
HAWKESBURY-NEPEAN VALLEY: NSW SES MANAGING TRANSPORT IMPACTS

Annex H

**Supporting document (NSW SES Response Arrangements for
Hawkesbury-Nepean Valley) to the Hawkesbury-Nepean Flood Plan**

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1 INTRODUCTION

1.1.1 Some of the first noticeable impacts of floods within the Hawkesbury-Nepean Valley are those that result in the closure of traffic and transport routes including:

- a. Bridge Closures;
- b. Ferry Closures; and
- c. Rail line closures.

1.1.2 At minor flood levels these closures can cause inconvenience and some isolations. However, during larger flood events some of these closures can affect the ability of people to evacuate from flooded areas and can have long term implications during the recovery phase.

1.2 BRIDGES

1.2.1 During minor to moderate Hawkesbury-Nepean Floods (Below 12.2m at the Windsor Gauge) a number of key bridges will close resulting in significant road diversions in order to cross the Hawkesbury River.

1.2.2 The main bridge closures during minor to moderate floods include:

- a. Yarramundi Bridge, Yarramundi;
- b. North Richmond Bridge, North Richmond;
- c. Windsor Bridge, Windsor; and
- d. Cattai Road Bridge, Cattai

1.2.3 During 'major' flood events (above 12.2m at the Windsor Gauge / and above 10.4m (24.5m AHD) at the Penrith Gauge) additional bridges may also be closed due to flooding including some that are on Regional and Sector Evacuation Routes. These include:

- a. Richmond Road Bridge over South Creek on the Blacktown - Richmond Road Evacuation Route;
- b. The Jim Anderson Bridge over South Creek, Windsor on the Hawkesbury Valley Way Evacuation Route;
- c. Victoria Bridge, over the Nepean River between Penrith and Emu Plains on the Great Western Highway sector evacuation route.

1.2.4 Flooding of the South Creek catchment from local catchment flooding may also result in the temporary closure of road bridges on the M4 Western Motorway and Great Western Highway Regional Evacuation Routes (1).

Table 1: Major Bridge Closures due to Flooding

Bridge Name	Closure location	Consequence of closure	Alternate Route	Bridge Deck level (Note: Will close prior to this height)	Agency Responsible for Closure
Cattai Creek Bridge (Cattai1) (2)	Cattai Creek crossing at Cattai Rd	Forces people to take longer alternative routes	Via Pitt Town Rd, Dural Rd, Old Northern Rd and Wisemans Ferry Rd	3.2m AHD deck height (Approx. 3.05m at the Windsor gauge)	TfNSW (contractors)
Yarramundi Bridge (YAO) (3)	Hawkesbury-Nepean River crossing at Yarramundi, Springwood Road	Forces people to take longer alternative routes	Via M4 Western motorway (Regentville Bridge)	6.62m AHD deck level	TfNSW (contractors)
Windsor Bridge (WN0) (3)	Hawkesbury River crossing at Windsor, Bridge St	Forces people to take longer alternative route	Via Bells Line of Road (North Richmond Bridge) or M4 Motorway	Deck height is 7.2m AHD (7.05m at Windsor gauge).	TfNSW (contractors)
North Richmond Bridge (NR0) (3)	Hawkesbury River crossing at North Richmond, Bells Line of Road / Kurrajong Rd	Forces people to take much longer alternative route	Via Bells Line of Road, Blue Mountains then M4 Western Motorway (Regentville Bridge)	8.80m AHD deck level (8.46m at Richmond gauge)	TfNSW (contractors)
Richmond - Blacktown Road Bridge (WN16) (4)	Blacktown Road where it crosses South Creek	Forces people to take much longer alternative route	The Northern Road or Llandilo Road Evacuation Routes	14.2m AHD deck level (Approx. 14.05m at Windsor gauge)	TfNSW (contractors)
Jim Anderson Bridge, Windsor (Windsor1) (5)	Hawkesbury Valley Way Evacuation Route over South Ck	Last evacuation route out of Windsor	None	17.3m AHD (17.15m at the Windsor gauge)	TfNSW (contractors)
Victoria Bridge, Penrith (Nepean 0) (3) (6)	Great Western Highway, Nepean	Bridge and rail line expected to be damaged. Cuts direct	Via Regentville Bridge on the M4 Western Motorway	29.83m AHD Bridge deck height (15.7m at Penrith gauge).	Penrith City Council

Bridge Name	Closure location	Consequence of closure	Alternate Route	Bridge Deck level (Note: Will close prior to this height)	Agency Responsible for Closure
	River Penrith / Emu Plains	access between Penrith and Emu Plains		Is expected to be damaged around 13.9m (28m AHD) at the Penrith gauge	
M4 Motorway Bridge at Regentville (Penrith 1) (3)	M4 Motorway crossing of the Nepean River	Last available crossing of the Nepean River	None	32.79m AHD deck level Note: This bridge can be flooded in a PMF due to the flood slope upstream of the Penrith gauge.	TfNSW (contractors)
Bridge over South Creek on Great Western Highway (1)	South Creek crossing of the Great Western Hwy near St Mary's	Temporarily closes Regional Evacuation Route for up to 5.5 hours during a PMF (1)	M4 motorway, however it is also likely to be flooded at the same time.	Around 25.2m AHD due to local catchment flooding	TfNSW (contractors)
M4 Western Motorway (South Creek Crossing) (1)	South Creek crossing near St Mary's	Temporarily closes major flood evacuation route for up to 4 hours during a PMF (1)	The Great Western Highway, however this is also likely to be flooded at the same time.	Around 28.5m AHD due to local catchment flooding	TfNSW (contractors)
M4 Western Motorway (Ropes Creek Crossing) (1)	Ropes Creek crossing near Erskine Park	Temporarily closes major flood evacuation route for up to 4 hours during a PMF (1)	The Great Western Highway, however this is also likely to be flooded at the same time.	Around 44.2m AHD due to local catchment flooding	TfNSW (contractors)
Blaxlands Crossing Bridge	Silverdale Road, Wallacia (Nepean River crossing)	Access cut between Wallacia and western side of the river	Silverdale Road (West side) and Park Road or	Deck height 35.13m AHD, (Approx. 5.5m at Wallacia	Wollondilly Council

Bridge Name	Closure location	Consequence of closure	Alternate Route	Bridge Deck level (Note: Will close prior to this height)	Agency Responsible for Closure
(Nepean River at Wallacia) (7)			Wallacia Alternative Route (East side)	weir gauge) but will be closed prior to this height.	

1.3 FERRIES

- 1.3.1 During initial low level flooding the closure of ferries at Sackville, Lower Portland, Webbs Creek and Wisemans Ferry causes local inconvenience and diversions.
- 1.3.2 When combined with local road closures due to flooding, ferry closures can result in some areas becoming isolated. This isolation occurs particularly on the North western side of the Hawkesbury River including the Macdonald Valley and Webbs Creek areas.
- 1.3.3 The Wisemans Ferry, Sackville, and Webbs Creek ferry closures are managed by Transport for NSW (TfNSW), whilst the Lower Portland Ferry is managed by Hawkesbury City Council.
- 1.3.4 Ferry closures are dependent on the velocity of floodwaters as well as the amount of debris present in the floodwaters.
- 1.3.5 The heights at which these ferries are likely to be closed are detailed in Table 2. However these heights are a guide only, and will be different for each flood event.

Table 2: Ferry Closures due to Flooding Impacts

Ferry	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Responsible Agency
Sackville Ferry (8)	Between Sackville Road and Sackville Ferry Rd	Cuts access between Sackville and Sackville North	Via Wisemans Ferry Rd and Sackville Ferry Rd or via East Kurrajong Rd	3.0 to 3.5m depending on debris (a)	TfNSW
Lower Portland (9)	Between River Road, Lower Portland	Cuts access between West Portland Road and River Road	Via Webbs Ck Ferry (if still open) or for eastern bank through Maroota	3.0 to 3.5m depending on debris (a)	Hawkesbury City Council
Webbs Creek	Between River Rd, Wisemans Ferry and St Albans Road	Cuts access to St Albans Rd and isolates the North West side of river	Use Wisemans Ferry (if still open) and	3.0 to 3.5m depending on debris (a)	TfNSW

Ferry	Closure location	Consequence of closure	Alternate Route	Indicative gauge height	Responsible Agency
		(assuming ferries are also closed)	Settlers Rd.		
Wisemans Ferry	Between Old Northern Rd, Wisemans Ferry and Wisemans Ferry Road	Cuts access between the north and south sides of the river.	None. Access to Gosford is via Brooklyn, but only if Wisemans Ferry Rd is still open.	3.0 to 3.5m (a)	TfNSW

Notes:

(a) Related to the Windsor Bridge Gauge at Windsor

1.4 TRAINS AND RAIL LINES

- 1.4.1 Both the Richmond and Western Rail Lines are at risk of closure due to flooding. The flood heights around which they are expected to be closed are provided in Table 3.
- 1.4.2 The Richmond Rail Line is likely to be closed first due to flooding to the west of Schofields.
- 1.4.3 The Western Rail Line at Penrith could potentially be closed for an extended period of time if its bridge over the Nepean River at Penrith is damaged and/or needs to be rebuilt during floods around 13.9m (28m AHD) or greater at Penrith.
- 1.4.4 During evacuations from Windsor onto the Hawkesbury Valley Way Route, evacuation traffic needs to cross the Richmond Rail Line in a number of locations as detailed in Table 3 and the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (10) and Traffic Management Task Manual (11).
- 1.4.5 If not already closed due to flooding, this Richmond Rail Line will need to be closed to allow for the evacuation of vehicle traffic. Rail line closures are the responsibility of NSW Trains.
- 1.4.6 Buses to replace trains will be organised through the Transport Functional Area.
- 1.4.7 The Transport Liaison Officer will assist with the coordination of the allocation of buses where there are competing bus resource requirements.
- 1.4.8 Transport arrangements for the movement of freight by truck instead of rail will need to be considered by the Transport Functional Area, the SERCON and Recovery Committees during the Recovery phase.

Table 3: Rail Closures due to Flooding Impacts and for Evacuation Purposes

Floodplain	Rail Impact	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
Richmond / Windsor / Ebenezer	Richmond Rail Line (12)	West of Schofields	Closure of rail line	Via Road	12.5m (a)
Richmond / Windsor / Ebenezer	Richmond Rail Line	Cox Street Emergency Rail Crossing, Windsor	Allow evacuation traffic from South Windsor to access Hawkesbury Valley Way Route	None	The Hawkesbury Valley Way Evacuation route will operate if floods are predicted to be above 15m AHD or
Richmond / Windsor / Ebenezer	Richmond Rai Line	Railway Road North to Railway Road	Allow evacuation traffic to use Hawkesbury	None	

Floodplain	Rail Impact	Closure location	Consequence of closure	Alternate Route	Indicative gauge height
		South Emergency Rail Crossing, Vineyard	Valley Way Route		14.85m at the Windsor gauge (a)
Richmond / Windsor / Ebenezer	Richmond Rail Line	Rail crossing at Level Crossing Road, Vineyard	Allow evacuation traffic to use Hawkesbury Valley Way Route	None	
Penrith	Western Rail Line (12)	Victoria Bridge Penrith / Emu Plains	Closure of rail line. Main link between Sydney, the Blue Mountains and Western NSW. Major transport implications	Via Road	Bridge is expected to be significantly damaged around 13.9m (b) (28m AHD)
South Creek	Western Rail Line (1)	Where it crosses South Creek	Closure of rail line for up to 5 hours due to local catchment flooding (1)	Via Road	Around 24.8m AHD (c)

Notes:

- (a) Related to the Windsor Bridge Gauge at Windsor
- (b) Related to the Victoria Bridge Gauge at Penrith
- (c) Not related to a flood gauge

2 COORDINATING BRIDGE CLOSURES

2.1 ISOLATION OF AREA TO THE WEST OF HAWKESBURY RIVER

- 2.1.1 The area to the west of the Hawkesbury River between the Grose River and the Macdonald River is mostly isolated from the eastern side of the Hawkesbury River when the following bridges and ferries are closed:
- a. North Richmond Bridge, North Richmond;
 - b. Windsor Bridge, Windsor;
 - c. Sackville Ferry
 - d. Lower Portland Ferry
 - e. Webbs Creek Ferry
 - f. Wisemans Ferry
- 2.1.2 The remaining road access from this western area to the east is via Bells Line of Road to Darling Causeway to Mount Victoria then east along the Great Western Highway to the Sydney metropolitan area.
- 2.1.3 Trucks making deliveries to supermarkets, shops, and commercial facilities would use this last remaining road route.
- 2.1.4 Many residents in this area commute over these ferries and bridges for work and other purposes.

2.2 MANAGING BRIDGE CLOSURES

- 2.2.1 Bridges will be monitored by the responsible agency and the decision to close them will be made by these agencies dependant on the individual circumstances surrounding each flood event. The precise level at which a bridge is closed in flood conditions, ranges from the soffit (underside) of the bridge to the bridge deck level, based on a risk assessment.
- 2.2.2 The deck height of bridges and the responsible agency for managing bridge closures are detailed in Table 1.
- 2.2.3 The risk assessment for closing of a bridge is dependent on a range of factors including:
- a. when flood waters reach the soffit (underside of bridge)
 - b. the amount of debris present within floodwaters,
 - c. Type of bridge
 - d. Condition of bridge
 - e. the rate of rise of floodwaters and water velocity.
- 2.2.4 However, the final closing height is determined by bridge owner, through their contractors.

- 2.2.5 The closure of the following bridges needs to be closely coordinated
- a. North Richmond Bridge, North Richmond;
 - b. Windsor Bridge, Windsor;
- 2.2.6 The principles for closing the bridge:
- a. In flood operations TfNSW, through their contactors, must keep in close liaison with the SES IMT, via the Transport Liaison Officer.
 - b. SES will use predictions of flood heights from the soffit level to the bridge deck level to advise people of the likelihood of the bridge closing.
- 2.2.7 The closure of bridges needs to be closely coordinated between the following:
- a. Hawkesbury-Nepean Incident Control Centre
 - b. Transport Management Centre
 - c. Hawkesbury LEOCON
 - d. SES Hawkesbury Unit Commander
 - e. TfNSW contractors on site at the bridges
- 2.2.8 More detailed arrangements for the closure of these bridges are outlined in the Hawkesbury-Nepean Traffic and Transport Operations Procedure and Pre-Plan (1) and Traffic Management Task Manual (2) as well as their associated Traffic Control Plans.

3 COMMUNICATION OF TRANSPORT INFRASTRUCTURE IMPACTS

- 3.1.1 Public communication of Transport Infrastructure impacts to Bridges, Ferries, Rail and Road Closures can be divided into:
- a. Pre-warning of possible flood impacts;
 - b. Actual closure details when they occur.

3.2 PRE-WARNING OF POSSIBLE IMPACTS

- 3.2.1 The NSW SES will advise of likely closure based on the Bureau predicted flood height rather than specifying precisely when and at what height these will be closed.
- 3.2.2 This would involve the issuing of a Flood Bulletin by the NSW SES, which could include the notification of the likely closures of major bridges, ferries, rail and roads.
- 3.2.3 The actual closure of bridges by the infrastructure owner is a risk based one.
- 3.2.4 TfNSW, through their contractors Downer Michel in the Hawkesbury-Nepean Valley, close a bridge below the bridge deck level based on their risk management criteria including:
- a. When flood waters reach the soffit (the underside of the bridge)
 - b. Type of bridge
 - c. Condition of bridge
 - d. Debris loading
- 3.2.5 The precise level at which the bridge is closed is between the soffit and the bridge deck. This will depend on the prevailing conditions and current risk.

3.3 COMMUNICATION OF ACTUAL IMPACTS

- 3.3.1 The communication of actual impacts including most major bridge, ferry or road closures is the responsibility of the Transport Functional Area through their existing communication channels.
- 3.3.2 Local road, bridge and some ferry closure notifications are the responsibility of the relevant Council.