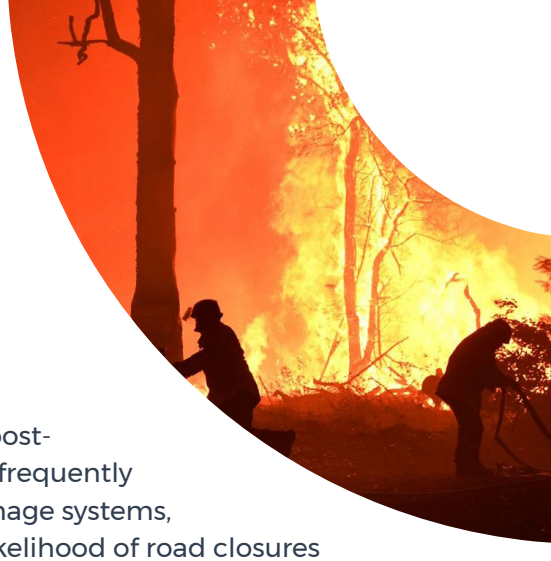
TECHNICAL BRIEF

BUSHFIRE RESILIENCE: WHY DRAINAGE INFRASTRUCTURE MATTERS MORE THAN EVER

Concrete Pipe and Precast
Association of Australasia



INTRODUCTION

The U.S. Federal Highway Administration (FHWA) recently released the TechBrief *Impacts of Wildfires on Highway Assets*, examining how increasingly severe wildfire events affect transport infrastructure. Drawing on research, case studies and interviews with transportation agencies, the report concludes that while fires can directly damage roads and infrastructure, the greatest long-term risk comes from post-fire flooding, debris flows and damaged drainage systems.

For drainage asset owners, designers and local governments, the findings reinforce the importance of selecting resilient materials capable of maintaining structural integrity during and after extreme fire events.

KEY FINDINGS

BUSHFIRES CREATE MULTIPLE INFRASTRUCTURE HAZARDS

Bushfires impact transport networks in two distinct ways:

- Direct exposure to extreme heat.
- Indirect impacts from flooding, erosion, debris movement and increased heavy vehicle traffic during recovery.

The FHWA notes that bushfire temperatures frequently exceed 1,090˚C and can 1,200˚C under severe conditions.

CULVERTS ARE AMONG THE MOST VULNERABLE ASSETS

One of the report's strongest findings concerns culvert performance.

According to the FHWA:

- HDPE and PVC culverts are susceptible to melting during bushfire events.
- Burning embers entering open pipe ends can ignite fires within culverts.
- Complete pipe failure can compromise roadway support and require full reconstruction.

The report also highlights that post-fire debris flows frequently overwhelm drainage systems, increasing the likelihood of road closures and infrastructure failure.

FIRE RESISTANCE VARIES SIGNIFICANTLY BETWEEN MATERIALS

The FHWA summarises published research comparing culvert materials.

MATERIAL	FIRE PERFORMANCE
Reinforced concrete	Highest fire resistance
Corrugated steel	Structural steel generally survives, although protective coatings may burn
PVC	Flammable
HDPE	Flammable

These findings support consideration of material selection as part of infrastructure resilience planning rather than simply initial construction cost.

THE GREATEST THREAT OFTEN COMES AFTER THE FIRE

Perhaps the report's most significant conclusion is that the majority of transport infrastructure damage often occurs after the flames have passed.

Post-fire conditions can produce:

- debris flows
- blocked culverts
- washed-out embankments
- pavement failures
- increased erosion
- accelerated pavement deterioration from
- reconstruction traffic.

The FHWA recommends more frequent inspection and cleaning of drainage structures following wildfire events to reduce these risks.

Image Source: https://sputnikglobe.com/20191227/sydney-water-infrastructure-under-threat-by-raging-australian-bushfires-1077885040.html

IMPLICATIONS FOR INFRASTRUCTURE OWNERS

For councils, road authorities and designers, the report highlights several practical considerations:

- Specify drainage materials that maintain structural integrity under extreme heat.
- Increase post-fire inspection of culverts and drainage systems.
- Consider whole-of-life resilience when selecting drainage infrastructure.
- Incorporate wildfire resilience into asset management planning.

RESILIENCE IS PARAMOUNT

As climate-driven extreme weather events become more frequent, infrastructure resilience must extend beyond flood capacity to include fire performance and post-fire recovery.

The FHWA findings reinforce that resilient drainage infrastructure is fundamental to maintaining transport connectivity during disaster recovery.

Concrete drainage systems provide a robust solution capable of withstanding extreme conditions while supporting the long-term resilience expected of critical public infrastructure.

Image Source: https://pursuit.unimelb.edu.au/articles/as-we-head-toward-summer-let-s-rethink-australia-s-bushfire-risk