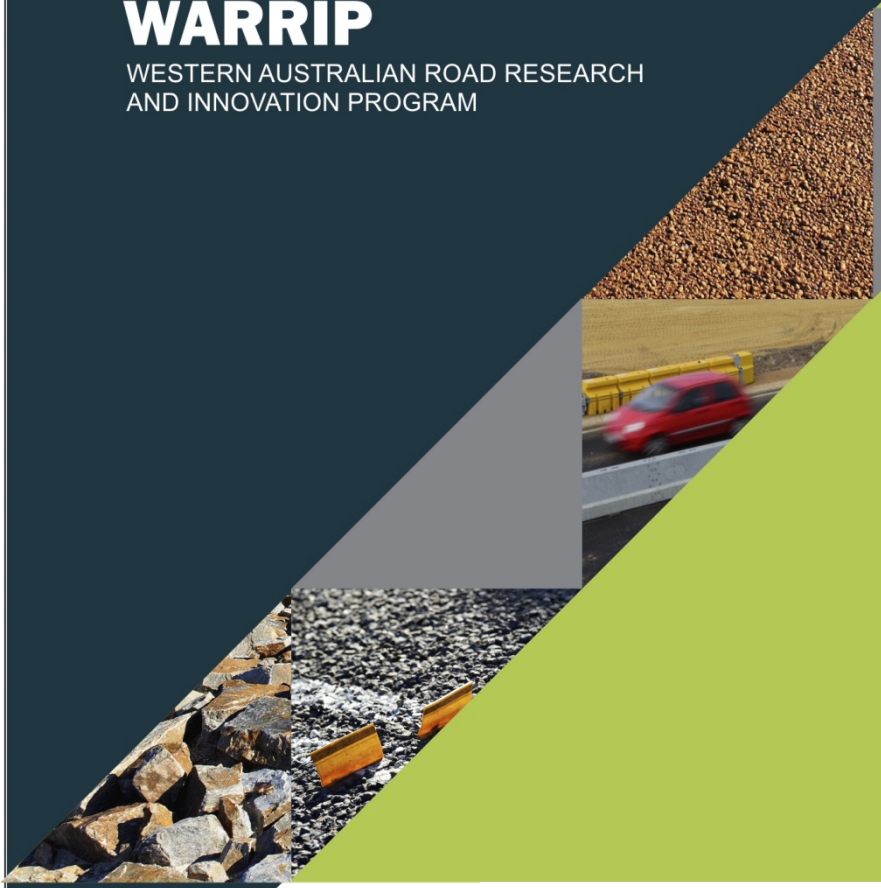
WARRIP
WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM

NACOE
NATIONAL ASSET CENTRE OF EXCELLENCE



Incorporating Bushfire Impacts into Road Design

Awareness Session for the Queensland Department of Transport and Main Roads
16 June 2022

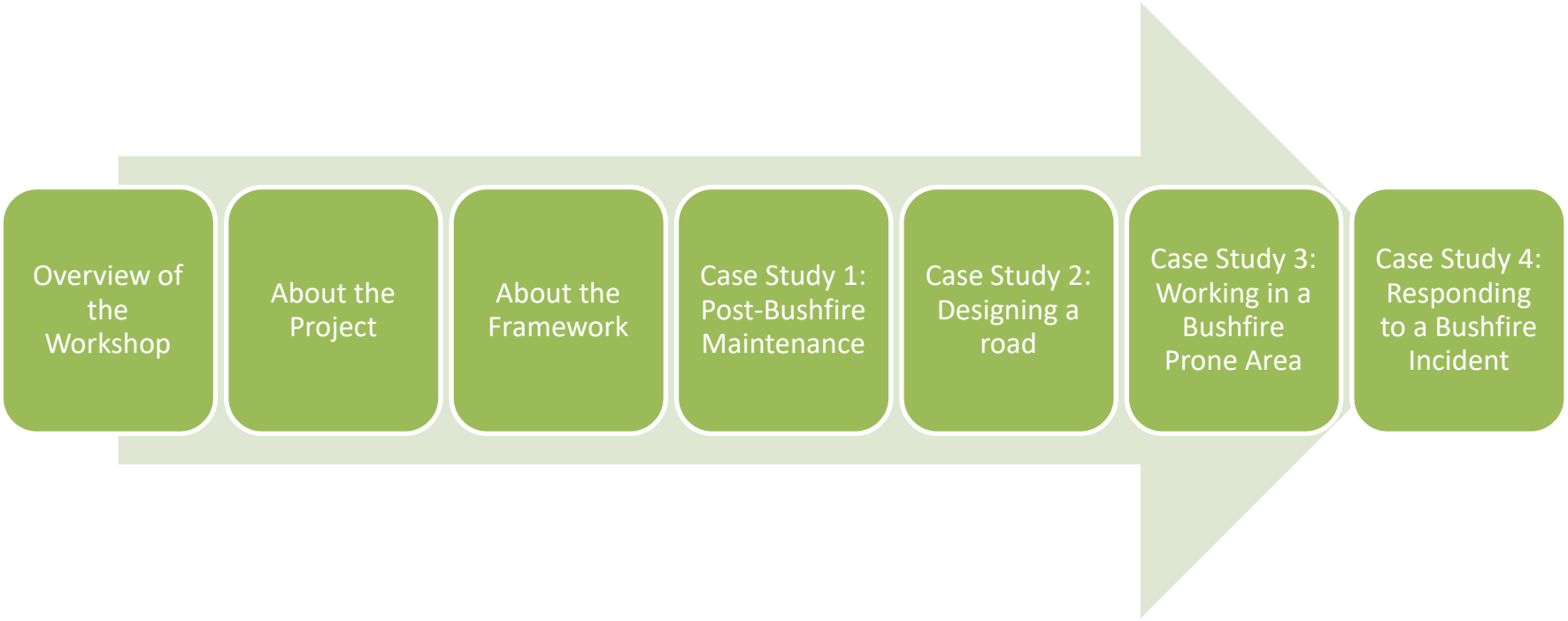
AN INITIATIVE BY:

mainroads WESTERN AUSTRALIA

Queensland Government

arrb

Agenda


Overview of the Workshop
About the Project
About the Framework
Case Study 1: Post-Bushfire Maintenance
Case Study 2: Designing a road
Case Study 3: Working in a Bushfire Prone Area
Case Study 4: Responding to a Bushfire Incident

WARRIP
WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM

NACOE NATIONAL ASSET CENTRE OF EXCELLENCE

Project Team

Melissa Lyons

ARRB Project Leader

Georgia O'Connor

Project Team Member

Ellyse Sheridan

TMR Project Manager

Louis Bettini

MRWA Project Manager

Karen Cogo

Quality Manager

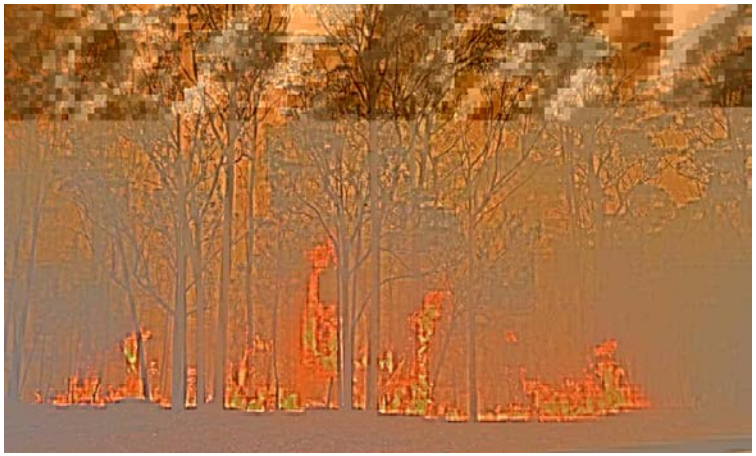
Purpose of the Workshop

- To disseminate the framework, and its strategies.
- To provide examples on how to use the framework, using hypothetical case studies.
- To raise awareness and understanding of the guidance provided on the planning, design and construction standards for bushfire risk.
- To assist with the implementation of the strategies developed in the framework research.

About the Project

Overview of the Project

- Joint project between the NACoE and WARRIP programs.
- It was identified that road agencies in both TMR & MRWA do not actively consider bushfire risk, in the same way that flooding risk is considered.
- Objectives of this project are:
  - Incorporate best practice bushfire management into road infrastructure planning, design, construction and maintenance practices.
  - To ensure bushfire risk is considered in transport network planning.
- The overall aim of this project is:
  - to develop a framework on how to plan, design and maintain road infrastructure in high bushfire risk areas.



Road Agency Strategic Objectives for Bushfire Management

- Preventing bushfire ignition in the road corridor through roadside vegetation design and maintenance
- Preventing the impact of a bushfire in a road corridor by minimising the damage to infrastructure within in the road corridor.
- Enabling quick recovery of road operations following a bushfire event.

Project Deliverables

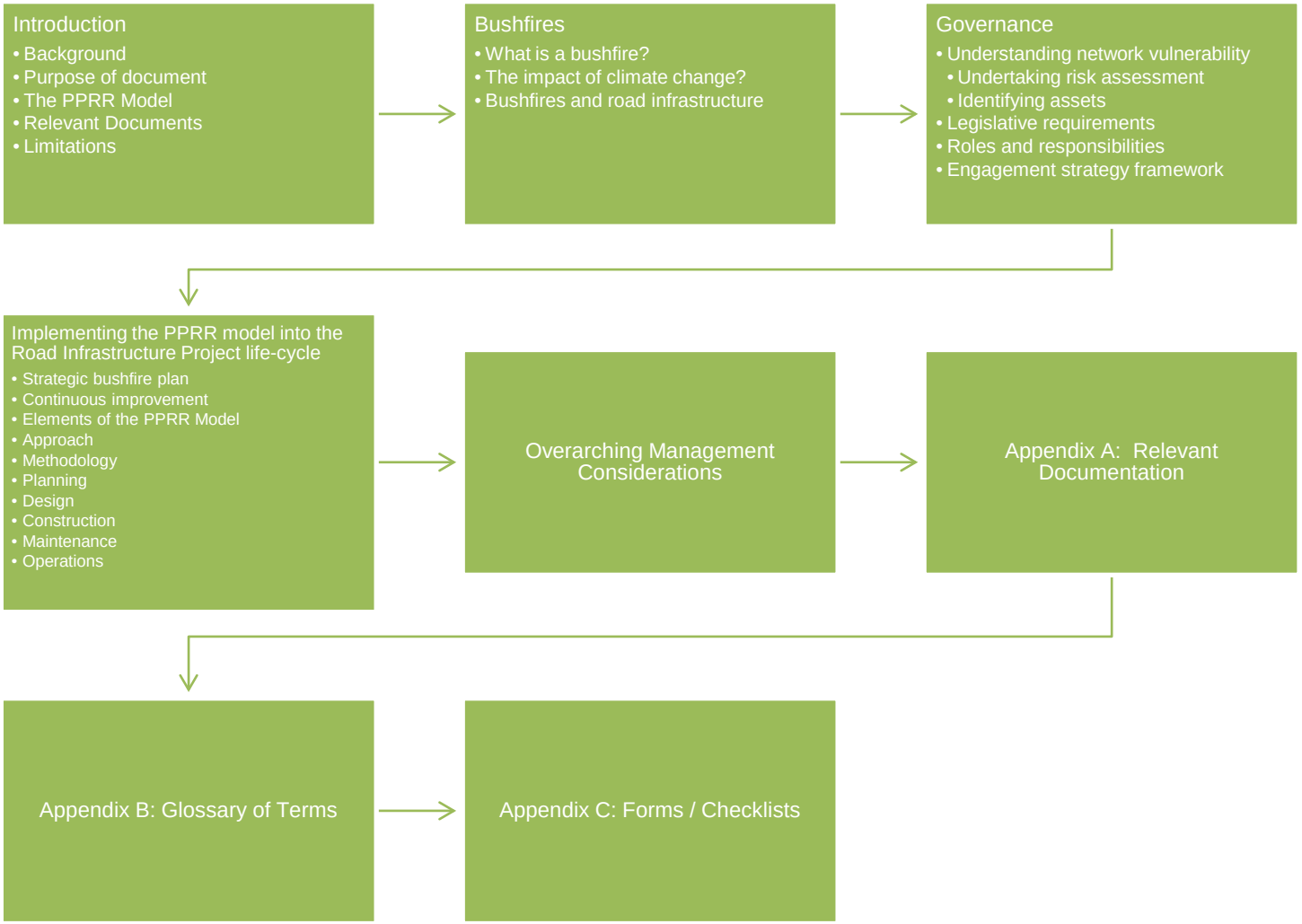
Literature Review	•National and international review of: • Best practice management strategies • Management considerations • Other disaster framework examples
Gap Analysis	•Review of current road agency documentation to identify where bushfire management is considered or needs to be considered.
Framework development	•Present strategies in the form of “Management Objectives” that can be implemented into road agency practice.
Workshop	•Stakeholder engagement workshop to review framework.
Awareness and support sessions	•Support, disseminate and implement the final published framework.
Final project report	•Provide background and framework develop basis •Present the recommendations and outcomes

The Framework

PPRR


Recovery
• strategies for improvement in post-disaster recovery.
Prevention
• through risk avoidance and risk reduction strategies
Response
• strategies for disaster management
Preparedness
• through overall policy strategic objective solutions

Structure of the Framework



Key aspects of the framework

- Road Agency Representative is the term used.
  - This should be applied to the relevant person for that activity.
- Management Objectives are provided at the commencement of each sub-section.
- Framework is relevant to both Qld and WA.
- Not only focused on what is currently done.
- Relevant documentation table in Appendix A
  - Includes:
    - Refers to road agency specifications (TMR & MRWA)
    - Literature review document section
    - Recommendations from literature review
    - Legislative requirements

Key aspects of the framework

4.2 Continuous improvement

Management Objective: When setting strategic planning objectives, the road agency representative should ensure that learnings from previous bushfire prevention, preparedness, response and recovery activities are implemented back into planning practices.

Lessons learned may include:

- Recent bushfire events which may reduce the need to undertake future prevention activities.
- Prevention activities that have been effective in both road design and on-going road maintenance.
- Preparedness strategies which have shown to be effective in lessening the impacts of disaster events.
- Response activities which have demonstrated immediate and effective action.
- Best-practice in recovery to 'Build-back-better'.

3.4.1 Community readiness

Management Objective: The road agency representative should work with the relevant fire service authorities to ensure that communities in bushfire-prone areas are aware of what they need to do in the event of a bushfire. This includes identifying and communicating the evacuation routes along the road network.

A key aspect of bushfire management is the engagement of the community for community readiness, as a well informed and prepared community will be more resilient, reducing pressure on the road and transport networks during and in the aftermath of a bushfire.

Community readiness should be undertaken, in collaboration with the relevant fire services authority, through hosting information sessions, or disseminating educational materials, on key issues including (but not limited to):

- Evacuation procedures and sources of information during an event
- Understanding alerts and warnings
- Understanding total fire bans
- Developing a personal fire and evacuation plan
- Preparedness and fire management of property and land.

4.7.5 Roadside furniture design strategies

Management Objective: The road agency representative should ensure that bushfire risk is integrated into the design and maintenance strategies for roadside furniture.

Roadside furniture design strategies to be considered for bushfire prevention include:

- Removing vegetation growth around roadside furniture; and
- Using non-flammable materials, such as metal for posts (rather than timber), as combustible materials are more likely to be damaged in a bushfire event.

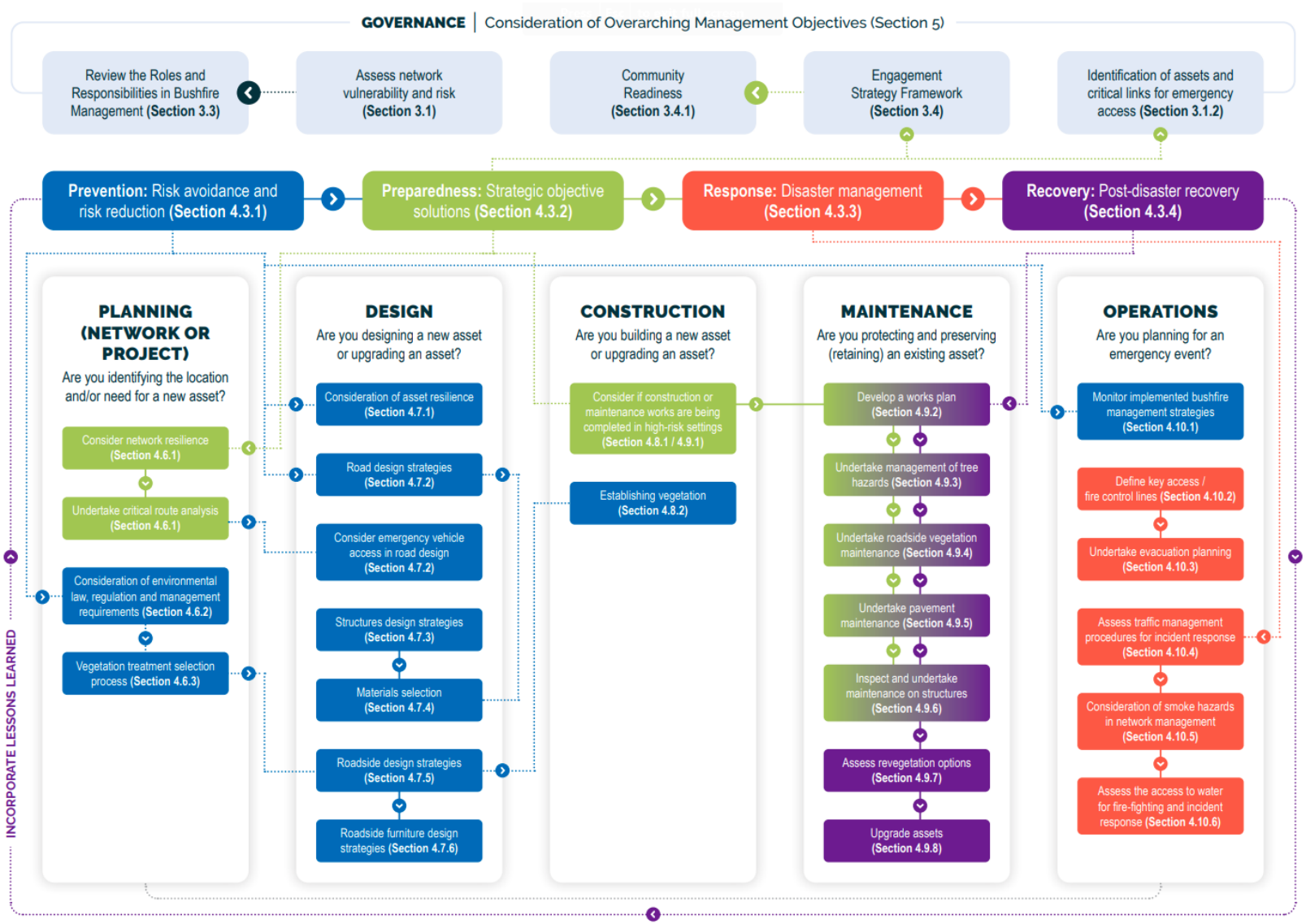
An example of a roadside is shown in Figure 4.11. The left-hand image shows vegetation close to the road and timber guideposts, the right-hand image shows how this was damaged by a bushfire.

Figure 4.11: Bushfire damage to roadsides

WARRIP

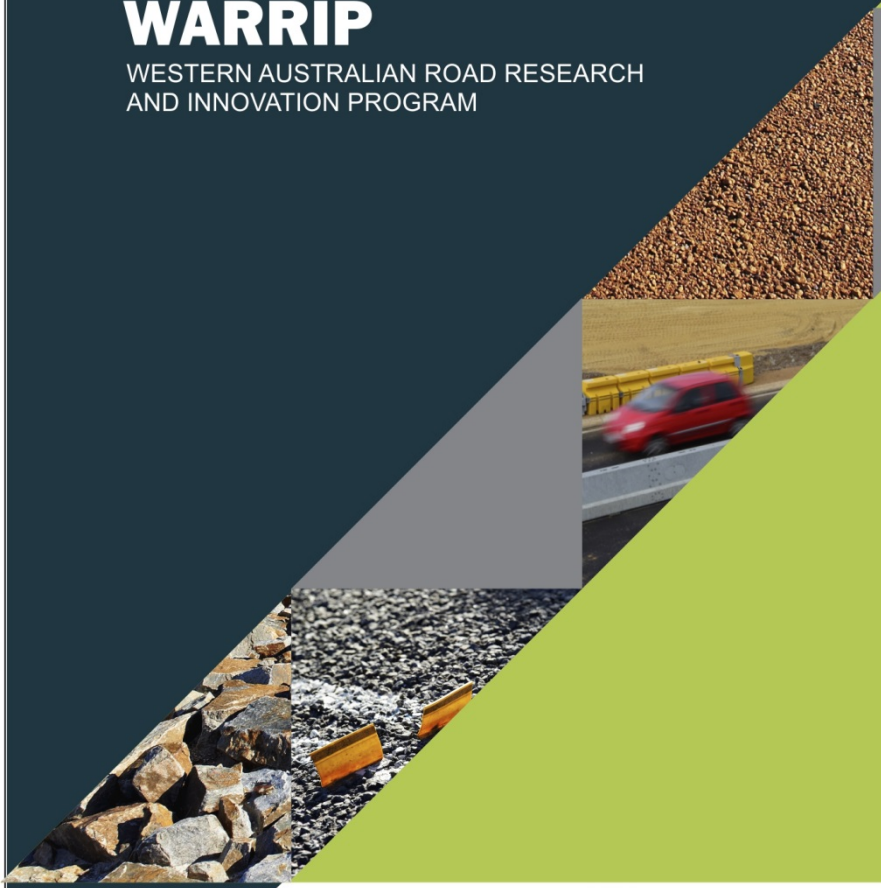
WESTERN AUSTRALIAN ROAD RESEARCH
AND INNOVATION PROGRAM

NACOE
NATIONAL ASSET CENTRE OF EXCELLENCE



WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM



Case Study 1: Post-Bushfire Maintenance

AN INITIATIVE BY:

THE GOVERNMENT OF WESTERN AUSTRALIA

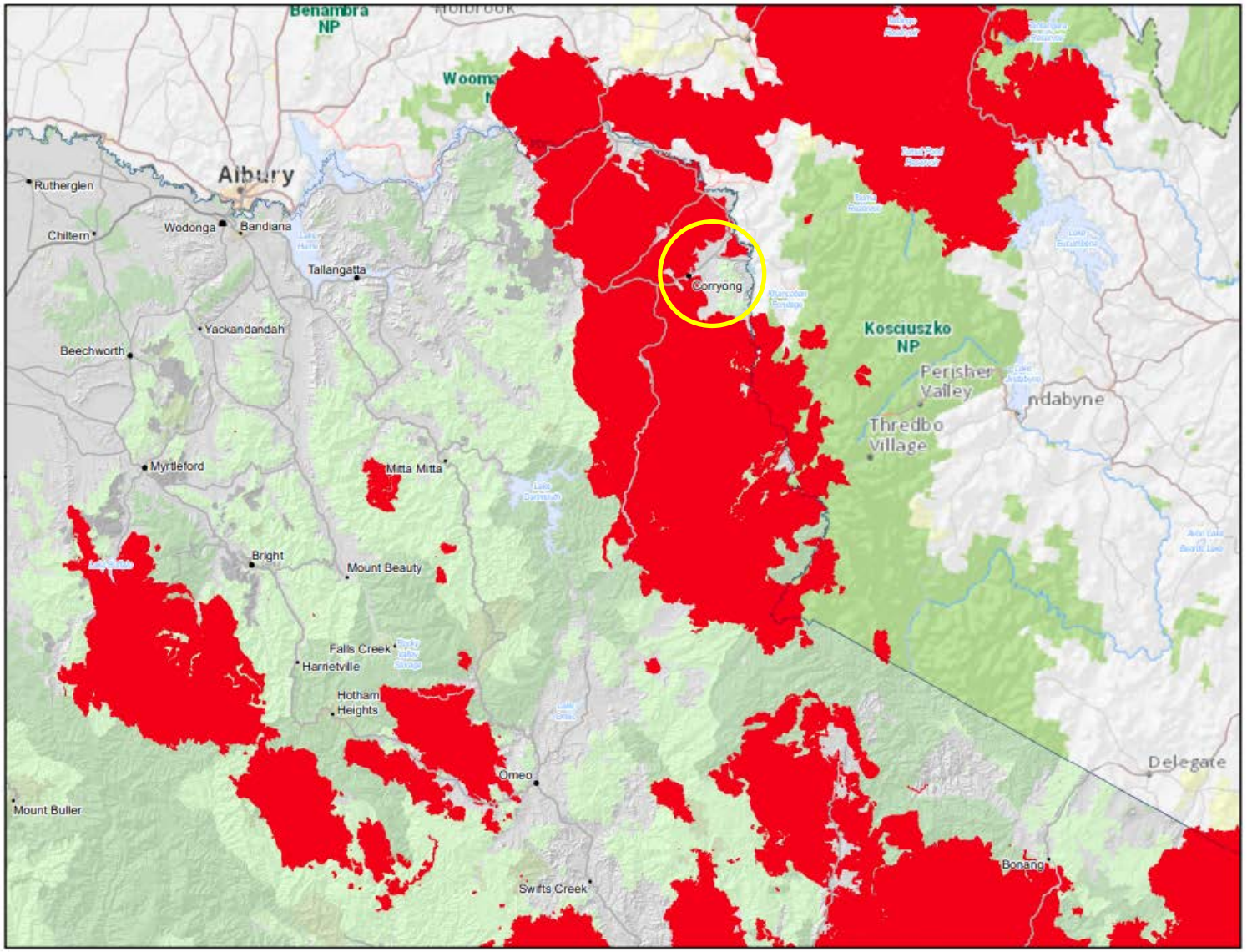
mainroads WESTERN AUSTRALIA

arrb

What happened?

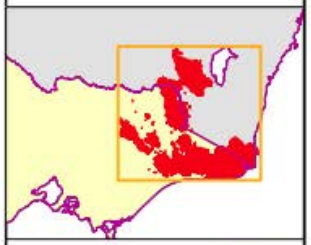
- Hume Fire Event 2019/2020, Murray Valley Highway in Corryong, north-east Victoria
- The sprayed seal pavement along the Murray Valley Highway in Corryong, Victoria was damaged.
- Sections of road showed vitrified binder and loss of aggregate.
- Sections of road showed damage from falling debris
- Road is fully closed prior to assessment.
- Asset managers to determine the type of maintenance required.

Hume Fires - Fire Extent 2019/2020



Freeways
Highways
Arterial Sealed
Arterial Unsealed
Local Sealed
Perennial Waterbody
Intermittant Waterbody
Wetland / Swamp
1920_BlackSummer_fires
COMMONWEALTH LAND
NATIONAL PARKS ACT AND NATURE CONSERVATION RESERVES
OTHER CONSERVATION RESERVES
OTHER PUBLIC LAND
PLANTATION
STATE FOREST

Total Fire area 1,502,674 ha
Total Fire increase 663,035 ha



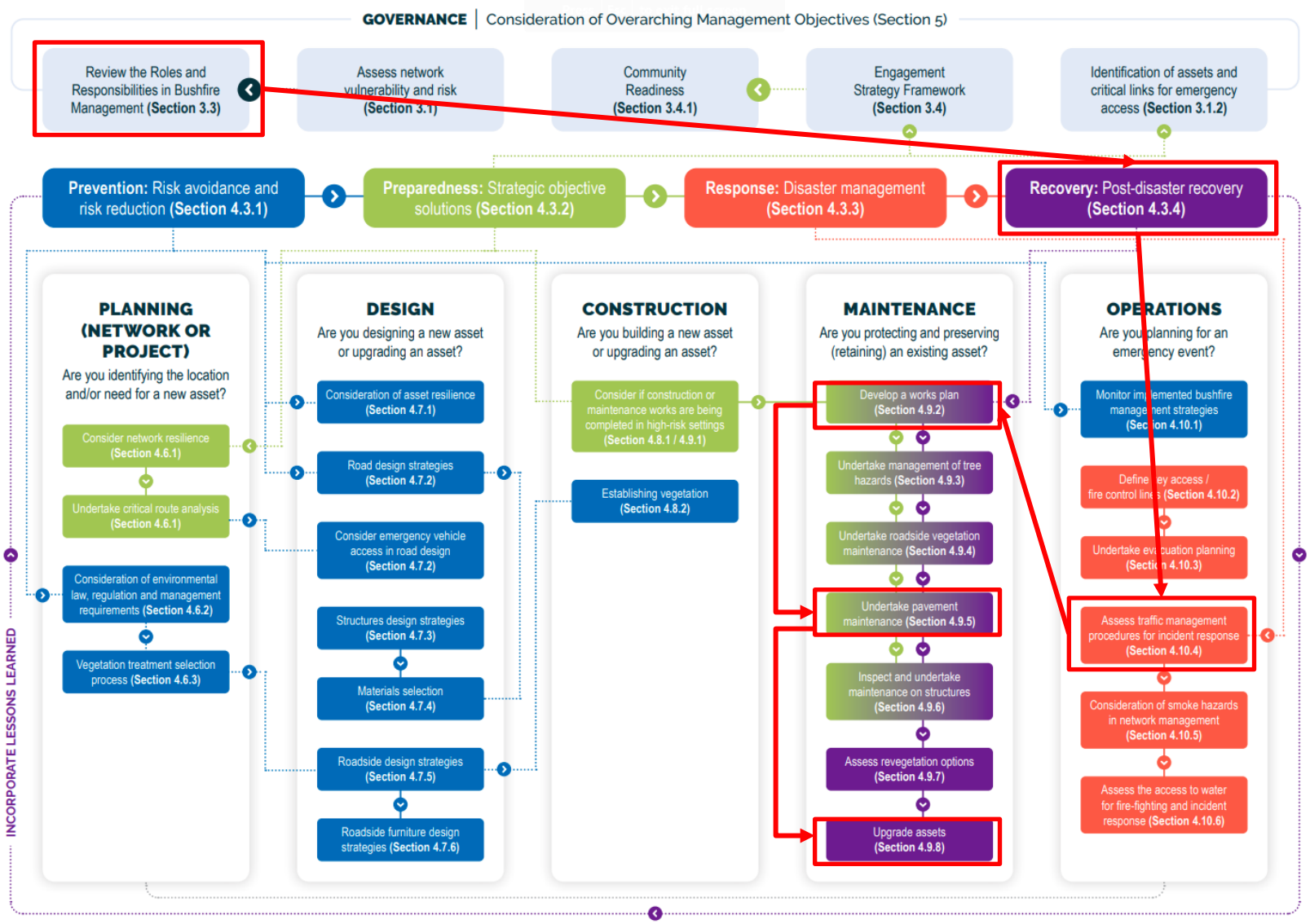
GDA

N

0 4.5 9 18 27 36 Kilometres

Disclaimer:
This map is a snapshot generated from Victorian Government data. The State of Victoria does not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for error, loss or damage which may arise from reliance upon it. All persons accessing this information should make appropriate enquiries to assess the currency of the data.

MXD name: G:\LFE_Group\FEM\Ops_Sup_Cap\Radio_Info_Sys\Mapping\Requests_Mapping\Royal_Commission_2020\mxds\Victorian_fires_fire_area_end1920v2.mxd
Date last saved/printed: Wednesday, 8 December 2021 1:30:19 PM
PC login: nw15
PC Number: WLFD4L1N2


GOVERNANCE | Consideration of Overarching Management Objectives (Section 5)
Review the Roles and Responsibilities in Bushfire Management (Section 3.3)
Assess network vulnerability and risk (Section 3.1)
Community Readiness (Section 3.4.1)
Engagement Strategy Framework (Section 3.4)
Identification of assets and critical links for emergency access (Section 3.1.2)
Prevention: Risk avoidance and risk reduction (Section 4.3.1)
Preparedness: Strategic objective solutions (Section 4.3.2)
Response: Disaster management (Section 4.3.3)
Recovery: Post-disaster recovery (Section 4.3.4)
PLANNING (NETWORK OR PROJECT)
Are you identifying the location and/or need for a new asset?
Consider network resilience (Section 4.6.1)
Undertake critical route analysis (Section 4.6.1)
Consideration of environmental law, regulation and management requirements (Section 4.6.2)
Vegetation treatment selection process (Section 4.6.3)
DESIGN
Are you designing a new asset or upgrading an asset?
Consideration of asset resilience (Section 4.7.1)
Road design strategies (Section 4.7.2)
Consider emergency vehicle access in road design (Section 4.7.2)
Structures design strategies (Section 4.7.3)
Materials selection (Section 4.7.4)
Roadside design strategies (Section 4.7.5)
Roadside furniture design strategies (Section 4.7.6)
CONSTRUCTION
Are you building a new asset or upgrading an asset?
Consider if construction or maintenance works are being completed in high-risk settings (Section 4.8.1 / 4.9.1)
Establishing vegetation (Section 4.8.2)
MAINTENANCE
Are you protecting and preserving (retaining) an existing asset?
Develop a works plan (Section 4.9.2)
Undertake management of tree hazards (Section 4.9.3)
Undertake roadside vegetation maintenance (Section 4.9.4)
Undertake pavement maintenance (Section 4.9.5)
Inspect and undertake maintenance on structures (Section 4.9.6)
Assess revegetation options (Section 4.9.7)
Upgrade assets (Section 4.9.8)
OPERATIONS
Are you planning for an emergency event?
Monitor implemented bushfire management strategies (Section 4.10.1)
Define key access / fire control lines (Section 4.10.2)
Undertake evacuation planning (Section 4.10.3)
Assess traffic management procedures for incident response (Section 4.10.4)
Consideration of smoke hazards in network management (Section 4.10.5)
Assess the access to water for fire-fighting and incident response (Section 4.10.6)
INCORPORATE LESSONS LEARNED

Review Roles and Responsibilities (Section 3.3)

Road agency	Asset management	• To plan hazard reduction works • To incorporate lessons learnt on effective bushfire management techniques • To implement revegetation practices to ensure slope stability and land management • To liaise with the asset managers of other infrastructure in the road corridor (e.g. utilities providers)	• To prioritise the protection of assets and work strategically with emergency response agencies when it comes to prioritising critical access routes	• To close unsafe roads and inform the responsible department within the road agency of the closure • To undertake inspections of structures and other critical infrastructure and apply appropriate administrative controls	• To prioritise maintenance for critical and/or essential assets for community accessibility • To undertake asset upgrades, where possible, to prevent further impacts of bushfires • To provide detailed information on the requirement for repairs

Develop a works plan (Section 4.9.2)

Management objective: When developing a works plan for maintenance activities, the road agency representative should give priority to key risk areas and critical infrastructure.

- Used to identify, prioritise and implement prevention and maintenance programs.
- Major categories of works to be considered in this works plan:
  - Maintenance: Regular ongoing day-to-day work necessary to keep assets operational, e.g. **road patching**, **line marking upgrades**, road sign maintenance, removal of flammable hazards including oil build-up from traffic, litter and drainage maintenance.
  - Renewal/refurbishment: Restores, rehabilitates, replaces the existing asset to its original capacity, e.g. gravel resheeting of unsealed road infrastructure – to restore to the same level of service.
  - Upgrades/improvements: Enhances the existing asset to provide higher levels of service, e.g. **reseal**, sealing of unsealed roads and widen seal (verge sealing).

Undertake Pavement Maintenance (Section 4.9.5)

Management objective: Undertake pavement maintenance activities as required based on an assessment of bushfire damage. Where the opportunity arises to make improvements or undertake preventative maintenance, this should be implemented in conjunction with recovery maintenance activities. This approach is known as 'build-back-better'.

Visual Assessment

Fire damage – vitrified binder and loss of aggregate

•Fire damaged area of spray seal close to the edge of the carriageway

•Bitumen binder appears black and glassy (almost vitrified in appearance). Seal was noted to be more brittle than adjacent unburnt area

•Localised loss of coarse aggregate from matrix of seal is apparent in burnt area

Damage from falling debris

•Serious damage to spray seal most likely due to falling tree branch. Bitumen appears friable. Coarse aggregate has been lost from seal and is apparent on the surface of the pavement

Wheel-path damage from radiant heat

•Photograph shows close-up of flushed and excess bitumen on surface of asphalt in vehicle wheel paths

•The key serviceability issue for the road surface is reduced wet-weather skid resistance

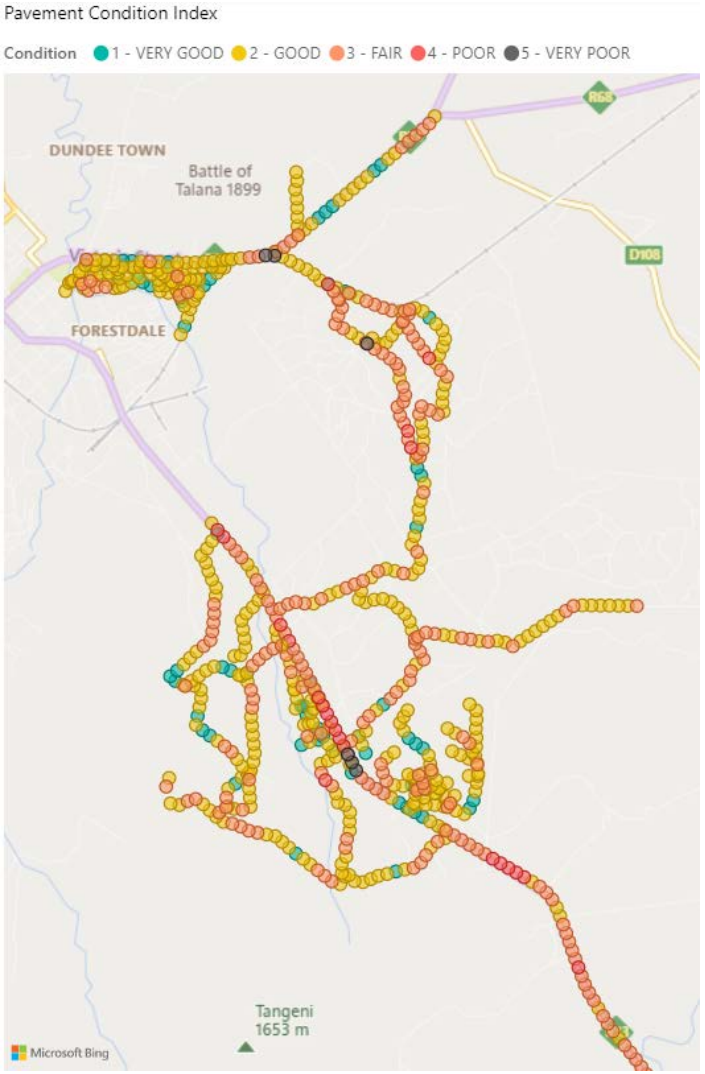
Fire damage on asphalt

•Photograph shows damage to asphalt. Bitumen was noted to be friable and coarse aggregate was observed to have been lost from the asphalt matrix.

Condition Assessment

The process for undertaking a pavement condition index (PCI) analysis is:

1. automated collection of network data
2. calculation of the PCI
3. identification of changes using a dilapidation or comparison technique with previous network condition assessments (or through visual surveys in priority locations).



Structural Assessment

- A structural assessment will provide information on pavement distress which may not be visible.
- A structural assessment can be undertaken using pavement deflection data collected with a traffic speed deflectometer or a falling weight deflectometer.
- Structural assessments are useful as they can provide information on the remaining useful life of a pavement structure.
- For undertaking a condition assessment, methodologies recommended include:
  - ARRB Best Practice Guide for Sealed Roads
  - ARRB Best Practice Guide for Unsealed Roads
  - Austroads AP-T273-14 Good Practice in Reseal Programming
- For remaining life assessments, methodologies recommended include:
  - ARRB Best Practice Guide for Sealed Roads
  - Austroads R649-21 Prolonging the Life of Road Assets Under Increasing Demand: A Framework and Tools for Informing the Development and Justification of Asset Preservation and Renewal

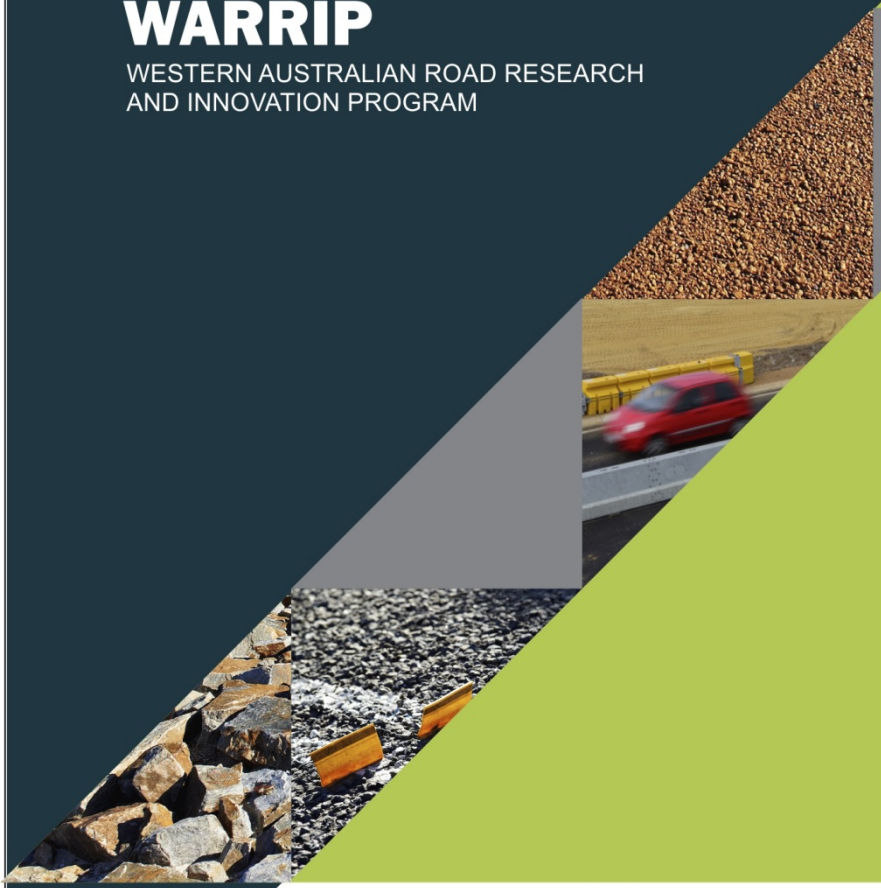
Upgrade Assets (Section 4.9.8)

Management objective: In order to ensure the future resilience of infrastructure following a bushfire , asset upgrades should be made, where possible. This includes the implementation of the prevention strategies defined for road design, roadside design and structural design.

Source: Downer (2022)

WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM



Case Study 2: Designing a road

AN INITIATIVE BY:

THE GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

arrb

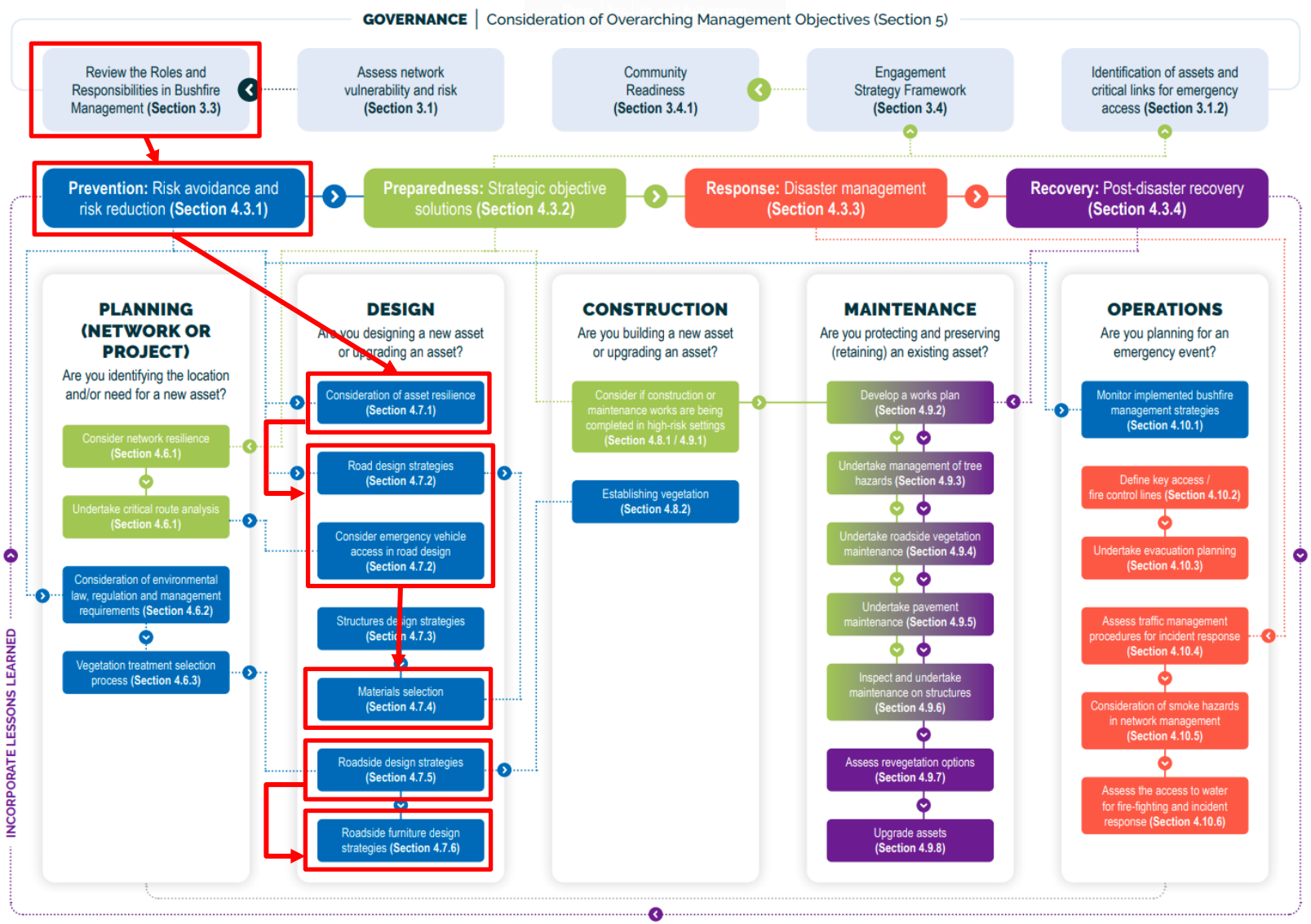
What is the situation?

- You are designing a road, but it is in a bushfire prone area.

WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH
AND INNOVATION PROGRAM

NACOE
NATIONAL ASSET CENTRE OF EXCELLENCE



Review Roles and Responsibilities (Section 3.3)

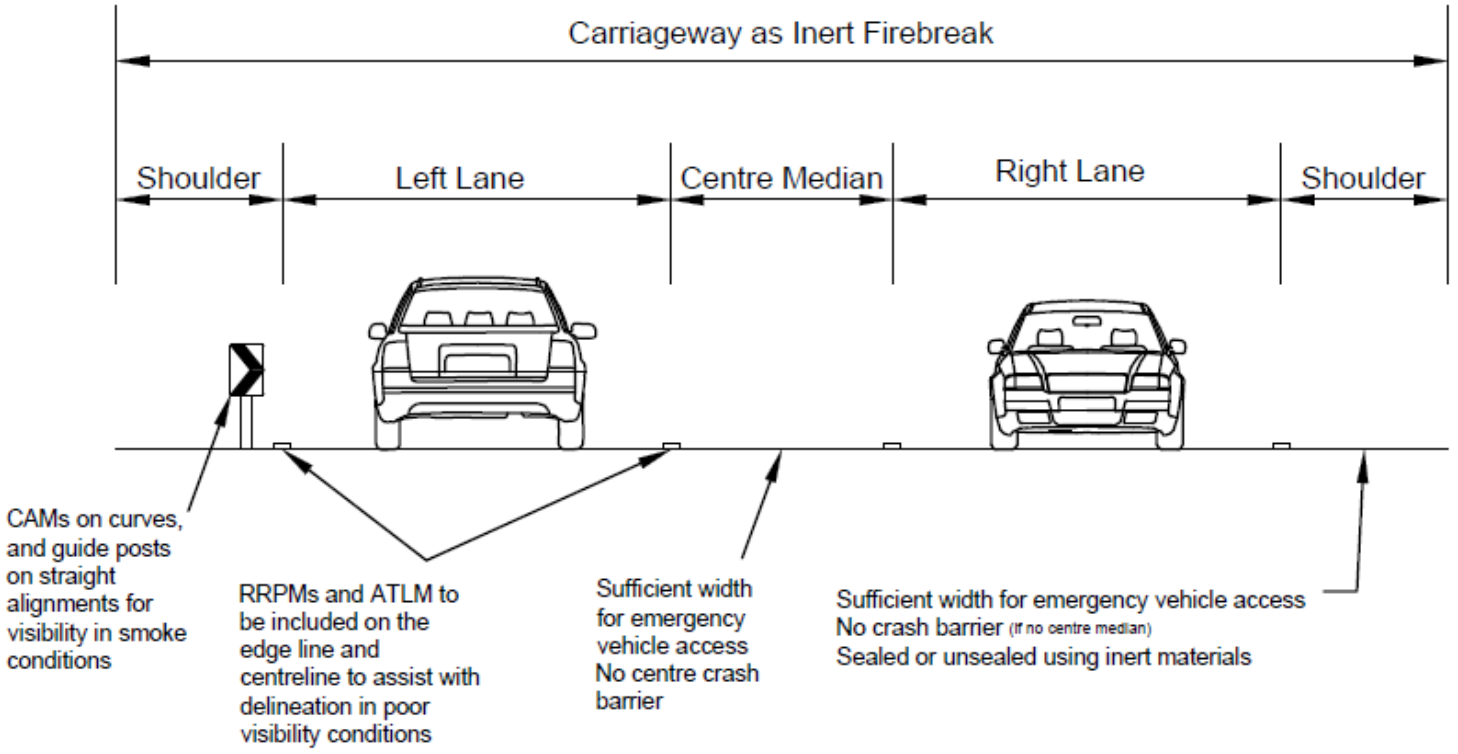
Road agency	Planners and designs	• To design road corridors in bushfire-prone areas to be resistant to the impacts of bushfires • To ensure all road assets are designed for resilience • To work with adjacent developers and residential planners (e.g. internal roads along boundaries as buffers, reduction of land gradients) • To incorporate lessons learnt on effective bushfire management techniques	• To ensure roads are designed to allow for response to emergency events (i.e. for emergency vehicle access) • To ensure all emergency vehicle access routes have been defined in the planning stages of the road corridor • To ensure roads are designed to allow for alterative exit routes for the community		• To assist with the development of maintenance and renewal plans for major works

Consideration of asset resilience (Section 4.7.1)

Adaptation treatment	Description	Expected financial implication	Example
Avoidance (build for end of design life scenario)	•Build to maintain standards and level of service for the climate change scenario expected at end of life against standard design lives •Avoid locations where bushfire prone area projections are expected to be significant	•Potentially high upfront costs, although no further costs for adaptation are required •Provides a higher level of service for entire design life •Risk that actual climate change will exceed prediction	•Bridge is designed and constructed to consider increased flood risk due to climate change •Alignment is moved to avoid coastal hazard zones
Planned adaptation	•Plan an upgrade program to progressively adapt the infrastructure as climate change occurs •Initial design considers predicted climate changes and provides functionality to adapt the infrastructure at another time •Consultation with program and asset managers required to secure investment program	•Moderate upfront costs expected, although further investment is required during infrastructure life cycle •Provides some increase in level of service	•Bridge components are selected and integrated into the design and constructed based on having a shorter design life than is usual and can be replaced when required
Progressive modification or redundancy (existing asset)	•Realign, redesign and/or reconstruct as required and as possible in response to verified climate change as part of existing maintenance regime or project upgrades. Future verified climate changes will be captured in investigatory criteria of audits	•Moderate upfront costs expected. Further climate changes will force redesign •Higher costs to adapt asset in long term •Maintains level of service	•Bridge is designed and constructed in such a way that adaptation responses, such as the height of the deck, can be elevated and can be undertaken as part of maintenance work or based on increased risk or opportunity such as upgrade works being planned •Road alignment is changed such that bridge over waterway is no longer required and can be decommissioned

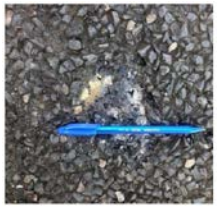
Road design strategies (Section 4.7.2)

Management objective: When selecting road design strategies, consideration should be given to the risk assessment that has been undertaken for the bushfire-prone area. Available guidelines for public and property access roads should be followed to ensure that emergency vehicles have adequate access and emergency egress for all road users.



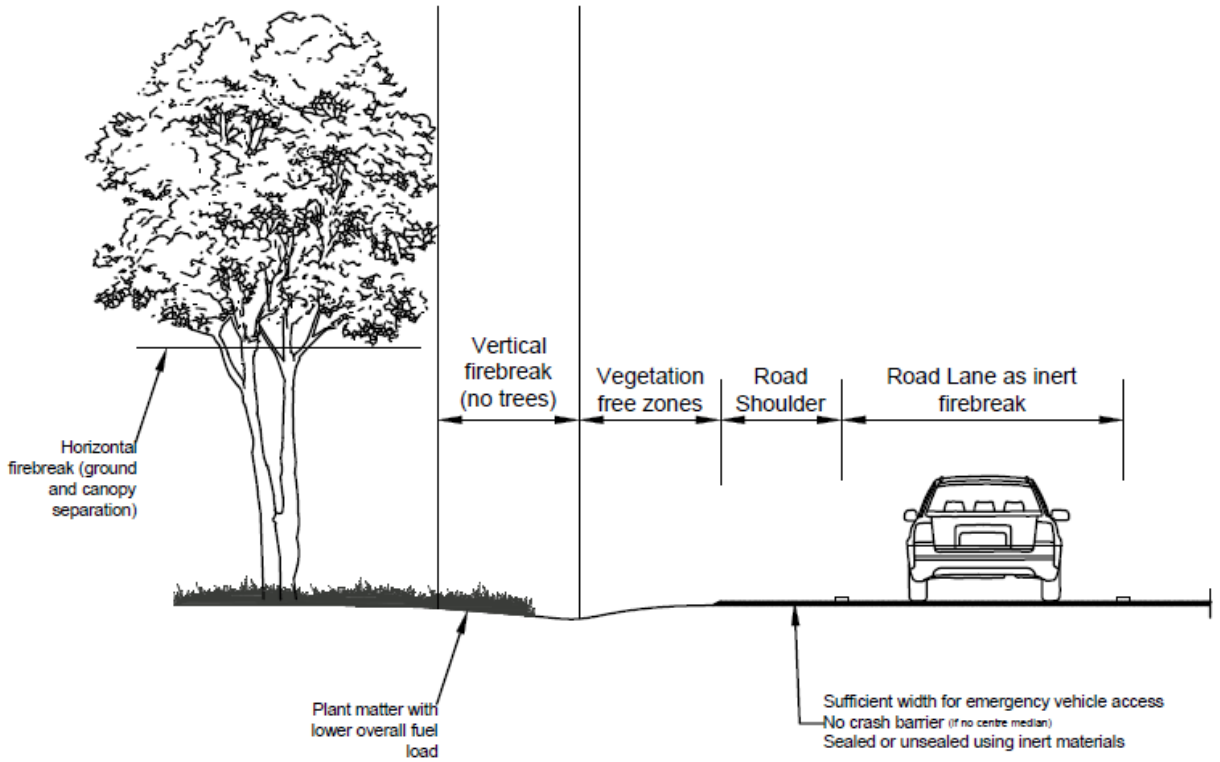
Materials Selection (Section 4.7.4)

Material use	Advice
Pavement materials	•Fire can have varying impacts on pavement materials, most notably on bituminous wearing courses. •Bitumen binder will oxidise and become hard and brittle when heated to high temperatures and can even burn if the temperature it is exposed to is significantly high. •While the bituminous materials cannot be substituted, it should be noted that a change in ongoing maintenance treatment periods and treatment types may be required preceding a bushfire, depending on the potential damage to the pavement.
Slope stabilisation	•Slope stabilisation refers to any implemented technique that aims to stabilise an unstable or inadequately stable slope. This type of treatment is important if loss of vegetation on a slope site due to a bushfire would be detrimental to overall slope stability. •The use of geosynthetic fibres or plastic netting for slope stabilisation is a potential option; however, these materials may not be suitable in high fire-risk areas as they may be at risk of damage from heat. •The use of rock armouring and other inert material for slope stabilisation can also be considered for areas where fire risk is considered too high for other engineered materials. •Many slope stabilisation materials can be damaged due to regular exposure to the elements. Images show turf reinforced matting that is crumbling as a result of exposure to the elements. If regular exposure does this, then bushfire damage is going to be even worse. •Designing slopes to be less reliant on stabilisation methods such as vegetation is one method of risk mitigation.
Other ancillary structures	Consideration should be given to the use of non-flammable and non-combustible materials such as concrete and metal instead of plastic or rubber for all ancillary structures including, but not limited to: •noise walls •crash barriers •guideposts •signage and ITS housings •wildlife crossings •turf reinforcement etc. •roadside furniture •rest area structures.



Roadside design strategies (Section 4.7.5)

Management objective: The road agency representative should provide design policies, guidance and specifications to ensure roadside design is undertaken with an appropriate level of bushfire consideration.



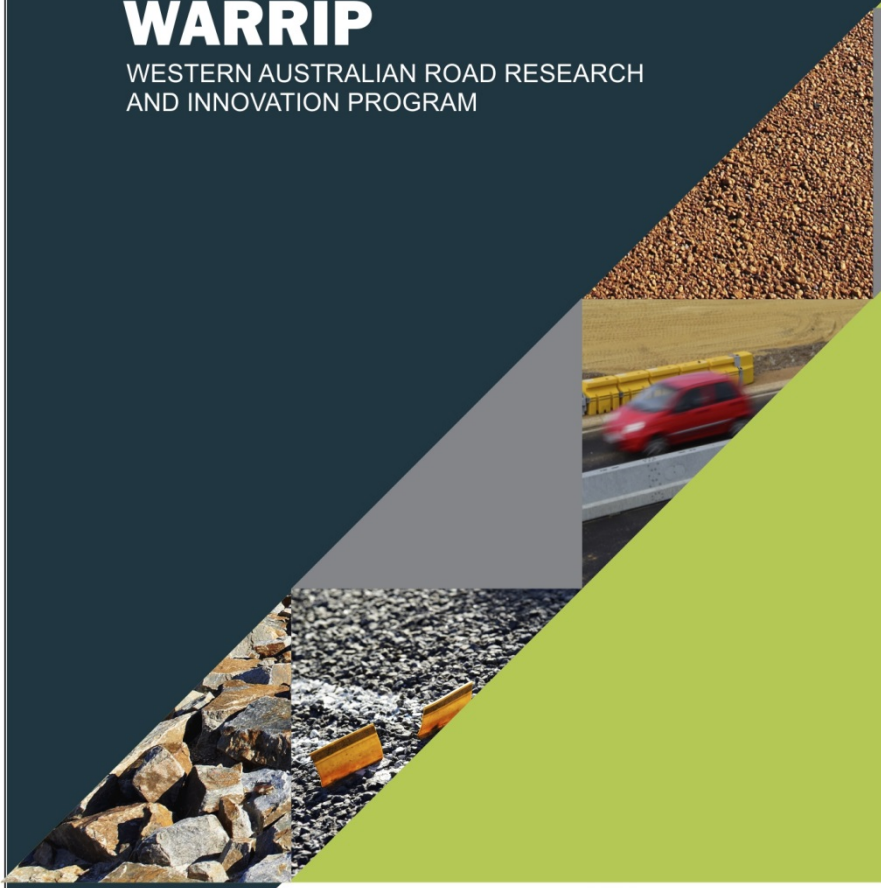
Roadside furniture design strategies (Section 4.7.6)

Management objective: The road agency representative should ensure that bushfire risk is integrated into the design and maintenance strategies for roadside furniture.

- Roadside furniture design strategies to be considered for bushfire prevention include:
  - removing vegetation growth around roadside furniture
  - using non-flammable materials, such as metal for posts (rather than timber), as combustible materials are more likely to be damaged in a bushfire .

WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM



Case Study 3: Working in a Bushfire Prone Area

AN INITIATIVE BY:

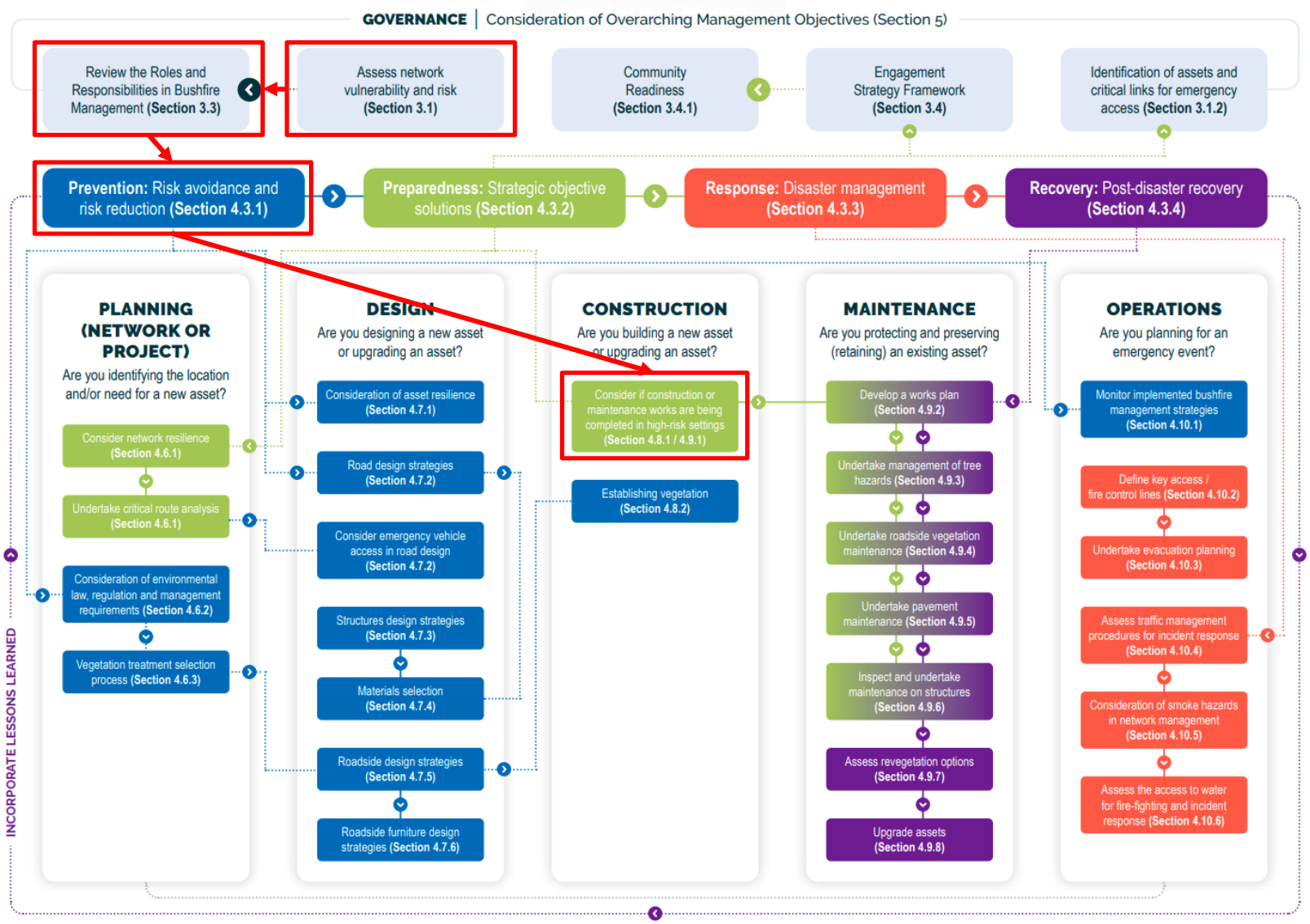
THE GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

arrb

What is the situation?

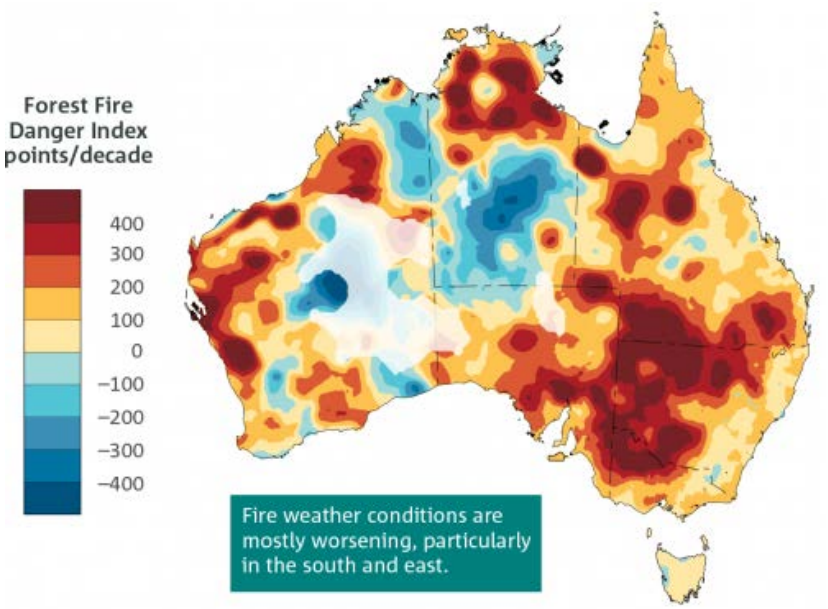
- Maintenance works are required, but the area has been identified as bushfire prone.
- Workers will need to undertake construction of new asset, rehabilitation or maintenance work in a bushfire prone area or during bushfire risk periods.


GOVERNANCE | Consideration of Overarching Management Objectives (Section 5)
Review the Roles and Responsibilities in Bushfire Management (Section 3.3)
Assess network vulnerability and risk (Section 3.1)
Community Readiness (Section 3.4.1)
Engagement Strategy Framework (Section 3.4)
Identification of assets and critical links for emergency access (Section 3.1.2)
Prevention: Risk avoidance and risk reduction (Section 4.3.1)
Preparedness: Strategic objective solutions (Section 4.3.2)
Response: Disaster management (Section 4.3.3)
Recovery: Post-disaster recovery (Section 4.3.4)
PLANNING (NETWORK OR PROJECT)
Are you identifying the location and/or need for a new asset?
Consider network resilience (Section 4.6.1)
Undertake critical route analysis (Section 4.6.1)
Consideration of environmental law, regulation and management requirements (Section 4.6.2)
Vegetation treatment selection process (Section 4.6.3)
DESIGN
Are you designing a new asset or upgrading an asset?
Consideration of asset resilience (Section 4.7.1)
Road design strategies (Section 4.7.2)
Consider emergency vehicle access in road design (Section 4.7.2)
Structures design strategies (Section 4.7.3)
Materials selection (Section 4.7.4)
Roadside design strategies (Section 4.7.5)
Roadside furniture design strategies (Section 4.7.6)
CONSTRUCTION
Are you building a new asset or upgrading an asset?
Consider if construction or maintenance works are being completed in high-risk settings (Section 4.8.1 / 4.9.1)
Establishing vegetation (Section 4.8.2)
MAINTENANCE
Are you protecting and preserving (retaining) an existing asset?
Develop a works plan (Section 4.9.2)
Undertake management of tree hazards (Section 4.9.3)
Undertake roadside vegetation maintenance (Section 4.9.4)
Undertake pavement maintenance (Section 4.9.5)
Inspect and undertake maintenance on structures (Section 4.9.6)
Assess revegetation options (Section 4.9.7)
Upgrade assets (Section 4.9.8)
OPERATIONS
Are you planning for an emergency event?
Monitor implemented bushfire management strategies (Section 4.10.1)
Define key access / fire control lines (Section 4.10.2)
Undertake evacuation planning (Section 4.10.3)
Assess traffic management procedures for incident response (Section 4.10.4)
Consideration of smoke hazards in network management (Section 4.10.5)
Assess the access to water for fire-fighting and incident response (Section 4.10.6)
INCORPORATE LESSONS LEARNED

Undertaking a Risk Assessment to Identify Bushfire-prone Areas (Section 3.1.1)

Management objective: The road agency representative should ensure a risk assessment is undertaken in accordance with the documentation outlined in Appendix A to identify bushfire-prone areas, including the likelihood and consequence of the risk in order to provide an overall representative risk score.

- Once the bushfire risk profile specific to a region is known, the functional characteristics of the bushfire hazard, exposure to the bushfire hazard, and the level and type of vulnerability in a given location can be identified.
- TMR have a bushfire risk assessment methodology, RBRAM.



Review Roles and Responsibilities (Section 3.3)

Road agency	Maintenance contractors	• To undertake and maintain hazard reduction practices via identified works plan	• To ensure appropriate prequalification documents, equipment, policies and procedures are in place to conduct work for state road agencies • To implement and action all prevention activities to be undertaken as part of road maintenance activities	• Inform the contract manager and the responsible department within the road agency of the closure	• To clear fallen trees and other debris which could inhibit access or road use • To ensure slopes have been stabilised • To undertake road maintenance on damaged road assets to ensure safe operation • To implement revegetation practices to ensure slope stability and land management

Working in a high-risk setting (Section 4.8.1/4.9.1)

Management objective: When undertaking road construction (and maintenance, see Section 4.9.1), the road agency representative needs to ensure that all emergency advice is monitored and followed. This includes what works can be undertaken during a total fire ban. If possible, deferring high-risk work to a time when the risk setting is lower should be considered.

Check

- Confirm if a total fire ban is or will be in place
- Check if the fire danger rating is extreme or above

Notify

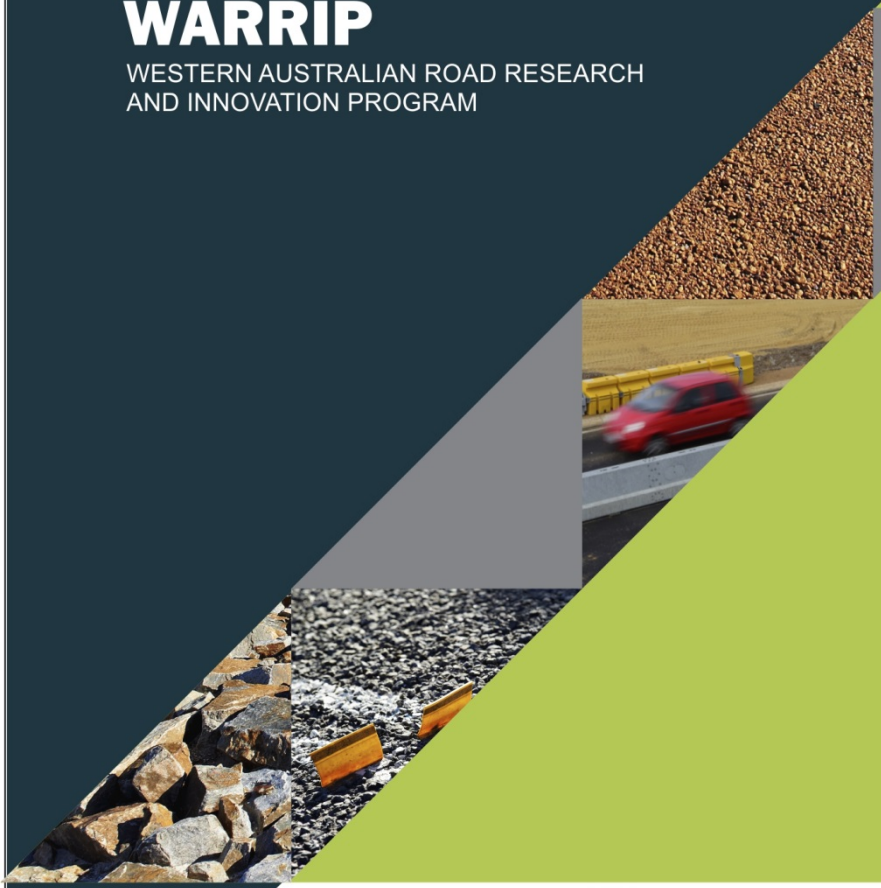
- Notify the relevant fire and emergency services authority and relevant local government of road works.
- Notify the relevant parks and wildlife service between 24 hours and 30 minutes prior to the activity commencing where the activity is occurring within 3 kms of land managed by a parks and wildlife service.

Proceed

- Subject to prescribed activity conditions, proceed with the activity as required.

WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM



Case Study 4: Responding to a Bushfire Incident

AN INITIATIVE BY:

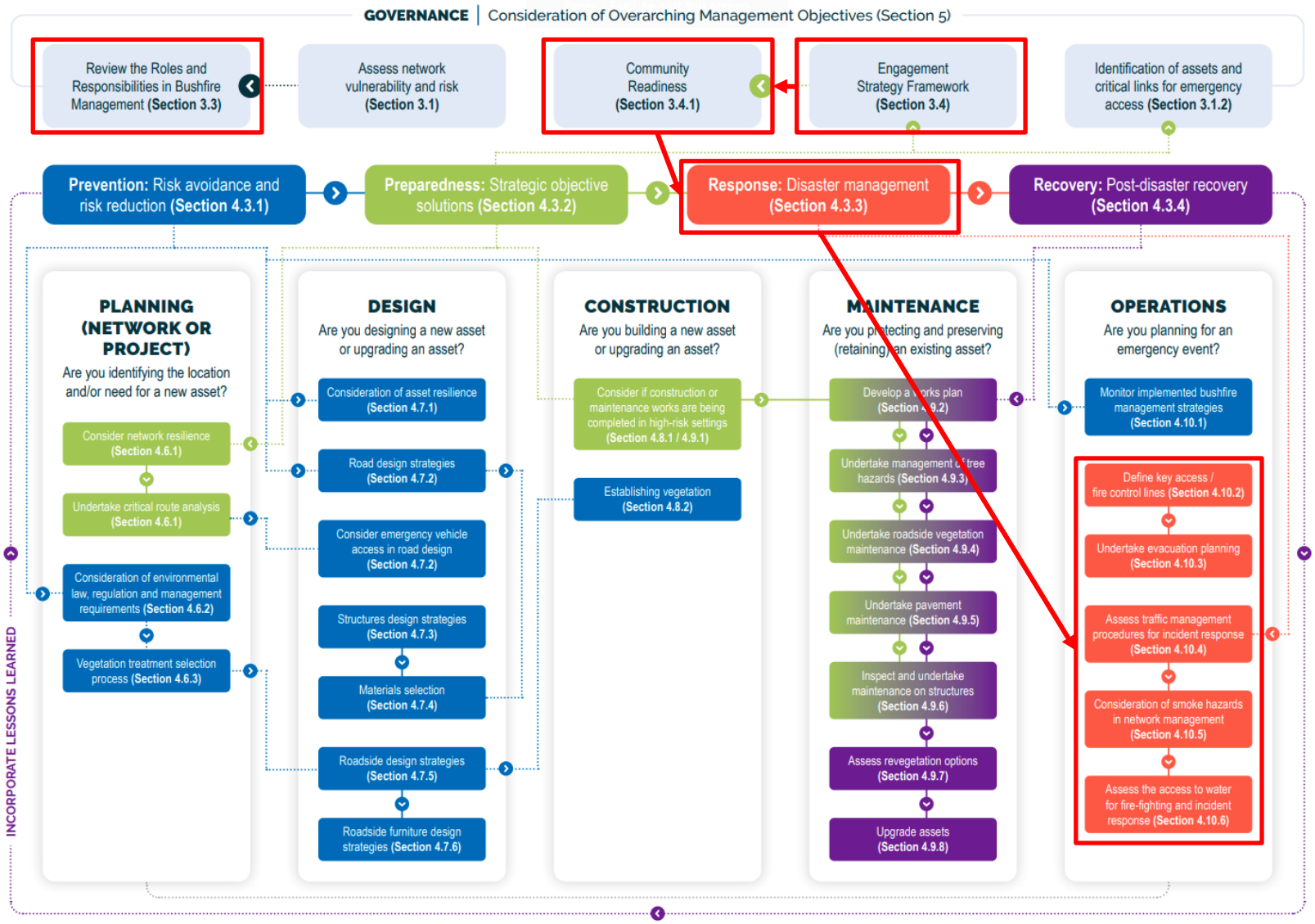
THE GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

arrb

What is the situation?

- A bushfire is occurring.
- The road agency needs to respond to the event.


GOVERNANCE | Consideration of Overarching Management Objectives (Section 5)
Review the Roles and Responsibilities in Bushfire Management (Section 3.3)
Assess network vulnerability and risk (Section 3.1)
Community Readiness (Section 3.4.1)
Engagement Strategy Framework (Section 3.4)
Identification of assets and critical links for emergency access (Section 3.1.2)
Prevention: Risk avoidance and risk reduction (Section 4.3.1)
Preparedness: Strategic objective solutions (Section 4.3.2)
Response: Disaster management (Section 4.3.3)
Recovery: Post-disaster recovery (Section 4.3.4)
PLANNING (NETWORK OR PROJECT)
Are you identifying the location and/or need for a new asset?
Consider network resilience (Section 4.6.1)
Undertake critical route analysis (Section 4.6.1)
Consideration of environmental law, regulation and management requirements (Section 4.6.2)
Vegetation treatment selection process (Section 4.6.3)
DESIGN
Are you designing a new asset or upgrading an asset?
Consideration of asset resilience (Section 4.7.1)
Road design strategies (Section 4.7.2)
Consider emergency vehicle access in road design (Section 4.7.2)
Structures design strategies (Section 4.7.3)
Materials selection (Section 4.7.4)
Roadside design strategies (Section 4.7.5)
Roadside furniture design strategies (Section 4.7.6)
CONSTRUCTION
Are you building a new asset or upgrading an asset?
Consider if construction or maintenance works are being completed in high-risk settings (Section 4.8.1 / 4.9.1)
Establishing vegetation (Section 4.8.2)
MAINTENANCE
Are you protecting and preserving (retaining) an existing asset?
Develop a works plan (Section 4.9.2)
Undertake management of tree hazards (Section 4.9.3)
Undertake roadside vegetation maintenance (Section 4.9.4)
Undertake pavement maintenance (Section 4.9.5)
Inspect and undertake maintenance on structures (Section 4.9.6)
Assess revegetation options (Section 4.9.7)
Upgrade assets (Section 4.9.8)
OPERATIONS
Are you planning for an emergency event?
Monitor implemented bushfire management strategies (Section 4.10.1)
Define key access / fire control lines (Section 4.10.2)
Undertake evacuation planning (Section 4.10.3)
Assess traffic management procedures for incident response (Section 4.10.4)
Consideration of smoke hazards in network management (Section 4.10.5)
Assess the access to water for fire-fighting and incident response (Section 4.10.6)
INCORPORATE LESSONS LEARNED

Review Roles and Responsibilities (Section 3.3)

Road agency	Network operations*		• To identify critical routes in disaster response • To develop traffic management plans for disaster situations • To incorporate lessons learnt on effective bushfire management techniques • To coordinate with emergency services when it comes to road closures and road condition • To provide information to emergency response authorities on which roads have been designed for and/or maintained for emergency vehicle access • To assess which roads need to remain open during an emergency response and to prioritise them. This includes roads identified in the critical route analysis, roads to evacuation centres and roads that are key water access routes for firefighting • To provide advice to those working in the road corridor. For example, major projects, public utilities maintenance and installation activities, road corridor permit (or ancillary works and encroachments) activities, roadworks	• To coordinate the closure of unsafe roads, maintain the single source of information for road closures on the network and provide detours as appropriate • To constantly monitor the network and quickly identify compromised evacuation routes and relay this information to the public • To provide real-time communications on road closures to road users and other agencies	• To coordinate with maintenance crews in identification of critical routes and priorities for reopening of the network

Definition of key access / fire control lines (Section 4.10.2)

Management objective: The road agency representative should employ a prioritisation system for characterising key access and egress roads.

Road classification	Description	Bushfire management requirements
Priority 1 roads, structures and/or routes	Key access and egress roads for communities and the travelling public via major link roads	•Implementation of techniques for ignition control, dangerous trees treatment, critical infrastructure protection, emergency services access and emergency services turning areas are critical
Priority 2 roads, structures and/or routes	Critical access and egress for high bushfire risk communities (These are key roads that provide access for sections of high-risk communities to travel to Priority 1 roads)	•Consider where access to and from communities is one way, or where vegetation may prohibit the function of a road during a fire •Where practicable the roadsides for Priority 2 roads should be managed to reduce hazards from vegetation
Priority 3 roads, structures and/or routes	Emergency service roads	•Roads should be designed to aid in the transition of emergency vehicles to and from an incident and fire
Fire trail and fire access track	A trail used for access with local knowledge and suitable fire agency vehicles	•Trails require annual pre-summer inspection, followed by identified remedial works to maintain access over this period
Fire control line	A fire control line is an inclusive term for all constructed or natural barriers and retardanttreated fire edges used to control a fire Roads defined as strategic fire control lines allow for a dual use in the protection of townships and population centres	•There are two main types of strategic fire control lines: •Active lines: where vegetation should be modified to offer safety to emergency services and allow for firefighting activities •Passive lines: where graded or ploughed-back techniques are used during the progress of a fire. These areas may have pre-planned works done to aid the access of plant and machinery (removal of impediments, rocks, etc.)

Undertake evacuation planning (4.10.3)

Management objective: The road agency representative should understand all effective emergency management plans which have been developed by the local police and fire services. The road agency representative should ensure these plans can be implemented on their network and are effectively communicated to the community through collaboration with these parties.

Incident Response

Traffic management (4.10.4)

- The road agency representative should ensure guidance for roadblocks is well-disseminated and understood, and that roadblocks are implemented effectively during disaster response.

Consideration of smoke hazards (4.10.5)

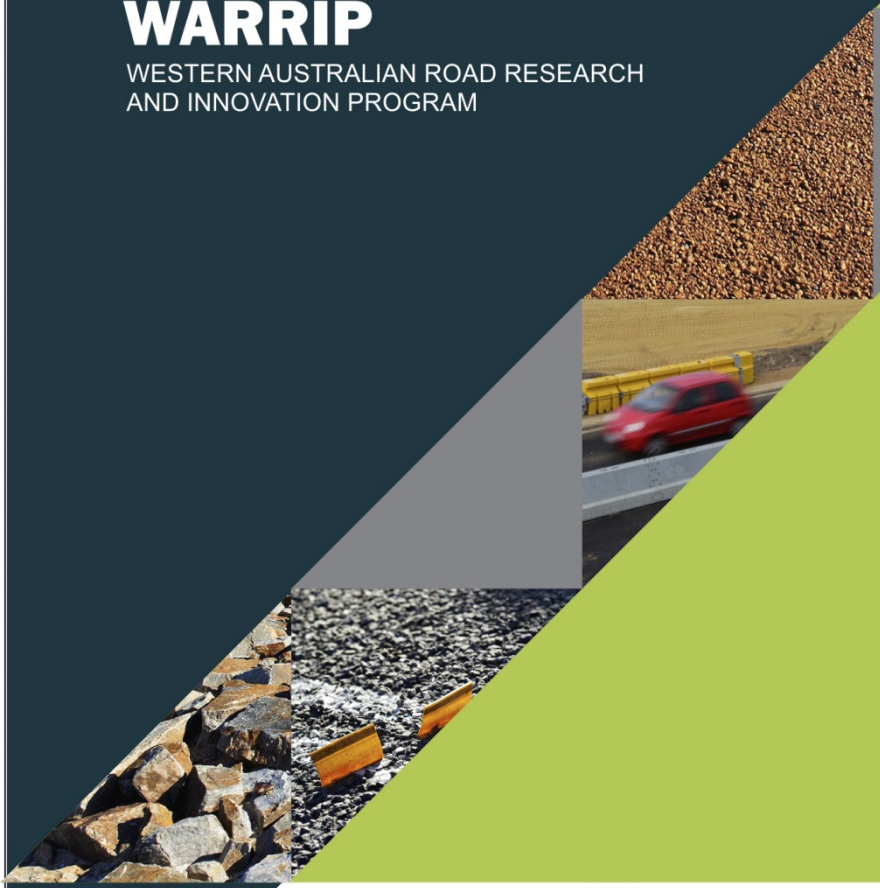
- The road agency representative should ensure smoke hazards are adequately considered as part of response efforts.

Access to water (4.10.6)

- The road agency representative should ensure that appropriate allowances have been made on road agency managed land for access to water for emergency services.

WARRIP

WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM



Questions?

AN INITIATIVE BY:

THE GOVERNMENT OF WESTERN AUSTRALIA

mainroads WESTERN AUSTRALIA

arrb

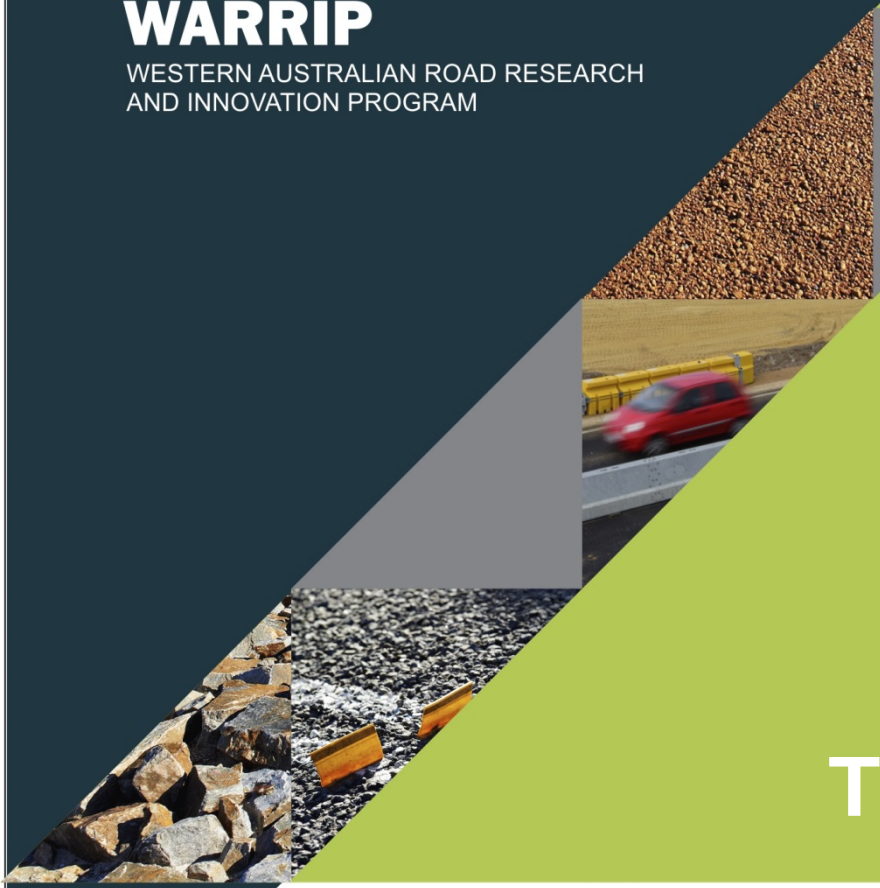
TMR Bushfire Implementation Plan & Strategy

Where do we start?

1. Collate recommendations from all sources (NACOE, Royal Commission, Assurance review….)
2. Prioritise and risk assess recommendations
3. Identify relevant TMR Teams/Divisions – stakeholder communication plan
4. Conversations with stakeholders
5. Develop projects (scope, costs, resources and so on)

WARRIP
WESTERN AUSTRALIAN ROAD RESEARCH AND INNOVATION PROGRAM

NACOE
NATIONAL ASSET CENTRE OF EXCELLENCE



Thank you for your time

AN INITIATIVE BY:

mainroads WESTERN AUSTRALIA

Queensland Government

arrb

References

- Downer 2022, Roads Contract Win, viewed 24 May 2022, https://www.downergroup.com/Roads%20Contract%20Win
- Forest Fire Management 2022, Past Bushfire Maps, viewed 23 May 2022, https://www.ffm.vic.gov.au/history-and-incidents/past-bushfires/past-bushfire-maps
- O'Connor, G., Dwyer, P., Rice, Z. & Lyons, M. 2022, *Framework to Incorporate Bushfire Resilience into Road Infrastructure*, National Assets Centre of Excellence (NACOE), Western Australian Road Research and Innovation Program (WARRIP), Queensland Department of Transport and Main Roads (TMR) and Main Roads Western Australia.
- O'Connor, G, Dwyer, P, Rice, Z, Lyons, M & Cogo, K 2022, *Incorporating Bushfire Impacts into Road Design Literature Review Report*, National Assets Centre of Excellence (NACOE), Western Australian Road Research and Innovation Program (WARRIP), Queensland Department of Transport and Main Roads (TMR) and Main Roads Western Australia.

Contact Information

Team Member	Project Role	Contact Information
Melissa Lyons	ARRB Project Manager / Materials	Melissa.lyons@arrb.com.au
Georgia O'Connor	Environmental Expert	Georgia.oconnor@arrb.com.au
Karen Cogo	ARRB Quality Manager / Road Safety Expert	Karen.cogo@arrb.com.au
Ellyse Sheridan	TMR Project Manager	Ellyse.M.Sheridan@tmr.qld.gov.au
Louis Bettini	MRWA Project Manager	louis.bettini@mainroads.wa.gov.au

Note: Please cc TMR/MRWA project manager