TRAINING AND **EMERGENCY** MANAGEMENT **UNIT**

Redland City Council - Fire Management Plan

Review Report 2017

Queensland Government

Redland City Council – Fire Management Plan

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Versions

Revision Date	Version	Author	Revision	Approved by
12/06/2017	V1.0	Ian Moore		
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Approvals

	Name	Signature	Date
QFES-TEM Project Executive	A/Supt. Andrew Sbrizzi	X	
Redlands City Council - Senior User	Mike Lollback	X	
QFES-PSU - Senior Supplier	Insp. Joel Gordon	X	

Definitions

Terms, Abbreviations and Acronyms	Meaning
BOM	Bureau of Meteorology
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EBN	Executive Briefing Note
EM	Emergency Management
FBAN	Fire Behaviour Analyst
FDI	Fire Danger Index, which is an indication of severity of fire weather resulting from Wind strength, Relative Humidity, Temperature and Drought Factor.
FDR	Fire Danger Rating, FDI categorised into levels of threat for community notification and warning purposes.
ISO	International Standards Organisation
Phoenix RapidFire (Phoenix)	The bushfire behaviour characterisation simulation created by the University of Melbourne.
PMO	Program Management Office
PSU	Predictive Services Unit
QFES	Queensland Fire and Emergency Services
QPWS	Queensland Parks and Wildlife
RCC	Redlands City Council
RFS	Rural Fire Service Queensland
SABRE	Simulation Analysis-Based Risk Evaluation, a new decision support framework that permits stochastic fire spread modelling, and provides a generalised visualisation and analysis environment for all types of data. https://sabre.qfes.qld.gov.au/#/signin
SMBI	Southern Moreton Bay Islands

Executive summary

This report summarises the findings of the Queensland Fire and Emergency Services (QFES) Training and Emergency Management Unit's independent review of the level of fire preparedness of council and private land within the Redland City Council area. The review was commissioned by Redland City Council Mayor Karen Williams in response to significant wildfire events that occurred on Macleay and Russell Islands in 2016.

The review was conducted between February and May 2017 and involved two phases. Phase one focused on the Southern Moreton Bay Islands, which comprise Macleay Island, Lamb Island, Karragarra Island and Russell Island. The second phase considered the mainland area of Redland City Council, which includes the suburbs of Mount Cotton, Redland Bay and Sheldon.

The review evaluated the level of vulnerability to wildfire, with specific regard to the Southern Moreton Bay Islands, and analysed Council's current maintenance plan to ensure it is scheduled for maximum benefit for the entire council area. The review assessed existing Council fire management arrangements and community understanding against their legislative requirements, and assessed the standards of council fire trails against QFES mapping data for wildfire response and planning. The review involved data analysis, field inspections and visual assessments, and community consultation activities with island residents and organisations, which included meetings, interviews, email correspondence and an online survey.

Assessment of vulnerability

In assessing the vulnerability of the Southern Moreton Bay Islands to wildfire, the review identified the following points of concern:

1. There is a significant level of illegal dumping of household, green and commercial waste on Russell and Macleay Islands that could potentially contribute to unpredictable fire intensity and safety hazards for emergency services personnel.
2. There are high to extreme levels of fuel loading in many areas of the Southern Moreton Bay Islands, particularly on Russell Island, often in excess of 15 tonnes per hectare.
3. There are a number of cases of private land-owners hoarding high levels of household, commercial and other waste, including green waste, tyres, oils, vehicles, building materials and other waste products. Some commercial operators are storing waste on privately owned land rather using Council's waste transfer stations.
4. Southern Moreton Bay Island residents have been observed as generally having a low level of personal and community resilience in relation to wildfire and other emergency events, particularly in the central and south-western areas of Russell Island. This is due to factors such as geographic isolation, an ageing population, poor preparation of properties, a limited of understanding of actions to take before and during an emergency, and communication challenges on the islands.
5. RFS personnel on the islands are available to respond a single crew 24 hours a day, seven days per week, however there is limited capacity to guarantee any additional crewing on a second vehicle during working hours as many volunteers work on the mainland.

6. Russell Island currently faces a significant risk posed by a single evacuation route. This is due to multiple factors, such as distance of travel, significant population on the southern end of the island, and significant wildfire risk that runs across the evacuation route.

In assessing the vulnerability of the mainland area of the Redlands to wildfire, the review identified the following points of concern:

7. The Redlands has an almost a continuous corridor of vegetation from Logan and Brisbane City Council areas into the north-eastern and south-eastern suburbs of Redland City Council. The continuity of fuel between reserve areas presents risks to most parts of the council area but particularly Sheldon and Mount Cotton, both displaying the highest probability of loss of undefended houses.
8. Two areas of urban development do not have reticulated water. These are the southern area of Redland Bay, east of Serpentine Road and south of Lagoon View Road, and Teviot Road Estate. A lack of reticulated water can present a risk to the community if threatened by wildfires.
9. Observations showed most houses in Mount Cotton and Sheldon were maintained to a standard that would likely prevent significant property loss in normal fire conditions and under average fire danger index levels. However, as both suburbs are primarily located in semi-rural or conservation areas, this will always present an elevated risk from wildfire when the fire danger index increases.

Review of current maintenance schedules

The review analysed historical and current datasets in order to assess Council's current maintenance schedules. After testing the fuel management component of Council's fire mitigation plan at an index of fire danger that occurs statistically most often, it was found to be beneficial in managing a sufficient amount of bushfire risk for most of the year.

Review of legislative requirements

The review assessed local laws and other legislation with a focus on the level of community understanding. It found a significant level of uncertainty around Redland City Council Local Law 3 (Community and Environmental Management) and Local Law 6 (Protection of Vegetation), which appear to be in conflict. The review makes a number of recommendations, including the creation of a simple summary document that explains land-owners' obligations in balancing ecological needs and community safety.

Collection and verification of mapping data

QFES and other responding services from the mainland have limited knowledge of the Southern Moreton Bay Islands, and rely on mapping and other data sets to plan responses to emergency situations. An assessment was undertaken to verify the accuracy of fire trails, fuel types and fuel loadings with relatively favourable results, however opportunities exist to enhance the data quality by implementing a data sharing agreement between QFES and Council.

Assessment of fire access trails

Fire access trails were physically assessed in conjunction with local Rural Fire Service (RFS) personnel against the standards set in the Parsons Brinckerhoff Southern Moreton Bay Islands Firebreak Report 2005. The review found that Council's current fire access trails are in general maintained to a suitable standard, however a number of new trails have been proposed that will enable the islands' RFS resources to quickly access high-risk areas.

Bushfire Risk Analysis Report and planning resource

In order to assist Council to plan for enhanced community safety and resilience during wildfire events, the QFES Predictive Services Unit (PSU) has developed an online interactive visual quantitative product, the SABRE Redland City Council Bushfire Analysis site, which has been provided to Council. Additional statistically based information and findings are presented in the Bushfire Risk Analysis Report – Redland City Council in Annexure A.

Key recommendations

The review makes the following recommendations for Council's consideration:

Southern Moreton Bay Islands (SMBI)

Recommendations 1 (Page 14) and 6 (Page 15) – Council enforcement of local laws would eliminate many of the issues on the SMBI, resulting in many other recommendations becoming less important.

Council is encouraged to increase the level of enforcement of local laws, with special focus applied to Local Law 3 on the SMBI. This key recommendation is discussed in Scope Points 1.1.

Recommendation 31 (Page 33) – Council's Bushfire Action Plan 2016 identifies a number of conservation zones are as Fire Exclusion Zones, which have no current schedule for reducing existing fuel levels. These areas present a significant risk to communities and must be managed as a priority. Council is encouraged to conduct a full assessment of the ecological value of this area and implement appropriate actions to reduce the threat to urban development. This key recommendation is discussed in Scope Point 2.

Recommendation 23 (Page 27) – Given increased risk levels on the SMBI and to a lesser degree on the mainland, Council is encouraged to provide a warning system that will work for a greater number of residents and be available in multiple formats to offer greater flexibility. Council is recommended to implement an improved system to provide early notification of emergencies and communication of advised actions for residents. This key recommendation is discussed in Scope Point 1.4.

Recommendations 15 (Page 19) and 34 (Page 37) – Council is encouraged to introduce outward facing mapping layers to the Redlands GIS tool Red-e-map to increase transparency and assist land-owners to be better informed as to their obligations. The specific layers that will assist are: Land Ownership (Private, Local, State, Federal) and Vegetation Protection Orders. This key recommendation is discussed in Scope Points 1.2 and 3.

Recommendations 28 and 29 (Page 30) – A secondary escape route from the southern end of Russell Island to the northern end is a key recommendation that should be seriously considered. Currently the highest fire risk area on the SMBI is the southern end of the island and there are multiple locations along Centre Road and Glendale Road where adjacent bushland could sustain a fire that would see this route unpassable. This key recommendation is discussed in Scope Point 1.6.

Mainland

Recommendation 55 (Page 74) – Enhanced education and awareness of current risks is key to encouraging direct community involvement in managing risks on privately owned properties. If communities are well-prepared it will enhance the work done by Council.

Council can implement many beneficial strategies to manage the likelihood of wildfire impact on communities, but these must take a cooperative approach with land-owners and residents taking ownership of the maintenance and preparation needs of their own properties. In order to better prepare the community for potential wildfire impact, Council is encouraged to liaise with QFES to discuss introducing a community-based bushfire education program via Volunteer Community Educators (VCEs). VCEs will use engagement strategies through the Prevention, Preparedness, Response and Recovery (PPRR) framework. VCEs will look to create resilient communities through effective leadership to develop, strengthen and sustain disaster resilience. Given the elevated risks identified in Mount Cotton and Sheldon, a program that includes specific information relevant to these locations would be of benefit to these communities. This key recommendation is discussed in Scope Point 4.3.

A full list of recommendations follows the conclusion of Part B of this report. The recommendations made by this review are from the standpoint of industry professionals and prioritise the protection of human life over the environment. Many recommendations will require shared responsibility between Council, residents, QFES and other agencies and community organisations that will be part of the solution to minimise any future impact to the Southern Moreton Bay Islands and the Redland City Council area as a whole from large and potentially destructive wildfires.

Introduction

In November and December 2016 a number of significant wildfire events occurred on Macleay and Russell Islands. While these incidents did not result in loss of life or significant property loss, residents of the Southern Moreton Bay Islands (SMBI) felt they were in a perilous position with many holding grave fears for their safety. Local emergency services and community organisations did an outstanding job protecting and assisting as many people as they could, given the very difficult conditions presented due to isolation from the mainland and the somewhat limited access to the resources required to bring the situation under control.

Soon after the fire was extinguished most residents endorsed the efforts of the emergency services, however a large number of SMBI residents voiced strong dissatisfaction about how the emergency procedures were implemented, more specifically how such intense fires were able to occur in their island communities. In a public forum held on Russell Island on 22 January 2017, residents raised a range of issues. These included the lack of fire bans, limited evacuation routes on all islands particularly from the southern end of Russell Island, identification of vulnerable residents, local laws preventing people from clearing their blocks, and identification of private land as opposed to council land, but most significantly the amount of fuel on undeveloped blocks. Among the many issues raised in such public forums and in communications to Redland City Council (Council) and the media, were concerns about the capacity of Council's Fire Management Plan. Mayor Karen Williams made a commitment that Council would commission the QFES to undertake an independent review of the level of fire preparedness of both council and private land on the mainland and SMBI and ensure the Fire Management Plan contributes to a safer community. This review fulfils this commitment.

To gain a better perspective of potential issues on the SMBI, given the obvious isolation, Council initially limited the scope of work to the SMBI. The review was later extend to include the mainland. In conducting the review, the QFES Training and Emergency Management Unit undertook the following actions:

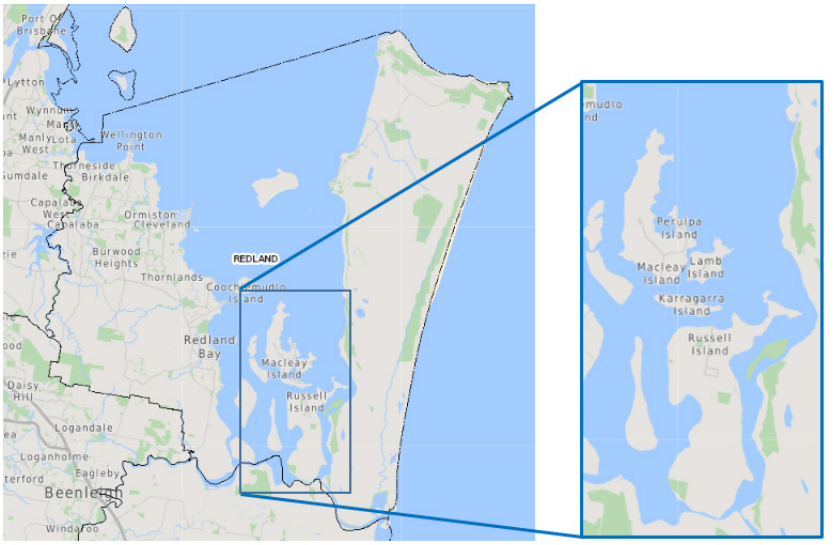
1. Review the vulnerability levels of the SMBI and mainland from wildfire
2. Review Council's current maintenance plan for the SMBI and mainland to ensure it is scheduled for maximum benefit
3. Review impacting legislative requirements to ensure there are no conflicts and gauge community understanding
4. Collect and verify mapping data utilised by QFES for planning and response to wildfires
5. Review council fire access trails to determine whether or not they are sufficient for QFES use
6. Produce a written report.

In addition, the QFES Predictive Services Unit (PSU) developed and provided an online interactive visual quantitative product, the SABRE Redland City Council Bushfire Analysis site. This will assist Council to plan for better community safety and resilience during wildfire events. Additional statistically based information and findings are presented in the Bushfire Risk Analysis Report – Redland City Council in Annexure A. Council's Disaster Planning Unit has been provided access to the SABRE website and QFES PSU will work with Council to establish a list of authorised users of this product (https://sabre.qfes.qld.gov.au/#/signin).

Redland City Council geographic area

Redland City, better known as the Redlands and formerly known as Redland Shire, is a local government area located in the south-east of the Brisbane metropolitan area in south-east Queensland. It is spread along the southern coast of Moreton Bay covering 537.1 square kilometres (207.4 sq. mi). Its mainland borders the City of Brisbane to the west and north-west, and Logan City to the south-west and south, while its islands are situated north of the City of Gold Coast.

The SMBI are located in the Council area to the south-east of Brisbane and comprise Karragarra, Russell, Macleay and Lamb Islands as shown below.



Redland City Council area, including insert of Southern Moreton Bay Islands.

The vegetation within the parks and reserves on the mainland is comprised largely of dry sclerophyll forest, melaleuca wetlands and mangrove communities. The islands comprise a range of vegetation types mainly spanning mangroves and sedgelands through to dry and wet eucalypt species with a range of undergrowth types and loads. The fire risk for the SMBI would be generally deemed as low to medium if not for the complexities of land ownership, the nature of the SMBI vegetation, climate, and access from the mainland. These all require a detailed understanding of the potential for bushfire and its potential impacts under a range of conditions so as to properly inform the development and implementation of appropriate mitigation strategies.

The mainland areas of Redlands largely have a bushfire risk of low to medium with patches of high risk around the communities of Mount Cotton, Redland Bay and Sheldon.

Stradbroke Island also known as Minjerribah is a large sand island located to the east of SMBI; at 275.2 square kilometres, it is the second largest sand island in the world. The island has three small towns, Dunwich, Point Lookout and Amity Point. The presence of a long-established Aboriginal community on the island has resulted in a successful native title determination. Tourism is a major and growing industry on the island, and Stradbroke has been a site for sand mining for more than 60 years. Tourism and mining are currently the island's main industries. In recent years a number of significant bushfires have occurred that consumed a large amount of bushland, but the threat from bushfire remains high.

Given Council's very limited land area management, Stradbroke Island has not been investigated within this review.

Scope of work

QFES – TEM was initially engaged by Council to conduct a review of the points presented below in three potential phases: Phase 1 – review and recommendations for SMBI, Phase 2 – review and recommendations for the mainland area of the Redlands and Phase 3 – review and recommendations for Stradbroke Island. Phase 1 commenced on 20 February 2017 with an initial contract period of four weeks, while commencement of Phase 2 and 3 would be dependent on the success of Phase 1. Preliminary findings and recommendations were presented to Council for Phase 1 on 16 March 2017, with a request from Council to proceed with Phase 2. Discussion between QFES and Council saw a mutual recommendation not to continue Phase 3 at this time due to minimal Council involvement in management of large parcels of land on Stradbroke Island.

The following are the agreed scope points as agreed in the TEM proposal document:

1. Review the vulnerability levels of the SMBI from wildfire
2. Review Council's current maintenance plan for the SMBI to ensure that it is scheduled for maximum benefit
3. Review impacting legislative requirements to ensure there are no conflicts and that they are understood by the community
4. Collect and verify mapping data utilised by QFES for planning and response to wildfires
5. Review Council's fire access trails to determine whether or not they are sufficient for QFES use.

Limitations of scope

At the commencement of this review, significant issues outside QFES' control limited the delivery of the completed review within the initial contracted timeframe:

- The Redland City Council Bushfire Action Plan was not in a usable format for the QFES Predictive Services team, however this was overcome with consultation and cooperation between the relevant Geographical Information System (GIS) departments and the PSU team, with an additional 10 days added to the length of the review.
- The impact of Tropical Cyclone (TC) Debbie in North Queensland and the following severe weather events caused by ex TC Debbie in south-east Queensland resulted in storm damage and significant flooding. Operational responses by both QFES and Council required this review be placed on hold for two weeks.
- The ability to determine whether Council's current maintenance program is scheduled for maximum benefit is not viable given existing limitations of modelling software and computer technology available to QFES. The current maintenance program has been proven to offer a measurable benefit, but alteration of the specific burn frequency and order of burning to provide maximum benefit is currently not achievable within existing resources.

- While assessing legislative requirements, the project team focused on the level of community understanding of local laws; assessing council by-laws against other legislation was considered out of scope.
- Reference has been made to a number of previous reports and procedure documents produced by or for Council. Many of these are now very dated, but it is out of scope to assess their current accuracy. It has been assumed that all prior requirements are still accurate.

Methodology

The review methodology considered the following:

a) GIS data was supplied in non-digital format by Council's Conservation Team. The data consisted of council reserves, hazard reduction zones and known burn history.
b) Council GIS, in conjunction with the Conservation Team and QFES Predictive Services Unit revised the data into a format usable by both QFES software and systems.
c) Council's Bushfire Plan contained a prescribed burn schedule, however many hazard reduction zones had a predicted burn date of "TBA". With expert knowledge of bushfire behaviour and data provided by Council, QFES Predictive Services Unit edited the scheduled date for each of the zones that had previously been assigned "to be announced" (TBA).
d) Clarification of council land, in particular on Russell Island, was sought and provided by Council's Conservation Team via hard copy maps and Council's Mowing and Fire Management Application.
e) Field inspections were conducted to develop an appreciation for the areas under Council management.
f) Field inspections of fire breaks and fire access trails were conducted with QFES Rural Fire Brigades, with on-the-ground findings compared to QFES mapping systems data and assessed to ensure they are fit for purpose as detailed in the Parsons Brinckerhoff SMBI Firebreak Report 2005.
g) Fuel loadings were assessed using collection of physical samples from key locations on each island.
h) Assessment of fuel loadings was conducted to verify the accuracy of vegetation types and fuel loadings within QFES predictive and mapping systems using the Overall Fuel Hazard Assessment Guide – July 2010 (Department of Sustainability and Environment, Victoria).
i) Assessment of various fire risk measures was conducted using multiple computer simulation tools including a bushfire simulator and risk assessment tool, Phoenix. Such risks include the measure of fire danger, known as the McArthur Fire Danger Index (FDI), which was developed in the 1960s by CSIRO scientist AG McArthur to measure the degree of danger of fire in Australian forests. This index combines a record of dryness, based on rainfall and evaporation, with meteorological variables for wind speed, temperature and humidity.
j) Consultation occurred with various residents and organisations to assist in the determination of their perceived level of vulnerability. This consultation took the form of face-to-face meetings, email correspondence, an assessment of feedback from prior community meetings, and an online survey (Appendix D).

k) The project team was provided with copies of current council legislation to compare and analyse against QFES and other relevant legislation in order to identify contradictions and measure the level of community understanding.

l) The project team identified a definition for the term "vulnerability" in order to measure and report on the review findings. While the term vulnerability can mean different things to different people, this report will assume that the following points are considerations in measuring the level of vulnerability of residents on the SMBI. It is beyond the scope of this report to provide in-depth analysis or recommendations with regard to vulnerability, but each of the following adds significant complications to the welfare of residents:
    - Age-related issues including fragility and mobility
    - Various disabilities, including mental health
    - Socio-economic disadvantage, including substandard living conditions
    - Geographic isolation of SMBI communities
    - Lack of transport on the SMBI.

m) Field inspections of fuel loadings were conducted to determine fuel loadings within council-managed land using the Overall Fuel Hazard Assessment Guide July 2010 (Department of Sustainability and Environment, Victoria).

n) The project team undertook visual assessment of some fire access trails within council-managed land to determine any trends of usability.

o) The team assessed various data sources relevant to the mainland using QFES Total Operational Mapping systems.

Consultation

As part of the review the TEM project team consulted with the following individuals and organisations:

- Southern Moreton Bay Combined Island Association Representatives
- Local residents via face-to-face meetings, email, social media and online survey
- Real Estate Agents on Russell and Macleay Islands
- QFES Rural Fire Brigades on each island
- Queensland Police Service (QPS) Officers on Russell and Macleay Islands
- State Emergency Services (SES) Officers on Russell Island
- Redland City Council Conservation Team
- Redland City Council GIS Team
- Redland City Council Disaster Planning Team
- Redland City Council Bylaws Department
- QFES Bushfire Prediction Unit
- QFES Rural Fire Service Officers
- QFES iZone Officer Brisbane Region.

Data collection sources and techniques

In order to complete this review the project team accessed a number of information sources and collected raw data via a variety of methods, including but not limited to:

- QFES Total Operational Mapping
- Redland City Council GIS and Red-e-Map
- Regional Ecosystem Database
- Ground truth (data observation) to identify remnant vegetation types
- Ground truth to identify fuel loadings using Destructive Fuel Sampling and Visual Fuel Assessments according to the Overall Fuel Hazard Assessment Guide (Department of Sustainability and Environment, Victoria)
- Ground truth to assess council-constructed access strips, trails and strategic breaks for accuracy and usability
- Visual inspection of known fire activity, including both prescribed burn programs and wildfire
- Visual inspection of areas where urban development meets undeveloped land with high fuel levels
- Online survey of SMBI residents to measure their level of preparedness, awareness and opinions on matters relating to this review.

Risk assessment and methodology

The issues identified and presented within this review have been assigned a risk score in order to assist with prioritisation. The Risk Rating Matrix and methodology used are based on the same Likelihood and Consequence Descriptors detailed on page 34 of the Redland City Council Disaster Management Plan – Part 1 – 2016.

The following provides the legend of risk categories used within this report:

E	Extreme Risk	**H**	High Risk	**M**	Medium Risk	**L**	Low Risk

Part A – Southern Moreton Bay Islands (SMBI)

The Southern Moreton Bay Islands comprise Macleay Island, Lamb Island, Karragarra Island and Russell Island.

The findings for the SMBI component of this review have resulted in a significant number of recommendations that, if implemented, will greatly enhance the safety and wellbeing of SMBI communities. The number of recommendations does not imply that the SMBI are currently an unsafe location to reside, however the obvious factor of isolation presents issues that are generally not of concern to mainland areas of south-east Queensland.

	*Southern Moreton Bay Islands (SMBI).*

Scope of work – Phase 1 – SMBI

The following are the agreed scope points as detailed in the TEM proposal document, with the relevant analysis, findings and recommendations presented below.

1. Review the vulnerability levels of the SMBI from wildfire.
2. Review Council's current maintenance plan for the SMBI to ensure that it is scheduled for maximum benefit.
3. Review impacting legislative requirements to ensure there are no conflicts and that they are understood by the Redlands community.
4. Collection and verification of mapping data utilised by QFES for planning and response to wildfires.
5. Review council fire access trails to determine whether or not they are sufficient for QFES use.

Scope Point 1 – Levels of vulnerability to SMBI

Given the relative isolation, residential demographics and general condition of vegetation on the SMBI the overall Risk Rating for the combined island communities has been assessed as high. The following points were identified as factors contributing to this risk rating:

1. Illegal littering and dumping of green waste, household waste and commercial waste on council and undeveloped private land.
2. Build-up of vegetation and ground fuel on council and private land.
3. Hoarding and excess build-up of domestic and commercial waste on some private land.
4. Limited access for QFES fire appliances to key locations with high fuel loadings.
5. Observations indicate SMBI residents have a low personal level of resilience relating to wildfire and other emergency events, including limited public awareness of Council's Disaster Management Plan.
6. Limited initial emergency response personnel and equipment on each of the SMBI and a lack of clear or workable inter-island deployment procedures for RFS personnel.
7. No workable secondary evacuation routes on each of the SMBI.

Each of these vulnerability factors will now be explored within the following section, including relevant recommendations.

Scope Point 1.1 – Illegal dumping of green waste, household waste and commercial waste on council and undeveloped private land

A significant level of illegal dumping occurs on Russell and Macleay Islands, with waste largely comprising commercial quantities of green waste, household waste, building waste, tyres and abandoned vehicles. On Russell Island the location of this dumping is not limited to specific locations, but is generally adjacent to fire access trails in unoccupied areas. On Macleay Island a significant level of illegal dumping exists within the privately owned estate known as 67 acres, south of Wirralee Street. While privately owned property locations have not been identified in this review, The project team will provide details of specific illegal dumping sites to Council for investigation.

The level of illegal dumping is sufficient to significantly impact the development of a wildfire, adding a considerable level of ground and near surface fuel, which contributes to unpredictable fire intensity that is difficult to manage. In addition, substantial illegal dumping will likely present a safety hazard for emergency services personnel due to waste that may be highly flammable, explosive in nature, or may emit toxic gases, all risks RFS crews are not equipped to safely manage. Illegal dumping can spread pests, weeds and create breeding ground for flies, mosquitoes and rats. The unknown properties of some waste may result in severe impact on air quality, water quality and the surrounding ecosystem.

Illegal dumping reduces the appeal of SMBI communities and bushland areas for tourists and the public. In addition poorly maintained environments that are left unchecked may lead to further acceptance of the illegal dumping practices, which can in turn lead to depleted community pride and reduction in property values.

Discussions with local residents suggest that illegal dumping occurs for three primary reasons:

- Council's waste transfer stations are currently closed for two days each week, which contributes to waste being dumped illegally.
- Large amounts of commercial green waste are the result of commercial operators being charged significant fees to dump trees and other green waste.
- High transport costs for removing unwanted vehicles can also make clearing operations prohibitive.

Overall Assessed Risk Level		**MEDIUM – HIGH**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (24)	**Medium (8)**	**High (24)**	**Low (6)**

Examples of illegal dumping and approximate location

The photographs below do not represent all identified incidents of littering and illegal dumping sites, but are provided to more accurately demonstrate the physical situations witnessed while conducting fuel and fire access trail assessments. It is estimated that more than 12 dumped vehicles currently exist on privately owned land south of Wirralee Street on Macleay Island, with approximately 20 dumped vehicles on Russell Island, many of which are in low tidal areas. It is unknown if these vehicles contain fuel, oils or other hazardous substances.

Council waste transfer stations on Lamb and Karragarra Islands are open 364 days per year and these islands have almost no instances of illegal dumping.

	**Example 1 – dumped vehicle, Macleay Island – undeveloped private land.**
	**Example 2 – dumped vehicle and rubbish, Russell Island – Council Road Reserve – Murraba Road.**
	**Example 3 – paint and thinners, Macleay Island – undeveloped private land.** A number of examples of paint thinner cans were identified on privately owned land on Macleay Island. It is unknown if these tins and drums contain paint, thinners or other hazardous substances.

	**Example 4 – gas cylinder and building waste, Macleay Island – Council Road Reserve – Donald Street.** A variety of industrial, commercial and household waste was located within many undeveloped sites, e.g. gas cylinders, vehicle engines, building waste, washing machines, televisions, etc.
	**Example 5 – tyres, Russell Island – undeveloped private land.** In addition to the illegally dumped tyres identified within bushland on Lamb, Russell and Macleay Islands, many developed blocks have extensive hoarding of old cars, trucks, boats, trailers, tyres and other mechanical waste.
 	**Example 6 – commercial quantities of green waste, Macleay Island – undeveloped private land.** By far the most prevalent form of illegal littering and dumping is green waste. On both Russell and Macleay Islands the project team witnessed many dozens of dumping sites on both council land and undeveloped private land. The green waste in most cases is now dry, adding a significant level to the surface and near surface fuel loadings of these areas. The additional fuel loading has not been included in any of the QFES bushfire prediction models and may result in extremely unpredictable fire behaviour. Besides creating unpredictable fire behaviour, the heavy fuel in the form of logs and stumps will continue burning for many days, even months, resulting in additional smoke hazard and possible re-ignition due to sparks and embers.

Recommendations

1. Raise community awareness of local laws via all available reporting and communication channels, encouraging residents to report instances of illegal dumping. Leverage off the Queensland Department of Environment and Heritage program: “See It, Report It, Stop It.”
2. Investigate the viability of operating Council’s waste transfer stations seven days per week on Russell and Macleay Islands, in the same manner as Lamb and Karragarra Islands.
3. Investigate alternatives to the existing disposal fees for commercial green waste, and the inclusion of mulching or chipping facilities at waste transfer stations to convert bulky green waste into a usable commodity for council and community.
4. Coordinate a systematic clean-up of impacted areas using council personnel and resources with assistance from volunteer community groups or organisations such as ‘Clean up

Australia'. As many illegal dumping locations are on private land, a partnership between Council and land-owners may be considered to assist in cost recovery. Any coordinated clean-up would include safety considerations for those involved.

5. Consult with RFS Regional Office to identify their needs with regard to vehicle wrecks for road crash rescue training. While the vehicles will still require removal from the islands, the costs would be partially offset by the training opportunities for emergency services.
6. Implement a proactive approach to Council's local law enforcement on the SMBI, which will likely require additional enforcement personnel and up-skilling of additional enforcement officers to assess matters relating to Local Law 3, including fuel loadings and reduction of hoarding and unsightly blocks.
7. Investigate the feasibility of access control to popular illegal dump sites. As many dump sites are on private land, cost recovery must be considered.
8. For illegal dumping or excessive build-up of fuel on private land, consider involvement of QFES, in accordance with the *Fire and Emergency Services Act 1990* Section 69 which states, "the occupier of a premises must take measures to reduce the risk of fire occurring and reduce the potential danger to persons, property and the environment in the event of a fire occurring".

Scope point 1.2 – Build-up of vegetation and ground fuel on council and private land

The overall fuel hazard is a measure of fuel available to burn and is defined in terms of low, medium, high, or extreme. Not all vegetation is fuel that readily burns, with the important fuel being dead vegetation that is thinner than a pencil (6mm) and tree bark, both referred to as fine fuels. Fine fuels comprise surface fine fuels (leaves, fallen bark etc., in the litter layer on the ground) and near surface fine fuels (twigs, leaves and grasses just above the ground surface).

How much fuel builds up in a given area depends upon how much the local vegetation 'sheds' fine fuel litter and how quickly it rots. The overall fuel hazard is measured by assessing the influences or hazard of the type of bark on trees, the amount of elevated fuel such as grasses, ferns and shrubs, and the amount of fine fuel on the surface of the ground.

Overall Fuel Hazard = Bark Hazard + Elevated Fuel Hazard + Surface Fine Fuel Hazard

The surface and near surface fuels are the main driving forces for wildfire intensity and high fuel loads can lead to much more intense and hotter wildfires that put the island communities and ecosystems at greater risk. Combatting wildfires with higher fuel loads is more unpredictable, requiring far more human and mechanical resources.

The SMBI Bushfire Management Plan 2004 states that hazard reduction programs aim to reduce the severity of a bushfire by reducing the amount of fuel available to burn during a bushfire. This makes the bushfire easier to control and reduces the level of bushfire damage to community and environmental assets. Hazard reductions must be completed with due regard to the protection and management of the natural environment. It is important to recognise that situations may arise where the necessary objectives of life and property protection are in conflict with environmental objectives. Wherever possible, solutions will be sought that protect both life and property and uphold

environmental principles. However, where both cannot be achieved, protection of life and property shall take priority.

The SMBI Bushfire Management Plan 2004 also states that fuel reduction is generally only needed when loads of dry fine fuel reach more than 12 to 15 tonnes per hectare. It is unknown whether or not the measure of fuel was deemed to be an overall fuel hazard assessment or just a measure of dry fine fuels at surface and near surface levels; the assumption is that this measure refers only to the latter. The project team has undertaken visual fuel assessments using the Overall Fuel Hazard Assessment Guide (Department of Sustainability and Environment, Victoria) and physical assessments using destructive fuel sampling methods. Results have indicated that many areas of the SMBI, but primarily Russell Island, are carrying a high to extreme fuel loading in excess of 15 tonnes per hectare in many areas. This is likely a result of multiple factors not limited to:

- Reduction in council prescribed burn programs in recent years
- Unseasonable dry weather
- Confusion from residents as to what can be removed from their land
- Limited burning on large private acreages due to the reported unwillingness of some Fire Wardens to issue fire permits.

The matter of Fire Wardens was raised specific to Lamb Island by the owner of a large acreage property and RFS volunteers on the island. Records show there have been no permits issued by RFS in a number of burn seasons. QFES is investigating the current warden structure on the SMBI and ensure that all Fire Wardens provide the correct standard of service to the residents of their area.

The survey of SMBI residents indicated that 52 per cent of respondents did not feel safe and that their number one fear was wildfire in overgrown vegetation (figure 1).

The Predictive Services Report and Bushfire Analysis Tool (Annexure A) provides fuel loading maps and various risk mapping results.

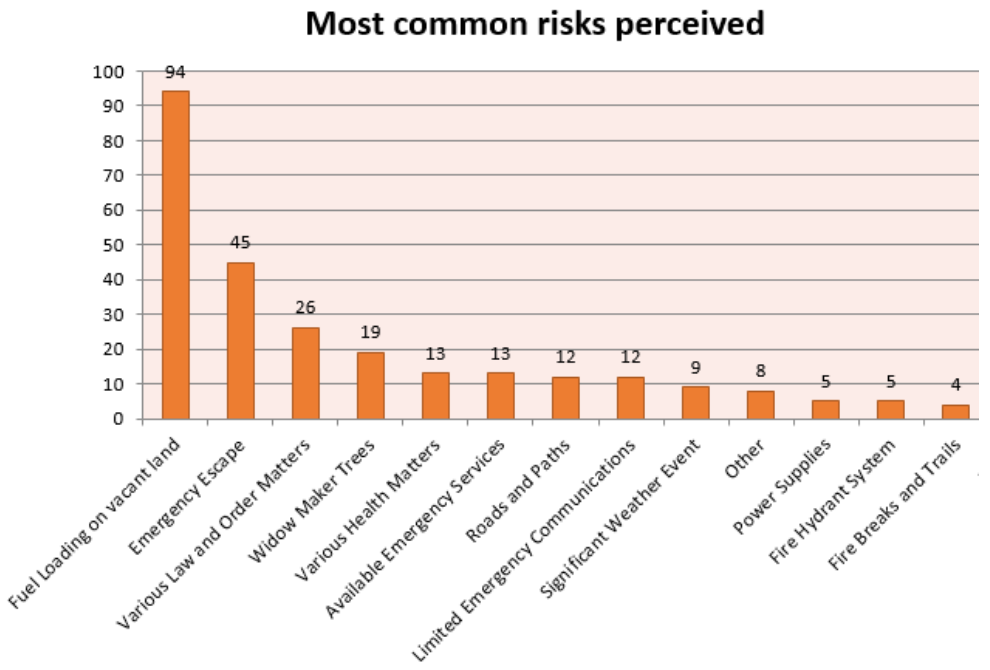


Figure 1 – Results of public survey – Perceived hazards to personal safety.

Overall Assessed Risk Level		**HIGH**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Extreme (32)	**Medium (16)**	**High (24)**	**Low (8)**

Examples of build-up of vegetation and ground fuel on council and private land

The photographs on the next page do not represent all incidents of high fuel loads, but are provided to more accurately demonstrate the physical situations the project team witnessed while conducting fuel and fire access trail assessments. These examples do not suggest that all SMBI have the level of elevated and near surface fuel, but they are indicative of observed areas that have not seen fire in more than 10 years. While privately owned property locations have not been identified in this review, The project team will provide Council with details of specific sites of high fuel loads.

	**Example 1 – elevated and near surface fuel witnessed with estimated overall fuel loading over 32 t/ha on Russell Island – Ecological area at western end of Bilabil Drive.**

	**Example 2 – surface fuel levels witnessed in excess of 300mm deep with an estimated surface fuel loading of more than 20 t/ha on Russell Island – west side of Centre Road in Whistling Kite Wetlands.**
 	**Example 3 – surface and near surface fuel levels on this private block are high with excessive vegetation cleared and piled in the middle of the block.** While this block does not represent a significant risk for initial wildfire ignition, it does become a high probability for spot fires resulting in neighbouring structures being exposed – Leanne Street, Macleay Island. This does not suggest that all SMBI have this level of ground fuel on all undeveloped blocks, but is indicative of many private blocks in areas that have not been maintained.

Recommendations

9. Implement the recommended prescribed burn schedule contained within the QFES Predictive Services Report on council-managed land (Annexure A).
10. Council should investigate the use of RFS and other service providers to assist or undertake these tasks. When conditions are favourable, the prescribed burn program must be a high priority.
11. In the event of prolonged unfavourable weather that limits prescribed burning, consideration must be given to implementing or strengthening fire access trails into fire breaks, as detailed in Rob Friend and Associates Fire Break Assessment Report for Redland Shire Council – 1996 and the Parsons Brinckerhoff SMBI Firebreak Report for Redland Shire Council – 2005.
12. When implementing any fire mitigation strategy, Council should ensure activities have a high profile and are publicised using all available channels. Council should report annually on prescribed burning outcomes in a manner that meets public accountability objectives, including publishing details of targets, area burnt, and funds expended on the program, as well as impacts on biodiversity. Council should lead by example with responsible management of fuel loadings on undeveloped land. Any publication of fire mitigation activities is to be accompanied by a call-to-action for private land-owners to help ensure a "Safer SMBI".
13. Implement an awareness-raising campaign for SMBI residents to promote a call-to-action to create a "Safer SMBI". The aim of this campaign will be to inform them of the good work being

done by Council and other land-owners, as well as educating residents and land-owners of their obligations under Local Law 3, Part 3 – Overgrown and Unsightly Blocks and Part 4 – Fire and Fire Hazards. The campaign also offers an opportunity to clarify the significant confusion among SMBI residents regarding Local Law 6 – Protection of Vegetation.

14. Encourage a closer working relationship between Council and RFS volunteers on the SMBI in the identification and management of blocks with excessive fuel loads on both council and private land.
15. Upgrade the Red-e-map system to indicate which blocks are council-managed and which are privately owned. While this knowledge will not reduce the fuel loading on the ground, it will assist residents to identify who they need to mediate with in order to resolve issues.

Scope Point 1.3 – Hoarding and excess build-up of green waste, household waste and commercial waste on some private land

Australian research estimates that between two and four per cent of any given population may suffer from hoarding disorders[1], with anecdotal evidence suggesting that the SMBI would have a much higher incidence than national average. Depending on the extent of the situation, affected individuals and their families may be at risk not only from fire and vermin infestation, but also physical and mental health issues, and significant challenges to their quality of life.

The project team identified a number of cases of private land-owners hoarding high levels of household, commercial and other waste on their properties, taking various forms not limited to green waste, tyres, oils, vehicles, building materials and other waste products. Discussions with a number of local residents and emergency services personnel indicate that hoarding on some private blocks has become excessive, largely due to the behaviour being ignored by Council, which has led to some residents perceiving this as permission to continue or increase the practice.

Some commercial operators are using privately owned land as waste storage areas, rather than paying disposal fees at council waste transfer stations. Local law enforcement appears to be managed reactively with enforcement usually undertaken only when a complaint is received. When a council officer does enter an area, they appear to drive past many unsightly blocks to get to the reported address, then drive past them again on the way out without taking any action.

Hoarding or excessive build-up impacts on public perception of SMBI communities, resulting in a reduced appeal for tourists and visitors. Leaving environments unchecked will likely lead to further acceptance of hoarding practices, which in turn can lead to depleted community pride, reduction of property values and a higher risk to the health and safety of people and the environment.

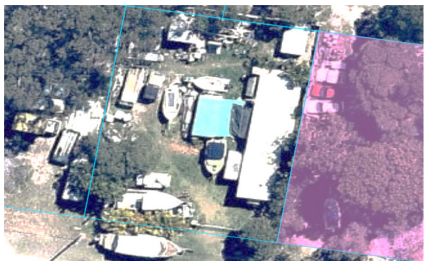
Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (12)	**Low (8)**	**High (24)**	**Low (4)**

[1] Footprints Inc: https://www.footprintsinc.org.au/news-and-events/hoarding-squalor

Examples of hoarding and excessive build-up of green waste, household waste and commercial waste on some private land

The photographs on the next page do not represent all incidents of hoarding and unsightly sites identified by the project team, however these are provided to more accurately demonstrate the physical situations witnessed while conducting fuel and fire access trail assessments. While privately owned property locations have not been identified in this review, the project team will provide Council with details of specific sites of hoarding and excessive build-up of waste materials.

	**Example 1 – hoarding of old vehicles, boats, trailers, etc. on private land on Lamb Island.** This form of hoarding has been identified at various locations on all SMBI. Some more significant than others, but all present significant potential hazards to the community and environment, as well as being unsightly.
	**Example 2 – excessive waste – Karragarra Island.** The project team did not have an opportunity to investigate this particular location on Karragarra Island; anecdotal evidence is that this area is well known to contain significant levels of waste oils and other engineering waste stored here. RFS officers have visited the property in the past.
 	**Example 3 – commercial green waste – Russell Island.** This privately owned block appears to be used as a storage location for fallen timber and waste from commercial tree felling operations. This operation seems to be long term with properly constructed tracks and various storage locations across the large block. While some clearance does exist between the bushland, it is likely that ignition of one or more piles would see a wildfire occur that would have significant impact on access to neighbouring properties.

	**Example 4 – excessive build-up of green waste, likely from clearing of block – Russell Island.** The green waste appears to have been cut many years ago, with no sign of development on the block at present. This form of excessive storage of waste from tree felling and block clearing is common on Russell Island. Local residents report that many such incidents have been raised with Council but little to no action has occurred.
 	**Example 5 – excessive hoarding – Russell Island.** **T**he project team believes that there is a high likelihood of this hazard having an impact on others in the area due to some substandard and makeshift housing in the immediate area. If a fire did occur, due to the ignition of fuels or the vehicles themselves, it would likely spread to bushland very quickly presenting a risk to those living in makeshift housing.

Recommendations

16. Consider engaging counselling services to assist residents that display hoarding behaviours. Council should ensure that enforcement officers are trained in dealing with vulnerable residents and those that exhibit hoarding tendencies. Benefits may exist in partnering with organisations such as Pathways, developed by Catholic Community Services (NSW & ACT). This group provides a central point of information on hoarding and its website provides links to resources and support groups.

Scope Point 1.4 – Low personal level of resilience relating to wildfire and other emergency events

As a general statement the residents of the SMBI have a low level of personal and community resilience in relation to wildfire and other emergency events compared to residents of the mainland. This is particularly true for the central and south-western areas of Russell Island. This may be a result of multiple factors including but not limited to:

- Isolation from the mainland support services
- Ageing demographic with potentially less mobility or ability
- Poor preparation of properties in high-risk areas of the SMBI
- Limited understanding of actions to take prior to and during an emergency
- Limited communication methods on parts of the island.

Residents have a much higher level of dependence on responding authorities to assist them in times of need as, given the physical isolation and limited capacity of emergency services and support agencies, many calls for assistance may go unanswered. Discussions and recent public meetings have seen some residents express unrealistic expectations of emergency services and support agencies, resulting in poor perception from those people the officers aim to protect and potentially depleted morale among volunteers.

While emergency services and Council have a responsibility to assist in providing a safe environment, it is recognised that residents must also be prepared to help themselves. A critical component in this is for residents to understand that the impact of wildfires on the SMBI is almost certain and their best defence is to have their own Bush Fire Survival Plan that provides some predetermined triggers. The survey of SMBI residents indicates that many have a plan but more than 25 per cent of respondents do not have a Bush Fire Survival Plan (figure 2).

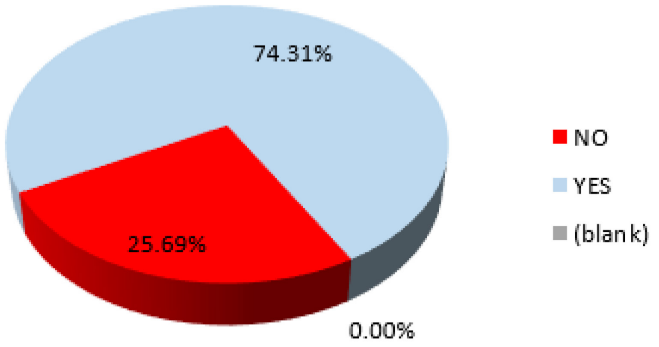


Figure 2 – Do you have a Bushfire Survival Plan for your home?

Maintenance levels of both private buildings and gardens can significantly affect vulnerability. A poorly maintained building with a significant accumulation of litter in gutters and roof gullies, weed infestation and unkempt gardens can all provide an unbroken fuel path to the building or to other flammable material (such as fire wood or gas cylinders) adjacent to the house, which will increase the vulnerability of a building to fire impacts. Throughout the SMBI numerous properties were identified that would likely not survive any form of impact by a wildfire due to one or several of the above-mentioned issues.

The project team observed temporary structures used as dwellings across the SMBI, but more frequently on Russell Island. These structures offer no protection from wildfire or severe weather events. It is unclear how so many similar situations can exist, yet it is again likely due to limited enforcement of local laws.

Council has gone to significant effort to produce its Disaster Management Plan. While it is available in hard copy and digital format the project team has not identified how Council brings it to the attention of residents. The survey of SMBI residents found that more than 40 per cent of residents had not accessed the Disaster Management Plan (figure 3). While this plan is extremely comprehensive, residents have communicated that it offers so much information many residents are daunted by the contents and thus have not read it.

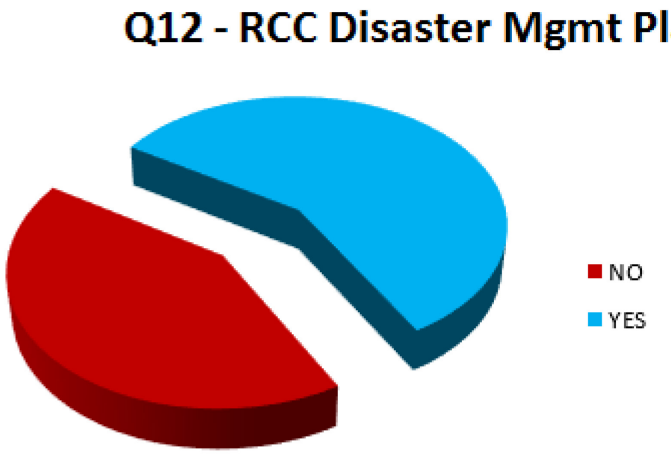


Figure 3 – Accessed Redland City Council Disaster Management Plan.

Discussions with Council's Disaster Coordination Unit indicate that social media and Council's website will be used for community notification, yet the survey of residents revealed a strong expectation of SMS, phone call or street to street notification by emergency services (Figure 4).

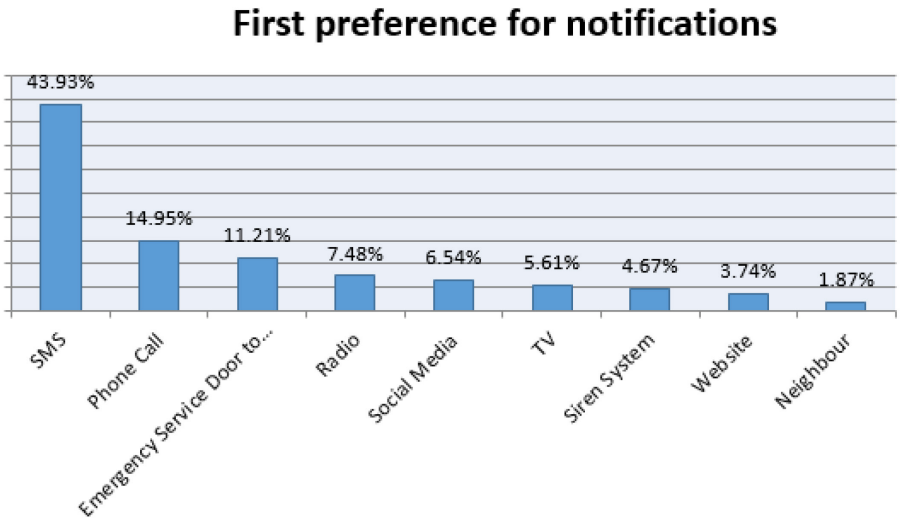


Figure 4 – Warning and notification preference.

Social media is an accepted method of distributing information, however it does not have the same reach as a phone call or SMS message. Consideration should therefore be given to including SMS and phone messaging to both landline and mobile as an initial channel for warnings. Further supporting SMS messages as an addition to the warning notification system for Council will better reach all SMBI demographics, especially the high percentage of people aged over 65, many of whom have not embraced social media as have those aged under 50. Implementation of an enhanced warning and notification system may be best managed via an opt-in system. Council is encouraged to investigate the MoretonAlert system implemented by Moreton City Council to inform the development of its own warning and notification system.

The survey also presented some concerning information regarding the reliability of mobile phones and mobile data on Russell Island. Of those who completed the survey more than 50 per cent of residents on Russell Island stated that they do not have reliable mobile phone coverage at their address (figure 5). This would also affect SMS capability, given that the number of residents with no mobile phone coverage was similar to the data coverage.

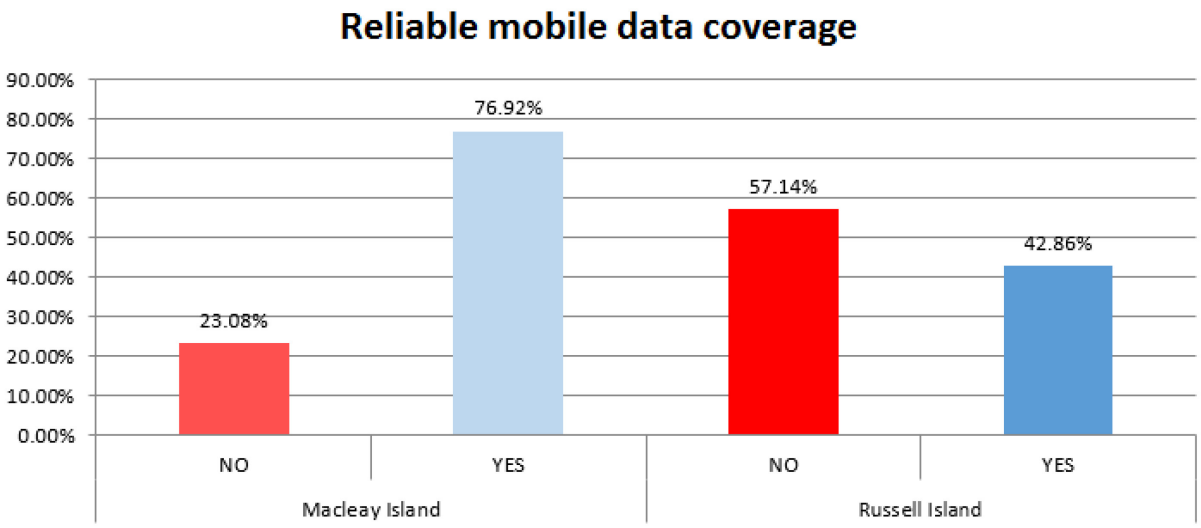


Figure 5 – Mobile data coverage on the SMBI.

The Redland City Council Disaster Management Plan lists radio stations ABC 612 AM and Bay FM 100.3 as information sources during an emergency. Some surveyed residents stated that radio reception for ABC 612 AM was poor on the eastern side of the SMBI. Discussions with Council's Disaster Management Team indicated that use of Bay FM 100.3 was unreliable given that they are a community radio station that is not staffed on a 24/7 basis. In light of the mobile coverage of parts of the SMBI, the added issue of unreliable radio coverage is of significant concern.

The SMBI have an extensive network of ground ball fire hydrants in place which benefit fire crews as they rarely have the water shortage issues normally experienced by mainland units, however for fire hydrants to be of benefit they must be maintained and easily accessible to fire crews. The fire hydrants on SMBI are maintained by Council in partnership with RFS units. Although the hydrants system is generally maintained to an acceptable standard in higher-density residential areas, cases have been identified of hydrants being inaccessible or not maintained to correct standards. Issues creating inaccessibility include but are not limited to overgrowth by vegetation, no hydrant marker posts, and hydrant pits contaminated by silt and dirt or impacted by vehicle movements. *Queensland Transport*

Operations (Road Use Management) Act 1995 – Road Rules Regulations Section 194 states that "a driver must not stop within one metre of a fire hydrant, fire hydrant indicator, or fire plug indicator"; this rule is frequently breached within the retail precincts of Macleay and Russel Islands.

Overall Assessed Risk Level		HIGH	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Extreme (32)	**Low (8)**	**Medium (12)**	**Low (2)**

	**Example 1 – gutters full of leaves and other plant matter.** This may provide an opportunity for embers from an active fire some distance away to start a small fire in the roof, which may quickly spread to the rest of the house. As crews will likely be committed at the initial fire, the house would almost certainly be destroyed. This does not suggest that all houses on SMBI have this issue, but it is indicative of many homes with trees or bush within close proximity.
	**Example 2 – unoccupied houses quickly become overgrown with high levels of surface and near surface fuel around the external.** Elevated fuels not only assist in dropping more fuel into the gutters, but access to the structure can become impossible due to low-hanging branches. This does not suggest that all houses on SMBI have this issue, but it is indicative of many homes that are unoccupied for long periods of time.

	**Example 3 – tents and lean-to structures serving as dwellings.** These types of structures were only seen on Russell Island, primarily located in the south-west corner and central parts of the island. It is not known how many residents are living under canvas on the SMBI. While outside of the scope of this review, consideration must be given to implement a plan to care for these community members when life-threatening events occur. It is unknown if anyone in this camp has a mobile phone or a vehicle.
	**Example 4 – a semi-permanent sub-standard home that is likely not meeting building regulations or local laws.** The structures are generally made of discarded building material such as sheet iron or ply board. These forms of structures were only seen on Russell Island, primarily located in the south-west corner and central parts of the island. It is not known how many residents are living in these conditions. Whilst outside of the scope of this review, consideration must be given to implement a plan to care for these community members when life-threatening events occur. It is unknown if anyone in this camp has a mobile phone or a vehicle.
	**Example 5 – fire hydrants must be available for use at all times.** This hydrant is located in the public carpark on Macleay Island. This example does not imply that all hydrants on the SMBI have major concerns. In general the hydrants on the SMBI are reasonably well-maintained.

Recommendations

17. Introduce and improve emergency information signage on the SMBI. Recommended signage should include a basic map of the relevant island, evacuation routes, information sources, e.g. ABC Radio 612 AM, Council's website and emergency locations, such as assembly areas, neighbourhood safer places and locations of emergency services facilities. These signs are to be displayed at the ferry and barge terminals, and could either stand alone or become part of the current Fire Danger Rating signs on the SMBI.
18. Erect evacuation area signs and neighbourhood safer places signage at relevant locations, with each including relevant emergency contact details. Council should liaise with Area Fire Management Groups to complete this matter.
19. Council partner with RFS to analyse the results of the Predictive Services Report and Bushfire Analysis Tool to tailor a new advance warning protocol. This new protocol may include tailored information to ensure vulnerable residents are accounted for and advised within 24 to 48 hours prior to an event, providing them with ample time to enact their own Bushfire Survival Plan.
20. Council should consider partnering with existing volunteer organisations to ensure vulnerable communities are targeted with relevant safety messages, programs and instructions. To be effective these need to be part of a well-designed long-term community education program that captures people's attention, allowing for local needs and circumstances, and regularly evaluated and improved. Programs with primary significance include, for example, Bushfire Survival Plans and Prepare, Act, Survive.
21. Conduct street audits to identify residents, addresses and locations requiring tailored emergency assistance during emergencies or evacuation, in collaboration with relevant authorities and community groups. The results are to be maintained in a register that is shared with emergency services and other relevant support organisations with pre-arranged responsibility for assisting the recorded residents.
22. Create a simplified or abbreviated Disaster Management Plan. In order to achieve this, the document may be limited to each island community and specific to seasonal risks. Included in this abbreviated plan should be critical information sources, e.g. ABC Radio 612 AM, Council's website, and a map that highlights critical points, such as evacuation routes, evacuation centres, assembly areas and neighbourhood safer places. Delivery of this information is tailored to meet the needs of the community.
23. Given the limited access many SMBI residents have to emergency warnings and advice due to communication challenges, identification of alternatives must be given high priority. Council is to investigate other feasible methods to notify residents of emergencies that require their attention.
24. Complete an audit of the fire hydrant maintenance program to ensure community expectations of accessibility and usability are being achieved.

Scope Point 1.5 – Limited initial emergency response personnel and equipment on each of the SMBI and lack of clear or workable inter-island deployment procedures for RFS personnel

Discussions with RFS and SES indicate that a large percentage of current volunteer personnel have limited availability during normal working hours as they work on the mainland. All RFS on the SMBI have the general availability to respond a single crew 24 hours a day, seven days a week, however there is limited capacity to guarantee any additional crewing on a second vehicle. The general exception to this statement is Lamb Island, as RFS officers confirmed that almost all members were retired and far more personnel were available than seats on the fire appliance. Lamb Island RFS and SES have indicated their strong and stable membership is available for inter-island support if required, providing there was a transport system available.

Statistical data detailed in the PSU Bushfire Risk Analysis (Annexure A) indicates that Fire Danger Index days of FDI 20 or above occur on average nine times each fire season. In these conditions the expectation is that wildfires would develop quickly based on the level of available fine fuels currently seen on the SMBI. A wildfire occurring in such conditions requires an aggressive suppression action by firefighters. Actions by the first resources to arrive at a wildfire are to protect lives and property by preventing further extension of the fire. A single firefighting resource can do little but pick a location to protect and anticipate the arrival of additional resources. Given the relative isolation of SMBI communities, the first arriving support is frequently from neighbouring SMBI.

In order to provide context, the fires that occurred on Russell Island on 15 December 2016 occurred on a day of FDI 9. While the initial crews followed operational procedure, they were quickly overwhelmed. The fire burnt through 150 ha and ultimately required the attendance of 48 fire appliances, 110 personnel and five aircraft. While there was no loss of life, property or injury to fire personnel, the outcome would have been much different had the FDI been 20 or above.

As the SMBI do not have urban fire resources on site, the RFS contends with more than bushfires, also providing initial actions at structural fires, road crashes and hazardous material incidents. Discussions with RFS personnel highlighted that there was no workable inter-island transport plan with no means to quickly transport the initial support crews from Lamb and Macleay Islands to Russell Island. The officer from Lamb Island tried multiple times to arrange water taxis, barge or other water transport but was ultimately forced to wait 30 minutes for the next scheduled public ferry to arrive. The idea of transporting personnel via SES flood boats was raised, but given the shared volunteer base and physical location of the flood boats it is likely that this would offer little benefit for rapid mobilisation.

Overall Assessed Risk Level		**HIGH**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (24)	**Medium (16)**	**High (18)**	**Low (8)**

Recommendations

25. Assist the RFS and SES to encourage new membership via council communications, website, community gatherings and other appropriate channels.
26. Local RFS brigades have stated that road crash rescue training is cost-prohibitive due to the expense of removing wrecked cars from the island. Council should investigate any cost-neutral transport opportunities to assist with removal of cars after training. This would enable RFS to provide training opportunities to personnel with direct benefit to SMBI communities.
27. Assist RFS and SES to facilitate a Memorandum of Understanding (MOU) with operators of ferries, barges and other vessels in the area to establish a structured procedure for inter-island support to enable SMBI services to respond as a group to other islands. Investigation should occur with all island units to confirm their availability to respond.

Scope Point 1.6 – No workable secondary evacuation routes at all on each of the SMBI

An evacuation route is used by residents to move from a point of danger to a point of safety. Council's Disaster Management Plan – Part 2 for the SMBI lists the evacuation route for each island and the indicated route offers immediate access to the primary evacuation point from each of the SMBI. In all cases the roads are sealed and currently in good condition. The Disaster Management Plan lists alternative assembly areas and evacuation centres, however there has been no information provided on alternative travel paths in the case of the primary evacuation route being impassable. Throughout the SMBI, the only community that has any significant risk posed by a single evacuation route is Russell Island. This is due to multiple factors, such as distance of travel, significant population on the southern end of the island, and significant wild fire risk that runs across the evacuation route. The Predictive Services Report and Bushfire Analysis Tool (Annexure A) clearly demonstrates that the wildfire risk to Centre Road during days of FDI 20 or above is significant.

It is anticipated that a full island evacuation is extremely unlikely, however the need to relocate a population from danger to safety is almost certain and, as indicated by the results to the online survey, residents of the SMBI consider evacuation routes as the second most worrying matter, as shown in figure 6.

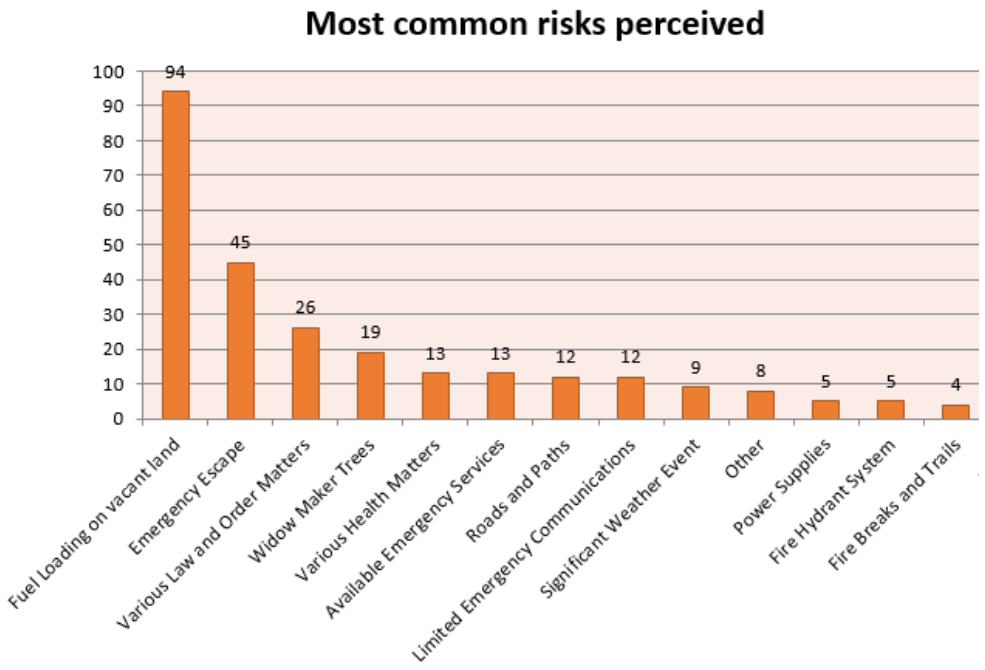


Figure 6 – Results of public survey – Perceived hazards to personal safety.

Overall Assessed Risk Level		**LOW – MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (18)	**Low (6)**	**Medium (12)**	**Low (4)**

Recommendations

28. Monitor the condition and usability of the evacuation routes listed in the Disaster Management Plan and conduct pre-fire season assessments of the amount and condition of fine fuels adjacent. The primary evacuation routes are to be considered as a minimum of Type 1 fire breaks with at least five to 10 metres of maintained land from the road edge to the start of vegetation.
29. Investigate any option to open a second evacuation route on Russell Island, which will be partially achieved if all fire trails and access tracks listed in Appendix A are utilised. If implemented, this new evacuation route must be communicated to the community and emergency plans updated.

Scope Point 2 – Review Council's current maintenance plan for SMBI to ensure it is scheduled for maximum benefit

In principle, Council's Conservation Teams are delivering the intended outcomes of the SMBI Bushfire Management Plan 2004. The Hazard Reduction Programs aim to reduce the severity of a bushfire by reducing the amount of fuel (vegetation) available to burn during a bushfire. This makes the bushfire easier to control and reduces the level of damage to the community and environmental assets. Council's Bushfire Action Planning confirms that Bushfire Action Plans provide the long-term management prescription for managing vegetation within reserves, the associated risk fires present to adjoining landholders and the ecological values inherent in reserve areas. This approach requires regular review in response to both the impact of unplanned fire and park planning priorities. The project team believes that management of fire exclusion zones must be revisited, as the team observed many examples of exclusion zones that had excessive fuel loadings. While fire may not be suitable for these areas, the fuel levels must be managed so they do not present a risk to the adjoining landholders.

The details presented in the QFES Predictive Services Report (Annexure A) and online SABRE product demonstrate that Council's current maintenance plan does present value to the community by reducing the impact of wildfire events.

To undertake the review of Council's current maintenance schedules, a significant level of scientific and statistical analysis of historical and current datasets was conducted. To conduct simulations and assessments a number of assumptions were made, the more significant being the level of danger being planned for. The measure of fire danger is termed as McArthur Fire Danger Index (FDI), and was developed in the 1960s by CSIRO scientist AG McArthur to measure the degree of danger of fire in Australian forests. This index combines a record of dryness, based on rainfall and evaporation, with meteorological variables for wind speed, temperature and humidity. Historical weather observations from the past 15 years in the Redlands indicate that during a calendar year a rating of FDI 10 is likely to occur 40 times, FDI 20 nine times, and FDI 30 twice. FDIs of 40 and 50 are seen much less frequently with a long-term average of less than one day per year. South-east Queensland has no recorded days over FDI 50 although some long-term forecasters predict that this is highly likely within the next 50 years. While strategies to ensure 100 per cent safety from all possible emergencies are desirable, FDI 20 was selected as the level on which to base findings, as this level statistically occurs most often. The fuel management component of Council's fire mitigation plan tested via the PSU simulations was found to be effective at FDI 20, and could reasonably be expected to manage a sufficient amount (but never all) of the bushfire risk for most of the year.

At FDI 20 the current Bush Fire Plan reduces the risk to the SMBI communities; figure 7 presents a summary of the findings. It is important to note that simply judging the value of mitigation activities by considering the grand total will be misleading given the total reduction in areas is only 21 hectares. The true benefit is gauged by the total number of hectares that is reduced from 'Probably Not Effective' to 'Probably Effective', which in this case is 116 hectares. Given that the primary purpose of

mitigation activities is to reduce risks to the community, the reduction to 'Probably Effective' will now allow QFES to protect a significant area across the SMBI.

Change in Area (ha) Between Baseline and Mitigation by DA Success Area by DA Success and Scenario

			DA Success Category				
Ignition Locality	FDI Level	Fuel Treatment	b. Not Effective	c. Probably Not Effective	d. Probably Effective	e. Effective	Grand Total
KARRAGARRA ISLAND	20	Baseline (Long Unburnt)		13 ha	14 ha	62 ha	88 ha
		Mitigation Option 1		11 ha	13 ha	62 ha	86 ha
LAMB ISLAND	20	Baseline (Long Unburnt)	0 ha	30 ha	25 ha	71 ha	126 ha
		Mitigation Option 1	0 ha	22 ha	24 ha	68 ha	114 ha
MACLEAY ISLAND	20	Baseline (Long Unburnt)	2 ha	216 ha	88 ha	381 ha	687 ha
		Mitigation Option 1	2 ha	204 ha	80 ha	393 ha	680 ha
RUSSELL ISLAND	20	Baseline (Long Unburnt)	6 ha	281 ha	208 ha	1,106 ha	1,600 ha
		Mitigation Option 1	5 ha	243 ha	202 ha	1,145 ha	1,596 ha

Figure 7 – Summary of mitigated area between baseline and mitigation options at FDI 20 for mainland localities.

Council has established fire management zones to provide the framework and direction for managing fire on council-managed land. Fire management zones provide a practical way of identifying, planning and applying appropriate fire regimes across the landscape. Within any one zone there may be one or many vegetation communities or habitats as well as climate characteristics; environmental, cultural or economic values; and a corresponding range of appropriate fire regimes depending on the purposes of the zone. Exclusion zones on the SMBI have many ecologically sensitive areas currently listed as fire exclusion zones with the aim of totally excluding fire. Fuel assessments and wildfire modelling suggest that the exclusion zones on the southern end of Russell Island are directly responsible for the extreme risk that wildfire will present on days of FDI 30+.

The recent fires have removed much of the fine fuel loadings from this part of the island, however many parts escaped impact by wildfire and continue to present a significant risk to the community. From Council's Bushfire Action Plan 2016, the specific zones of concern are EZrs8, EZrs9, EZrs10, EZrs11, EZrs12 and EZrs13.

Council's Conservation Team uses QFES methodologies prescribed in the Redland City Council Fire Management Operational Guideline 2007. While it is unlikely that there has been any significant change to these methodologies, it is outside of the scope of this review to make a full assessment of this document to ensure it reflects current QFES methodologies.

Overall Assessed Risk Level		**LOW - MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (10)	**Low (4)**	**Medium (12)**	**Low (4)**

Recommendations

30. Create access trails within the southern zone of Russell Island to allow RFS units to enter for fire suppression activities. These trails would ideally be constructed and maintained to Type 3 fire trail as described in the Rob Friend and Associates Fire Break Assessment Report 1996.
31. Revisit the current fire management practices detailed in Redland City Council Bushfire Action Plan 2016, specifically Section 3 (South) of Russell Island. The plan recommends the consideration of possible burns to maintain regional ecosystems. Given that protection of life and property is always to be placed above environmental concerns, prescribed burns should be considered to reduce fine fuel loadings that currently increase the significant impact of wildfire. As detailed in QFES PSU Risk Analysis Report (3.2 Key Assumptions) prescribed burning of ecological zones has not been programmed. Council should explore how best to incorporate these zones into the proposed prescribed burn schedule.
32. As the current Redland City Council Fire Management Operations Guidelines were prepared by QFES in 2007, it is recommended that this document be fully assessed to ensure it still presents an accurate guide for operations.
33. Conduct an analysis of the SMBI using SABRE tool to identify areas that require specific works to provide a greater level of safety to the community. Conducting an assessment at FDI 30+ will enable Council to identify areas that may benefit from activities other than fuel mitigation in order to better respond to the risk.

Scope Point 3 – Review of local laws, *Fire and Emergency Services Act* and other associated legislation

Discussions with SMBI residents and online survey results have identified a significant lack of understanding and dissatisfaction around Council's local laws. Upon investigation, the project team has identified a perceived conflict within the local laws.

Local Law 3 – Community and Environmental Management, Part 3 – Overgrown and Unsightly Blocks requires land-owners to manage overgrown and unsightly allotments. Local Law 3, Part 4 – Fire and Fire Hazards stipulates a requirement to manage fire hazards for the purpose of protecting the environment and public health, safety and amenity within the local government area.

Local Law 6 – Protection of Vegetation contains a requirement to protect significant vegetation. The objectives of this law are to provide:

- appropriate protection for significant vegetation
- management of protected vegetation
- necessary powers to enforce Vegetation Protection Orders (VPO)
- the necessary powers to require appropriate action to reinstate vegetation damaged in contravention to the local laws.

It is the understanding of the project team that a blanket VPO protects all of the SMBI, although this information is not readily available to the public. Those residents interviewed expressed significant confusion and frustration with this issue. This confusion appears partly to blame for the excessive fuel loadings in some parts of the SMBI. More than 40 per cent of survey respondents stated that Council's local laws limited their ability to prepare their allotment for wildfire (figure 8).

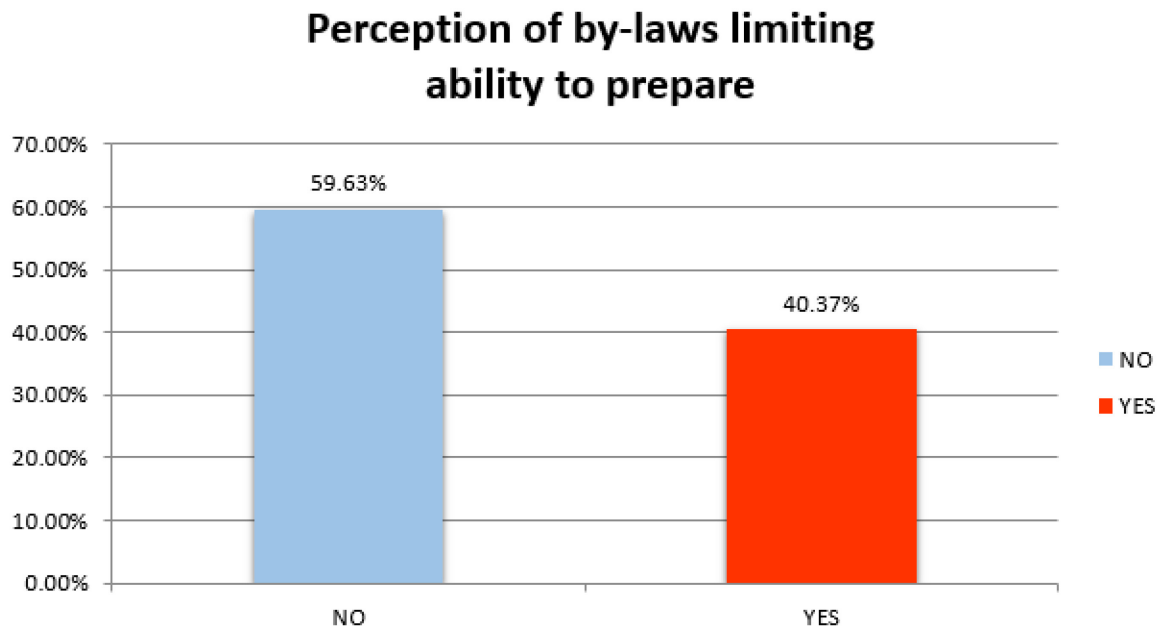


Figure 8 – Perception of local laws limiting ability to prepare allotment for fire.

Evidence suggests that local law enforcement on the SMBI is almost entirely reactive to complaints from the public with little proactive enforcement.

This lack of enforcement has contributed to significant vegetation loadings with illegal dumping of commercial quantities of various waste and storage of large numbers of vehicles and machinery. Residents advised that without enforcement of local laws by Council, they felt somewhat ignored in their plight to achieve a safer island community. Those residents interviewed appeared to be highly aware of Local Law 3, yet they expressed the opinion that Council itself does not take it seriously, citing examples of enforcement officers investigating a specific complaint driving past yet failing to inspect many allotments clearly in breach of the law, with excessive amounts of fuel, illegal dumping and hoarding.

SMBI residents also questioned the ecological value of vegetation on many allotments. From accounts of those that have resided on the SMBI since the 1980s, almost all vegetation was wiped from the landscape during the initial clearing and development of the land in the 60s and 70s. Basic assessment of the SMBI sees little evidence of pre-clearing remnant vegetation. The project team does not imply that the above statements are correct but it must be acknowledged that the issues raised warrant further investigation in order to provide clarity for residents.

The ability to contact and network with neighbouring property-owners was another specific point of concern for residents, who in many cases had been proactive in maintaining their own property only to have a tree that hangs over or near their property continuing to drop branches and leaves. Residents were unsure whether or not they could enter a vacant block of land to clear offending vegetation or take action to ensure the owner of the vacant neighbouring block had the correct level of clearance from fences and structures.

Local Law 6 – Protection of Vegetation offers specific circumstances where damage to vegetation is permitted with an allowable distance of three metres for clearing hazards, however 10 metres is acceptable from a dwelling lawfully constructed at the date of commencement of this local law. The issue revolves around what date the local law commenced, which is not clearly detailed, creating another point of confusion that can lead to conflict between neighbours or residents and Council.

Another issue that was highly represented in the online survey was a fear of so called ‘widow maker’ trees. Many residents reported raising their concerns with Council, only to be told that the tree presented no danger. In some cases these trees were on the property of the occupant and in other cases were on neighbouring properties or public land. While it is not within the scope of this review or the expertise of the project team to offer an opinion on the hazards these ‘widow maker’ trees present, it is another example of the way conservation laws can create conflict and concern among SMBI residents.

In many cases determination of property ownership was misunderstood; in any case where occupants were unaware of land ownership Council was generally assumed to be the owner. This fact does little to encourage or foster a good relationship between residents and Council.

Overall Assessed Risk Level		**LOW – MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (10)	**Low (4)**	**Medium (12)**	**Low (4)**

	**Example 1 –** A resident on Macleay Island stated that his neighbour could not be contacted to clear vegetation away from his property. He was unsure whether he could clear up to three metres from the fence to offer protection to his property.
	**Example 2 –** A resident on Russell Island stated that his neighbour ignored requests to clear excessive vegetation from their allotment.
	**Example 3 –** A resident on Karragarra Island raised concerns about tree limbs overhanging his home. In high winds the concern was that a branch may fall on his home. He had no idea how to identify or contact his neighbour.

Recommendations

34. Council to upgrade the Red-e-map system that displays properties that are currently covered by a VPO. Additional information should be made available to indicate:
    - Who requested the VPO
    - Date of notice of VPO
    - Date of VPO confirmation
    - Vegetation type being protected.
35. Consider an audit of possible dangerous trees on public land and make the results of this audit visible to public.
36. Produce a simple, easy to understand document that clearly states the obligations to land-owners relating to Local Law 3 – Community and Environmental Management and Local Law 6 – Protection of Vegetation. As current confusion is significant, examples and pictures must be given that clearly detail and demonstrate the hierarchy of these laws. This document can be promoted and distributed amongst SMBI residents and land-owners.
37. Conduct an education campaign for residents via social media, community meetings and other channels on how to access contact details for neighbouring properties for mutual vegetation and property management.
38. Undertake a periodic survey of residents and land-owners to ensure local laws are being understood.

Scope Point 4 – Review current QFES mapping data utilised by QFES for planning and response to wildfires

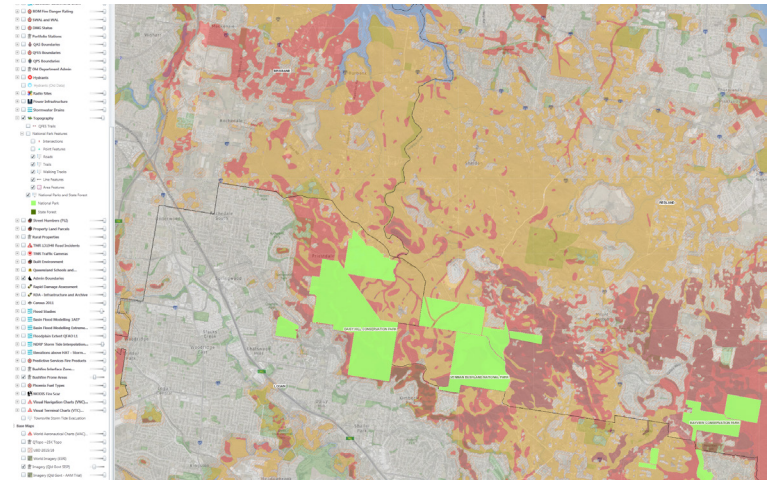
QFES' mission is to save life and protect property. In a rapidly changing and increasingly complex technological environment, Fire Officers are finding they need to be more strategic in the use of technology to successfully overcome challenges. Geographic information systems (GIS) have surfaced as a pivotal technology that enables better planning and action for both strategic and tactical needs.

For more than a decade, QFES has used GIS to reduce risk, increase efficiency, and improve outcomes. Fire service executives and information technology professionals continue to find new ways to apply GIS technology to solve ever-increasing demands. GIS is a powerful information management system with an ability to collect, analyse, and visualise information based on location. The only drawback is that it relies on the accuracy of the data in order to deliver a worthwhile product.

A significant amount of time was dedicated to ground truthing the data within QFES GIS systems. Visual observations and physical destructive sampling techniques were implemented to determine the accuracy of the fuel types and fuel loadings within Council boundaries. The review of this data has improved the predictive modelling technology utilised by the QFES Predictive Services Unit to measure and plot the spread of wildfire. The project team visited each of the SMBI and conducted visual Fuel Hazard Assessments using the nationally recognised method outlined in Reference C of the PSU Bushfire Risk Analysis (Annexure A). Physical fuel samples were collected at various sampling locations on the SMBI. These physical samples were prepared, then dried and weighed to obtain a definitive measure of near surface and surface fuel loads.

Other information collated and provided by Council's GIS Team for potential inclusion in the QFES Total Operation Mapping systems included:

- Historic Prescribed Burn Data
- Vegetation Types
- Fire Access Trail
- Neighbourhood Safer Places



QFES GIS Product – Total Operational Mapping (TOM).

Scope Point 5 – Review council fire access trails to ensure they are fit for use by QFES

A common misconception among SMBI residents is that Council has a series of fire breaks in place to slow or stop wildfires. Council's Conservation Manager advises that the SMBI do not have strategic fire breaks, rather a series of well-placed fire access trails. Fire access trails are in place to enable rapid access for firefighters to an initial fire location which has the potential to spread rapidly if not contained quickly. Fire mitigation activities require a solid network of documented and maintained fire access trails; these are used as anchor points for prescribed burn activities. Rapid access to a location is best identified in the planning phase for wildfire response; local RFS units and QFES units from the mainland have access to this via online mapping tools. The mapping data within the QFES tools has been gathered over many years from various sources. An assessment of accuracy has been conducted during this review via ground truthing and discussions with local RFS personnel and Council conservation officers. In many cases data has been found to be outdated or inaccurate.

Council has a number of documented and maintained fire access trails that are detailed in its Bushfire Action Plan 2016. These which were assessed to ensure usability by responding RFS and QFES appliances. The fire access trails documented in Council's Bushfire Action Plan 2016 were largely maintained to a standard that was fit for purpose.

During the ground truthing exercise a number of sites were identified across the SMBI, but primarily on Russell Island, that represented a specific risk due to population growth and fuel loadings that had no prior fire access trails or in some cases had trails that had become unusable.

Given the limited RFS resources available on the SMBI, it is essential that roadways and fire trails provide rapid access to a fire in its early stages in order to implement strategic suppression or property protection actions. Consultation with local RFS units and Council's Conservation Team has resulted in the proposal of a number of new fire trails.

The recommendations within this section will identify trails that have been removed from QFES mapping systems as they were no longer relevant, documented QFES trails that did not appear on Council trail maintenance and a number of proposed new access trails that do not exist at this point, but would greatly enhance the safety of SMBI residents.

Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (24)	Medium (12)	Medium (12)	Low (4)

Examples of access trails that do not allow for rapid access to responding emergency services

The following photographs do not represent all fire access trails, see Appendix A for a full list.

Example 1 – Tim Shea's Wetlands Reserve

This reserve was impacted by wildfire in December 2016, with a response by QFES supported by Council's Conservation Team to create impromptu fire access trails to protect structures.

Charles Terrace offers access to fire appliances at both ends however the trail has a boardwalk section in the middle. Investigation is recommended into the maximum weight of boardwalk or a potential upgrade to allow light attack RFS units to pass over.

The impromptu fire access track created by Council between Michiko Street and Charles Terrace is to become a permanent access trail. More work is required on this trail, to remove two trees that currently impede easy access to RFS units. As the track does not fully connect with Charles Terrace, a turnaround point is required midway to allow vehicles to easily reverse up to the end of the track.

Example 2 – private land, North of Glendale Road, Russell Island.

This private land was involved in a wildfire in January 2017. During this event RFS required a track to be cleared to provide an anchor point to conduct fire suppression activities. This access was critical in halting the easterly spread of the fire prior to the escarpment that would have seen fire spread to structures in the immediate vicinity.

Example 3 – council land, Strategic Access Trail, Avondale Road, Russell Island.

Given the limited strategic capacity to anchor firefighting efforts to defend structures north of Kurrajong Road, a new strategic fire trail is required. This recommended trail would link a number of road reserves and existing fire access trails.

	**Example 4 – council land, Fire Access Trail, Tim Shea's Wetlands Reserve.** This photograph is of a traffic control bollard. It is locked with a council padlock, but it is unlikely that this padlock would be usable as it was heavily weathered.

Recommendations

39. Implement recommended fire access trails as per Fire Trail Assessment (Appendix A). As some recommended fire access trails would be constructed and maintained on private land to enhance safety for the community, negotiation between Council and private land-owners will be required. It is recommended that the land-owner agree to provide access while Council provides the trail maintenance. Fire access tracks should be controlled by bollards or similar to reduce the likelihood of improper use. If negotiations for trails on private land are not positive, the *Fire and Emergency Services Act 1990* Section 69 provides legislative power to require fire access or fire breaks to be created. For this to be enacted QFES would require further analysis to be conducted and legal implications considered.
40. Conduct an internal audit of fire access trails and tracks to ensure they meet the requirements laid out in Rob Friend and Associates Fire Break Assessment Report for Redland Shire Council – 1996 and the Parsons Brinckerhoff SMBI Firebreak Report for Redland Shire Council – 2005. The project team's visual assessment of fire trails indicated that the standards detailed were not being adhered to in all cases. All fire trails should be maintained with consideration to the standard detailed in the Redland City Council Fire Management Operational Guideline 7 – Preparedness. Height of the trails to be maintained to ensure suitability of RFS medium attack units.
41. Annual inspection and maintenance by Council of all fire access track bollards and locks. Inspections revealed some padlocks were impossible to use due to exposure to the elements and poor maintenance. Encourage a partnership between RFS units on the SMBI and Council to perform periodic inspections of fire access trails to ensure they are fit-for-purpose. Council to implement a quick and easy to use process to report findings and submit requests for repairs or servicing.
42. Implementation of proposed fire trails and data shared between Council and QFES for inclusion in fire management tools and QFES TOM System.

Conclusion – Southern Moreton Bay Islands

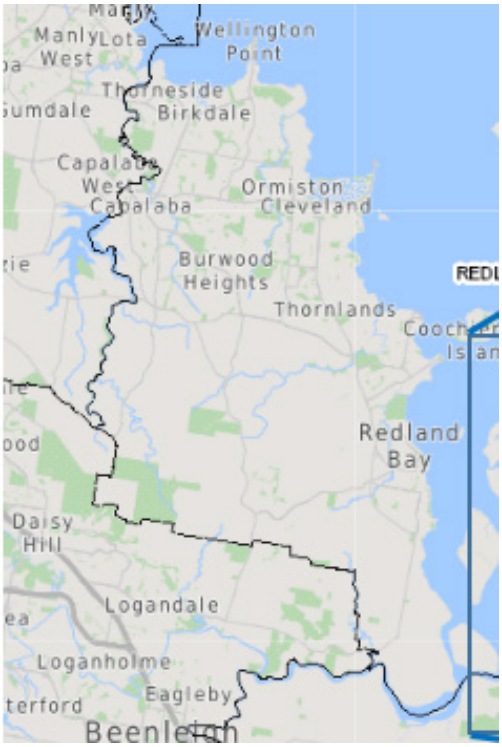
With a total of 43 recommendations for the SMBI, there are a range of issues requiring attention, some more urgent than others as indicated by the corresponding Risk Assessment scores. In general, residents of the SMBI are reasonably secure, providing there is a shared partnership between the community and Council with regard to maintaining safety. It cannot be denied that the obvious factor of isolation from mainland services presents unique issues not seen elsewhere in the Redlands, but it is expected that residents would have anticipated this when moving to an island community not connected to the mainland. Consultation and communication between Council, residents and other stakeholders will be essential to successfully implementing many of the recommendations documented in this section.

Combined risk score for SMBI

Overall Assessed Risk Level		**HIGH**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (20)	Medium (9)	Medium (17)	Low (5)

Part B – Redland City Council Mainland

Redland City Council's mainland is spread along the southern coast of Moreton Bay covering 537.1 square kilometres bordering the City of Brisbane to the west and north-west, and Logan City to the south-west and south. Large mainland suburbs include Capalaba, Cleveland, Victoria Point, and Redland Bay.



Mainland area of Redland City Council.

The vegetation within the parks and reserves on the mainland largely comprise dry sclerophyll forest, melaleuca wetlands and mangrove communities. The mainland area of Redlands has a general bushfire risk of low to medium with patches of high risk around the communities of Mount Cotton, Redland Bay and Sheldon.

Scope of work – Phase 2 – Mainland

The mainland scope points were a derivative of the SMBI group. The project team in consultation with council identified the following. The mainland does not experience issues relating to isolation, however given the much larger geographic area, population and expanse of bushland within council reserves and private land there remain points for consideration.

Focus for the mainland should be:

1. Review current maintenance plan to ensure it is scheduled for maximum benefit
2. Review fire access trails to ensure they are fit for purpose
3. Assess local laws for conflicts and understanding
4. Assess vulnerability of rural and semi-rural acreages.

Given the large reserves and parks that Council manages, the project team has provided a basic appraisal of a number of key locations with the council area hazards identified. The appraisals are general in nature with any specific issues documented. This does not imply that all hazards have been identified, rather a trend of issues has been provided for Council to consider.

Limitations of scope

At the commencement of this review, significant issues outside QFES' control limited the delivery of the completed review within the initial contracted timeframe:

- The Redland City Council Bushfire Action Plan was not in a usable format for the QFES Predictive Services team, however this was overcome with consultation and cooperation between the relevant Geographical Information System (GIS) departments and the PSU team, with an additional 10 days added to the length of the review.
- The ability to determine whether Council's current maintenance program is scheduled for maximum benefit is not viable given existing limitations of modelling software and computer technology available to QFES. The current maintenance program has been proven to offer a measurable benefit, but alteration of the specific burn frequency and order of burning to provide maximum benefit is currently not achievable within current resources.
- While assessing legislative requirements, the project team focused on the level of community understanding of local laws; assessing Council by-laws against other legislation was considered out of scope.
- Reference has been made to a number of previous reports and procedure documents produced by or for Council. Many of these are now very dated, but it is out of scope to assess the current accuracy. It is assumed that all prior requirements are still accurate.

Scope Point 1 – Review Council's current maintenance plan to ensure it is scheduled for maximum benefit

The details presented in the QFES Predictive Services Report (Annexure A) and online SABRE product demonstrate that Council's current maintenance plan does provide value to the community by reducing the impact of wildfire events. However, the ability to provide an assessment that guarantees maximisation of scheduled maintenance is currently unachievable due to limitations of QFES' current modelling software and computer systems. It is likely that future software enhancements will provide a more precise measurement of effectiveness that will enable schedules to be modified for maximum impact.

The project team conducted substantial scientific and statistical analysis of current and historical datasets in order to review Council's current maintenance schedules. In order to conduct simulations and assessments, the project team made the same assumptions as detailed above in Scope Point 2. The fuel management component of Council's fire mitigation plan tested via the PSU simulations was found to be effective at FDI 20 and could reasonably be expected to be of benefit in managing a sufficient amount of the bushfire risk for most of the year.

At FDI 20 the value of the current Bush Fire Plan presents a benefit to the mainland communities by reducing the amount of fuel (vegetation) available to burn during a wildfire. This makes bushfires easier to control and reduces the level of bushfire damage to community and environmental assets. The details presented in the QFES Predictive Services Report (Annexure A) and online SABRE product demonstrate that benefits are seen in all areas of the mainland, but more predominantly in the Redland Bay, Alexandra Hills and Mount Cotton areas. Figure 9 presents a summary of the findings. It is essential to understand that simply judging the worth of the mitigation activities by looking at the grand total will be misleading, given this column presents the change of chance of success across multiple variables. The true benefit is gauged by the total number of hectares that are reduced from 'Probably Not Effective' to 'Probably Effective'. This figure is approximately 250 hectares. Given that the primary purpose of mitigation activities is to reduce risks to the community, the reduction to 'Probably Effective' will now allow QFES to protect a significant area that would have likely been damaged.

Change in Area (ha) Between Baseline and Mitigation by DA Success Area by DA Success and Scenario

Ignition Local	FDI Level	Fuel Treatment	DA Success Category: b. Not Effective	c. Probably Not Effective	d. Probably Effective	e. Effective	Grand Total
ALEXANDRA HILLS	20	Baseline (Long Unburnt)	2 ha	64 ha	238 ha	664 ha	969 ha
		Mitigation Option 1	2 ha	56 ha	154 ha	712 ha	923 ha
BIRKDALE	20	Baseline (Long Unburnt)	1 ha	69 ha	91 ha	536 ha	697 ha
		Mitigation Option 1	1 ha	64 ha	84 ha	549 ha	698 ha
CAPALABA	20	Baseline (Long Unburnt)	4 ha	176 ha	335 ha	984 ha	1,499 ha
		Mitigation Option 1	4 ha	175 ha	318 ha	1,001 ha	1,497 ha
CLEVELAND	20	Baseline (Long Unburnt)	1 ha	44 ha	94 ha	371 ha	510 ha
		Mitigation Option 1	1 ha	44 ha	91 ha	354 ha	489 ha
COOCHIEMUDLO ISLAND	20	Baseline (Long Unburnt)		17 ha	25 ha	67 ha	109 ha
		Mitigation Option 1		15 ha	20 ha	73 ha	108 ha
MOUNT COTTON	20	Baseline (Long Unburnt)	24 ha	968 ha	1,316 ha	1,832 ha	4,141 ha
		Mitigation Option 1	24 ha	950 ha	1,277 ha	1,890 ha	4,141 ha
ORMISTON	20	Baseline (Long Unburnt)	1 ha	55 ha	31 ha	254 ha	342 ha
		Mitigation Option 1	1 ha	54 ha	32 ha	264 ha	351 ha
REDLAND BAY	20	Baseline (Long Unburnt)	6 ha	1,131 ha	1,096 ha	2,059 ha	4,292 ha
		Mitigation Option 1	4 ha	1,061 ha	983 ha	2,253 ha	4,302 ha
SHELDON	20	Baseline (Long Unburnt)	3 ha	433 ha	1,245 ha	539 ha	2,220 ha
		Mitigation Option 1	3 ha	425 ha	1,209 ha	583 ha	2,220 ha
THORNESIDE	20	Baseline (Long Unburnt)	0 ha	16 ha	10 ha	77 ha	102 ha
		Mitigation Option 1	0 ha	16 ha	10 ha	76 ha	101 ha
THORNLANDS	20	Baseline (Long Unburnt)	1 ha	201 ha	437 ha	1,186 ha	1,826 ha
		Mitigation Option 1	1 ha	194 ha	422 ha	1,207 ha	1,824 ha
VICTORIA POINT	20	Baseline (Long Unburnt)	0 ha	113 ha	156 ha	627 ha	897 ha
		Mitigation Option 1	0 ha	106 ha	164 ha	628 ha	898 ha
WELLINGTON POINT	20	Baseline (Long Unburnt)	1 ha	53 ha	48 ha	354 ha	455 ha
		Mitigation Option 1	0 ha	45 ha	51 ha	318 ha	414 ha

Figure 9 – Summary of mitigated area between baseline and mitigation options at FDI 20 for mainland localities.

While Council's Maintenance Plan was demonstrated to offer benefit to the community, a broad conclusion from the PSU analysis is to consider that fireline intensity mapping alone is not sufficient to appreciate and mitigate bushfire risk. Fireline intensity mapping displays the rate of energy release per unit length of fire front usually expressed in kilowatts per metre (Kw/m), the measure of energy release per unit length of fire front. The higher the number the less likely that fire crews will be able to safely attack the fire front. It is generally the measure used by councils and other organisations to measure risk to a community. This study shows the potential for significant ember attack to penetrate considerable distances into developed and urban areas in the Redlands that are far removed from large fuel blocks. While the specific risk of house loss in these areas remains low, a confluence of conditions involving strong winds, and an aggressive fire upwind in spotty fuel types could cause smoke and ember impacts well outside those areas normally considered at risk of bushfire. While some residents in coastal mainland areas may feel they are at no risk in the event of a fire in the Redlands area, this may not be the case.

Council has established fire management zones to provide the framework and direction for managing fire on council-managed land. These zones provide a practical way of identifying, planning and applying appropriate fire regimes across the landscape. Within any one zone there may be one or many vegetation communities or habitats as well as climate characteristics; environmental, cultural or economic values; and a corresponding range of appropriate fire regimes depending on the purposes of the zone. Many ecologically sensitive areas currently listed as fire exclusion zones with the aim of

totally excluding fire in order to protect fire-sensitive species or rehabilitate areas that have been impacted by unfavourable conditions in the past. Council's fire mitigation schedule currently displays all fire exclusion zones with no planned date to reduce fuel by use of fire. A visual assessment of a number of zones found that those close to urban areas are of some concern. The level of fine surface and near surface fuel is in many cases well above the level expected level of 16 – 20 tonnes per hectare. Most exclusion zones have comments in the Bushfire Action Plans that indicate Maintain Regional Ecosystem, Manage Mowing and Monitor Fuel Loads. The project team did not identify documented levels of fuel that would be deemed acceptable or any strategy to deal with higher levels if identified.

The project team undertook a small number of ground truthing activities of the smaller reserves to the north of the council area with all presenting similarly, thus not all council reserves were physically inspected. The larger reserves that present a more direct exposure to residential, commercial and community assets around Cleveland, Capalaba and Alexandra Hills and the large conservation areas in the south of the council area were assessed using the Overall Fuel Hazard Assessment Guide. The assessment did not aim to correct current fuel types or fuel loadings, rather provide some visual and basic context to recommendations made within this review. The level of testing was not consistent with the standard required for inclusion in any simulations thus QFES Predictive Services utilised mapping data only to conduct all simulations and modelling for the mainland areas of Redland City Council.

Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (12)	Medium (12)	Medium (12)	Medium (12)

Recommendations

43. Implement a program to review fuel levels within all land management zones including Exclusion Zones.
44. Use FDI 20 for general bushfire risk decision-making regarding the efficacy of planned mitigation efforts. Sufficient mitigation effects achieved at this level represent a reasonable balance of resource expenditure and payoff.
45. Utilise QFES PSU to repeat a simulation-based approach to annual bushfire risk analysis, updating the latest fire scar history, fuel maps, disruptions, etc. The QFES PSU recommends Council provide the latest fuel treatment history and fire scar data as at March each year, and that this analysis is repeated at FDI 20.
46. Use the SABRE site created for this study to undertake a detailed analysis of the mainland area for FDI 20+ to identify any areas or issues that may require attention.

Scope Point 2 – Review council fire access trails to determine if they are sufficient for QFES use

There are a significant number of fire access trails and breaks within the parks and reserves on the mainland. Council's Conservation Team manages in excess of 80 kilometres of trails and tracks. Limited by time the project team conducted a partial assessment of all fire access trails and breaks. Observations suggest that the primary fire trails are maintained to a standard that is fit for use by QFES resources and to the level of 75 per cent as detailed in the Redland City Council Conservation Fire Management Framework and Operational Guidelines.

The full area of the mainland is provided with fire coverage by permanent urban resources; there are currently no rural resources within the mainland area. In most cases the first responding vehicle to any reported fire will be a QFES Type 3 Urban Pumper as detailed in the Conservation Fire Management Framework and Operational Guidelines. These vehicles do not offer 4x4 access and are typically not to be taken off hardstand surfaces. On request additional resources with 4x4 capability are available from responding emergency agencies.

Reserves in the urban area currently have a perimeter trail to the standard of Type 3 as detailed in Rob Friend and Associates Fire Break Assessment Report, being five metres of slashed area with grass regrowth and a further five metres of fuel reduction. The existing external trails and breaks will offer some but not total protection from direct fireline impact in conditions under FDI 20, but above this the benefit diminishes. The intent of a Type 3 trail is to allow easy movement of fire appliances along the break in all situations; the trail is in most cases an area of grass that is maintained by regular slashing.

As detailed in the Conservation Fire Management Framework and Operational Guidelines, Council's reserves and parks operate fire management zones as a practical way of identifying, planning and applying appropriate fire regimes across the landscape. These zones as detailed as: Asset Protection Zone (APZ), Wildfire Mitigation Zone (WMZ), Conservation Zone (CZ), Rehabilitation Zone (RZ) Reference Zone and Exclusion Zone (EZ). In all but APZ and WMZ, fuel loadings may reasonably be expected to be higher than the accepted 16 – 20 tonnes per hectare. Areas that are remote from assets and private land may offer opportunities to allow fuel loads over 20 tonnes per hectare, but given the urban and commercial growth in the Redlands it is expected that this is largely not viable. Physical inspections of multiple parks and reserves have resulted in an assumption that Council's Conservation Team manages the perimeter trails to an average Fire Break Level 3. This will largely be acceptable for up to FDI 20, but after this will likely see diminished value. Zones other than WMZ and APZ were observed to contain higher fuel loadings and have almost no manual reduction of fuel adjacent to the trail. This results in the Type 3 trail becoming a Type 5. Trails maintained to a Type 5 level are deemed as unacceptable for vehicular access, nor would they offer the level of protection required for urban or commercial development.

Local residents around some smaller reserves in the Redlands area have been observed using the fire access trails for storage of caravans or other vehicles. For a trail to be usable it must be clear at all times.

Overall Assessed Risk Level		**LOW**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (12)	Low (6)	Low (6)	Low (6)

The following is an example of fire trails adjacent to a conservation zone.

Greater Glider Conservation Area – Zone WMZ3 – This area is currently documented in the plan as a Wildfire Management Zone, but is signed as a conservation regrowth area. Observation suggests that this zone is currently managed as a Rehabilitation Zone (RZ) and incorrectly detailed in Council's Bushfire Action Plan 2016. The Overall Fuel Assessment for this zone is over 30 tonnes per hectare (see images 3 & 4). Given the fuel loading in this area, the current fire access trail or break does not offer sufficient protection to the dwellings at the end of Kindred Street. Referencing the Rob Friend and Associates Report 1996 it would currently appear to be maintained to a Fire Break Type 5 (see image 1) whereas the perimeter trails that do not border a conservation area of Exclusion Zones are maintained to Type 3 (see image 2). This is of particular concern for any urban development located on the east to south-east side of a block as, during elevated levels of FDI 20+, it is highly likely that these boundaries will receive direct impact from fires that occur within the reserve.

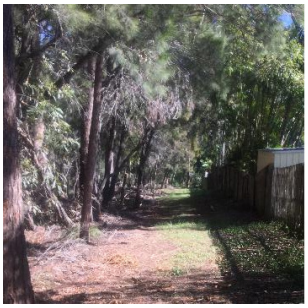
	*Image 1 – Type 5 access trail.*
	*Image 2 – Type 3 access trail.*
	*Image 3 – Fuel load >30 tonnes per hectare.*

	*Image 4 – Fuel load >30 tonnes per hectare.*

Recommendations

47. As there is limited reduction of fine fuel by burning for all management zones except Wildfire Mitigation Zones (WMZ), an assumption is that fuel levels may reach a level outside of the expected level of 16 – 20 tonnes per hectare. For this reason, it is recommended that all trails bordering all management zones, except Wildfire Mitigation Zones, and urban or commercial development should be maintained to a minimum of Type 3, including the five-metre fuel reduced zone beyond the five-metre slash line. The existing trails appear to be maintained to a standard of Fire Break Type 5, which is a three to five-metre slashed area, but no additional fuel reduction has been undertaken beyond the slash line.
48. Conduct a minimum six-monthly assessment of all perimeter trails and breaks to ensure they remain fit for purpose and meet the standard detailed in the Rob Friend and Associates Fire Break Assessment Report 1996. This would best be completed after storm season and before fire season.

Scope Point 3 – Local laws and other legislation

Local Law 3 and Local Law 6 present similar concerns to land-owners and residents, particularly in Redland Bay and areas known as the Mainland Hinterland within the Redland City Council Disaster Management Plan. No survey was conducted on the mainland but observations of high fuel loadings were made on a number of private blocks in the hinterland areas of Mount Cotton and Sheldon and a couple of locations in the far south of Redland Bay near the Logan River. The high fuel loadings may be the result of other matters, but it is expected that many of these instances would be the result of local laws or Vegetation Protection Orders.

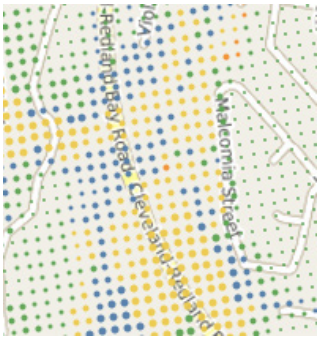
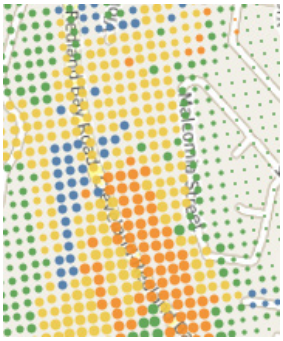
Given the availability of emergency services, multiple evacuation paths and generally better building standards, the instances of high fuel loadings on the mainland in isolated patches of vegetation still present a hazard, but do not represent the same level of risk as they do on the SMBI. Of greater concern is the continuity of vegetation contained within wildlife corridors. While these are integral for fauna, the combination of National Parks, State Parks, Council Reserves and Wildlife Conservation Zones create a significant opportunity for propagation of fire in conditions over FDI 20. As indicated in the Predictive Services Report (Annexure A) there are many locations in the Mainland Hinterland that will face significant exposure to wildfire if there is an ignition on days with FDI 20+.

The following is an example of an area covered by a Vegetation Protection Order, initially placed in the 1990s as a tree protection order. In Malcomia Street, Redland Bay, the house blocks on the western side extend into the bushland, with approximately half the block cleared for the residence and the other half in the natural state. The surface and near surface fuel load in the VPO area of private land is Very High to Extreme, likely above 20 tonnes per hectare. With an FDI 20 these structures are expected to be defensible but this becomes less likely for FDIs over 20. Residents likely believe that the cleared area between the structures and vegetation will be sufficient to protect their homes. With FDI 20 or less, it is reasonable to believe that under most conditions the houses would not be directly impacted, but with FDI 30+ the chances of impact increase significantly. The chance of direct attack to save the house falls to 'Probably Not Effective', as displayed in images 7 and 8. If the homes are unoccupied on a day of elevated FDI 30+ and a bushfire does impact the structure, the chance of the unoccupied structure surviving may be as low as 30 per cent (see images 9 and 10). This does not imply that this particular example is frequently seen or is exclusive, but it does highlight issues that may arise in high fuel load areas covered by VPOs where residents are unaware of the obligations and allowable actions to protect their homes.

Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (12)	Low (6)	Medium (12)	Low (6)

	*Image 5 – Behind eastern side of Malcomia Street*
	*Image 6 – Behind eastern side of Malcomia Street*

Images 7 and 8 display the likelihood of a successful direct attack if the house was impacted by a wildfire.

	*Image 7 – FDI 30*
	*Image 8 – FDI 40*
	

Images 9 and 10 display the likely house loss if the house is unoccupied when impacted by a wildfire.

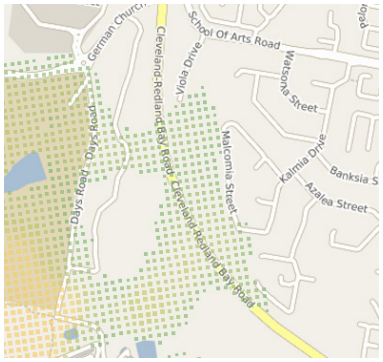


Image 9 – FDI 30

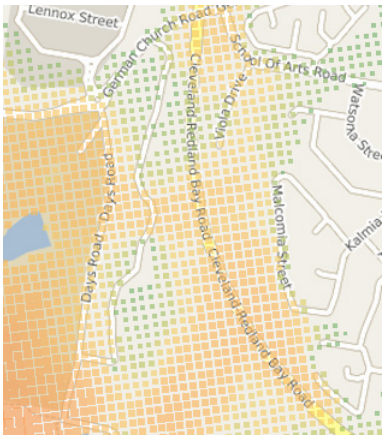
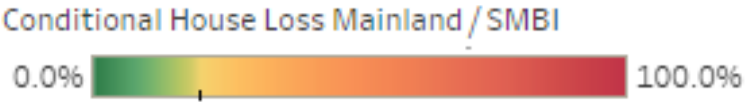


Image 10 – FDI 4



Recommendations

49. Council to use the SABRE site created for this study to undertake its own detailed analysis of areas covered by VPOs on the mainland.
50. Work with QFES to roll out additional awareness and educational material that explains how residents can best manage vegetation on blocks covered by VPOs.

Scope Point 4 – Level of vulnerability

For the purpose of this review the measures of vulnerability for the mainland are considered to be:

1. Exposure to large council reserves, State Parks, National Parks and other large blocks of undeveloped bushland
2. Access to reticulated water (fire hydrants)
3. Level of preparation for disasters.

Scope Point 4.1 – Exposure to large council reserves and other parkland

While no survey of mainland residents was undertaken, the project team's observations indicate that most urban residents feel reasonably safe from bushfire. It is a common perception that you will not be impacted unless you live in the bush. The Redlands is a very green area compared to other parts of south-east Queensland with an almost continuous corridor of vegetation from Logan and Brisbane City Council areas into the north-eastern and south-eastern suburbs of the Redlands. The continuity of fuel between reserve areas presents risks to most parts of the council area, including locations that would likely feel safe and isolated from these events. The Predictive Services Review (Annexure A) offers Council the opportunity to identify parts of the council area that would generally not be impacted by direct fireline activity but have potential for ember and convection impact. The images below were generated within SABRE, and show that with FDI 20 conditions most areas within the Redlands have the potential to be impacted by the effects of fire. Figure 9 includes all impact types, while figure 10 uses the same data and filters out those types containing direct fire impact to leave just the areas where ember and convection impact without fire impact are indicated. This map can help with community planning and tailoring messages to the public in terms of how best to prepare their properties. These maps should not be interpreted as hyper-accurate, but rather be considered to provide broad area-based guidance.

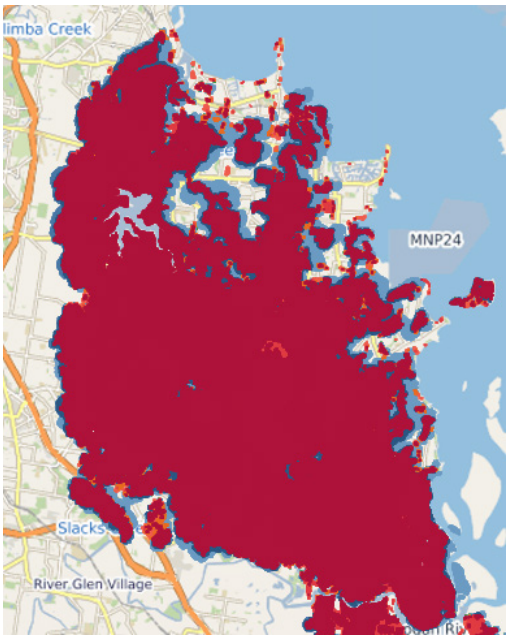


Figure 9 – All forms of fire impact

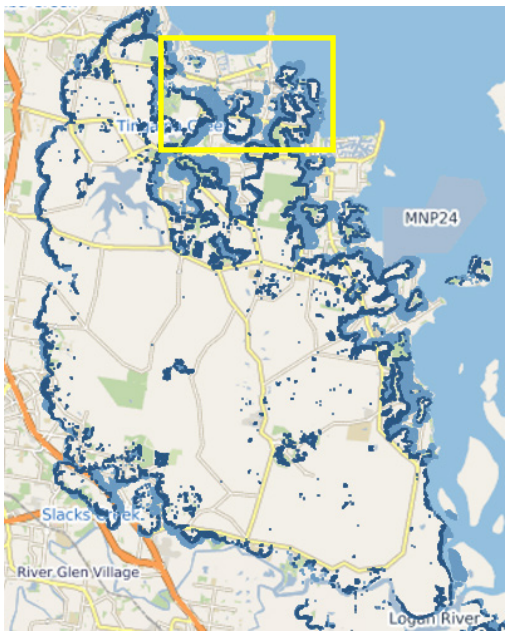


Figure 10 – Ember and convection only

Figure 11 – Close-up view of northern areas of mainland that would have potential of convection or ember impact on a day of FDI 20.

A primary driving force of ember and convection impact is wind. The predominant winds experienced in the Redlands during the dryer months of the year, like most of south-east Queensland tend to come from the western arc between about 230 and 300 degrees, clustering more tightly around 270 degrees as the FDI rises beyond FDI 20. These westerly winds usually build in speed through the morning, then at some point the sea breeze comes in and the wind swings to the east / north-east, bringing with it higher relative humidity and lower temperatures.

A particularly important feature of Redlands fire weather is the sea breeze. At FDI 10 to 20 the sea breeze wind shift to the northeast typically comes in between 1200hr and 1700hr. As the FDI increases, the sea breeze tends to take longer and longer to come in, with FDI 35 – 40 seeing it come in as late as 1800hr to 2000hr. On some days, the sea breeze may not overcome the land-driven westerlies at all.

These factors mean that more ember impact will typically be to the east of the fire. When establishing a schedule for prescribed burn activities for maximum community protection it would be beneficial to

look to east of the reserves or parks to identify properties or assets that may be at risk if a fire was to take hold in areas of high fuel and on a day of FDI 20+.

Ember attack is likely to be a concept not considered by most residents in Council's mainland communities, and while Queensland does not witness the same catastrophic fire weather seen in Victoria and New South Wales, our weather patterns have intensified over the past 15 years. The following photographs are taken from Victoria and New South Wales and depict the possible impact of a significant ember attack, likely during periods of high FDI. At this stage FDI 50 would be considered a one in 20-year event and south-east Queensland has no recorded experiences of FDI 50+. In recent times Queensland has seen many weather-related records rewritten and events that would have been deemed one in 100-year events are occurring far more often. This would seem to confirm that we should assume FDI 50+ may be seen more often in the future.

News Limited photograph of buildings in Winmalee, NSW that have succumbed to ember attack from the Blue Mountains, NSW fires in 2014. The unburnt condition of the vegetation around the buildings is evidence of ember attack on unprotected and probably undefended buildings.

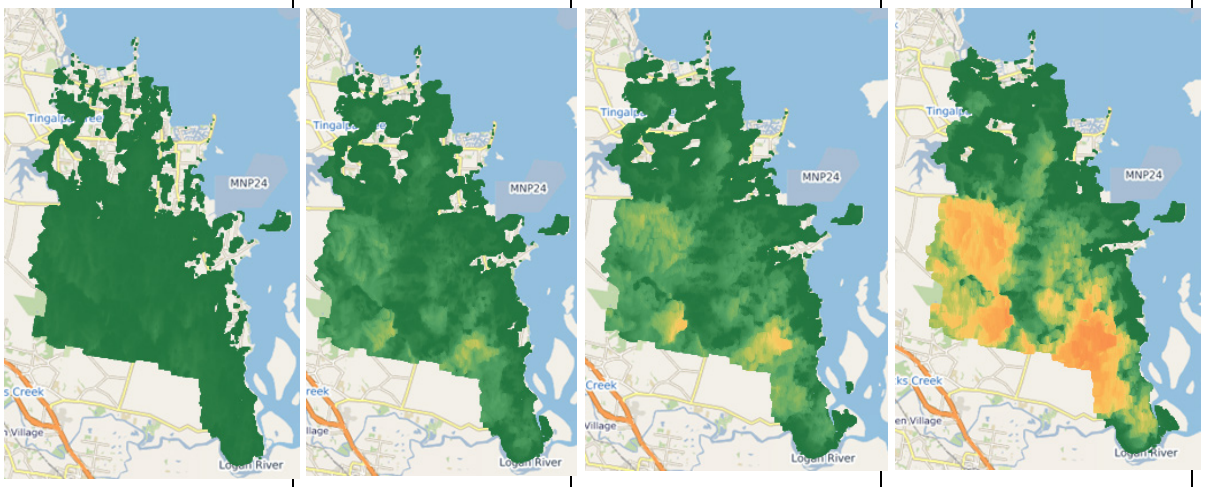
ABC News photograph of buildings that have succumbed to ember attack from the Blue Mountains, NSW fires in 2014. The unburnt condition of the vegetation around the buildings is evidence of ember attack on unprotected and probably undefended buildings.

Estimated percentage of potential undefended house loss

An undefended house is a structure that is vacant at the time of impact from fire and has no direct protection or suppression activities from residents, fire services or the public. QFES Predictive Services Unit has used Phoenix to estimated probability of loss for a standard dwelling (Annexure A). This calculation is not dependent on a dwelling being present, but is an estimate that assumes a fire impact occurred, and if a standard dwelling was present, gives the resultant probability of loss under the average fire conditions calculated by Phoenix. Phoenix estimates house loss empirically, and the formula is based on examining the losses of several thousand homes in past fires where fire impacts were either known or able to be reconstructed with confidence. Full details of these findings are contained within Annexure A.

The following images were generated with Council's SABRE program (figure 12). They display the likely percentage loss of undefended houses. The two particular residential locations that clearly display the highest probability of loss of undefended houses are the Sheldon and Mount Cotton areas, at FDI 40 the percentage chance of loss is more than 40 per cent; even at lower FDI the potential percentage is significantly higher than other areas within the Council mainland.

It should also be noted that these values would decrease significantly if dwellings were well-prepared ahead of fire impact, decreasing further if they were defended by their occupiers, and further again if they were defended by firefighters. These findings reinforce how critical is it for residents to take maximum responsibility to ensure that their property is prepared ahead of the recognised fire season.



FDI 10	*FDI 20*	*FDI 30*	*FDI 40*

Figure 12 – Percentage loss of undefended houses in Redland City Council area.

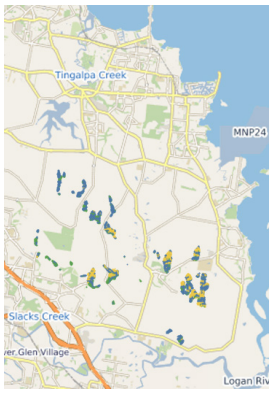
Direct Attack Success

Direct Attack (DA) is a firefighting technique involving the application of water to the flaming zone of a bushfire. The level of effectiveness of this strategy can be estimated as a function of the fireline intensity measured in kilowatts per lineal metre (kW/m) of fire front. Phoenix calculates the average fireline intensity per 30-metre grid. In turn, the average fireline intensity is categorised into the average estimated Direct Attack Success level by grouping average fireline intensities into the categories shown in figure 13. Broadly speaking, average fireline intensities above about 4000 kW/m are too dangerous for ground-based DA to be employed, and if it is employed it tends to have reduced effect and poses greater risks to firefighter safety. Beyond about 10,000 kW/m, intensity is too high for water to have any substantial effect on suppression success. Most of the water applied at the rates fire appliances can deliver it turns to steam prior to it having a significant effect on intensity.

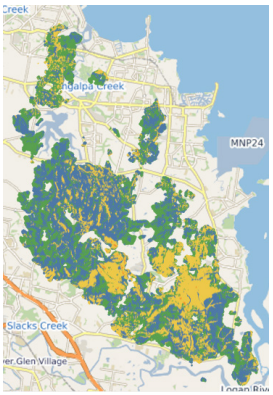
Average DA Success	
a. Certainly Not Effective	>30000kW/m
b. Not Effective	>10000kW/m to 30000kW/m
c. Probably Not Effective	>4000kW/m to 10000kW/m
d. Probably Effective	>2000kW/m to 4000kW/m
e. Effective	<2000kW/m

Figure 13 – table of DA Success categories as a function of fireline intensity measured in kW/m

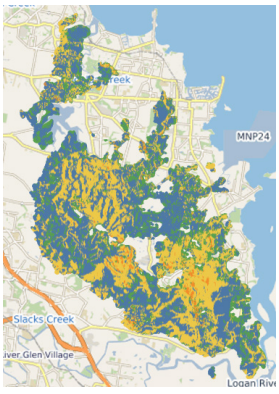
It can be established from the images in figure 14 that at a normal FDI 10, Direct Attack is likely to be effective for all but a few small patches around Mount Cotton. The success of Direct Attack drops significantly as the FDI levels increase with Direct Attack measured at 'Probably Not Effective' across many areas of the Redlands.



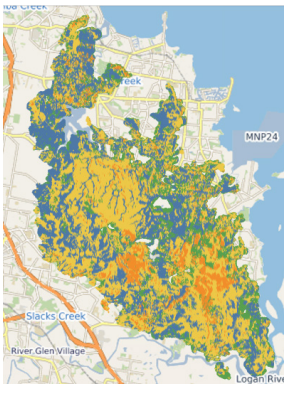
FDI 10



FDI 20



FDI 30



FDI 40

Figure 14 – Direct Attack Success modelling, displays fireline intensity

Overall Assessed Risk Level		**MEDUIM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (18)	Medium (18)	Medium (12)	Medium (12)

Recommendations:

51. Council to consider updating section 1.4 – Natural Disaster Vulnerability and section 2 – Locality Risk Profiles within the current Redland City Council Disaster Management Plan. Additional information to include:
    - Fire weather appreciation information that clearly explains FDI levels and the levels upon which the Fire Mitigation Strategies are based.
    - Impact area map that displays potential ember attack areas.
    - Direct Attack Success probability.

Scope Point 4.2 – Access to reticulated water and fire hydrants

The water reticulation system is a permanent piece of infrastructure provided to deliver treated water to lots from an Urban Utility Authority through a system of pipes, mains, control valves, etc. for household or industrial use. It will supply uninterrupted water at a positive pressure for firefighting purposes via above-ground or below-ground fire hydrants. Observations indicate that all hydrants not positioned on private land are below-ground hydrants, termed 'ground ball hydrants' by QFES. Fire services use the hydrant for a continuous flow of water, which may be vital to firefighting operations. All QFES fire appliances permanently stationed in the Redlands area are fitted with on-board water tanks that, depending on the type of appliance, will have a capacity of 500 to 2,000 litres. This supply will generally provide an initial attack capability. In the first minutes of a fire emergency a continuous water supply from the water mains must be accessed through at a hydrant or other alternative source. In every fire emergency, getting a hydrant to work is one of a firefighters' key priorities.

Almost all urban development areas within the Redlands are covered by the reticulated hydrant system, but two areas have been identified that are outside this coverage. While planning for these areas was probably undertaken to the standard of the day, the lack of reticulated water now presents a risk to the community if threatened by wildfires.

No reticulated supply – area one

Area one with no reticulated water is the southern area of Redland Bay, east of Serpentine Road and south of Lagoon View Road. This location has limited urban development, but households in the Muriel Street area are in a disadvantaged location given that they are on the extreme south-east of Native Dog and Serpentine Creek Conservation Areas. With typical weather patterns seen on days over FDI 20 definability of this area would be marginal (see figure 15). SABRE mapping displays only the expected intensity and other fire spread likelihood; it does not consider the physical limitations of responding resources, so it is assumed that the Direct Attack success rating of 'Probably Not Effective' would likely be extended to 'Not Effective'.

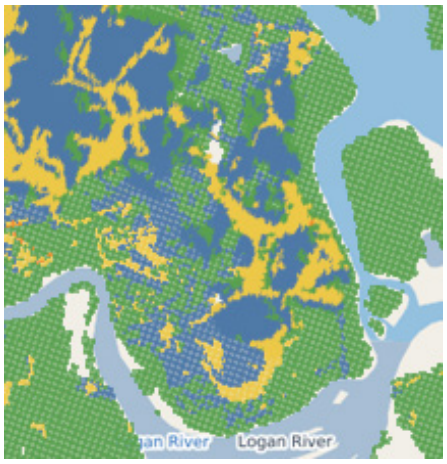


Figure 15 – Direct Attack Success modelling at FDI 20

No reticulated supply – area two

Area two with no reticulated water is Teviot Road Estate. This estate does not fall within the Redlands area, however it is directly adjacent to public land that is managed by Council. The Teviot Road Estate is sandwiched between the council-managed reserves of Native Dog and Serpentine Creek Conservation Areas, and the Carbrook Wetlands Conservation Park managed by Logan City Council. This estate has significant acreage development, a single evacuation route and no reticulated water (image 11 shows small red dots to indicate hydrant locations). A number of properties have dams, but this source cannot be guaranteed and in most cases QFES lacks immediate access.

Given the prevalent wind direction on days with FDI 20+ this estate would probably not come under direct attack by fire originating on reserves managed by Council, but with the potential for blustery conditions caused by local topography and a strong sea breeze likely in the afternoon, the potential impact from wildfire from any direction cannot be totally discounted. Direct Attack Success likelihood for FDI 20 (image 17) is unlikely to be favourable and it is far worse if FDI 30+ is reached (image 18). As with the example of southern Redland Bay, given the distance for QFES resources to travel and no reticulated water, the viability of structure defensibility is greatly reduced.

Council's Bushfire Action Plan lists Bayview Conservation Area (Kidd Street Section) to the area to the north and Bayview Conservation Area (Serpentine Creek Section) to the east. Of particular note are the two large Exclusion Zones Ezk4 (image 13) and EZs1 (image 14); these border the urban estate. An assessment of the fuel loading within the area believed to be EZk4 (image 12) indicated fuel loads in excess of 30 tonnes per hectare and there is currently no planned date for clearing. Images 15 and 16 were taken at the point indicated in image 12.

	*Image 11 Hydrant Map for Teviot Rd estate.*
	*Image 12 Survey location, EZk4.*

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	*Image 13 Management Zone EZk4.*
	*Image 14 Management Zone EZs1*
	*Image 15 Picture taken within EZk4.*

Image 16 Picture taken within EZk4.

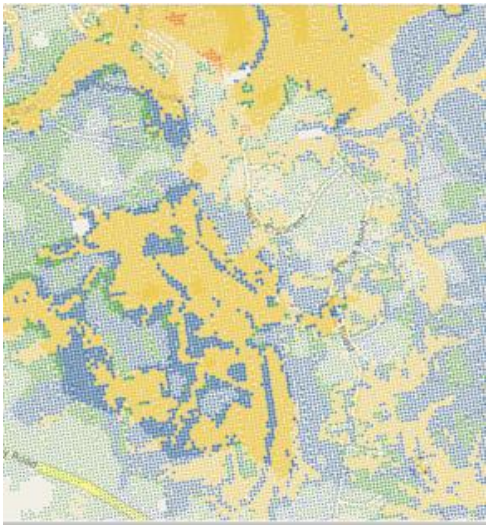


Image 17 Direct Attack Success FDI 20.

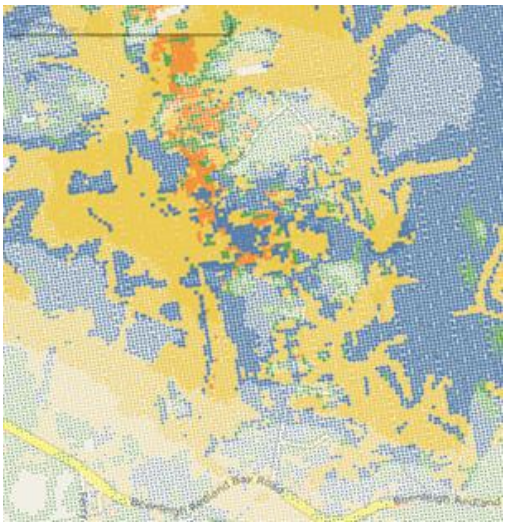


Image 18 Direct Attack Success FDI 30.

Overall Assessed Risk Level		**MEDUIM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (18)	Low (4)	Low (4)	Medium (12)

Recommendations:

52. Conduct an assessment of the EZk4 and EZs1 to determine the environmental objective of these areas. Develop a plan to reduce and maintain the fire fuel loadings in these zones to below 16 tonnes per hectare.
53. Construct and maintain a fire access trail that follows the boundary between private land and council-managed land. The objective of this access track is to offer a level of protection to the adjacent houses and to provide rapid access for QFES resources to the rear of the properties in Teviot Street and the street leading from it to the east. The track is to commence at the access gate at the northern end of Teviot Road and tie in with Serpentine Creek at a point where the objective can be achieved. The following image indicates the proposed trail in yellow. Given the current fuel loadings and the fuel loadings observed in Exclusion Zones the minimum standard for the trail would be a Type 3 as indicated in the Rob Friend and Associates Report 1996. As this area is a border with Logan City Council it is likely that construction and maintenance of this trail will be a shared responsibility.

Image 19 – proposed fire access trail leading east from Teviot Street

54. On days of forecast FDI 30+ or QFES Wildfire Alert Level 3, Council is to ensure that a bulk water tanker be made available for immediate response on request from QFES. Confirmation of the availability of this resource is to be confirmed daily with QFES Brisbane Region on said days. To increase the safety of staff operating this vehicle, it is recommended that they achieve satisfactory completion of Fire Management Level 1, and be kitted with appropriate firefighting personal protection equipment. Council is to confirm with QFES that the fittings on water tanker/s are compatible with both QFES Urban and Rural appliances.

Scope Point 4.3 – Level of preparation for disasters

The 2009 Victorian Bushfires Royal Commission Final Report states: "The Commission uses the expression 'shared responsibility' to mean increased responsibility for all. It recommends that state agencies and councils adopt increased or improved protective, emergency management and advisory roles. In turn, communities, individuals and households need to take greater responsibility for their own safety and to act on advice and cues given to them before and on the day of the disaster event."[2]

As detailed in the Redland City Council Conservation Fire Management Framework and Operational Guidelines, Council has the following objectives that relate directly to community preparation for fire and other disasters:

- Ensure the community is well-informed about both bushfire hazards and self-protection
- Ensure land-owners and occupiers understand their bushfire management responsibilities
- Encourage community participation in managing bushfire risk.

The Fire Management Framework presents risk management strategy options to reduce vulnerability and risk, including community fire awareness and educations programs, and building compliance with Australian Standard AS 3959 – Construction of buildings in bushfire-prone areas. Given that risk can never fully be managed, communities are to be encouraged to report fires early thus allowing a more rapid response and timely awareness of evacuation protocols.

Education and awareness

No survey of mainland residents was undertaken to gauge awareness of Council's Disaster Management Plan or the number of households that have a current bushfire plan. Discussions with QFES personnel who facilitate programs in the Redlands such as Prepare, Act, Survive report that a number of community workshops and meetings have occurred in recent years to better prepare the community throughout the high fire risk areas of the Redlands area. Children in this region would have likely received fire education from the QFES, including bushfire awareness and home survival plans. Statistics indicate that 10 per cent of Mount Cotton residents and seven per cent of Sheldon residents are children aged five to nine years.

Council maintains a proactive social media presence that regularly promotes the importance of being "Storm Safe" and "Fire Ready". This is supported by community awareness activities, such as "Street Speak". Both RFS and SES have extensive media campaigns that align with the beginning of the relevant danger period of the year: flood, storms and bushfire. Effective communication is central to the processes of bushfire preparedness and response and all involved in distributing safety messages to Redlands residents are supporting this communication.

While the SMBI offer some disadvantages to distributing relevant bushfire safety messages and communications, residents provided strong feedback that not enough had been done to inform and educate them. An advantage that the SMBI have is that the community is protected by a group of volunteers that live among residents. While this group of volunteers may not provide all education and information, they have played an important part in assisting the community and as such are generally well-respected for the job they do and the information they provide. On the mainland, bushfire-related communication and education is generally presented by representatives of the emergency services or Council. These people may not live in the area and the information they present

[2] 2009 Victorian Bushfires Royal Commission Final Report, p. 6

is often of a generic nature. Community engagement, whether raising awareness or providing education, should connect directly with individuals, provide relevant, tailored information and maintain preparedness.

Community-based bushfire education is a key strategy in the attempt to promote bushfire safety and should be seen as part of an all-hazards approach to risk. A number of sources confirm that the abundance of educational materials and programs typically engages only those already interested in bushfire mitigation measures. It appears that information or risk awareness does not convince people to adopt a more proactive response to bushfire safety. Education efforts seem to work better when they involve local people in their design and delivery, localising content to account for specific contexts.

Identified areas of concern

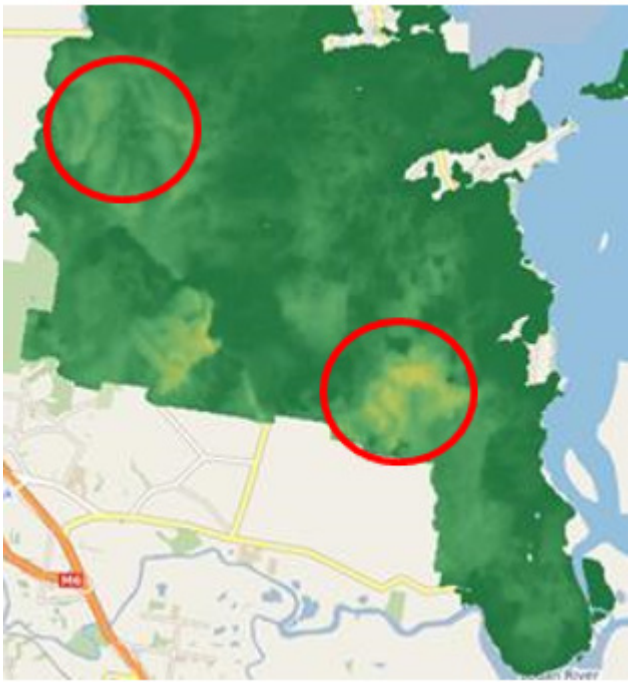
Given the findings of potential house loss and impact from all forms of fire attack, the project team focused a period of time on observing residential preparedness in the areas of Mount Cotton and Sheldon.

Properties in the Sheldon area are generally significant in size, on acreage and built in the 1980s; this would suggest that many houses are not built to the current standard of Australian Standard AS 3959 – Construction of buildings in bushfire-prone areas. Council's Disaster Management Plan demographics suggest the area that does not have a significant retired population. Given the average property price range, it is assumed that most households would be dual income with the house being unoccupied and undefended from fire on most weekdays.

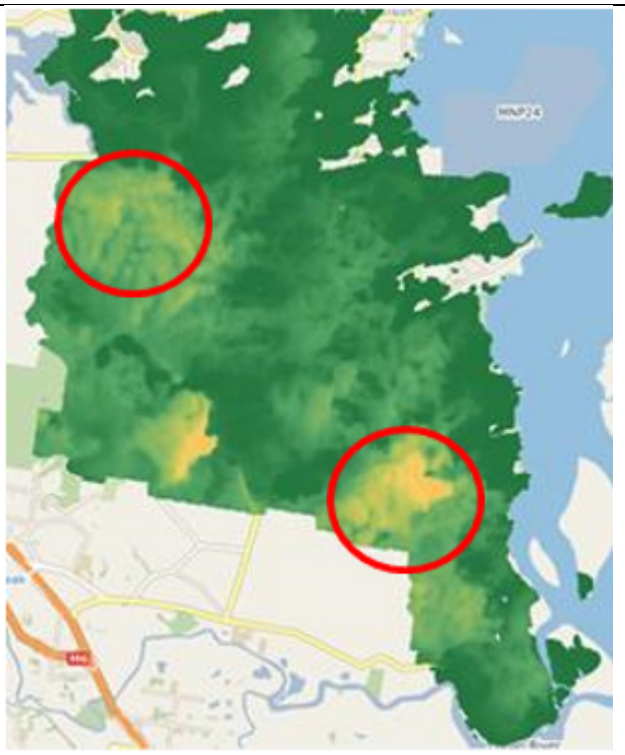
Properties in the Mount Cotton area vary greatly from old original farm buildings to large, recently built executive style homes. The new Mount Cotton properties and most of the Sanctuary Drive estate have been built after introduction of AS 3959, thus should all be constructed to a standard that offers features to somewhat limit the impact of ember attack from a bushfire. The standard does however leverage off the house being maintained to the same standard and this cannot be confirmed. Like Sheldon, many homes within the Sanctuary Drive estate will likely be unoccupied during weekdays, but some areas of Mount Cotton may include single-income households with one person at home periodically during weekdays. Mount Cotton does not have a high percentage of retirement-aged residents.

Overall Assessed Risk Level		**MEDUIM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
Medium (18)	Low (6)	Medium (18)	Medium (12)

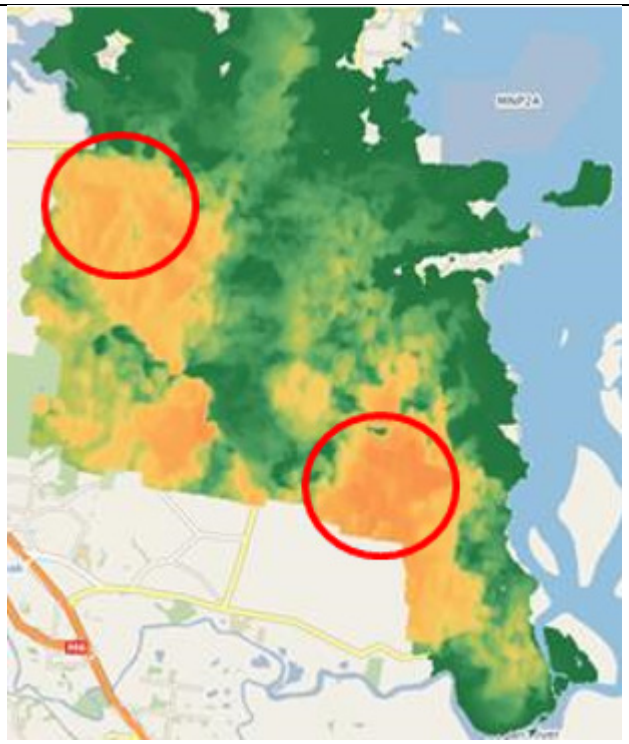
Estimated percentage of potential undefended house loss



FDI 20
Sheldon – As high as 10%
Mount Cotton – As high as 15%



FDI 30
Sheldon – As high as 16%
Mount Cotton – As high as 25%



FDI 40
Sheldon – As high as 40%
Mount Cotton – As high as 45%

As a general observation, most households in both Mount Cotton and Sheldon present reasonably well with houses generally well cared for and maintained to a standard that would likely prevent significant property loss in normal fire conditions of under FDI 20. However both suburbs are primarily located in semi-rural or conservation areas; this will always present an elevated risk from wildfire when FDI climbs, with the dangers proportionally increasing with the FDI level. No amount of planning or preparation will ever guarantee protection of life and property from the effects of fire, but implementing regular and seasonal inspections and maintenance to houses and properties will reduce the probability of significant impact.

The following are examples that were identified during ground truthing activities. These examples do not imply that all houses in these areas share the identified issues, nor does it imply that the photographs were the only houses with these concerns:

- Overgrown vegetation around houses and over roofs (images 20 and 22).
- Poor maintenance of gutters and house surrounds, build-up of leaves, twigs, bark and other debris from the roof and gutters (images 20, 21, 23 and 24).
- Poor access to structures due to long narrow driveways, overhanging trees and security gates (images 25, 27 and 30).
- House address numbering that is not visible from the roadway (image 26).
- Structures built prior to 2009 not meeting current standards AS 3959 that will present a much-reduced level of survival in a wildfire (image 24).
- LPG gas cylinder not installed correctly, relief valves vent towards the structure (no image).

	*Image 20 – Sanctuary Drive, Mount Cotton.*
	*Image 21 – Brushbox Court, Mount Cotton.*
	*Image 22 – Brushbox Court, Mount Cotton.*
	*Image 23 – Krause Road, Mount Cotton.*

- Potential for some escape routes to be cut by fire should the decision to evacuate be left too late (images 28 and 29).

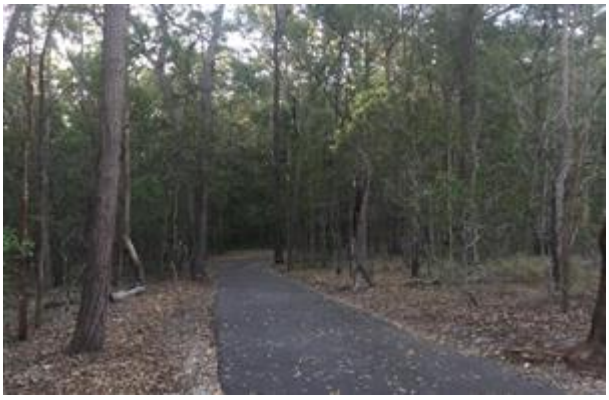
	*Image 24 – Krause Road, Mount Cotton.*
	*Image 25 – West Mount Cotton Road, Sheldon.*
	*Image 26 – West Mount Cotton Road, Sheldon.*
	*Image 27 – Sheoak Road, Sheldon.*

	*Image 28 – Mt View Road, Mount Cotton*
	*Image 29 – Avalon Road, Sheldon.*
	*Image 30 – Avalon Road, Sheldon*

Protection of cultural and natural heritage

A range of concerns around the protection of a number of cultural and heritage sites within the Redlands area. As the assessment of Cultural and Natural Heritage was not within the scope of this review, no significant time was allocated for this, however some instances were identified during ground truthing activities.

The property behind Weippin Street appears not to be managed by Council but reports from a local resident indicated that this block is a culturally sensitive area. The resident stated that there is an elders meeting circle within the bushland. After brief assessment of the area nothing was identified that met the description, but this area currently has a Combined Fuel Assessment of more than 30 tonnes per hectare, with no breaks or fire access trails between this block and the neighbouring industrial properties.

The Scribbly Gum Conservation Area EZ4 is a fire exclusion zone with a combined fuel load of more than 30 tonnes per hectare; the area of concern is the western side of the creek. A visual inspection located a Canoe Tree within this zone and while some level of manual fuel reduction has taken place at the base of the tree this is not anticipated to protect this site under FDI 20+.

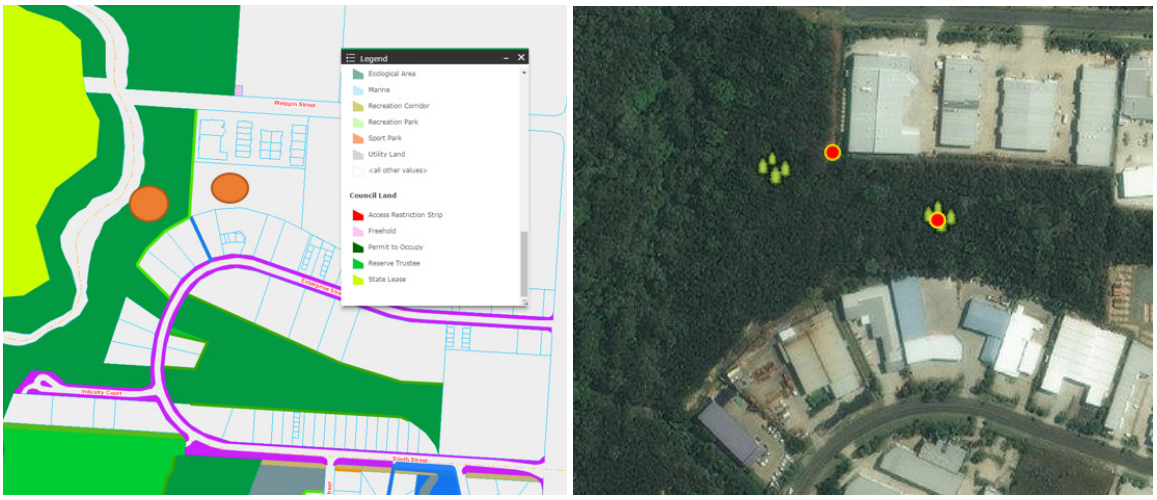


Figure 16 – Approximate location of the reported culturally significant area.

No assessments of other culturally sensitive areas were completed, but given the two examples witnessed it is anticipated that other sites may be at a similar level of risk from bushfire.

Area behind Weippin Street Cleveland, approx. combine fuel loading > 30 tonnes per hectare.

Recommendations:

55. Liaise with QFES to identify any capacity to introduce a community-based bushfire education program via Volunteer Community Educators (VCEs). VCEs will use engagement strategies through the Prevention, Preparedness, Response and Recovery (PPRR) framework. VCEs will look to make resilient communities through effective leadership to develop, strengthen and sustain disaster resilience. Given the elevated risks identified in Mount Cotton and Sheldon, a program that includes specific information relevant to these locations would be of benefit to these communities. Council should continue the good work it is currently doing to promote and advertise these information and education sessions.
56. Perform an audit of the council area to identify all significant cultural and heritage locations and implement steps to ensure that these assets are protected from impact by wildfire.

Conclusion – Mainland

The bulk of Council's mainland area presents well with generally similar levels of wildfire impact risk as many outer suburbs of Brisbane. However, research completed by QFES PSU has indicated that the suburbs of Mount Cotton and Sheldon do present with elevated risk level of Undefended House Loss Potential.

Of the management zones documented in Council's Bushfire Action Plan 2016, a number of examples of extreme fuel loads were observed within conservation and fire exclusion zones. It is understood that these zones are in place to assist vegetation and landscape to recover or to protect plant species that do not favourably handle fire impact. It would seem that ecosystem values are being prioritised above public safety within these zones. There is no suggestion that a deliberate realignment of priorities has occurred, rather it is likely a practice that has come about during changes to personnel within the Conservation Team.

The QFES PSU Report details areas within the council area that may be impacted by ember or convection attack under elevated FDI levels; this model includes many areas that were not impacted by fireline modelling. As both Council and QFES have relied on fireline intensity mapping to identify communities at risk of fire impact, many residents within the community may not have sufficient knowledge to fully appreciate the potential impacts within their community. Additional education and awareness is recommended to ensure that residents and land-owners in all areas of potential impact know how best to prepare themselves and their property.

Council is encouraged to continue with the predictive modelling style of analysis for prescribed burns and other fuel mitigation activities, using data from the preceding year, including prescribed burns, wildfires, mowing, slashing and clearing. This new approach removes much of the manual assessment evaluation that is currently undertaken by Council's Conservation Team, replacing it with a scientific and statistical assessment. QFES is also able to provide advice and assistance with the physical prescribed burn program if required.

Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (18)	Medium (12)	Medium (10)	Low (8)

Review conclusion

Of the management zones documented in Council's Bushfire Action Plans 2016 a number of examples of extreme fuel loads were witnessed within conservation and fire exclusion zones. It is understood that these zones are in place to assist vegetation and landscape to recover or to protect plant species that do not favourably handle fire impact. It would seem that ecosystem values are being prioritised above public safety within these zones. There is no suggestion that a deliberate realignment of priorities has occurred, rather it is likely a practice that has come about during changes to personnel within the conservation team.

It is the opinion of the project team that greater community resilience would be achieved with a more community-based fire safety and education program. While QFES already provides a valuable service to the community there are many areas and options to be investigated in order to achieve the level of preparedness and resilience envisioned by Council and the Emergency Services.

Overall Assessed Risk Level		**MEDIUM**	
Social / Community	***Infrastructure***	***Environmental***	***Economic***
High (19)	Medium (10)	Medium (12)	Low (6)

Summary of recommendations

The following is a summary of recommendations that address the issues identified by the project team during the review. These recommendations are not presented in order of importance, rather they are listed under scope of work headings. Council is encouraged to consider implementation of these recommendations.

Part A – Southern Moreton Bay Islands

Scope Point 1 – Levels of vulnerability to SMBI

Scope Point 1.1 – Illegal dumping of green waste, household waste and commercial waste on council and undeveloped private land

1. Council raise community awareness of local laws via all available reporting and communication channels, encouraging residents to report instances of illegal dumping. Leverage off the Queensland Department of Environment and Heritage program: "See It, Report It, Stop It."
2. Investigate the viability of operating Council's waste transfer stations seven days per week on Russell and Macleay Islands, in the same manner as Lamb and Karragarra Islands.
3. Investigate alternatives to the existing disposal fees for commercial green waste, and the inclusion of mulching or chipping facilities at waste transfer stations to convert bulky green waste into a usable commodity for council and community.
4. Coordinate a systematic clean-up of impacted areas using council personnel and resources with assistance from volunteer community groups or organisations such as 'Clean up Australia'. As many illegal dumping locations are on private land, a partnership between Council and land-owners may be considered to assist in cost recovery. Any coordinated clean-up would include safety considerations for those involved.
5. Consult with RFS Regional Office to identify their needs with regard to vehicle wrecks for road crash rescue training. While the vehicles will still require removal from the islands, the costs would be partially offset by the training opportunities for emergency services.
6. Implement a proactive approach to Council's local law enforcement on the SMBI, which will likely require additional enforcement personnel and up-skilling of additional enforcement officers to assess matters relating to Local Law 3, including fuel loadings and reduction of hoarding and unsightly blocks.
7. Investigate the feasibility of access control to popular illegal dump sites. As many dump sites are on private land, cost recovery must be considered.
8. For illegal dumping or excessive build-up of fuel on private land, consider involvement of QFES, in accordance with the *Fire and Emergency Services Act 1990* Section 69 which states, "the occupier of a premises must take measures to reduce the risk of fire occurring and reduce the potential danger to persons, property and the environment in the event of a fire occurring".

Scope Point 1.2 – Build-up of vegetation and ground fuel on council and private land

9. Implement the recommended prescribed burn schedule contained within the QFES Predictive Services Report on council-managed land (Annexure A).
10. Council should investigate the use of RFS and other service providers to assist or undertake these tasks. When conditions are favourable, the prescribed burn program must be a high priority.
11. In the event of prolonged unfavourable weather that limits prescribed burning, consideration must be given to implementing or strengthening fire access trails into fire breaks, as detailed in Rob Friend and Associates Fire Break Assessment Report for Redland Shire Council – 1996 and the Parsons Brinckerhoff SMBI Firebreak Report for Redland Shire Council – 2005.
12. When implementing any fire mitigation strategy, Council should ensure activities have a high profile and are publicised using all available channels. Council should report annually on prescribed burning outcomes in a manner that meets public accountability objectives, including publishing details of targets, area burnt, and funds expended on the program, as well as impacts on biodiversity. Council should lead by example with responsible management of fuel loadings on undeveloped land. Any publication of fire mitigation activities is to be accompanied by a call-to-action for private land-owners to help ensure a "Safer SMBI".
13. Implement an awareness-raising campaign for SMBI residents to promote a call-to-action to create a "Safer SMBI". The aim of this campaign will be to inform them of the good work being done by Council and other land-owners, as well as educating residents and land-owners of their obligations under Local Law 3, Part 3 – Overgrown and Unsightly Blocks and Part 4 – Fire and Fire Hazards. The campaign also offers an opportunity to clarify the significant confusion among SMBI residents regarding Local Law 6 – Protection of Vegetation.
14. Encourage a closer working relationship between Council and RFS volunteers on the SMBI in the identification and management of blocks with excessive fuel loads on both council and private land.
15. Upgrade the Red-e-map system to indicate which blocks are council-managed and which are privately owned. While this knowledge will not reduce the fuel loading on the ground, it will assist residents to identify who they need to mediate with in order to resolve issues.

Scope Point 1.3 – Hoarding and excess build-up of green waste, household waste and commercial waste on some private land

16. Consider engaging counselling services to assist residents that display hoarding behaviours. Given that this behaviour tends to become more problematic in elderly people, Council should ensure that enforcement officers are trained in dealing with vulnerable residents. Benefits may exist in partnering with organisations such as Pathways, developed by Catholic Community Services (NSW & ACT). This group provides a central point of information on hoarding and its website provides links to resources and support groups.

Scope Point 1.4 – Low personal level of resilience relating to wildfire and other emergency events

17. Introduce and improve emergency information signage on the SMBI. Recommended signage should include a basic map of the relevant island, evacuation routes, information sources, e.g.

ABC Radio 612 AM, Council's website and emergency locations, such as assembly areas, neighbourhood safer places and locations of emergency services facilities. These signs are to be displayed at the ferry and barge terminals, and could either stand alone or become part of the current Fire Danger Rating signs on the SMBI.

18. Erect evacuation area signs and neighbourhood safer places signage at relevant locations, with each including relevant emergency contact details. Council should liaise with Area Fire Management Groups to complete this matter.
19. Council partner with RFS to analyse the results of the Predictive Services Report and Bushfire Analysis Tool to tailor a new advance warning protocol. This new protocol may include tailored information to ensure vulnerable residents are accounted for and advised within the 24 to 48 hours prior to an event, providing them with ample time to enact their own Bushfire Survival Plan.
20. Council should consider partnering with existing volunteer organisations to ensure vulnerable communities are targeted with relevant safety messages, programs and instructions. To be effective these need to be part of a well-designed long-term community education program that captures people's attention, allowing for local needs and circumstances, regularly evaluated and improved. Programs with primary significance include, for example, Bushfire Survival Plans and Prepare, Act, Survive.
21. Conduct street audits to identify residents, addresses and locations requiring tailored emergency assistance during emergencies or evacuation, in collaboration with relevant authorities and community groups. The results are to be maintained in a register that is shared with emergency services and other relevant support organisations with pre-arranged responsibility for assisting the recorded residents.
22. Create a simplified or abbreviated Disaster Management Plan. In order to achieve this, the document may be limited to each island community and specific to seasonal risks. Included in this abbreviated plan should be critical information sources, e.g. ABC Radio 612 AM, Council's website, and a map that highlights critical points, such as evacuation routes, evacuation centres, assembly areas and neighbourhood safer places. Delivery of this information is tailored to meet the needs of the community.
23. Given the limited access many SMBI residents have to emergency warnings and advice due to communication challenges, identification of alternatives must be given high priority, Council is to investigate other feasible methods to notify residents of emergencies that require their attention.
24. Complete an audit of the fire hydrant maintenance program to ensure community expectations of accessibility and usability are being achieved.

Scope Point 1.5 – Limited initial emergency response personnel and equipment on each of the SMBI and lack of clear or workable inter-island deployment procedures for RFS personnel

25. Assist the RFS and SES to encourage new membership via council communications, website, community gatherings and other appropriate channels.
26. Local RFS brigades have stated that road crash rescue training is cost-prohibitive due to the expense of removing wrecked cars from the island. Council should investigate any cost-neutral transport opportunities to assist with removal of cars after training. This would enable RFS to provide training opportunities to personnel with direct benefit to SMBI communities.
27. Assist RFS and SES to facilitate a Memorandum of Understanding (MOU) with operators of ferries, barges and other vessels in the area to establish a structured procedure for inter-island

support to enable SMBI services to respond as a group to other islands. Investigation should occur with all island units to confirm their availability to respond.

Scope Point 1.6 – No workable secondary evacuation routes at all on each of the SMBI

28. Monitor the condition and usability of the evacuation routes listed in the Disaster Management Plan and conduct pre-fire season assessments of the amount and condition of fine fuels adjacent. The primary evacuation routes are to be considered as a minimum of Type 1 fire breaks with at least five to 10 metres of maintained land from the road edge to the start of vegetation.
29. Investigate any option to open a second evacuation route on Russell Island, which will be partially achieved if all fire trails and access tracks listed in Appendix A are utilised. If implemented, this new evacuation route must be communicated to the community and emergency plans updated.

Scope Point 2 – Review Council's current maintenance plan for SMBI to ensure it is scheduled for maximum benefit

30. Create access trails within the southern zone of Russell Island to allow RFS units to enter for fire suppression activities. These trails would ideally be constructed and maintained to Type 3 fire trail as described in the Rob Friend and Associates Fire Break Assessment Report 1996.
31. Revisit the current fire management practices detailed in Redland City Council Bushfire Action Plan 2016, specifically Section 3 (South) of Russell Island. The plan recommends the consideration of possible burns to maintain regional ecosystems. Given that protection of life and property is always to be placed above environmental concerns, prescribed burns should be considered to reduce fine fuel loadings that currently increase the significant impact of wildfire. As detailed in QFES PSU Risk Analysis Report (3.2 Key Assumptions) prescribed burning of ecological zones has not been programmed. Council should explore how best to incorporate these zones into the proposed prescribed burn schedule.
32. As the current Redland City Council Fire Management Operations Guidelines were prepared by QFES in 2007, it is recommended that this document be fully assessed to ensure it still presents an accurate guide for operations.
33. Conduct an analysis of the SMBI using SABRE tool to identify areas that require specific works to provide a greater level of safety to the community. Conducting an assessment at FDI 30+ will enable Council to identify areas that may benefit from activities other than fuel mitigation in order to better respond to the risk.

Scope Point 3 – Review of local laws, *Fire and Emergency Services Act* and other associated legislation

34. Council to upgrade the Red-e-map system that displays properties that are currently covered by a VPO. Additional information should be made available to indicate:
    - Who requested the VPO
    - Date of notice of VPO

- Date of VPO confirmation
- Vegetation type being protected.

35. Consider an audit of possible dangerous trees on public land and make the results of this audit visible to public.
36. Produce a simple, easy to understand document that clearly states the obligations to land-owners relating to Local Law 3 – Community and Environmental Management and Local Law 6 – Protection of Vegetation. As current confusion is significant, examples and pictures must be given that clearly detail and demonstrate the hierarchy of these laws. This document can be promoted and distributed amongst SMBI residents and land-owners.
37. Conduct an education campaign for residents via social media, community meetings and other channels on how to access contact details for neighbouring properties for mutual vegetation and property management.
38. Undertake a periodic survey of residents and land-owners to ensure local laws are being understood.

Scope Point 4 – Review current QFES mapping data utilised by QFES for planning and response to wildfires

No recommendations

Scope Point 5 – Review council fire access trails to ensure they are fit for use by QFES

39. Implement recommended fire access trails as per Fire Trail Assessment (Appendix A). As some recommended fire access trails would be constructed and maintained on private land to enhance safety to the community, negotiation between Council and private land-owners will be required. It is recommended that the land-owner agree to provide access while Council provides the trail maintenance. Fire access tracks should be controlled by bollards or similar to reduce the likelihood of improper use. If negotiations for trails on private land are not positive, the *Fire and Emergency Services Act 1990* Section 69 provides legislative power to require fire access or fire breaks to be created. For this to be enacted QFES would require further analysis to be conducted and legal implications considered.
40. Conduct an internal audit of fire access trails and tracks to ensure they meet the requirements laid out in Rob Friend and Associates Fire Break Assessment Report for Redland Shire Council – 1996 and the Parsons Brinckerhoff SMBI Firebreak Report for Redland Shift Council – 2005. The project teams' visual assessment of fire trails indicated that the standards detailed were not being adhered to in all cases. All fire trails should be maintained with consideration to the standard detailed in the Redland City Council Fire Management Operational Guideline 7 – Preparedness. Height of the trails to be maintained to ensure suitability of RFS medium attack units.
41. Annual inspection and maintenance by Council of all fire access track bollards and locks. Inspections revealed some padlocks were impossible to use due to exposure to the elements and poor maintenance. Encourage a partnership between RFS units on the SMBI and Council to perform periodic inspections of fire access trails to ensure they are fit-for-purpose. Council to implement a quick and easy to use process to report findings and submit requests for repairs or servicing.
42. Implementation of proposed fire trails and data shared between Council and QFES for inclusion in fire management tools and QFES TOM System.

Part B – Redland City Council Mainland

Scope Point 1 – Review Council's current maintenance plan to ensure it is scheduled for maximum benefit

43. Implement a program to review fuel levels within all land management zones including Exclusion Zones.
44. Use FDI 20 for general bushfire risk decision-making regarding the efficacy of planned mitigation efforts. Sufficient mitigation effects achieved at this level represent a reasonable balance of resource expenditure and payoff.
45. Utilise QFES PSU to repeat a simulation-based approach to annual bushfire risk analysis, updating the latest fire scar history, fuel maps, disruptions, etc. The QFES PSU recommends Council provide the latest fuel treatment history and fire scar data as at March each year, and that this analysis is repeated at FDI 20.
46. Use the SABRE site created for this study to undertake a detailed analysis of the mainland area for FDI 20+ to identify any areas or issues that may require attention.

Scope Point 2 – Review council fire access trails to determine if they are sufficient for QFES use

47. As there is limited reduction of fine fuel by burning for all management zones except Wildfire Mitigation Zones (WMZ), an assumption is that fuel levels may reach a level outside of the expected level of 16 – 20 tonnes per hectare. For this reason, it is recommended that all trails bordering all management zones, except Wildfire Mitigation Zones, and urban or commercial development should be maintained to a minimum of Type 3, including the five-metre fuel reduced zone beyond the five-metre slash line. The existing trails appear to be maintained to a standard of Fire Break Type 5, which is a three to five-metre slashed area, but no additional fuel reduction has been undertaken beyond the slash line.
48. Conduct a minimum six-monthly assessment of all perimeter trails and breaks to ensure they remain fit for purpose and meet the standard detailed in the Rob Friend and Associates Fire Break Assessment Report 1996. This would best be completed after storm season and before fire season.

Scope Point 3 – Local laws and other legislation

49. Council to use the SABRE site created for this study to undertake its own detailed analysis of areas covered by VPOs on the mainland.
50. Work with QFES to roll out additional awareness and educational material that explains how to residents can best manage vegetation on blocks covered by VPOs.

Scope Point 4 – Level of vulnerability

Scope Point 4.1 – Exposure to large council reserves and other parkland

51. Council to consider updating section 1.4 – Natural Disaster Vulnerability and section 2 – Locality Risk Profiles within the current Redland City Council Disaster Management Plan. Additional information to include:
    - Fire weather appreciation information that clearly explains FDI levels and the levels upon which the Fire Mitigation Strategies are based.
    - Impact area map that displays potential ember attack areas.
    - Direct Attack Success probability.

Scope Point 4.2 – Access to reticulated water and fire hydrants

52. Conduct an assessment of the EZk4 and EZs1 to determine the environmental objective of these areas. Develop a plan to reduce and maintain the fire fuel loadings in these zones to below 16 tonnes per hectare.
53. Construct and maintain a fire access trail that follows the boundary between private land and council-managed land. The objective of this access track is to offer a level of protection to the adjacent houses and to provide rapid access for QFES resources to the rear of the properties in Teviot Street and the street leading from it to the east. The track is to commence at the access gate at the northern end of Teviot Road and tie in with Serpentine Creek at a point where the objective can be achieved. Given the current fuel loadings and the fuel loadings currently observed in Exclusion Zones the minimum standard for the trail would be a Type 3 as indicated in the Rob Friend and Associates Report 1996. As this area is a border with Logan City Council it is likely that construction and maintenance of this trail may be a shared responsibility.
54. On days of forecast FDI 30+ or QFES Wildfire Alert Level 3, Council is to ensure that a bulk water tanker be made available for immediate response on request from QFES. Confirmation of the availability of this resource is to be confirmed with QFES Brisbane Region daily on said days. To increase the safety of staff operating this vehicle, it is recommended that they achieve satisfactory completion of Fire Management and be kitted with appropriate firefighting personal protection equipment. Council is to confirm with QFES that the fittings on water tanker/s are compatible with both QFES Urban and Rural appliances.

Scope Point 4.3 – Level of preparation for disasters

55. Liaise with QFES to identify any capacity to introduce a community-based bushfire education program via Volunteer Community Educators (VCEs). VCEs will use engagement strategies through the Prevention, Preparedness, Response and Recovery (PPRR) framework. VCEs will look to make resilient communities through effective leadership to develop, strengthen and sustain disaster resilience. Given the elevated risks identified in Mount Cotton and Sheldon, a program that includes specific information relevant to these locations would be of benefit to these communities. Council should continue the good work it is currently doing to promote and advertise these information and education sessions.
56. Perform an audit of the council area to identify all significant cultural and heritage locations and implement steps to ensure that these assets are protected from impact by wildfire.

Appendix A: Assessment of Fire Access Trails and Tracks on SMBI

The following are fire access trails currently in QFES mapping tools and offer strategic benefit. These fire access trails require maintenance from Council in order to be reinstated and maintained to a level 3, as documented in Rob Friend and Associates Fire Break Assessment Report 1996.

Street / Name	Current issue
Borrows Street, Russell Island	Reinstate track between Wylie Street and Fern Terrace. Currently overgrown and impassable due to fallen timber. This fire trail would be used by QFES for better access to the adjacent billabong.
Norfolk Street, Russell Island	Reinstate track between Minjerriba Road and Maroondah Street to improve immediate access.
Glendale Road, Russell Island	Reinstate track under the powerlines between Peytone Avenue and Centre Road to improve immediate access.
Eagle Street, Macleay Island	Reinstate track between Western Road and Columbia Street. This track is required to ensure rapid access between the two streets to provide fire coverage as the road is in place, but is currently blocked by boulders. It is unknown if the road was blocked by Council or by residents. If access control to this area is required it is suggested that boulders be removed and a key-operated bollard be erected in the middle.
67 Acres – Between Kate Street, Noondoo Street and Wirralee Street, Macleay Island	This proposed trail is on private land but provides essential access for RFS to control fires in this parcel of land. Tracks have already been created, but they are not maintained, therefore Council should negotiate with the land-owner for the ability to maintain this track. QFES may have ability to require this track under section 69 of the *Fire and Emergency Services Act*,

The following are fire access trails currently in QFES mapping tools and offer strategic benefit. These trails are currently in good condition and appear to be maintained, but do not appear on the Council maintenance map. They will require continued maintenance from Council to ensure they remain viable.

Street / Name	Current issue
Borrows Street	Between Wylie Street and High Street
Harrison Street	Full street length
John Street	Full street length
Glendale Road	Area between Centre Road and Peytone Ave. This roadway is integral and does show on Council mapping with a category of “other”. The track is in an acceptable condition complete with bollards however ongoing maintenance is to be scheduled.

The following are proposed fire access trails that do not exist but have been identified via consultation with QFES and Council's conservation officer as having strategic value.

Location and benefit
East end of Pharlap Street to Catamaran and Yacht Street. This proposed trail would provide the ability to travel more easily around the Council Reserve between Pharlap Street, Catamaran Street and Bernborough Street. Possibly incorporate RCC /RB78A.
Southern end of Hillview Parade to Glendale Road. This proposed trail is on private land but provides essential access for RFS to control fires in this parcel of land. RFS has already created a track during recent fires, however Council should negotiate with the land-owner for permission to maintain this track as a fire access trail and fit appropriate bollards to limit recreational drivers.
South End Road to Centre Road via Hacking Ridge Road. This proposed trail is to be constructed wholly on council land and is to run on the south-eastern edge of the swampy area. It would provide an access trail for RFS to the rear of houses. No rapid access currently exists to this area.
East end of Glendale Road has a previous track to connect Glendale Road to The Boulevard. This has become largely unusable due to a wash out. Suggest reinstating access between these roads in order to provide access for RFS crews a control line to work with. Currently there is limited ability to stop a fire running north-south along Headland Circuit.
The bushland between Michiko Street and Charles Terrace was cleared by Council during the recent wildfires and provided strategic access to RFS crews to defend houses. This track does not currently appear on Council's Mowing Plan and the suggestion is to maintain it to Type 2 break/trail. It is difficult to navigate an appliance on this track due to trees. Council should endeavour to improve access by strategically removing a tree to remove 90 degree corners and create a vehicle turn-around area towards the end of the trail.
Charles Terrace. Consider options to make the board walk and walking trail available to RFS light attack vehicles. The existing trail has council bollards to control access and is sufficient width but the load limit of the board walk is unknown. This trail offers significant strategic benefit given the distance to travel to get to the northern end of Charles Terrace.

Appendix B: Other reference documents

Document title	Document version	Document location
AS / NZS ISO 31000:2009 Risk Management – Principles and Guidelines	2009	`https://infostore.saiglobal.com/en-au/Standards/AS-NZS-ISO-31000-2009-1378670/
Fire and Emergency Services Act 1990	1990	https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/FireARescSeA90.pdf
Hoarding and Squalor (Footprints Inc)	2016	https://www.footprintsinc.org.au/news-and-events/hoarding-squalor
Overall Fuel Hazard Assessment Guide (Department of Sustainability and Environment – Victoria)	2010	QFES Predictive Services Unit
Parsons Brinckerhoff SMBI Firebreak Report for Redland Shire Council – 2005	2005	Redland City Council
QFES methodologies for RCC	2007	Redland City Council
Qld Transport Rule Section 194	2009	https://www.legislation.qld.gov.au/LEGISLTN/CURRENT/T/TrantOpRURR09.pdf
Redland City Council Disaster Management Plan	2016	http://www.redlandsdisasterplan.com.au/
Redland City Council Conservation Fire Management Framework & Operational Guidelines	No date	Redland City Council
Redland City Council Local Law 3 – Community and Environmental Management, Part 3 – Overgrown and Unsightly Blocks	No date	https://www.redland.qld.gov.au/info/20194/local_laws/413/local_law_3_%E2%80%93_community_and_environmental_management
Redland City Council Local Law 3 – Community and Environmental Management, Part 4 – Fire and Fire Hazards	No date	https://www.redland.qld.gov.au/info/20194/local_laws/413/local_law_3_%E2%80%93_community_and_environmental_management
Redland City Council Local Law 6 – Protection of Vegetation	No date	https://www.redland.qld.gov.au/info/20194/local_laws/416/local_law_6_%E2%80%93_protection_of_vegetation
Rob Friend & Associates Fire Break Assessment Report for Redland Shire Council – 1996	1996	Redland City Council
SMBI Bushfire Management Plan 2004	2004	Redland City Council
2009 Victorian Bushfires Royal Commission Final Report	2010	http://www.parliament.vic.gov.au/papers/govpub/VPARL2006-10No332Summary.pdf

Appendix C: Survey of Southern Moreton Bay Islands – questionnaire

TRAINING AND EMERGENCY MANAGEMENT

Redland CITY COUNCIL

Independent Review into Redland City Council Bushfire Management Plan

After the bushfires that impacted Macleay Island in November 2016 and Russell Island in November and December of 2016, Redlands City Council made a commitment to enlist the services of an independent organisation to review their Planned Prescribed Burns Program and other bushfire preparation activities. Training and Emergency Management is the commercial division of Queensland Fire and Emergency Services and have been contracted to complete this review.

We truly value the information you will provide, your responses will contribute to our analyses of the Redlands City Council Bushfire Plan. This survey can be completed anonymously but we would welcome some basic contact details in order to follow up and provide critical safety information as required.

Time Frame: We have an objective to deliver a completed review to Redlands City Council in early April, data will collected via this survey until 28th March.

Question 1 – On which of the Southern Moreton Bay Islands do you reside?

Answer: _____

Question 2 – How long have you live on the SMBI's?

Answer: _____

Question 3 – Do you reside in a rental property?

Circle the answer: YES / NO

Question 4 – Please circle the correct statement that best describes your perceived level of safety from fires and other emergencies on the SMBI's?

Answer: I feel very unsafe / I feel unsafe / I feel reasonably safe / I feel very safe

Question 5 – In order of priority please list the 4 most significant risks / hazards to your personal safety and the community as a whole.

Answer 1: _____

Answer 2: _____

Answer 3: _____

Answer 4: _____

Question 6 – From your understanding, is there any law (state or local) that limits your ability to prepare your house or property for Bushfire or other disasters?

Circle the answer: YES / NO

Question 7 – If you answered YES to Question 6, what activities or tasks are not permitted?
Answer 1: _____
Answer 2: _____
Answer 3: _____
Answer 4: _____

Question 8 – Do you have reliable mobile PHONE coverage at your address? Allowing you to make and receive calls and send and receive SMS messages?
Circle the answer: YES / NO

Question 9 – Do you have reliable mobile DATA coverage at your address? Allowing you to view websites and apps?
Circle the answer: YES / NO

Question 10 – Do you have a Bushfire Safety Survival Plan?
Circle the answer: YES / NO

Question 11 – Do you have working smoke alarms in your home?
Circle the answer: YES / NO

Question 12 – If a Bushfire threatens your area, how would you expect to receive Emergency Information? List up to 4 answers with 1 being you're most preferred or likely to use.
Answer 1: _____
Answer 2: _____
Answer 3: _____
Answer 4: _____

Question 13 – Have you accessed the Redland City Disaster Management Plan?
Circle the answer: YES / NO

Name: _____
Address: _____
Phone: _____
Emails: _____

Privacy Statement – All details in the survey are optional but will assist us to analyse issues and provide follow up information as required. Your details will not be used for any marketing purposes or shared with any person or organisation outside of QFES and RCC.

Appendix D: Survey of Southern Moreton Bay Islands – results

Survey results are available on request from QFES-TEM via a Redlands City Council representative.

E-mail: tem@qfes.qld.gov.au

TRAINING AND **EMERGENCY** MANAGEMENT

Phone 1300 650 028 **Email** tem@qfes.qld.gov.au

Website www.qfes.qld.gov.au/training