockets of native forest involved in the fire. Typically, native forests are found in the gullies or valleys within the forestry blocks as small pockets of remnant forest. These native areas are generally characterised by low flammability fuels that are a mix of tall beech and podocarp trees (averaging 20 m tall) with an understorey of litter, moss, bark, punky tree stumps, ferns and small shrubs. Field observations showed that the presence of low flammability vegetation types did slow or halt the head of the fire initially, but continued smouldering. However, these areas were not wide enough to stop the spread from spot fires. At the time of the fire: (using 10 km/h wind; FFMC 90.7; BUI 125, 0-degree slope): Fuel loads were estimated to be 30 – 40 t/ha; Forward rates of spread were calculated at 40 m/h; Flame lengths approx. 1.5 – 2 m; Head fire intensities of 650 - 750 kW/m.

### *Grasslands*

- 3.30** Grasslands were typically situated outside of the forest estate on the lower elevations and flatter slopes. The grass fuels in and around the ignition area were 90-100% cured, making it extremely easy to ignite and for a fire to develop quickly. Embers generated from a burning forest could also easily ignite new spot fires in these fine, flashy grass fuels. The heights of the grass fuels varied, ranging between 2 – 20 cm tall. These areas were typically grazed and kept short. After the major runs in the forest, the fire broke out into grasslands in Redwood Valley that were surrounded by homes and orchards. Overnight and into the early hours of the morning, the fire behaviour was reduced to a creeping fire around the homes. The fire in this fuel type was more easily contained or self-extinguished overnight as the weather conditions eased, although where fire encountered old man pines or pungas, or ran into gullies, considerable work was required by ground crews over the following week to ensure effective blacking out. At the time of the fire: Fuel loads were estimated up to 3 t/ha; forward rates of spread were calculated at 1,000 m/h; flame lengths up to two metres; head fire intensities approximately 1,000 - 1,600 kW/m.

### *Fire Weather*

- 3.31** In the lead up to the fire start (on 5 February), the region had already experienced 10 days of Extreme forest fire danger and 16 days of Very High (in the first 36 days of the year). The dry spell prior to the occurrence of the fires had contributed to the declaration by Fire and Emergency New Zealand of a Prohibited Fire Season (also known as a Total Fire Ban) across the Nelson and Tasman regions on 27 January. The closure of public access to recreational areas across the Tasman District was also declared due to the dry conditions and very high fire dangers. Warnings of the fire risk were advertised via newspaper articles, radio interviews and TV stories published in the lead up to the fire.
- 3.32** On the day the fire broke out, the fire dangers were Extreme for Forest and Scrub, and Very High for Grassland fuels (FFMC 90.7, DMC 95, DC 451, ISI 11.4, BUI 125 & FWI 37.8). The daily Fine Fuel Moisture Code (FFMC) was at its peak of 90.7 on the day the fire broke out and remained relatively high until rain fell on the 24 February (8.2 mm). The very high FFMC value is an indication that fine fuels are extremely dry and susceptible to ignition. The moderately high Initial Spread Index (ISI) and extreme Fire Weather Index (FWI) values also indicate the potential for rapid fire development, high fire intensity and significant control problems. In addition, a Code Purple forestry activity restriction level was in place, indicating to the forest industry a shutdown of the forest from 1pm each day.
- 3.33** The weather observations from Dovedale were regarded as a close representation of the weather conditions experienced at the fire site. This station was approximately 4 km away from the area of origin, and 2 km away from the fire's final extent. Over the 2018/2019 fire season, few significant rainfall events occurred. The last significant amount of rain that fell was on 26 December (5.4 mm). As a result, fine, medium and heavy fuels progressively dried out leading up to the fire start.
- 3.34** The day the fire broke out, minor amounts of rain were reported in the morning at many nearby locations (0.6 mm was recorded at Dovedale). The next major rain events occurred on the 24 February and 8 March (when 8.2 mm and 33.8 mm of rain fell, respectively). Further decent amounts of rain fell on the dates 9, 12, 13, 14, 27, and 31 March. These rain events aided in the fire's mop-up, significantly reduced any remaining hotspots along with a reduction in the fire weather codes and indices. This also resulted in the handover back to local resources and eventually back to the forest owners.
- 3.35** The high values of Duff Moisture Code (DMC), Drought Code (DC) and Buildup Index (BUI) components indicate the presence of high available fuel loads within soil organic layers and woody fuels, and the potential for deep-seated burning and mop-up problems. These very high/extreme levels of the moisture codes are amongst some of the worst ever recorded for the Nelson and Tasman regions, indicating the potential for any forest fires to become large and difficult to put out.

- 3.36 Recollections from first responders on the day the fire broke out, suggest that the conditions on the day were not that unusual or severe. Weather throughout the fire response was generally reflected in daily fluctuations between the prevailing south-west winds and north-east sea breeze, with the fire occurring right on the convergence zone of these two wind patterns. A light to moderate south-westerly wind was typically experienced overnight and into the morning with a change to a north-easterly in the afternoon. The strength of these winds varied between days, although overall the wind speed was not high for any period. During 5 to 13 February, daily temperatures at 12:00 ranged between 16 - 27°C. Relative humidity ranged from 30 - 81%. Wind speeds ranged between 6.8 – 17.6 km/h. Mop-up was prolonged and extensive, mostly due to the drought conditions and the fuel types the fire was burning in. During the response, there was no sign of rainfall relief until 24 February (19 days since ignition), and eventually significant rain fell on 8 and 9 March.

**Table 1: Weather and Fire Weather Index (FWI) System readings for Dovedale at 12:00 NZST (13:00 NZDT) on the first three days of the Pigeon Valley forest fire.**

	Day 1 5/02/2019	Day 2 6/02/2019	Day 3 7/02/2019
Temperature (°C)	24.9	16.7	18.4
Relative Humidity (%)	36	81	43
Wind direction (degrees)	249	13	43
Wind speed (km/h)	17.6	9.7	9.7
24 h Rainfall total (mm)	0	0.6	0
Days since rain >0.6 mm	22 (3.8 mm on 14 Jan)	0	1
Fine Fuel Moisture Code (FFMC)	90.7	83.7	87.2
Duff Moisture Code (DMC)	95	96	98
Drought Code (DC)	451	457	464
Initial Spread Index (ISI)	11.4	2.9	4.7
Buildup Index (BUI)	125	126	128
Fire Weather Index (FWI)	37.8	14.3	20.6
Forest fire danger class (FFDC)	Extreme	Moderate	High
Grass fire danger class (GFDC)	Extreme	Extreme	Extreme
Scrub fire danger class (SFDC)	Very High	Moderate	High
Grass curing (%)	90	90	90

## SUMMARY OF THE FIRE ENVIRONMENTAL FACTORS

- 3.37 The effect of topography on fire behaviour was significant in terms of the initial spread after ignition, and had a moderate effect over the course of the fires. Weather and fuels also played major roles. The contributing factors to the Pigeon Valley fire's speed, intensity and deep-seated burning underground were as follows:
- A deep-seated drought and a heatwave in the lead up to the fire's ignition.
  - Extremely dry forest fuel: *P. radiata* pine forest types, native forest; and highly flammable fuel types: gorse scrub and 90-100% cured pasturegrass.
  - Presence of second and third rotation forest fuels creating high available fuel loads and deep-seated burning.
  - Warm, dry and moderately windy conditions.
  - Moderate slopes: 22 to 33 degrees (40% and 65%), 15 degrees (over first 20 m).
  - Daily Fire Weather on 5 Feb. 2019 (Dovedale): FFMC: 90.7; DMC: 95; DC 451; ISI: 11.4; BUI: 125; FWI: 37.8; FFDC: Extreme; GFDC: Very High; SFDC: Extreme.
  - Hourly Fire Weather at 14:00 (Dovedale): FFMCh 88.0; ISlh 7.5; FWlh 28.6.
  - Recorded weather at 14:00 (Dovedale): Temp: 25.8 °C, RH: 34%, Wind speed: 16.9 km/h, Wind direction: WSW (250 degrees).

## 4 DISCUSSION AND RECOMMENDATIONS

- 4.1 In this section of our report, we provide discussion of each of the terms of reference that the Review worked to and make recommendations where we have considered it appropriate to do so. In a number of cases we have made observations on issues that we have not considered significant enough to warrant a recommendation: we encourage Fire and Emergency New Zealand to have regard to these recommendations to the extent that they can, in association with other actions they may be taking in response to this report or more generally as part of the process of building the organisation.
- 4.2 It is important to note that in those instances where we have discussed possible improvements that could be applied to future operations, this need not be read as a criticism of the way in which the fires were managed. Few reviews of fire and emergency incidents, working with the benefit of hindsight, would not identify learning points for the future and indeed this is one of the main reasons that reviews of this nature are commissioned. Our comments and recommendations should therefore be read in the spirit that they are intended, which is to support continuous improvement of the delivery of fire and emergency services both in New Zealand and beyond.

### RISK REDUCTION

- **Risk reduction activity during the fire season and whether that activity was adequate**
- **Any learnings that arise from risk reduction activity prior to that fire season, where it is believed that that activity mitigated the fires**

- 4.3 In general terms, when we refer to risk reduction, we refer to activities that reduce the risk – in terms of likelihood and consequence – of a particular natural hazard. In the context of the Tasman fires, the hazard in question is wildfire. There is a significant overlap between risk reduction and readiness, because good levels of readiness may be expected to mitigate the consequences of wildfires occurring. Recognising that, we have focused our discussion of risk reduction more on the broader policy and strategy approaches in place to mitigate risk on an ongoing basis, whereas in our discussion on readiness later in this report we will primarily consider operational readiness to respond to fire.

#### *Regional and tactical fire planning*

- 4.4 Extended drought across New Zealand had primed the landscape for fire in early 2019, with only 3-5 mm falling in January 2019 and the last significant rainfall recorded on the 26<sup>th</sup> December 2018. Fire and Emergency New Zealand had been active in advising the public that elevated fire danger conditions were anticipated for the Tasman region and on the 20<sup>th</sup> January all fire permits were cancelled. On the 27<sup>th</sup> January a Prohibited Fire Season was declared and a range of fire restrictions and community preparedness initiatives were implemented including the public access closure of all forests and high risk areas. A voluntary Code of Practice for the restriction of activities and forestry operations fire prevention guidelines was publicised accompanied by a TV and printed media campaign.
- 4.5 Despite this extensive engagement with the community by the Nelson Fire and Emergency New Zealand team, there was still a general impression among other stakeholders we met with that this event was a one off and a common comment heard by the Review was that *“it won’t happen again in my lifetime”*. Because of this feeling there appears to still be a reluctance, by some, to change the way they do things and to incorporate fire protection into their day to day business or home life. When a large landholder was asked by the Review what they would do differently in the future, the response was *“nothing”*. The concept of ‘Build Back Better’ did not appear to be evident among those external stakeholders that were interviewed during the review.
- 4.6 All of the people we met with from a range of forestry, farming and community backgrounds indicated that they were aware of the heightened fire risk in the period leading up to the Tasman fire. However their preparedness and knowledge about what this meant, and what actions they should take, varied considerably. There was a general lack of awareness within the Nelson and Tasman community around the risk, to them, of unplanned fire. This echoes the findings from the National Disaster Resilience Strategy<sup>4</sup> which found that the *“level of individual and household preparedness and awareness of risk in New Zealand is not as high as it should be given the risks New Zealand faces.”*
- 4.7 The lack of appreciation of fire as a risk in New Zealand is quite understandable given that the overall number of high fire danger days in any one season in New Zealand is generally low. Fire is often not considered as a major natural hazard in the New Zealand context. However, with climate change and the associated expected increase in temperatures and decrease in rainfall, this may become increasingly part of the New Zealand hazard landscape. To be prepared for this requires a pro-active approach to achieve joint ownership of the risk and a shared understanding with the community around fire prevention and preparedness.
- 4.8 If there is one high-level message that this Review communicates with the New Zealand public, we hope it will be that fires of this kind must be expected to occur more frequently in the future, and all stakeholders involved, down to the level of individual residents in fire-prone areas, need to prepare for that.

4 *National Disaster Resilience Strategy Rautaki ā-Motu Manawaroa Aitua*, Ministry of Civil Defence & Emergency Management, April 2019

- 4.9 The Review looked at the level of overall community and stakeholder preparedness and awareness. It appeared that much of the risk reduction undertaken around homes and businesses was undertaken when the smoke was already in the air – in one situation a major water supply tank (clad in timber) feeding water for fire protection to a large industrial facility was being cleared around and made safe as the fire was approaching. This is in contrast to more fire-prone locations in Australia, where individuals and businesses routinely conduct housekeeping activities around their properties in advance of the fire season and with a view to their own risk reduction.
- 4.10 We think that future Fire and Emergency New Zealand communication with stakeholders should focus on fire risk reduction to businesses and domestic properties being a shared responsibility undertaken routinely and not a periodic or seasonal activity. This will require jointly and cooperatively determined longer term preparatory planning for fires, feeding into a parallel process that embeds risk reduction practices into the community's normal operating systems. The Tasman District Council should be commended for undertaking a number of risk reduction activities in the days prior to the 5th February, such as closing Parks and Reserves; however we felt that more could have been done in the weeks and months leading up to the period of very high fire dangers that occurred.
- 4.11 During our discussions with stakeholders, it became apparent to the Review that Fire and Emergency New Zealand had previously commenced a formal risk reduction and strategic mapping process. This involved the development of "Wildfire Threat maps" to identify wildfire threats in each Region and District by looking at fire risks and values on a tenure blind basis. Detailed plans were then to be developed for the highest risk areas with key stakeholders involved in validation of these plans. These Wildfire Threat Maps were then to be used as Strategic and Tactical Fire Management Plans with the Nelson area being used as a trial for a possible roll-out across the whole of New Zealand.
- 4.12 This process commenced over 4 years ago; however we were informed that the process had stalled while a reconsideration of the process and approach was undertaken in the context of the change in overall fire management structure in New Zealand and the National Risk Reduction Technical Group ceased to operate.
- 4.13 The Review considers that the stalled Strategic and Tactical Fire Management Plans are an essential national element in Risk Reduction and preparedness to manage fire risk across the New Zealand landscape. Objective 15 in the National Disaster Resilience Strategy states the need to take a *"whole of Region approach to resilience by embedding key strategic objectives into regional plans and strategies."* We note also the discussion of Strategic and Tactical Fire Management Plans in the report into the Port Hills fire of 2017<sup>5</sup>, so that it is clear to us that the relevance of this type of planning has already been identified and understood in New Zealand.
- 4.14 To meet the intent of the National Disaster Resilience Strategy, the Review believes that Fire and Emergency New Zealand needs to take ownership and direction of a process to develop a national system. This system should require, enable and empower the Regions, in partnership with the community, to develop Regional strategic plans along with tactical implementation plans. These risk mitigation tactical implementation plans need to look at the local scale to provide property owners (from the householder through to the larger forest companies) the actions that they need to take responsibility for implementing around their properties as part of their combined community preparedness.
- 4.15 The Strategic and Tactical Fire Management Plans should cover the broad range of issues that are aimed to reduce the risk across the landscape. The plans would classify the vegetation, identify the high risk areas and then look at the opportunities to reduce the risk. They would also identify and document the stakeholders involved and the measures agreed to be implemented to mitigate the risks.
- 4.16 We also consider that more work could be undertaken to build on the awareness and pilot programs already being delivered by Fire and Emergency New Zealand. This process of regionally based strategic and tactical fire planning will bring Fire and Emergency New Zealand and the community together in a shared responsibility framework. It is acknowledged that for this suggested program to be successful into the future will require allocation of specific additional Fire and Emergency New Zealand resources.
- 4.17 It is important that private property owners should undertake the fire preparedness works that are identified as necessary as an outcome of planning processes. Adequate business insurance is an important part of the resilience picture but is not, without more, an adequate risk mitigation strategy. Fire and Emergency New Zealand should establish and coordinate collaborative forums for stakeholders to regularly meet throughout the year with the purpose of discussing and updating the activities that have or have not been implemented in line with agreed Region and District-wide fire preparedness plans.

#### Recommendation 1

Fire and Emergency New Zealand should develop and implement a nationally consistent framework for strategic and tactical fire planning, community education and risk reduction activity that engages all stakeholders including the New Zealand public as a whole.

## *Fire breaks*

- 4.18** An area of risk reduction, around the value of fire breaks, is worthy of specific mention in this section. The issue of fire breaks was a common discussion point with some people stating that they believed they serve no useful purpose. The strategic planning process proposed by the Review will provide an opportunity for Fire and Emergency New Zealand to reinforce with key stakeholders, the absolute need for good vehicle access and the value of having breaks of modified fuel in strategically pre-planned locations. There is a common misconception that the purpose of fire breaks is to stop fires, so that if a fire is likely to overwhelm a fire break they are seen as having diminished value. We consider that fire breaks should be seen as roads and trails that, if properly maintained and located, enable quick and safe access and egress for responding crews, areas from which to undertake indirect attack (back-burning) in the case of wildfire and areas that will assist in containing the spread of lower intensity fires; for this reason the appropriate planning and implementation of fire breaks in managed areas of vegetation should be viewed by relevant landowners as a priority and as part of their shared responsibility to reduce risk.

## *Fire restrictions*

- 4.19** Weather and climate are the key and arguably the most variable components of the fire environment, and weather is an essential determinant of fire behaviour and fire danger levels. Assessing the effect of fire weather on potential fire occurrence and fire behaviour, in New Zealand, is assisted by the use of the New Zealand Fire Danger Rating System (NZFDRS). The NZFDRS is used by Fire and Emergency New Zealand, and the forest and rural stakeholders, for a range of fire management activities and to also inform the public of prevailing fire danger conditions.
- 4.20** The current system of fire dangers in New Zealand involves Fire and Emergency New Zealand monitoring weather data which determine the following Fire Behaviour Indices:
1. Initial Spread Index (ISI) – index indicating the expected rate of fire spread by combining the effects of rain, wind, relative humidity and temperature.
  2. Build up Index (BUI) – index based on dryness of the total fuel profile and its availability to burn.
- Together these provide a Fire Weather Index (FWI) which is used as the general index of fire danger throughout the forested rural areas of New Zealand.
- 4.21** When the FWI and BUI reach (or are expected to reach) certain levels, as monitored by Fire and Emergency New Zealand fire managers, a Restricted Fire Season is declared. This restricted fire season then stays in place until it is removed or elevated to a Prohibited Fire Season by Fire and Emergency New Zealand based on any changes to the BUI and FWI. The setting of the restricted fire season is publicly notified and its implication is that it then requires a person to obtain a permit before lighting any unauthorised types of fire in the open air.
- 4.22** The Fire Behaviour Indices are continually monitored by Fire and Emergency New Zealand during the restricted fire season. Should conditions become increasingly hot and dry and the Indices continue to rise a Prohibited Season is declared which basically bans the lighting of all fires in the open air. This prohibition on the lighting of all fires is then in place for an extended period of time until the prohibited season is ended.
- 4.23** Fires however can and do start from various activities other than from direct lighting. Activities such as grass slashing, welding, grinding, chainsaw operations, tracked machinery operations and any activity involving ground engaging equipment can cause sparks which, on high to extreme fire danger days, will start fires. While the cause of the Pigeon Valley fire was out of scope for this Review, we understand that the identified likely cause is agricultural operations in a paddock of dry grass. The current rules around the prohibited season do not appear to cover this form of ignition.
- 4.24** Unplanned fire can have critical impacts on forestry and the forestry business. The Forestry industry is a major agriculture industry in New Zealand. It is the third largest exporter behind Dairy and Meat and expects to be the largest by 2025. The New Zealand forestry plantation industry employs over 20,000 people, covers 7% of New Zealand and has a gross income of over \$5 billion per year. Recent Government announcements have provided further investment into the timber industry of around \$50 million.
- 4.25** The Forest industry across the world is only too aware of its susceptibility to the impacts from unplanned fires. In recognition and response to the potential for fires to start from a range of sources, the Forest Industry in New Zealand has developed a voluntary Forest Operations Fire Risk Management Code. This Code contains a number of restrictions that are implemented by forest companies on their forest estate on days of extreme fire dangers including actions such as early day time cessation of machine operations, restriction on certain spark generating activities and an overall higher level of preparedness and awareness.
- 4.26** Although the responsibility for fire needs to be shared by all the community, the current Forest Operations Fire Risk Management Code remains voluntary and applicable only to the forest industry. From experience in Australia, and noting that the Tasman fire started externally to the forest estate, the Review considers that the restrictions covered under the Code should apply to all people and industry in the affected community.



Image 3: Fuel conditions at the time of the Tasman fires. Credit: John Moorhead

- 4.27** While speaking to Fire and Emergency New Zealand managers in the Tasman District, we were shown guidelines in development that were intended as a code for the elimination or limitation of heat and spark generating activities in periods of elevated fire danger. We commend this initiative, noting that it appears to have proceeded to date on a voluntary basis in that area only. We are of the view that there is a need for national guidelines in this space and that serious consideration should be given to making them mandatory.
- 4.28** It is not unreasonable to expect that all stakeholders (including Forestry) are required to refrain from specific activities that could produce sparks during a period of extreme fire dangers. On days of extreme fire danger, when a prohibited season has already been declared, Fire and Emergency New Zealand should have the capacity to set a total prohibition on all forms of spark producing activity and declare a Total Fire Ban that applies to the whole community. Total Fire Bans for the coming day should be declared based on the afternoon forecast and declared in 24 hour blocks. The declaration of a Total Fire Ban can be reconsidered, based on the afternoon forecast conditions, as to whether conditions dictate continuing declaration for the following 24 hours.
- 4.29** To allow business continuity, restrictions on activities through the declaration of a Total Fire Ban must be a day-to-day occurrence set the evening prior based on the latest predicted weather predictions. The declaration has to be made in a timely manner and distributed across numerous communication channels to ensure the community are fully aware of the risk and restrictions in place and have time to make adjustments to their business or activities.
- 4.30** The declaration of a Total Fire Ban, as currently practised in many Australian jurisdictions, is not taken lightly and is only used when the indices are predicted to reach significant levels of heightened risk. The Review heard a number of representations from businesses and the community around the impact that fire restrictions have on their ability for their business to continue operating. Whilst this is accepted as a valid concern and perception, business can and does continue during these periods of restrictions with modifications and adjustments put in place. The forest industry is possibly the most affected by such restrictions. However, through altering work patterns, working at night outside the peak fire danger periods of the day, or stopping work once the broadcast FWI reaches a predetermined level, any such impacts can be minimised.
- 4.31** As already discussed, although most people are aware of periods of high fire dangers the understanding of what actions are subsequently required is highly variable. By implementing 24 hour Total Fire Bans, as seen in Australia, there is a concentrated and heightened community awareness that the day is more than just another hot and dry day associated with the often drawn out prohibited season.

## Recommendation 2

2a. Fire and Emergency New Zealand should establish and promote a set of risk reduction guidelines/requirements around permitted heat and spark activities that relate to the community as a whole and not just Forestry.

2b. Fire and Emergency New Zealand should work to promote any changes required to legislation or regulations to develop a mandatory system of 24 hour Total Fire Ban days applicable to the whole community, to be declared by Fire and Emergency New Zealand based on predicted fire weather and associated risk.

## READINESS

- **Pre-planning undertaken regarding the fire season and whether that activity was adequate**

- 4.32 We have discussed under the heading of 'risk reduction' the issue of strategic and tactical fire management planning and community understanding of risk. In this section we focus on operational planning and its effects in facilitating the response to fire.

### *Pre-planned resource availability*

- 4.33 The context of the fires and antecedent weather conditions have already been set out in this report. Despite this acknowledged period of high to extreme fire danger levels the Review did not see clear evidence that the level of readiness of dedicated suppression resources reflected this situation.
- 4.34 It was clear that both Fire and Emergency New Zealand and the forestry industry in the Tasman District were on high alert during this period. Resource availability in the District was based on there being a duty officer incident controller and a logistics officer both on pager turnout 24/7, as well as the fire tower lookout to assist with logistics. Lists of IMT personnel by role and their daily availability were made up each week and kept by the duty officer, and these personnel could be activated by the lookout or duty logistics officer. An extra incident controller/operations manager from Canterbury was bought in over the weekend solely for standby. The urban duty officer from Nelson was also on 24/7 call and there was a list of silviculture crews' whereabouts for immediate turnout.
- 4.35 Under these arrangements, staff were available to respond immediately to the Pigeon Valley fire when it broke out, and two Deputy Principal Rural Fire Officers and the local Area Commander were on scene within a short time frame to coordinate the firefighting effort. We consider that these arrangements could be further refined and applied across New Zealand to reflect what is becoming standard practice in Australia, to have a formalised pre-determined resourcing matrix for elevated fire danger days, and resourcing levels commensurate with risk agreed and documented in advance to lessen the burden on fire managers dealing with fire starts and having to resource them appropriately.
- 4.36 On days of elevated fire dangers, the establishment of a predetermined daily readiness matrix allows for resources to be available and on dedicated stand-by in strategic locations spread across Regions. This matrix identifies the type, time, location and level of commitment required from various stakeholders, depending on the forecast Fire Weather Index and the fire danger, and can also include a communications plan for accessing resources when required. Such a matrix provides a ready reckoner for the standing up of assets such as dedicated IMTs, aircraft, ground resources and machinery.
- 4.37 We found that initial response from ground resources to the Pigeon Valley fire was prompt, and it was also possible to obtain aerial firefighting resources relatively quickly because they had been working in the Marlborough Region and were in the process of demobilising from there when the alarm was raised. There was some time taken to mobilise heavy machinery, which forms a major part of managing fast moving forest fires in steep and often inaccessible terrain. On elevated fire danger days it is desirable to have these pieces of equipment strategically placed, available and ready to respond immediately. It is also essential that any District has an on-call co-ordinator that has a full list and location of all dedicated and available resources to enable an appropriately weighted immediate response when required.
- 4.38 A robust and standardised approach to resourcing on days of very high to extreme fire dangers, that works irrespective of individuals, would benefit Fire and Emergency New Zealand across the country. The Review considers that there would be significant value in Fire and Emergency New Zealand establishing a national process to get Regional and District stakeholders together prior to the fire season to determine how resources can be made ready to ensure the appropriate mix of heavy plant, aircraft, ground resources and incident management teams are in place on days of high fire danger. Establishing resources on dedicated stand-by at the higher fire danger levels is not wasted effort if an incident does not happen: it provides an opportunity for essential training, familiarisation, testing of facilities and interagency interactions.
- 4.39 It is acknowledged that there are costs associated with having people and machinery on location at the work site in preparation for a potential fire start. There is however a significant reduction in associated risk by having these resources available for immediate response, and a well-constructed readiness matrix will balance resource to risk and work on the basis of an escalating level of resources on standby as fire danger indices increase. It is widely accepted by agencies across Australia that, on days of elevated fire dangers, the longer it takes for appropriate resources to respond to an ignition the less chance there is of timely containment and suppression. The one single action that provides the absolute best cost benefit ratio and overall return on investment is minimising of response times.
- 4.40 As described above, there was a list in existence in the Tasman District indicating the availability of local resource by role. We think that it would be helpful if such lists were, in advance of days of elevated fire danger, developed into an outline incident management team structure so that individuals are aware of their allocated role should an incident commence and also know who will be filling other roles in the incident management structure. This should be standard practice across New Zealand to provide initial capacity, resourcing and support prior to any escalation should a National team be requested.

- 4.41 The lack of a robust and consistent picture, shared by all stakeholders, of the location and type of resources that are available on any specific fire danger day could lead to confusion and ineffective use of available resources in the event of future large incidents. The importance of this issue will only increase further as the climate changes and New Zealand experiences an increase in the days where multiple and simultaneous emergencies might occur. Improved pre-allocation of resources on days of significant fire danger including IMT, aircraft and heavy plant on dedicated standby will assist in improving readiness.

#### Recommendation 3

Fire and Emergency New Zealand should introduce a policy that each Region develops a matrix of air, ground, incident management team and machinery resources that will be on stand-by at given forecast levels of fire danger, to include business rules about response times.

#### Aircraft

- 4.42 Aircraft are a considerable resource that is essential for fire suppression efforts in New Zealand. This section relates to aircraft with respect to readiness; further discussion around the actual operational use of aircraft on the Tasman fires can be found in this report under Response.
- 4.43 At the peak of the Tasman fires up to 23 rotary wing and 2 fixed wing aircraft were utilised in suppression activities. In addition to ensuring the safe and efficient operation of the aircraft working over the fire ground, the aircraft managers also had to deal with all the ancillary aspects of aircraft such as helipad locations, additional aircraft and fuel requirements.
- 4.44 The aircraft utilised on the first day of the Pigeon Valley fire included two helicopters that were known to be available in the Marlborough District under local arrangements and had in fact just finished working on a fire there. Arrangements in place at the time did not call for aircraft to be specifically on standby at Nelson. The calling in of additional resources was done from different locations and by different people, so that the coordination and tracking of what was present and en route to the fire was somewhat fluid.
- 4.45 Because of the expense of maintaining aviation resources in readiness to combat fire, different jurisdictions will manage this in different ways. We understand the reluctance of fire managers to expend significant sums on having helicopters on standby 'just in case' when no incident may occur. That said, the early availability of aircraft in conditions such as were experienced in the Tasman District in early February 2019 may be key to the effective early suppression of wildfires, particularly in the rural/urban interface. An example of this occurred on 8 February when aircraft from the Pigeon Valley fire were diverted to the new start at Atawhai, and managed to contain it very quickly despite its potential to burn into more difficult country and grow at least as large as the Pigeon Valley fire had done.
- 4.46 The complexity and expense of aircraft management and the difficult cost/benefit decisions that may have to be made make this an ideal subject for national coordination and budgeting. In our view, Fire and Emergency New Zealand could make significant improvements to aircraft management by establishing a national capacity to coordinate and manage all aircraft and associated suppliers centrally and strategically. Fire and Emergency New Zealand may wish to consider an approach currently undertaken in Australia where the procurement, contracting and Regional allocation of aircraft are managed on a national basis. Regions and other stakeholders can then add to this national capability where required.
- 4.47 The Review recommends that Fire and Emergency New Zealand take the first step of establishing a national air function. This new function would aim to efficiently and effectively contract and allocate appropriate aircraft in appropriate locations across the country. It would also allow the seamless sharing and moving of resources across the Regions when required to meet changing and developing demands, as well as co-ordinating the essential components of bulk fuel supplies and support services.
- 4.48 An additional advantage of centralising the coordination of aircraft nationally could be the development of an associated national tracking system for aircraft which would allow the Air Attack Supervisor to have instant, live and real time tracking of all aircraft on the fire ground. The associated national data base could be accessible to all aviation personnel on the fire ground and updated regularly to contain the latest information around aircraft type, availability, pilots and equipment available. A similar system operates nationally in Australia and discussions with the Australian National Aerial Firefighting Centre may be of value. This would provide significant safety benefits to Fire and Emergency New Zealand when managing and operating with aircraft and prevent aircraft self-deploying.

#### Recommendation 4

Fire and Emergency New Zealand should develop a national aviation management function.

## Data Sharing

- 4.49** Information flow, both in the planning and response phases of an emergency incident, is generally recognised to be of key importance. During our discussions with stakeholders it became obvious to the Review that issues were being experienced around data and data sharing capacity. It was highlighted to us by a number of different people that data sharing, data information and systems are an area where significant improvements can and need to be made.
- 4.50** Lack of the most recent data caused challenges to the IMT as they worked to gain control of the Tasman Fire. The data existed but the issue was how to access this from the various impacted stakeholders. The IMT subsequently found it hard to gain a single source of truth that everyone would work to at the same time and the Planning cell became frustrated at the lack of essential information such as basic maps showing access, water points and vegetation type.
- 4.51** As part of normal commercial forest operations, the forest companies have accurate and detailed maps of all their assets including age class, access roads, helicopter landing sites, water points and general layout. Major industry (such as sawmills) also have detailed digitally mapped information showing points of interest for emergency management such as water points, dangerous substances access and egress. Up to date formal assessments and documentation of these sites is critical to understanding the risk profile of the region; however obtaining this information during the Tasman fire was not easy.
- 4.52** Access to the latest natural and cultural heritage data is equally as important in fire suppression planning as basic structure and landscape mapping. All fire suppression operations must take into account, and be sympathetic to, the environment in which they are being undertaken. Access to the latest natural and cultural heritage layers of the area is essential to the IMT as tactics and strategies are determined. Lack of awareness and early access to this information can lead to catastrophic inadvertent, and often irreparable, destruction of these important natural and cultural sites.
- 4.53** We consider that it would be sensible for all Fire and Emergency New Zealand Regions to conduct an audit of what data they consider would be required to manage a significant incident (not necessarily limited to fire) within their area and then verify that relevant data sources are readily accessible. National guidelines could facilitate this process both as a checklist, and in order to provide a vehicle to promote lessons identified from previous incidents about data requirements and areas that require to be considered in pre-incident planning.

### Recommendation 5

Fire and Emergency New Zealand should develop national guidelines for pre-season data sharing between stakeholders, and Regions should be responsible for ensuring that they have identified key data sources to support operations and verifying that they will be readily available in the event of an incident occurring.



Image 4: Credit: Fire and Emergency New Zealand

### *Incident control ICT facilities*

- 4.54 In addition to the challenges around an apparent lack of a single, complete and updated dataset were the different operating systems used by industry, stakeholders and individuals within the IMT. There did not appear to be one common and consistent information and communications technology (ICT) policy leaving some operators trying to learn new systems whilst attempting to provide urgent support for the IMT. Some people we spoke to reflected that the data management systems in use at the incident control centre (ICC) were foreign to them and not consistent with what they were trained to operate within. The varying use of ARCMAP and ARCGIS is just one example of this inconsistency that currently exists across Fire and Emergency New Zealand and those that are required to operate in the IMT roles.
- 4.55 A single ICT system (which may be a framework made up of a standard suite of ICT applications), used nationally for Fire and Emergency New Zealand to manage incidents and emergencies, should be developed across all Regions in New Zealand. This will allow the common sharing of the most recent and up-to-date map data layers between forestry companies, industry, iwi, DOC and Fire and Emergency New Zealand whilst taking into account the sensitivities that exist around some of this data. People required to use this system can be trained in advance to ensure their proficiency and confidence remains current. Such a system would also allow for uniform standard templates to be developed, refined and updated to meet the needs of Fire and Emergency New Zealand and its operatives.
- 4.56 Intricately linked in with data sharing and common data systems is the connectivity of the ICC. The Review team was made aware that the ICT capacity at the ICC for the Tasman fire was far from ideal. Many people did not have access to appropriate computers, data terminals were not available and in many cases non-generic log-ins for external agency staff did not exist. This caused work-arounds including some data transfer via memory stick to overcome incompatible systems and the use of private email accounts. In the absence of any standardised system, people will fill the gaps with their own work around solutions. These quick fix actions all run the risk of data being compromised or lost and having data that is then not accessible to incoming shifts.
- 4.57 The Tasman fire incident control point changed locations no less than four times over the first four days with three changes of location in the first day. Some changes in location are inevitable as an incident develops from being controlled from the front line to a longer duration incident controlled from an incident control centre. However, inconsistencies in ICT provision risk causing lost time, confusion and possible lost data at the most critical time of the incident. Pre-planning around the connectivity of the ICC will also assist to ensure the actual location is suitable for an ongoing large incident over a period of time.
- 4.58 We suggest that in conjunction with recommendation 5, nationally consistent guidelines are developed and that all possible future ICC locations are identified, tested and endorsed prior to the established fire season. This identification, testing and endorsement of ICC facilities should form part of the Fire and Emergency New Zealand annual readiness actions and utilise IMT exercises to audit and check compatibility. Local exercises for the establishment of IMTs are ideal to test connectivity and working spaces within the pre-identified ICC locations.

### Recommendation 6

Fire and Emergency New Zealand should develop guidelines for proposed ICC locations, functionality and connectivity, to include a single ICT system to be used across all locations. ICC locations should be tested and endorsed prior to each season.

## RESPONSE

- **Firefighting operations and performance on-the-ground (including: the initial and extended responses; the attraction, deployment and support of surge capacity; the effectiveness of handovers; the effectiveness of aerial operations; and the capability and capacity of Fire and Emergency New Zealand to respond to other incidents)**

- 4.59 The chronology of the fires has already been set out in section 3 of this report, and we do not consider that it would add value to analyse those events in detail and pass detailed comment on frontline operations. Fire and Emergency New Zealand has undertaken a series of debriefs in which many of those operational issues have been ventilated, and lessons captured to support continuous improvement. In the context of this review we have sought to identify and discuss what we see as key strategic learnings from the response in the context of this term of reference.

### *Predictive services*

- 4.60 The field of fire prediction and consequence management has developed in recent years to the point where the role is an essential element in any wildfire IMT. We consider that ideally, an IMT for a significant vegetation fire would have at least one qualified and equipped fire behaviour specialist, supported by a fire behaviour analyst focusing on long term planning. This resource needs to be supported by field observers and a situation officer working in the IMT.

- 4.61 The Review identified some good practice at various stages of the Tasman fires in this regard, but our impression was that there was not a consistent approach to the utilisation and support of the predictive services function between NIMTs. This was highlighted in one case where we were informed that the fire behaviour analyst was removed and reallocated to provide assistance with resourcing within the IMT, leaving the role unfilled.
- 4.62 Upon further investigation it became evident to the Review that the number of trained and experienced Fire Behaviour Analysts available to Fire and Emergency New Zealand, with the capacity to operate, run and interpret Prometheus<sup>6</sup> in a timely manner, falls short on occasion, with personnel who are trained in this skillset often not being well-utilised. Training in this important area has been limited across New Zealand over the past three years and this has now led to a skill shortage of suitable Fire Behaviour analysts that can effectively and efficiently operate the fire modelling system. The Review considers that Fire and Emergency New Zealand should build on its cohort of trained, skilled and experienced Fire Behaviour Analysts and ensure that they are available on a national roster during the fire season, to support the predictive capacity within the regional and national IMTs, and we reflect this in our broader recommendation on NIMTs below.
- 4.63 During the Tasman fires it appeared to us that some strategic decisions were being made without the benefit of up-to-date modelling and options analysis to underpin the suppression and consequence management activities that the IMT was undertaking. The importance of managing the consequences of events for the community and the environment, as well as managing the hazard itself, is now well-recognised by emergency managers: effective consequence management depends in turn on adequate and reliable intelligence to allow incident managers to make sound, evidence-based decisions.
- 4.64 The Review has no doubt that the decision to evacuate Wakefield was the correct decision based on the information provided to the Nelson Tasman Emergency Coordination Centre from the IMT. On two occasions after the first day relative humidity fell below 40%, which combined with other weather conditions was conducive to spot fire activity. Police had given advice that five daylight hours' notice was required in order to conduct an orderly evacuation of Wakefield which inevitably meant that predictions had to be made for likely scenarios well in advance. The Review did, however, consider that the requirement for ongoing monitoring and fire prediction services to support a decision to allow the residents of Wakefield to return as soon as possible could have been given greater prominence and this may be a reflection that New Zealand capacity to sustain ongoing fire prediction operations was challenged by the extent of this incident.

#### *National Incident Management Teams (NIMTs)*

- 4.65 A major part of any emergency response agency's Readiness and Response is having high level trained and skilled management teams in place that are ready to activate at short notice to manage any major incident that may occur. New Zealand is well served in this area of high level pre-identified Incident Management Teams and has been since 2001 when the then National Rural Fire Authority established preformed NIMTs to manage wildfires across New Zealand. These teams have operated effectively since that time; however the Review has concluded that the approach is now due for a refresh and review. The bringing together of fire agencies across New Zealand into Fire and Emergency New Zealand offers an opportunity to review and revisit the NIMTs, their composition, training and (given the expanded mandate of Fire and Emergency New Zealand) their role in the wider management of all incidents.
- 4.66 Based on discussions with a number of stakeholders that we spoke to, and on documentation from after-action reviews held across the country, it has become apparent to us that the operation of the individual NIMTs has tended to diverge over time. The operating systems within the NIMTs has now got to the point that each team operates in separate ways utilising different systems and processes. We concluded that resourcing of the individual NIMT team positions has not been reviewed for some time and has not kept up with advances in critical areas such as resources, fire prediction and consequence management.
- 4.67 Without exception, all members of NIMTs who were interviewed showed a high level of dedication and enthusiasm to the team in which they operated and there is no question of their passion to be actively involved. The Review was however made aware of people temporarily back filling roles that they were either unfamiliar with or not as skilled as they could be for a complex wildfire incident. In several instances we were informed that this was the first time an individual had filled the role in an IMT, let alone in a NIMT. This also reflected other comments made to us about the way in which some functions were managed within the NIMTs during the incident and that some positions were actually not filled through lack of available people.
- 4.68 The idea and concept of NIMTs is used in other countries around the world and is sound and seen by many as best practice. Effective NIMTs consist of experienced, trained and highly skilled members who can operate at the largest and most complex incidents. The challenge for New Zealand lies with maintaining these skills, maintaining membership and having appropriate people available to fill the roles required who are not only capable but also skilled, trained and experienced.

6 Prometheus is a computer program used to simulate fire spread based on given weather and fuel conditions. It requires trained and skilled operators to run successfully

- 4.69 The shortfalls experienced in the staffing of NIMTs around the Tasman Fire was exacerbated by the long duration of the incident, and it indicated that there is a lack of higher level IMT surge capacity. Fire and Emergency New Zealand was also challenged by the fact that it had deployed NIMT members to Australia to assist with fire management there. The lack of depth across New Zealand for trained and experienced people to fill the roles on the NIMTs became more obvious over time as each new NIMT had to borrow people from other teams to fill roles and maintain full functionality. This had a cascading effect resulting in some situations where people from outside the trained and skilled pool of NIMT members were being asked to step up as vacancies opened and could not be filled. The possibility of multiple simultaneous incidents associated with a warming climate will make this situation worse if it is not addressed.
- 4.70 The Review was informed that while annual national training has been undertaken in New Zealand for NIMTs, there have been limited training courses available for individual roles for at least the last 10 years. The Review was also informed that NIMT members have been requesting this type of training at a number of national annual forums. We believe that the training of NIMT members, who are expected to take on the management of the largest and most complex incidents, is an area that requires immediate and significant investment.
- 4.71 Fire and Emergency New Zealand is now an organisation containing a combination of people with highly developed Urban and Rural skills. Fire and Emergency New Zealand is establishing a new future for fire and emergency management in New Zealand and the time is right to re-visit the construction, number, location, make-up and role of the NIMTs. With access to a larger and diverse group of personnel with advanced fire, leadership and management skills, the base membership of the NIMTs should be broadened. The inclusion of appropriate people from partners such as DOC, the forest industry, SCION, iwi, emergency management and others can all help to build and strengthen NIMT capability.
- 4.72 In addition, the process of inclusion of other stakeholders into the NIMTs will help to embed a shared responsibility and build and encourage shared accountability and engagement, including reducing cultural boundaries. To ensure ongoing utilisation and skills maintenance of the NIMTs they should be considered as all-hazard IMTs operating across all hazards and risks throughout New Zealand and abroad. This would further enable a broader and more diverse membership bringing a range of appropriate skills to the team and allow for surge capacity and succession planning into the future.
- 4.73 The Review concluded that there is a need for Fire and Emergency New Zealand to develop a detailed internal policy around NIMTs, membership and expectations. A number of people commented how their normal work area within Fire and Emergency New Zealand restricted their involvement due to competing business needs. This had cascading impacts with short shifts (a 2 day deployment was reported), increased churn within the team and in some instances vacancies within the team that could not be filled. Business as usual is an important consideration, and one that Fire and Emergency New Zealand needs to consider in their business continuity planning; however Fire and Emergency New Zealand cannot afford to have people they have trained and developed over time, to then not be available when called upon. A comment made by one interviewee is worth repeating here in this report – *“Incident Management is business as usual.”*
- 4.74 The Review considers that a detailed and comprehensive training regime with an ongoing currency validation process is required to ensure that the high level NIMT members attain and maintain the skills required of the position. The first part of this training regime could be for Fire and Emergency New Zealand to undertake a stocktake of what they have at the moment and then look at a national training needs analysis for IMT members. This would then guide the priorities for future fire management training within Fire and Emergency New Zealand.
- 4.75 New Zealand have benefitted greatly from the great foresight shown by senior National Rural Fire Authority people in the past in establishing overseas agreements with the US, Canada and Australia for the exchange of firefighters and IMT members. New Zealand continues to maintain strong involvement in the Forest Fire Management Group overseas study tours where future leaders can investigate fire related systems and processes utilised in other countries. The Review supports these initiatives and skill enhancement opportunities and suggests that they should be continued and built upon with further opportunities investigated. Additional opportunities around possible Fire and Emergency New Zealand IMT involvement during the large annual national prescribed burning program in Australia is one example where important wildfire skills and experience could be gained, developed and enhanced.

#### Recommendation 7

Fire and Emergency New Zealand should undertake a comprehensive review of the National Incident Management Teams and their processes, operating policies, training and membership including an increased focus on predictive services capacity to support fire suppression and consequence management.

### *Training in wildfire management*

- 4.76** The Tasman fires utilised resources from a wide range of locations and partner agencies. However it was clear to the Review that many of those people who were involved did not have familiarity with the wildfire management environment. People on the fire ground came from a range of backgrounds (rural and urban) and were asked to undertake activities that they were not practised in. While a part of this issue was the lack of a structured resource ordering system (discussed in detail later in this report) there was also clear evidence that many Fire and Emergency New Zealand and partner agency personnel lacked training in vegetation firefighting techniques. This type of training is essential for personnel who are going to undertake a fire line suppression or supervisory role.
- 4.77** Throughout a number of discussions we gained the impression that the level of training required to be safe and effective in wildfire suppression is not always understood. It needs to be understood by everyone involved that experience in extinguishing small scrub fires with water is not an adequate preparation for tackling large-scale vegetation fires. By way of a benchmark, in Australia at least 60 hours training in wildfire suppression is required at recruit level for wildfire qualified firefighters (on top of the many additional hours required in general safety, navigation and firefighting), and a further 80 hours specific wildfire training is required to qualify as a wildfire crew leader<sup>7</sup>. It can be seen from this that obtaining a sound understanding of wildfire suppression is not a matter of undertaking a weekend course or similar, and the depth of training and practice required should be factored into training schedules and pathways for all firefighters who may be tasked to manage large-scale vegetation fires in the future.
- 4.78** Land management partners play a key role in fire management in New Zealand. Invariably they are involved in all larger vegetation fires as their asset is either threatened or is actually burning. Forest owners and Department of Conservation (DOC) have a ready resource of trained and fit personnel with experience and local site knowledge that is invaluable during any incident. As such, they are a significant asset that the Review considers should continue to be utilised as part of New Zealand's core vegetation fire management capability.
- 4.79** To effectively and safely utilise land management personnel requires a concerted approach to their training and development. The winter period is an opportunity for these workers to be asked to focus on wildfire management training and skills maintenance to national standards. Land management workers often move around the industry throughout New Zealand, and training to a national standard provides confidence to any Region when utilising this work force. The Review considers that there is a real opportunity for Fire and Emergency New Zealand to capitalise on this available work force by developing formal agreements to provide assistance with fire related training and equipment.
- 4.80** The issue of fire break construction during the Pigeon Valley Fire was a very sensitive issue and was raised on many occasions by a range of those stakeholders who were interviewed. We have already mentioned in this report the importance of these breaks and the need to have effective regional fire plans in place, incorporating fire breaks, as part of overall risk reduction activities. However there is always the need to establish new trails or upgrade old containment lines when dealing with large forest fires. This is a legitimate and essential part of fire suppression, but effective and environmentally conscious implementation of these breaks requires training and a good understanding of wildfire and the environment.
- 4.81** The Review was informed that many of the plant managers and plant operators on the Tasman Fire had no formal training in the placement of fire breaks or wildfire suppression training beyond a basic introduction to wildfire, and had never been involved in any previous form of large fire suppression operations. In addition they appear to have had little training or recognition of the importance of targeted communication with landowners before containment lines are constructed across private land. Many landowners and people within the local community critically questioned the placement of some of the containment lines as they were not made aware of the wider fire suppression strategy.
- 4.82** While it is acknowledged that the plant managers did an outstanding job of managing many heavy machines for very long periods of time, we were concerned that they had not been provided with the required background knowledge, training and experience linked to fire behaviour, ecology, heritage, forestry, and agriculture. This resulted in issues relating to the first days of fire break construction that could have been avoided. These issues were managed effectively once the Field Operations Manager was in place, but by that time many of the trails had already been constructed.

- 4.83 The Review considers that there is a need to increase wildfire training for the many different fire ground roles, and a standard policy requiring a given level of wildfire training before becoming involved in these operations would help to set benchmarks and provide clarity. Equally, identifying opportunities to gain practical wildfire experience in Australia and North America should continue to be a goal for Fire and Emergency New Zealand, whether through the current regime of resource sharing, or collaboration in planned burning activities.

#### Recommendation 8

Fire and Emergency New Zealand should review wildfire related training requirements across Fire and Emergency New Zealand and key partner agencies, and identify national requirements for standard wildfire training for personnel in all roles (including fireground support roles such as plant manager).

#### *Incident control systems*

- 4.84 It was reported widely during the review that there was confusion over terminology used on the fire ground. This led to misunderstandings around the roles and responsibilities of various people on the fire ground and ultimately on their effectiveness.
- 4.85 New Zealand emergency management agencies, including Fire and Emergency New Zealand, currently use the New Zealand Coordinated Incident Management System (CIMS) as their incident control system (ICS). The use of ICS has become mainstream in Australasian and North American emergency management agencies since its origins in the 1970s (which themselves date back to earlier military concepts of functional management). ICSs vary but typically adopt the concepts of command and control, functional management, management by objectives and span of control in their doctrine.
- 4.86 Australian fire and emergency service agencies use the Australasian Inter-service Incident Management System (AIIMS) for the management of incidents. AIIMS has been developed by fire and emergency services, with input from New Zealand, and is similar to the North American National Incident Management System (NIMS).
- 4.87 While AIIMS and CIMS are recognisably related, there are differences between the two. CIMS has a wider focus on incident, local, regional and national arrangements (which is entirely appropriate for a government-sponsored document) whereas AIIMS goes into more detail about the key tasks and outcomes required of functional roles at an incident level as befits a document that has been developed with an incident management emphasis in mind. AIIMS has a substantial body of supporting material including accredited training courses and checklists that are available to practitioners including Fire and Emergency New Zealand.
- 4.88 In the course of this Review, we heard from a number of different fire managers that there was an appetite within Fire and Emergency New Zealand to adopt AIIMS as its preferred ICS because they considered it to be a more effective ICS for their work. These comments were based on significant experience by these people in managing large-scale events in North America and Australia while on deployment from New Zealand. We note as well that this was a recommendation of the Port Hills review.
- 4.89 While considering the way in which the Pigeon Valley fire in particular was managed, we identified a number of ways in which the implementation of AIIMS might have assisted. The first was around sectorisation and span of control. While span of control is recognised by CIMS as a key principle, AIIMS goes into more detail about how span of control is to be maintained, particularly in the Operations function.
- 4.90 Without going into lengthy operational detail, we are of the view that there were issues around the way the Pigeon Valley fire was sectorised (divided into different geographical areas for management purposes) and the use of divisions; we concluded that there were at times serious issues with span of control, with a sector commander identified on one occasion as having greater than a 1:12 span of control (1:7 is considered the top bound and 1:5 much better for an event such as a wildfire); and the concept of strike teams/task forces (groups of five units led by a strike team or task force leader) was not embedded, exacerbating span of control and resourcing issues.
- 4.91 AIIMS also describes in more detail how aviation management and plant management is embedded into an incident management structure. In the view of the Review, it provides a clearer statement of the principle of unity of command, where each person in the incident management structure has one, but only one, manager, and it is clear that decision-making power lies with the incident controller. There was a recurring theme in conversations we had that the mobile Command Unit at the Pigeon Valley fire seemed at times to be operating as an incident control facility (to the point of operators wearing vests identifying themselves as incident controller). Under the AIIMS structure it would have been clearly understood by all that the Command Unit is a physical facility but that decision-making power rested with the incident controller back in the relevant incident control centre, transmitted down through a chain of command of operations officer, divisional commander (if any) and sector commander.

- 4.92 We are not suggesting in this discussion that CIMS is not fit for purpose and to the contrary, as noted above, it is recognisably related to AIIMS and NIMS. Where we consider that AIIMS may add significant value is that in its development over the past 20 years, it has been through a number of revisions with significant input from operational experts going into each one. This has established it as a rich resource for incident managers based on lessons identified, and significant research into the practice of incident management. Another peripheral benefit of AIIMS is that as the ICS used by all Australian fire and emergency service agencies, sound knowledge of AIIMS makes it easier to fit into Australian incident management structures in the event of a deployment.
- 4.93 For all these reasons, we endorse and repeat the recommendation of the Port Hills Review that Fire and Emergency New Zealand should embed AIIMS as its preferred ICS. Not only would it be out of scope for us to recommend this for any other New Zealand agency, we do not think that that is necessary. We think that more senior Fire and Emergency New Zealand managers would require to be 'bilingual' in AIIMS and CIMS anyway, and there are very few points of difference between the two systems that would actually make the practice of AIIMS inconsistent with CIMS – it is important for officers such as the incident controller and public information officer to understand how they fit into New Zealand national arrangements, but there is no reason in our view why Fire and Emergency New Zealand cannot practise AIIMS within the agency and still fit into the higher-level CIMS framework where this becomes necessary by reason of the nature or scale of the incident being managed.
- 4.94 We have already referred to the extensive training materials available for AIIMS, and by extension opportunities to attend training courses in Australia based on AIIMS roles may prove of value for NIMT members and others.

#### Recommendation 9

Fire and Emergency New Zealand should embed AIIMS as the preferred internal incident control system for the management of its incidents. Personnel who interface outside of Fire and Emergency New Zealand with one or more agencies including the broader emergency management arrangements should retain an understanding of CIMS management structures and liaison and reporting requirements so they can operate in that capacity when required.

#### Resource management

- 4.95 The effective and efficient tracking of resources (people, machinery and aircraft) on any fire is challenging with the situation in a state of constant change. It is however crucial for planning, logistical and safety reasons. The Review acknowledges that the Tasman fires had many different facets making this task challenging: however we have concluded, following extensive discussions and feedback on the subject, that a lack of any systematic Fire and Emergency New Zealand process for the management of resources made the task much harder. Despite the efforts by those people assigned to Resources and Logistics within the various IMTs, the Review formed the view that, regardless of which NIMT was in place, resource management was not mastered until very late in the incident.
- 4.96 The Review has considered relevant files and paperwork and spoken with a range of people and we are of the opinion that the Incident Action Plan (IAP) for the first 10 to 12 days did not accurately represent the resources on the fire ground. There was never a common agreed picture of actual resources, what was arriving and what was leaving. These issues experienced around resourcing caused increased and unnecessary frustration and stress to all involved and has resulted in financial reconciliation challenges that are still ongoing five months later.
- 4.97 The Review considers that the lack of a national Fire and Emergency New Zealand resource tracking and availability system caused extensive undue and unnecessary workloads and exposed Fire and Emergency New Zealand to a multitude of Workplace Health and Safety Issues. It is a safety critical issue for incident managers to know who has been allocated to the fireground on any particular shift so it can be confirmed that they have arrived, are being adequately supervised, and have safely demobilised at the end of a shift. When we heard comment to the effect that incident managers did not have a clear view of what units had been assigned, this was an immediate cause for concern. The Review was informed that the issue of the lack of accurate resource tracking became so prominent during the fire suppression effort that, at one stage, the IC took himself off-line to try and gain a better understanding of what resources were on the fire ground. This in itself was not ideal and could have compromised the continuity of operations.
- 4.98 We understand that resource requests for the Pigeon Valley fire in particular were being made through multiple channels using differing terminology. There was little coordination, which resulted in confusion over accountability for resource ordering and tracking between the ICC, Regional Coordination Centre (RCC) and the National Coordination Centre (NCC). Some areas within Fire and Emergency New Zealand went well outside their role and responsibility and the Review was informed of a number of cases where resources were sent that were never requested or required, while other resource orders requested by the IMT went unfilled without proper justification being given.
- 4.99 Our assessment of the position as a whole was that there was a lack of clear consistent doctrine on whose responsibility it was to assess resource needs and order resources; and beyond that, there was lack of clarity

at regional level about the status of resource requests and whether, in effect, it was at the discretion of Regions to decline to fill them or take a different view about what was needed.

- 4.100** An effective resource management system will include the components of a single point of truth for assessing resource needs and issuing resource requests; a process for those requests to be received and collated and the availability of appropriate resources to be identified; standard descriptors for resources and a standard length of deployment; and a process for movement orders to be communicated to the required resources and then their movement through the system be tracked until they are received by the requesting incident management team. Where a resource request cannot be filled from one particular region, there needs to be a process for other regions to be requested to provide them. We are of the view that the systems and standard operating procedures required to underpin an effective resource management system were not in place, and this is an area that Fire and Emergency New Zealand should develop.
- 4.101** Issues were also encountered with the management of resources arriving and departing from the fire ground. The Review was told of the arrangements in place for signing resources in and out, and it appears that a mobile facility was available to support resource management at the location where the mobile Command Unit was set up and resources were being mustered. The impression we got was, however, that there was no systematic staging area management that would have supported the accurate tracking of personnel and equipment being tasked to operational activities. We consider that formal staging area management is an integral part of resource management at a large incident, and we would encourage Fire and Emergency New Zealand to investigate the way in which this function is carried out in other jurisdictions and develop a cadre of trained staging area managers who are able to apply systematic methods to the managing of resources inwards and outwards on the incident ground.
- 4.102** A further issue that we encountered in relation to resource management was that of self-deployment of resources. This term refers to a situation when individuals or units respond to an incident without having been tasked to do so through official channels. Self-deployment can lead to negative outcomes in terms of awareness of what resources are actually at the incident; over-supply of particular kinds of resources; or depletion of strategic reserves that incident managers may believe are available to be assigned to other incidents or to work on the incident later on, but are in fact not available because they are at the incident.
- 4.103** Self-deployment can occur with the best of intentions, and we heard one particular account of a resource that self-deployed because they believed that there was a capability gap that needed filling, and they were in fact correct about that and were able to do good work. That does not, however, mean that self-deployment should be supported or expected to happen in the future. The likelihood of self-deployment is reduced significantly if all personnel are aware of the official channels and authorising environment for ordering and tasking resources, so that there is no ambiguity about whether they have been officially requested or not. Resource readiness matrixes, of the type recommended earlier in this report, also help by providing confidence that there are no resource gaps if a major incident starts.
- 4.104** We do not think that any value would be added by Fire and Emergency New Zealand trying to identify who may have self-deployed on this occasion and seeking to counsel them over that: what we do suggest however is that in developing standard operating procedures for resource ordering and tracking, Fire and Emergency New Zealand should actively seek to develop a culture in which self-deployment is recognised as being undesirable.

#### Recommendation 10

Fire and Emergency New Zealand should develop systems and standard operating procedures to support a national resource ordering, tracking and availability system, to include developing a cadre of trained staging area managers.

#### *Aerial operations*

- 4.105** The Review is aware of comment that has been made outside the Review process in relation to the use of aircraft in operations on the Tasman fires. We were accordingly keen to understand the basis on which aircraft had been ordered and used, and the level of analysis that underpinned aircraft operations.
- 4.106** The use of aircraft for firefighting has become much more prominent in Australasia over the past 5-10 years. It is a common experience that increasing amounts are spent on fire aviation: a comparison of the numbers and types of aircraft deployed in Tasmania in major fires in 2013, 2016 and 2019 will bear this out.
- 4.107** Aircraft can be a critical tool in managing vegetation fires, and increasingly there is a public expectation that all available methods will be used in fire suppression. We do not question the use of aircraft at the Tasman fires, and we also recognise that in the early stages of a fire it may be an inexact science working out how many aircraft should be ordered and how they can successfully be deployed. It does however need to be recognised that on days of extreme fire danger, the fire behaviour is such that controlling a head<sup>8</sup> fire with aircraft is very unlikely until conditions change to a low intensity fire environment.

8 The head fire is the side of the fire having the fastest rate of spread (US Forest Service definition)



Image 5: Credit: Fire and Emergency New Zealand

- 4.108** It is important for incident managers to consider, when ordering aircraft, what the strategic plan is; what the aircraft will do and whether there are any other options available; and regardless of the need for aircraft, some financial tracking needs to be carried out in order that incident managers should be aware on a day to day basis what aircraft are costing.
- 4.109** Numerous aircraft were utilised on the Tasman fire suppression efforts. By the time the first NIMT was in place on the second day, there were 23 helicopters and two fixed wing machines operating on the Tasman fires. The sole initial Air Attack Supervisor (AAS) was managing all these aircraft in the developing stages of the Tasman fires and his focus was correctly on maintaining safe operating distance between aircraft. The Review was informed that this initial attack mode operated for the first three days during which the AAS was trying to gain some organisation around the aircraft usage.
- 4.110** It appeared to the Review, however, that through no fault of the Air Attack Supervisor, these aircraft were operating with minimal strategic direction. With no established tactics or aerial firefighting section of the IAP to work to, they were effectively alternating from one flare up to the other operating with minimal ground support and trying to focus on placing water on the head fire. It is well known that aircraft will not usually extinguish a fire on their own and they are most effectively employed working on joint suppression strategies with ground resources. It is also acknowledged that a head fire attack on extreme weather days is ineffective. Without ground crews working in unison the use of aircraft becomes even less effective and may provide a questionable return on expenditure.
- 4.111** During interviews, we were provided with reports and photographs indicating that much of the initial bucketing was being ineffective in the overall context of the fire suppression effort. Actions being undertaken did not obviously match the tactics required to meet the IC's strategic intent. Air resources on the Tasman fire still remained at 23 up to the 6<sup>th</sup> day of the fire when they were reduced to 10.
- 4.112** Consideration of incident action plans for the Pigeon Valley fire did not demonstrate a clear justification for the use of aerial resources or explain, in the context of the fire as a whole, how they were being tasked and why. The Review was also made aware of a number of non-strategic air activities involving repeated aerial inspection of the fire ground by a range of personnel and media.
- 4.113** The large numbers of aircraft did however allow the Air Division Commander (ADC) to rotate the aircraft and pilots. The pilots were operating in a high pressure and high risk environment and the ability for the ADC to shut down 2 to 3 aircraft at any one time was an effective means of resting pilots with no adverse impact on fire suppression activities.
- 4.114** We wish to be clear that we do not question the skill and professionalism shown by the aircraft pilots in undertaking operations, and as noted above we are not challenging the use of aircraft by the AAS and ADC at this incident – it was clearly appropriate to do so. Clearer contemporaneous analysis of what aircraft were required to do that could not be done from the ground; how aircraft were tied in with ground resources to achieve joint objectives and generate synergies; and some options analysis around what would have happened if aircraft had not been used to the extent that they were, would have assisted in a retrospective judgement about whether aircraft were being used efficiently at this incident, or not.
- 4.115** Questions about when to use aircraft for fire suppression, and how to do so cost-effectively, are by no means unique to New Zealand, and the Review is aware of ongoing discussions in Australia around ways in which judgements about aircraft use might be best supported. We encourage Fire and Emergency New Zealand to reach out to Australian fire suppression agencies to take part in those discussions, and the establishment of a national air function for New Zealand, responsible for policy as well as operational management of aircraft, would be a valuable step towards refining the use of aircraft for firefighting in New Zealand.

## *Plant and machinery*

- 4.116 The use of heavy plant and machinery is a fundamental part of fire suppression operations and like aviation, is an expensive component of suppression. Containment lines need to be enlarged or implemented in strategic locations to meet the objectives as stated in the IAP. Heavy plant use must however follow the same lines as aircraft with systems in place that ensure their effective and appropriate utilisation.
- 4.117 The role of Plant Manager is critical to this effective use. The Plant Manager needs to be a trained and qualified fire manager specialising in containment/fire line construction. They need a high knowledge of fire behaviour, fire suppression, ecological issues and cultural issues. As discussed earlier in this report, we gained the impression that Plant Managers and operators on the Tasman fires lacked some of the technical fire related knowledge that is essential for their role, and had very limited previous fire line experience.
- 4.118 The Review noted that there were no 'Dozer chasers' assigned to the heavy machinery to guide and assist their progression during the extensive containment line construction. We believe that in some cases this led to containment lines being placed in incorrect locations causing unnecessary damage to private infrastructure and pasture. In one case, the operator's lack of fire suppression related experience and knowledge resulted in a large heavy machine pushing in a new trail 3 times, being overrun and having to fall back each time. In another situation over 120 metres of fence was pulled up as the operator did not have tools to cut the fence before proceeding.
- 4.119 We have referred above to the need for Fire and Emergency New Zealand to consider more broadly what requirements exist for wildfire suppression training, and this should in our view include the provision of training for plant managers. An understanding of fire suppression tactics and objectives, incident control systems, fire weather, and specific techniques related to use of machinery in a wildfire context, would in our view be a significant capability boost for the sector.
- **On-the-ground communication, coordination and collaboration between Fire and Emergency New Zealand and other response partners (such as: contractors; the Nelson and Tasman Councils; Civil Defence, New Zealand Police); from the perspective of Fire and Emergency New Zealand<sup>9</sup>**
- 4.120 One of the significant features of the Tasman fires was the declaration of a state of local emergency by the Mayors of Nelson City and the Tasman District. This declaration, in turn, led to the Nelson Tasman CDEM Group taking a lead role in the control of the emergency situation, and as such Fire and Emergency New Zealand was no longer the control agency.
- 4.121 Having had the opportunity to speak to the Mayors in particular, we were struck by the effectiveness with which communication took place between Fire and Emergency New Zealand staff and the local government level to bring this about. The declaration of a state of local emergency had also been a feature of the Port Hills fire in 2017; this provided a clear precedent for what happened, and we received positive feedback about the way in which Fire and Emergency New Zealand communicated with relevant parties and was able to be responsive to their needs for reassurance about the strategy and management of the fires.
- 4.122 Overall it appeared to the Review, from speaking to a number of stakeholders across the emergency management field, that Fire and Emergency New Zealand was seen as providing appropriate information to partner agencies within the CIMS management structure (which was being led by the Nelson Tasman CDEM Group following the declaration of the state of local emergency) and there was a joined up approach to managing the needs of the community. Public sentiment remains positive and supportive towards responding and supporting agencies.
- 4.123 One issue that was brought to our notice concerned the strategy for allowing people back into the town of Wakefield after it had been evacuated, and the lines of communication involved. This was one instance in which communication did not work as well as it might have done, owing to a misunderstanding around the authorising environment for ending the evacuation. This led to a message being relayed that Fire and Emergency New Zealand agreed to the evacuation being ended, whereas in fact the incident controller had not approved that action. On consideration by the Review we concluded that the absence of a night shift for the Fire and Emergency New Zealand incident management team had contributed to this state of affairs.
- 4.124 To be clear about the issue, there were firefighting personnel on duty 24 hours a day and some good work was able to be done at night time in the early stages of the fire. However, the IMT structure according to our understanding worked a day shift but there was often no Fire and Emergency New Zealand incident controller or IMT on duty at night. We can understand that there may not have been a need for a fully staffed team to be available around the clock, and we appreciate that the Nelson Tasman CDEM Group was the control agency for the incident at this point.

9 It is out of scope for this review to consider the perspective or actions of other agencies; a separate review being led by the Ministry of Civil Defence and Emergency Management will consider the interagency response.

The Review does however take the view that there needs to be an authoritative Fire and Emergency New Zealand management structure in place around the clock to deal with issues that may arise – such as the management of an evacuation, or even a critical incident involving firefighters. Night time is also the appropriate time for producing the updated IAP for the following days activities based on all the feedback from the preceding day shift. We suggest that when considering the review of the NIMTs recommended above, Fire and Emergency New Zealand should factor in a requirement to provide night cover – this could be done by having deputies attached to certain positions in the NIMT to do night shift, rather than requiring an entire second NIMT to be available.

- **Connection with, and co-ordination between the on-the-ground firefighting operations (IMT) and the Fire and Emergency Regional Co-ordination Centre (RCC) and National Co-ordination Centre (NCC) – both within the incident response framework, and more broadly across Fire and Emergency New Zealand**

- 4.125 The Review considers that the relationships between incident, regional and national level were not always clear to the participants involved in the Tasman fires, and that this would probably be replicated should a similar incident recur under current arrangements.
- 4.126 It is a common organisational arrangement across Australasia and no doubt beyond to have a tiered structure for emergency management based on local, regional and state/national spheres of influence. This generally works well from the point of view of management reporting lines when there is no major incident occurring (that is, for nearly all of the time), but it raises particular issues when there is a major incident.
- 4.127 The logic of the local – regional – national hierarchy is challenged when an incident management team is set up that by definition, needs some of the most senior and experienced emergency managers in the country to lead it. In New Zealand, the NIMT is tasked to a particular incident by national managers, which immediately raises the question of who the NIMT Controller reports to – is it the local manager where the fire is, the regional manager, or the national manager? We encountered some uncertainty on the point among people we spoke to; and most significantly it did not seem to be written down in policy anywhere.
- 4.128 Another issue relates to the problems with resource management referred to above. Incident management doctrine provides that it is the incident management team that should be responsible for assessing their resource needs and ordering resources. We were made aware, however, of a number of occasions on which resources were ordered 'for' the incident by higher tiers of management and without consulting the IMT; and conversely, resource requests generated by the IMT being declined at regional level apparently on the basis of a judgement about what was appropriate.
- 4.129 We consider it to be key to the effective working of the organisation during times of crisis that there is unambiguous policy about the chain of command. Incident managers need to know who they are reporting to, and regional and national levels of management need to have a clear expectation about what it is appropriate for them to do by way of intervention in incident issues and what it is not. There is always a danger that a coordination centre at regional level will start getting involved in issues that from a doctrinal point of view, are issues for the incident management team to determine and clear demarcations are needed to prevent that from happening.
- 4.130 The Review spoke with different people who had different suggestions about what these reporting lines and demarcation zones should look like in a major incident. It would go beyond our remit to adjudicate between different theories and recommend a single structure – fundamentally that is for Fire and Emergency New Zealand to work out based on a range of factors. What we do recommend is that Fire and Emergency New Zealand should come up with a clear statement about reporting lines, command responsibilities and demarcation of roles as between IMTs, RCCs and the NCC for all Fire and Emergency New Zealand incidents, before the next fire season.

#### Recommendation 11

Fire and Emergency New Zealand should review, clarify and document the roles of the NCC, RCC and IMT in Fire and Emergency New Zealand managed incidents, to include reporting lines for NIMTs.

- **Connection with, and co-ordination between the NCC and the National Crisis Management Centre (NCMC)**

- 4.131 The Review had the opportunity to meet with a number of the most senior Fire and Emergency New Zealand managers who held responsibility for briefing upwards to national government on the Tasman fires. These fires, the Pigeon Valley fire in particular, garnered significant amounts of national media attention and there was a need for governmental and political briefing at the highest level.

- 4.132 No-one we spoke with raised any specific issues relating to the interface between Fire and Emergency New Zealand and the Government. There were, however, two observations that we noted relating to the availability of information for national briefing purposes.
- 4.133 The first of these relates to a 'senior adviser' role that was put in place with the NIMTs assigned to the Tasman fires; the first time that this had been done. This role sat outside the IMT and reported back to the national office, the aim as we understand it being both to provide some support for the Fire and Emergency New Zealand controller, and to assist with information flow upwards to national level.
- 4.134 Such an arrangement may clearly confer benefits both on the IMT and the national organisation, but our reflection having spoken to a number of people involved is that there needs to be clear communication to the NIMT controllers in particular what this role is for and how (if at all) it fits into the chain of command. Another factor that may be relevant is that it is a key duty of the Fire and Emergency New Zealand controller to be reporting up and out – we are not convinced that this is something that an advisor, however senior and experienced, is best placed to be doing, and there is a concern that that could derogate from the controller's authority or, alternatively, lead to breakdowns in communication. We do not challenge the 'senior adviser' concept but would encourage Fire and Emergency New Zealand to issue clear policy guidance as to its scope and place in the chain of command.
- 4.135 Our second observation relates to the need for information at government level that has to be filled by the IMT, and is a responsibility of the Fire and Emergency New Zealand controller to manage. We did encounter a suggestion on occasion that some NIMT controllers felt this to be burdensome, along the lines of 'don't they realise we have a fire to manage?' The Review understands and has sympathy for such feelings, but notes that the practice of incident management in the 21<sup>st</sup> century involves covering all of the needs of government, media, community stakeholders and the public as well as just the technical management of the fire. It is important that senior Fire and Emergency New Zealand managers have the earliest and best information possible from the incident, to enable them to maintain community and political confidence in the organisation. NIMT controllers must expect to service organisational and governmental requests for information and must have structures in place that allow them to do this as well as manage all the other facets of the incident. This is an issue that we would expect the renewed NIMT training that we have suggested in this report to cover.
- **Connection with, and use of, other functions and teams within Fire and Emergency New Zealand's National Headquarters (NHQ)**
- 4.136 In our discussions with staff based both locally and at Fire and Emergency New Zealand Headquarters in Wellington, we did not identify any points of concern beyond the issues already discussed relating to role clarity. It was apparent to the Review that the NIMT concept, which is well-supported by NHQ, was well-received and is an effective way of sharing national capability.
- 4.137 We spoke to individuals who had a national role in their day to day job who were able to use their skills and experience effectively in the context of the NIMT, notably (although by no means limited to) in the Public Information function.
- 4.138 While we encountered little specific feedback on the use of national functions and teams on the Tasman fires, it goes without saying that some of the solutions relating to issues around capacity raised in this report – for example, resource management, or reporting from the incident management team to stakeholders and government – may lie in the utilisation and deployment of resources from NHQ to bolster the capacity of NIMTs in specialist areas.
- **Welfare of staff (including the response to any safety concerns, such as fatigue management)**
- 4.139 In general terms, the impression that the Review gained of the attention given to the welfare of personnel over the course of the Tasman fires is positive. Our understanding is that there were a relatively low number of injuries, although there are two incidents that will be discussed in a little more detail below.
- 4.140 In talking with a number of participants in the fire suppression operations, both at management and front-line level, we heard that there were on occasions mismatches between expectations of some personnel and the facilities on offer. We consider that this is most probably because of the low frequency of incidents of this scale and nature in New Zealand and the consequent lack of exposure of people to 'campaign' style events. There was also a mix of expectations stemming from the background of the individual involved or their position in the organisation. This is of course not a criticism, but is rather a reality that Fire and Emergency New Zealand could keep in mind when considering, for example, further wildfire suppression training opportunities and the way in which Fire and Emergency New Zealand culture develops into the future.



Image 6: Crews working in forestry blocks on the Pigeon Valley fire.

- 4.141** Examples of the sort of issue that arose are in the provision of tented accommodation rather than motel style accommodation; mass catering being provided rather than individuals procuring their own meals, and the longer shift patterns that are sometimes encountered at wildfire events in comparison to a structure fire. The way in which these issues were managed at the Tasman fires struck the Review as consistent with accepted practice elsewhere in Australasia, which implies that some expectations management in terms of what people deploying to a campaign fire are likely to find, could be useful. This activity is best carried out away from the fire season, instead of waiting until an incident is occurring.
- 4.142** Two specific health and safety issues that the Review heard about involved an apparent exposure of a firefighter to carbon monoxide, and another firefighter who contracted a disease in circumstances that gave concern that others might have been exposed to the source as well.
- 4.143** In relation to the carbon monoxide (CO) issue, we thought that it was positive that individuals in the incident chain of command had recognised the potential for this to be a hazard in the wildfire environment, as it has been shown<sup>10</sup> that in certain circumstances CO in bushfire smoke can be a problem. We would observe however that there did not appear to be any scientifically verified system for then carrying out monitoring of CO exposure on the fire ground. AFAC has published a guideline<sup>11</sup> on managing exposure to bushfire smoke, which refers to the potential for CO to be an issue, and we would encourage Fire and Emergency New Zealand to consider that guideline and then reach conclusions about what if any contingency measures it wishes to put in place for monitoring at future events. If a risk assessment were to suggest that monitoring is indicated, then there are examples that can be drawn on from Australian agencies of how this may effectively be done. It is important that monitoring is done with the full knowledge of the IMT and in accordance with recognised good practice and on scientific advice, to avoid the risk of misleading results.
- 4.144** In relation to the infectious disease issue, we were pleased to hear that the individual in question made a good recovery. We were led to understand, however, that there was some initial reluctance to report the circumstances as a safety issue, because there was no conclusive evidence that the disease had in fact been contracted while the individual was firefighting and there were other possible exposures. Subsequently the matter was established to be a work-related exposure. Our view is that safety reporting systems should be used purposively to mitigate potential safety risks to personnel, and that an incident can be reported as a 'possible' exposure for further investigation even if causation cannot be demonstrated at the time. At least, this provides Fire and Emergency New Zealand with the chance to assess the circumstances and consider whether there is any need to issue precautionary advice. We suggest that Fire and Emergency New Zealand should promote a safety reporting culture that errs on the side of caution in all circumstances.

<sup>10</sup> *Smoke Exposure on the Fire Ground: A Reference Guide*, Reisen, F and Meyer, CP 2009 (CSIRO / Bushfire CRC)

<sup>11</sup> *Managing bushfire smoke exposure*, AFAC 2018

- **Financial effectiveness and financial processes including the remuneration and reward of Fire and Emergency New Zealand personnel, but only to the extent that it may have affected their availability to participate in the response**

- 4.145 We had the opportunity to speak with some of the people who had been directly involved with financial management during and after the fires, in the course of this Review. Our first observation would be that financial management is broadly recognised across Australasia as being a significant challenge in fire and emergency management, and not always something we do well. We can contrast the position in North America, particularly the United States, where the financial implications of actions are carefully considered and tracked across the life of an IMT.
- 4.146 The objection is sometimes raised that financial considerations should not drive emergency response activities, and IMTs should 'do what needs to be done'. There is an element of truth in that of course. However the fact is that emergency managers spend public money, and it should be spent with consideration. In addition, a financial options analysis available to an IMT can help to highlight the opportunity costs of proposed courses of action when compared to different activities.
- 4.147 We concluded that the financial management activities taking place on the Tasman fires were more advanced than some examples that could be taken from Australia. However, there is still more that could be done. AIIMS now highlights the Finance Officer as being an IMT member reporting directly to the controller, rather than through the logistics section. The controller can and should be asking the finance officer to give a costing both on the activities taking place on a day to day basis, and proposed activities such as bringing in a line-scanning aircraft. It should in this context be noted that financial information might actually support a course of action that had not been considered previously; for example paying for a heavy water-bombing aircraft to fly across from Australia might be costly, but might more than pay for itself in terms of the assets that could be saved.
- 4.148 Overall we think that credit is due to Fire and Emergency New Zealand and particularly the local management in the Tasman District who had financial management provisions in place at an early stage of the incident. We suggest that Fire and Emergency New Zealand think more broadly about embedding finance officers in the IMT and encouraging incident controllers to take a measured but genuine interest in the costs of operations in real time and as part of any significant options analysis.
- 4.149 We kept in mind the term of reference relating to remuneration and reward when speaking to people but had no feedback of significance about this, and so do not make any specific comment on it.
- **Reporting mechanisms and engagement with key stakeholders (including the public, the Board, the United Fire Brigades' Association, the New Zealand Professional Firefighters Union, the Forest and Rural Fire Association of New Zealand, the Ministers of Internal Affairs and Civil Defence and Emergency Management, the Ministry of Civil Defence and Emergency Management, Department of Prime Minister and Cabinet, and the Department of Internal Affairs (as Fire and Emergency New Zealand's monitoring agency))**
- 4.150 Overall, while the Review spoke to a wide range of people across Fire and Emergency New Zealand, partner agencies, government and the community, we did not find concerns being raised with us about stakeholder reporting and engagement. The history of efforts made in this area of engagement with key stakeholders, by the Tasman fires IMTs and local management, was acknowledged by all levels of the community and the government and should be commended. We have already discussed the need for upwards reporting to NCC and NCMC levels and have made observations in relation to those mechanisms. We did not, however, find significant issues to criticise in the way that stakeholder management took place within this event.
- 4.151 In saying that we would observe that a substantial amount of the required engagement with stakeholders should be taking place well in advance of an incident occurring. It is not reasonable to expect incident management teams or indeed other levels of management to be servicing a broad range of stakeholders during an incident beyond what is operationally necessary, and where discussions need to take place to build and manage relationships we think that this should be occurring year-round – those discussions could themselves focus on what information and communications are reasonably to be expected of all parties when a major incident is on foot.
- 4.152 We have considered it out of scope to look at Fire and Emergency New Zealand's business as usual stakeholder management, as that could in itself be a significant project. Our discussions with Fire and Emergency New Zealand management have left us confident that there is an organisational understanding of the key importance of stakeholder engagement and we anticipate that this will continue to be pursued.

#### *Iwi*

- 4.153 Iwi as tangata whenua with their long cultural history in New Zealand hold specific information and knowledge that is essential in all the facets of fire management across Risk Reduction, Readiness, Response and Recovery, as well as being custodians of sensitive cultural information that good practice in fire management requires to be taken into account when developing suppression strategies and objectives.

- 4.154 During the Tasman fires there was good practice demonstrated in terms of involving iwi in the incident management structure. The Review understands however that this was not a normal part of all IMT processes and was largely due to the initiative of an individual IC on one of the NIMTs. We heard that not only was the embedding of an iwi representative in the IMT highly beneficial in terms of the management of the fires, but that the relationships built during the incident have had positive after effects and have helped to strengthen relationships between iwi and the local councils in the area after the fires.
- 4.155 This is an example of the Review being able to learn lessons from things that went well, as well as things that could have been done differently. We think that Fire and Emergency New Zealand should as a matter of course include iwi liaison as a position within all IMTs for significant incidents, particularly where there are effects on the community or the landscape. It is essential that thought is given in advance as to how to involve iwi participation from the outset and how to fully accommodate them into the local and national IMTs and this may of course vary from location to location. The concept of incorporating iwi representation in the Planning area of an IMT is invaluable to ensure that cultural aspects are accommodated in all operational decisions and clearly identified in the IAP.
- 4.156 Action on iwi involvement within the IMT teams aligns directly with Objective number 8 under the National Disaster Resilience Strategy. This objective is to build the relationships with iwi to ensure greater recognition, involvement and understanding of iwi issues in emergency management.

#### Recommendation 12

Fire and Emergency New Zealand should develop doctrine to formally integrate iwi into local and national IMTs.

## RECOVERY

- **Learnings available; noting that the Fire and Emergency New Zealand Act 2017 does not contain recovery function obligations, and that policy issues regarding remediation of damage caused to uninsured land while fighting the fires is out of scope.**

- 4.157 Recovery is now widely recognised as being a core function of incident management, and the language of 'transition to recovery' is frequently replaced now with an acknowledgement that all incident management activities have to be considered with an eye towards recovery requirements. Although the scope of the Review in considering issues related to recovery is relatively narrow, we identified two areas in particular where Fire and Emergency New Zealand may have opportunities in the future to support community recovery from similar events.

### *Tracks and containment lines*

- 4.158 Whilst remediation of damage caused to land whilst fighting fires is outside the scope of this review, we did hear from many interviewees about issues associated with placement and implementation of containment lines. Containment lines act as a barrier to further fire progression and can include rivers, heavily grazed pasture or manmade bare earth trails. As mentioned previously in this report, the construction of bare earth tracks and trails are often essential for effective containment of forest fires providing an opportunity to undertake back burning into the fire to secure fire edges and to have the confidence the edge will hold should further threatening fire weather eventuate.
- 4.159 The way in which the strategy to construct new containment lines is implemented on the fire ground has a significant impact on the need for follow up remediation. Any construction of fire breaks requires close scrutiny and consideration and the work should only be undertaken when based on the most recent fire progression advice from the FBAN. The construction of dozer lines takes time and is expensive. Advanced planning is required to ensure they are in the right place and will be constructed before the fire reaches that location. If the strategy is to place these trails as "backup insurance" then work needs to be undertaken by the Planning Unit on the cost versus benefit of this strategy before it is implemented.
- 4.160 As already discussed in this report, the Review does not believe that effective fire progression modelling was always available to the IC when he was required to make these decisions which led to the construction of over 40 km of new fire trails predominantly on privately owned land.
- 4.161 Once the decision-making process to proceed with heavy plant on fire containment lines has been made, it is essential that there is a trained and skilled group of specialists that are available and able to implement the agreed strategy. The operation of implementing bare earth containment lines is expensive and comes with environmental and cultural implications. It is essential that the operation is managed, communicated and directed by a trained specialist. The skills required include heavy machinery management but more importantly include a sound understanding of fire suppression, land management, cultural and ecological skills and communication skills with landowners.

- 4.162** The Review formed the opinion, based on interviews and a field visit, that many of the trails were constructed with no consideration of ecological, social or cultural issues. Experience in Australia has shown that trails can be constructed quickly and in consideration of all the issues as long as the Plant Manager and 'Dozer chaser' are provided with the land management and fire suppression skills and training.
- 4.163** Recovery activities on tracks and trails needs to be considered as the trails are being constructed. Careful placement of removed soil and thoughtful selection of trail location take little effort but can save time, money, effort and angst when it comes to recovery and rehabilitation.
- 4.164** The implementation of new trails, especially on private land, should be associated with a formal and documented communication process. The Review is not convinced that this always occurred on the Pigeon Valley fire. This process need not be long and, in the context of fire suppression, can be simple and straight forward. The private property owners will have local and specific information that will be critical in the effective placement of these trails and time needs to be taken to communicate with them wherever possible.
- 4.165** The training of Plant Managers and 'Dozer Chasers' should be an integral part of Recommendation 8 of this report and the training should include the consideration of ecological, social and cultural values when implementing new track and trails along with communication protocols when working on private land.
- 4.166** The Review noted the positive efforts made by the IMTs to integrate recovery management considerations early in the response decisions and actions. This enabled a well-informed and coordinated transition from response to recovery. We feel that this early intervention has ensured that while concerns have been raised about remediation and compensation the overall public sentiment has remained positive and supportive towards the responding and support agencies.



Image 7: Remotely piloted aircraft system being used to assess conditions on the Pigeon Valley fireground.

#### *Cordon management*

- 4.167** Cordon management was identified as an issue in the Port Hills fire review, and we similarly received feedback, particularly from community members, about the cordons in place around evacuated areas and the length of time for which local residents were kept out of their properties, particularly in the Redwood Valley area. Because cordon management became a responsibility of the Nelson Tasman CDEM Group after the declaration of a state of local emergency, it is out of scope for this Review to consider directly how cordon management was handled. We do however consider that Fire and Emergency New Zealand has some particular inputs that could be useful in this area.
- 4.168** Cordon managers, when they are organisations other than Fire and Emergency New Zealand, are likely to be relying to an extent on Fire and Emergency New Zealand advice as to whether it is safe to let residents back in. This is a weighty responsibility and we would never suggest that Fire and Emergency New Zealand should do other than prioritise community safety as its primary objective. Communities are however always anxious to return home as soon as they can, and we would be of the view that the Fire and Emergency New Zealand incident action plan should reflect this as an incident objective from the earliest possible point.
- 4.169** This may require regular and robust fire behaviour analysis, as discussed earlier in this report. It may also involve prioritising the identification and treatment of dangerous trees by qualified personnel. Another capability that Fire and Emergency New Zealand may be able to offer is damage assessment, perhaps utilising urban search and rescue resources who are familiar with working in a damage assessment context. We take the view that Fire and Emergency New Zealand can bring to the table its expertise in damage and risk assessment and fire prediction, and take on responsibility for advocating for cordons to be re-opened as soon as it is genuinely safe to do so, with the aim of promoting community recovery. Efforts in this space may in the long run have as much of a positive benefit on the community as the suppression of the fire itself.

## 5 CONCLUSIONS

- 5.1 Throughout this Review it was noted by the Review team on many occasions that there was never one mention of dissatisfaction from the community and stakeholders with Fire and Emergency New Zealand and the way it operates – the reputation of Fire and Emergency New Zealand was never questioned. Public sentiment remains positive and supportive towards responding and supporting agencies around the Tasman Fires. It is very encouraging to see the high esteem in which Fire and Emergency New Zealand and its employees continue to be held by those that were directly impacted by this event. This is a particularly significant finding given that maintaining the trust and confidence of the community is identified as a key measure of success for fire and emergency services in the AFAC publication *What is Operational Success for Fire and Emergency Services* (2014).
- 5.2 The Review would also like to record our impression of the strong relationships that the Principal Rural Fire Officer, the Area Manager, and their teams had with local communities, partner agencies and elected representatives. On a number of occasions people we spoke to underlined how these relationships, that had been established and nurtured over time, directly facilitated the response to the Tasman fires and underpinned trust in the way that the response was being managed.
- 5.3 We are conscious that in setting out our conclusions on the terms of reference that we were given, that there is a risk that we will be seen as having been negative in our approach. The Review team members have all had the experience of having a mirror held up to our activities and we understand that it can be an uncomfortable feeling having ‘areas for improvement’ discussed. We would like to be quite clear that the way in which the Tasman fires were managed was in our view a positive and successful one. There was ample evidence of lessons having been taken from the Port Hills review and incidents in Australia and further afield, and initiatives such as aerial firefighting and precautionary evacuations being successfully adopted.
- 5.4 New Zealand does not have an extensive history of large vegetation fires and so it is all the more to the credit of the people involved that this significant incident was managed without loss of life, major injury, or extensive loss to the built environment. We think that the outcomes of this fire season should give the community in New Zealand a level of confidence that Fire and Emergency New Zealand is able to manage these significant incidents and take appropriate actions aimed at keeping the community safe.
- 5.5 If the recommendations of this report are able to be adopted and operationalised, we think that this track record of success will be enhanced even further, and the uncertain future fire regime in New Zealand heralded by climate change can be managed effectively by Fire and Emergency New Zealand and its people.

## 6 GLOSSARY

<b>AAS</b>	Air Attack Supervisor
<b>ADC</b>	Air Division Commander
<b>AFAC</b>	Australian Fire and Emergency Service Authorities Council
<b>AIIMS</b>	Australasian Inter-Service Incident Management System
<b>ANZEMC</b>	Australia New Zealand Emergency Management Committee
<b>BUI</b>	Build up index
<b>CDEM</b>	Civil Defence Emergency Management
<b>CIMS</b>	Coordinated Incident Management System
<b>CO</b>	Carbon monoxide
<b>DC</b>	Drought Code
<b>DMC</b>	Duff Moisture Code
<b>ECC</b>	Emergency Coordination Centre
<b>FBAN</b>	Fire Behaviour Analyst
<b>FFDC</b>	Forest Fire Danger Class
<b>FFMC</b>	Fine Fuel Moisture Code
<b>FWI</b>	Fire Weather Index
<b>GFDC</b>	Grass Fire Danger Class
<b>IAP</b>	Incident Action Plan
<b>IC</b>	Incident Controller
<b>ICC</b>	Incident Control Centre
<b>ICS</b>	Incident Control System
<b>ICT</b>	Information and Communications Technology
<b>IMT</b>	Incident Management Team
<b>ISI</b>	Initial spread index
<b>MCDEM</b>	Ministry of Civil Defence & Emergency Management
<b>NCC</b>	National Coordination Centre
<b>NCMC</b>	National Crisis Management Centre
<b>NIMT</b>	National Incident Management Team
<b>NRFA</b>	National Rural Fire Authority
<b>RCC</b>	Regional Control Centre
<b>SFDC</b>	Scrub Fire Danger Class
<b>Sitrep</b>	Situation Report
<b>TFB</b>	Total Fire Ban

## REFERENCES

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*What is Operational Success for Fire and Emergency Services*, AFAC, 2014

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*Victorian Purchasing Guide for PUA12 Public Safety Training Package Version No 2.1*, Victorian Government, 2013

*Smoke Exposure on the Fire Ground: A Reference Guide*, Reisen, F and Meyer, CP 2009 (CSIRO/Bushfire CRC)

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# ANNEXE A: FIRE AND EMERGENCY NEW ZEALAND

## About

The Fire and Emergency New Zealand Act 2017 combined urban and rural fire services into a single, integrated fire and emergency services organisation – Fire and Emergency New Zealand – with a mandate to provide a wide range of services for communities. The Act provides the framework under which Fire and Emergency New Zealand operates and sets out principal objectives, main functions and additional functions.

### Principal objectives

- Reducing the incidence of unwanted fires and the associated risk to life and property.
- Protecting and preserving life, and preventing or limiting injury, damage to property, land and the environment.

### Main functions

- Promoting fire safety (including guidance on the safe use of fire as a land management tool) and firefighting.
- Delivering fire prevention, response and suppression services.
- Protecting the safety of persons and property endangered by incidents involving hazardous substances.
- Rescuing trapped people as a result of transport accidents or other incidents.
- Undertaking urban search and rescue.

### Additional functions

- Responding to
  - medical emergencies
  - maritime incidents
  - weather events, natural hazard events and disasters
  - incidents where substances present a risk to people, property or the environment
  - any other situation where Fire and Emergency New Zealand can assist.
- Promoting safe handling, labelling, signage, storage and transportation of hazardous substances.
- Performing other rescues.
- Providing assistance at transport incidents.

### Fire and Emergency New Zealand Statement of Intent

- Reducing the likelihood of unwanted fires
- Reducing consequences from emergencies, and
- Helping build resilient communities.

## History

For most of New Zealand's history, fire services were funded and managed locally. There was little central coordination, resulting in significant variation between local fire services. The Ballantynes' Fire of 1947, where 41 people lost their lives, was a watershed moment in the history of fire services in New Zealand. It led to the passing of the first fire safety legislation.

A further reform in 1975 amalgamated local authority Fire Boards into a national New Zealand Fire Service. However, Rural Fire Authorities were retained as separate organisations, coordinated by the National Rural Fire Authority. For over 40 years, there were no further significant changes to fire service legislation.

Two reviews of the fire services were undertaken between 2012 and 2015. These considered mandate, rural and urban governance and support structures, legislation modernisation, funding, and coordination with other emergency services. Through extensive consultation with stakeholders, these reviews resulted in wide agreement on the type of fire services needed in New Zealand, and how best those services should be supported and funded. They paved the way for reform.

These reviews also drew on lessons from other fire services internationally on how best to approach the reforms. To be successful, the changes should be co-designed with the sector, incorporate the perspective of communities, and grow an organisation that is reflective of the communities it serves. Following these two reviews, the New Zealand government agreed to unify urban and rural fire services, to use a new funding model, and to create a new law for fire services in New Zealand.

## ANNEXE B – THE REVIEW TEAM

### NEIL COOPER, ACT PARKS AND WILDLIFE SERVICE

Neil Cooper is the Senior Director of the Fire, Forests and Roads Unit with the ACT Parks and Conservation Service, located in Canberra Australia. He completed his BSc (Forestry) degree at the Australian National University in 1982. His early career saw him involved in plantation forestry establishment, silviculture and harvesting up until 1999 when he took on the role of Manager of Fire with the then ACT Forests department. Neil has been on two overseas fire deployments to the United States and one to Canada, as well as being involved in a number of large campaign fires in Australia. Neil has presented papers at International forums including at the United Nations in Rome in 2010 and 2012. In 2010 he was awarded the Public Service Medal (PSM) for his achievements in fire management.

Neil fills a number of National roles including Director on the AFAC Board, Chair of the Forest Fire Managers Group, AFAC Board sponsor and Deputy Chair of the AFAC Rural Land Management Group and the longest standing member on the Forest and Forest Product Committee (Ministerial Council subcommittee under COAG).

### PAUL CONSIDINE, AFAC

Paul is qualified as a barrister in the UK. He has held positions in Australian state and Commonwealth public services, including as a Director of Investigations in the office of the Commonwealth Ombudsman.

Paul joined the Australasian Fire and Emergency Service Authorities Council in 2010 as Manager, Operations (Urban Fire and State Emergency Services). In 2013 he took up a two-year ministerial appointment as an Assistant Inspector of the Scottish Fire and Rescue Service, with HM Fire Service Inspectorate in Scotland: in that capacity he was lead inspector on various inquiries and reports into the SFRS.

Paul returned to AFAC in 2016 to work on the National Resource Sharing Centre, an Australasian initiative for sharing fire and emergency management resources. He was subsequently appointed General Manager of the Emergency Management Professionalisation Scheme, which promotes emergency management as a profession and sets professional practice standards for a range of emergency management roles. Paul is currently Director, Capability and Assurance at AFAC with responsibilities across the fields of national capability, resource sharing, and reviews and inquiries.

### BRYAN CARTELLE, FIRE AND EMERGENCY NEW ZEALAND

Bryan joined Local Government in 1990 as Manager of Rural Programmes, part of this role held the Principal Rural Fire Officer responsibility. With the formation of Auckland Council in 2010 Bryan as Principal Rural Fire Officer developed a strategy to further rationalise the number of fire authorities, to one enlarged rural fire district for Auckland, down from nine fire authorities.

Bryan brings a significant local government and private sector background to his role along with a sound understanding of volunteerism, having been a volunteer in both Coastguard and the Ministry of Primary Industries.

Having recently completed a secondment to the role of Regional Manager Rural Bryan holds the position of Service Delivery Advisor. Until recently, Bryan has been Incident Controller/team leader for 15 years on the National Incident Management Team (Team Cartelle).

### DARRYL PAPESCH, FIRE AND EMERGENCY NEW ZEALAND

Darryl first joined Fire and Emergency New Zealand (then known as NZ Fire Service) as a Volunteer Firefighter in 1981 when he was 16. He then joined the Auckland career staff in 1986 and after about 9 years he transferred to Ngā Tai Ki Te Puku (Region 2), where he worked in a number of Districts, finally settling in the Waikato in 2000.

In 2010 Darryl progressed to the rank of Assistant Area Commander Waikato, which he held for 7 years before accepting a position at NHQ as the Manager of Operational Efficiency & Readiness, the position he currently holds. Darryl has other roles within the organisation particularly around Career and Volunteer Officer development and training.



Image 8: Credit: Fire and Emergency New Zealand

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