

Department of Planning and Environment

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Marsden Park North

Flood Planning Advice Report

Anthea Sargeant (Chair)

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18 May 2023



Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land, and we show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally, and economically.

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Marsden Park North

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Defined terms

Term	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
Department	Department of Planning and Environment
FEM	Hawkesbury-Nepean Valley Flood Evacuation Model Report, July 2022
Flood Inquiry	NSW Flood Inquiry (July 2022)
GHP	Garfield Holdings Pastoral
INSW	Infrastructure NSW
Interim Results	draft Hawkesbury-Nepean Flood Study (prepared by INSW, dated April 2022)
MPN	Marsden Park North
NWGA	North West Growth Area
PAP	Precinct Acceleration Protocol
Panel	Flood Advisory Panel
PLUS	DPE Planning and Land Use Strategy division
PMF	Probable Maximum Flood
Landowner Group	Landowners representing the major landholdings within Marsden Park North including Garfield Holdings Pastoral and Leamac
Rezoning	State-led rezoning of the Marsden Park North Precinct
SES	NSW State Emergency Service
Site	Marsden Park North Precinct
TAG	Flood Technical Advisory Group
TAR	Flood Technical Advisory Report
TfNSW	Transport for NSW
V/l/hr	Vehicles/lane/hour

1 Introduction

1. The Department of Planning and Environment (**Department**) has established Flood Advisory Panels (**Panel**) to provide advice regarding the flood risk associated with certain 'high risk' planning proposals and other planning-related matters, in light of the recommendations of the NSW Flood Inquiry 2022 (**Flood Inquiry**). The Panel review process for these matters is intended as an interim measure pending the establishment of a NSW Reconstruction Authority, in accordance with the Flood Inquiry recommendations.
2. A Technical Advisory Group (**TAG**) was also established by the Department to deliver expert technical advice to Panels in accordance with the TAG terms of reference (dated 12 December 2022) and at the direction of the Panels. The advice of the TAG is not binding on the Panels or on the Department's Planning and Land Use Strategy (**PLUS**) division, which remains the delegated decision maker for the planning proposals referred to the Panels.
3. The Marsden Park North Precinct (**MPN**) was released for planning by the Department in June 2014 as part of the Precinct Acceleration Protocol (**PAP**). In September 2018 the Department exhibited an amendment to the *State Environmental Planning Policy (Sydney Regional Growth Centres) 2006* for Marsden Park North, planning greenfield urban development.
4. On 10 January 2023 the Panel received a request for advice from PLUS (**PLUS Request**) in relation to the State-led rezoning (**rezoning**), which is detailed in Section 1.1 below.
5. The Department's Executive Director Anthea Sargeant (Chair), and independent members Dianne Leeson and Peter Cochrane were appointed to constitute the Panel with respect to this request.

1.1 Advice Request

6. The PLUS requested advice from the Flood Advisory Panel with respect to the MPN rezoning on 10 January 2023 (**PLUS Request**). The PLUS Request sought the Panel's recommendations on how to proceed with this rezoning in relation to flood and evacuation matters, with possible options being:
 - Proceed to finalisation in advance of the implementation of recommendations 18 and 19 of the Flood Inquiry.
 - Proceed with certain aspects of the rezoning.
 - Proceed with the rezoning under certain conditions.
7. PLUS also requested the Panel specifically consult with the following stakeholders as part of considering the rezoning:
 - Transport for New South Wales (**TfNSW**).
 - Urbis, as representatives of the precinct's major developer group (**Landowner Group**).

1.2 Material Considered by the Panel

8. In this review, the Panel considered a range of material (**Material**) detailed in Appendix A.

9. The Panel requested the TAG provide technical advice on specific flood-related risks of the rezoning, having regard to the Flood Inquiry and its recommendations as accepted by government (either absolutely or in principle). The TAG was requested to advise whether the rezoning adopts a tolerable, risk-based flood planning level considering the documentation as listed in Appendix A.
10. The TAG's advice is summarised in the Technical Advice Report (TAR) dated 27 April 2023. The TAG advice is a compilation from several independent experts.
11. In addition to material listed in Appendix A, the Panel have also considered the conclusions of the following Hawkesbury-Nepean Flood Studies:
 - *Hawkesbury-Nepean Valley Flood Evacuation Model Report* (prepared by Infrastructure New South Wales (INSW) dated July 2022) (FEM).
 - *Hawkesbury-Nepean Valley Regional Flood Study* (prepared by INSW and WMA Water, dated July 2019) (HNV Regional Flood Study).
 - *Draft Hawkesbury -Nepean Flood Study – Interim Results* (prepared by INSW, dated April 2022) (Interim Results).
12. To date, the FEM has not been made publicly available and the Interim Results have limited circulation amongst government agencies and targeted council's and stakeholders. However, these resources are considered particularly relevant to the Panel's consideration of the Precinct as the latest and most current NSW Government flood modelling for the Hawkesbury-Nepean catchment.
13. The FEM was developed through an expert-led interagency government process to assess cumulative regional road network capacity during a flood evacuation based on the SES's Flood Plan arrangements. The FEM simulates the SES evacuation timeline and arrangements under a range of assumptions. It provides the NSW Government with a repeatable process to quantify existing and ongoing risk associated with the cumulative impact of growth and climate change on road evacuation capacity in the Hawkesbury Nepean Valley.

1.3 The Panel's Meetings

14. As part of its advice, the Panel met with various stakeholders as set out in Table 1. Panel's Meetings.

Table 1. Panel's Meetings

Meeting	Date
Site Inspection	06 March 2023
PLUS	06 March 2023
Landowner Group	08 March 2023
Council	08 March 2023
TfNSW	21 March 2023
Landowner Group follow-up 1	22 March 2023
Landowner Group follow-up 2	13 April 2023

2 State-led Rezoning

2.1 Site and Locality

15. The MPN is one of 16 precincts within the Northwest Growth Area (**NWGA**). MPN sits between the Riverstone West precinct to the northeast, and the West Schofields precinct to the Southeast.
16. The Site is located approximately 20km northwest of the Parramatta Central Business District (CBD) and approximately 12km northwest of the Blacktown CBD, sitting entirely within the Blacktown Local Government Area.
17. The Site is approximately 1,227 hectares (ha) in area bound by South Creek on the northwest, Eastern Creek and Bells Creek to the east, Excelsior Avenue to the south, and Richmond Road to the west.
18. The dominant land use within the precinct consists of large and small lot rural-residential properties. There are approximately 4,000 existing properties across the precinct owned by approximately 500 landholders.
19. The rezoning covers three major landholders, Garfield Holdings Pastoral (**GHP**) to the west, Leamac to the Northeast, and a collection of other private and publicly owned lands to the southeast (see Figure 1). A key feature of the privately owned lands to the southeast are the 'Scheduled Lands' established in the 1800's as paper subdivisions. New dwellings are not permissible on the Scheduled Lands, However, there is a history of unapproved developments on the land.



Figure 1. Marsden Park North locality and landholders (Prepared by URBIS, dated 8 March 2023)

2.2 Background

20. GHP and Leamac are the landholders subject to the PAP. Shortly after the commencement of the PAP, Leamac entered into a land development agreement with Mirvac and GHP entered into a land development agreement with Stockland Development Pty Ltd.
21. Table 2 below provides a brief history of the state-led rezoning to date.

Table 2. Timeline of rezoning

Date	Proposal Stage	Comment
June 2014	Precinct Acceleration Protocol	The Department released the MPN precinct for planning under the PAP. Under the PAP, GHP and Leamac committed to forward funding the cost of precinct planning, the delivery of essential services, and the delivery of regional infrastructure needed to support the precincts development. Shortly after the commencement of the PAP, Leamac entered into a land development agreement with Mirvac and GHP entered into a land development agreement with Stockland Development Pty Ltd.
September 2018	Discussion Paper Exhibited	The Department exhibited a discussion paper outlining the planned amendments to the State Environmental Planning Policy (Growth Centres) 2006 and proposed outcomes of a master plan.
December 2021	Landowner Group met with Department and TfNSW	The Landowner Group met with TfNSW and the Department to identify infrastructure requirements and establish forward funding arrangements for the Precinct within the NWGA.

2.3 State-led Rezoning

22. The rezoning proposes to uplift the 1,227ha precinct from the existing rural zoning to a mixed-use urban centre (see Figure 2 for further detail). The proposed rezoning includes provision for:
- B4 Mixed Use
 - B6 Enterprise
 - R2 Low Density Residential
 - R3 Medium Density Residential
 - RE1 Public Recreation
 - E2 Environmental Conservation.
23. The proposed land use outcomes resulting from the indicative layout plan include:
- estimated 6,224 total dwellings
 - estimated population of 19,917
 - three local centres
 - a community facility
 - 13 sports fields (~57ha open public space)
 - four schools (an existing public primary, two existing private K-12, and a proposed primary)
 - retained environmental conservation land (~83ha).

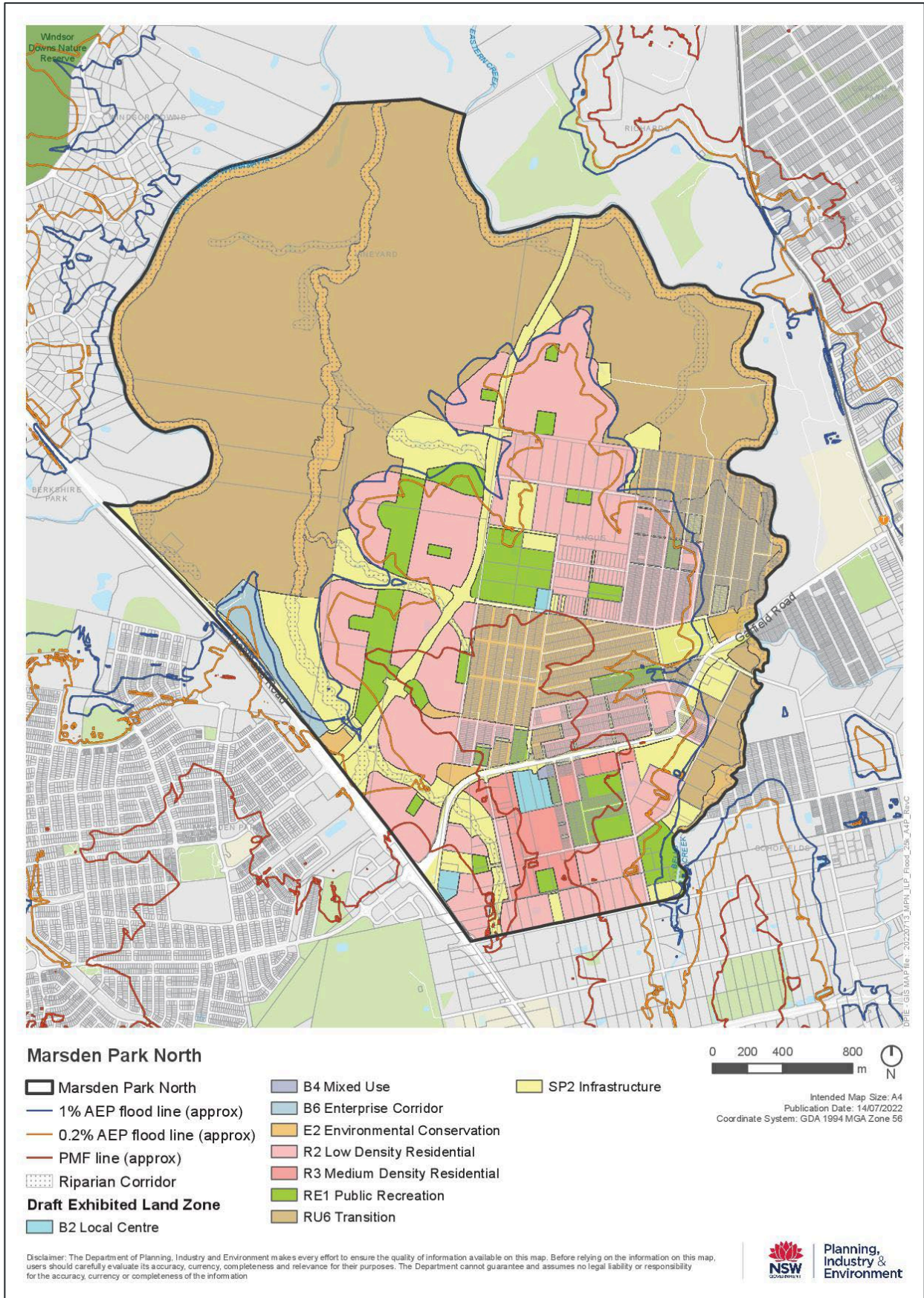


Figure 2. Marsden Park North Indicative Layout Plan with flood modelling (1% and 0.2% annual exceedance probability (AEP) flood events, Probable Maximum Flood (PMF)) (Prepared by the Department, dated 14 July 2022)

3 The Panel’s Consideration

3.1 Key Issues

24. The following section provides a summary of the key issues identified and considered by the Panel in response to the PLUS Request.

3.1.1 Flood Hazard and Behaviour

Landowner Group Comments

25. The Landowner Group submitted the following documents that consider flood hazard and behaviour:

- Marsden Park North Precinct Exhibition Discussion Paper (Prepared by the Department, dated September 2018)
- Marsden Park North Precinct Water cycle and Flood Management Strategy Report (prepared by J. Wyndham Prince, dated August 2018)
- Land Zone and Flood Contour Map (prepared by Department, dated July 2022).

26. The following table summarises flood modelling considered in the rezoning:

Table 3. Summary of Landowner Group’s flood modelling from Flood Management Strategy, Marsden Park North Precinct Exhibition Discussion Paper, and the Land Zone and Flood Contour Map

AEP	ARI (years)	Summary
5%	1 in 20	Not modelled.
1%	1 in 100	The 1% flood level is set at 17.3 metres (m) Australian Height Datum (AHD) (J. Wyndham Prince, p57). The 1% AEP flood event primarily inundates the north-western portion of the precinct between Bandon Road and South Creek, as well as to the east between existing developed areas and Eastern Creek. Development has been limited to within the extent of the existing 1% AEP flood level, except for a limited number of lots where the flood level encroaches (J. Wyndham Prince, p58).
0.2%	1 in 500	The 0.2% AEP flood event impacts the same areas noted above in the 1% AEP, broadly expanding the flood affected footprint of the precinct evenly by several hundred metres. Notably, the proposal seeks to rezone areas for residential use within the modelled 0.2% AEP flood event (see Figure 2).
0.02%	1 in 5000	Not modelled.
PMF	NA	The regional PMF level is set at 26.4m AHD (J. Wyndham Prince, p57).

27. According to the proposed rezoning, development has been limited below the 1% AEP flood planning level as a measure to mitigate flood impacts across the precinct. Where development is impacted by the 1% AEP flood event, filling is proposed to lift the land to be at or above the flood planning level. No more than 4,100 of the proposed dwellings will be located between the 1% AEP flood planning level and the PMF. The rezoning proposes a total yield of approximately 6,224 dwellings.

28. At its meeting with the Panel on 8 March 2023, the Landowner Group indicated:

- The current extent of proposed development is all above the 1% AEP and could facilitate a maximum of 4,100 dwellings between the 1% AEP and the PMF. Approximately 500 dwellings are currently located below the 0.2% AEP flood planning level, but above the 1% AEP flood planning level.
- It would be willing to accommodate fill or resilient building measures for any dwellings located below the 0.2% AEP (RL 19.6m AHD).
- It also suggested that raising land to the 0.2% AEP would be the preferred option as it would reduce property risk, avoid additional cost to home purchasers, and reduce the overall evacuation risk, amongst several other noted benefits.
- The FEM fails to differentiate variations to 'risk to life' across the floodplain. The same loss rate is applied to people evacuating from the middle of the floodplain as is applied to people on the fringe who could walk a short distance from rising floodwaters.
- The landholders who already have parcels of land allocated under the 'Scheduled Lands' (see Paragraph 19) should be prioritised for development, where the land is located above the 1% AEP flood planning level.

Council Comments

29. At its meeting with the Panel on 8 March 2023, the council noted:
- Land below the 1% AEP has not been fully utilised for its potential as open space. Land remains in private ownership with restrictions.
30. Council's response, received 28 March 2023, noted any change to the long-established flood planning level of 1% AEP plus freeboard will need to be very clearly and carefully communicated to the broader community.

PLUS Comments

31. At its meeting with the Panel on 6 March 2023, PLUS noted:
- In response to Flood Inquiry recommendation 18, the flood planning levels for the Marsden Park North Precinct need to be reconsidered.
 - The PLUS team noted that the flood modelling in the exhibited proposal is based on publicly available data from 2019. The exhibited proposal plans for approximately 4,000 dwellings below the PMF flood event. Approximately 50 dwellings are noted as being located below the 1% AEP flood level.
 - PLUS noted that the FEM modelling for the MPN precinct is much more extensive than the flood modelling relied upon by the Proposal.

Agency Advice

32. In its meeting with the Panel on 21 March 2023, TfNSW noted:
- MPN Precinct as a standalone development under the current proposed development yield would create a significant increase to the risk to life, almost doubling the average annual people at risk for the broader Hawkesbury-Nepean Catchment from 42 to 88 by 2041 according to the FEM.
 - Lower development yield numbers had been modelled for MPN Precinct, resulting in a reduction to the risk to life. However, lower yield numbers did not sufficiently reduce evacuation pressures on Richmond Road to address cumulative impacts on the broader floodplain.
33. In further advice provided to the Panel on 28 April 2023, TfNSW noted:

- In response to comments from the Landowner Group on the inadequacy of ‘risk to life’ considerations in the FEM, TfNSW noted the model had considered areas which could be safely evacuated using short, direct, and rising flood evacuation routes (TfNSW, p1).

34. In advice provided to the Panel on 6 March 2023, INSW noted:

- The Proposal has not been accompanied by adequate flood modelling. The Proposal needs to consider a broader range of flood events up to and including the PMF. It should be noted the Interim Results indicate flood levels for a range of flood events have increased in the Hawkesbury-Nepean catchment (INSW, p1-2).
- Additional modelling needs to consider the post-development flood risk (INSW, p5).
- The cumulative impact of significant development on the floodplain has not been quantified in the Proposal. Cumulative impact modelling is required for the proposed balanced cut and fill with respect to a range of flood levels (INSW, p2).
- The impact of projected climate change has not been modelled adequately. The Interim Results prepared by INSW, considerate of regional climate change factors, indicate that the 1% AEP event for the MPN area could increase by up to 0.75m by 2060 (INSW, p7).

35. In advice provided to the Panel on 23 March 2023, State Emergency Services (**SES**) noted:

- The Landowner Group has not undertaken adequate flood risk assessment. However, the Interim Results prepared by INSW indicate the 1% AEP will rise by 0.3m above current modelled levels and the PMF will rise by 3.9m above current modelled levels (SES, p2) (*note: the Panel understands that the Interim Results do not factor in climate change impacts, so the 0.3m rise does not account for climate change*).
- The existing *Hawkesbury Nepean Regional Flood Study (2019)* indicates much of the site will be impacted by H5-H6 flooding in a 0.2% flood event (SES, p2).
- Fundamentally the proposal increases ‘risk to life’ for people living and working in the floodplain (SES, p3).
- The Landowner Group should consider the cumulative impacts that any development will have on risk to life and future community and emergency service resources (SES, p6).

TAG Advice

36. *Flood Impact Assessment:*

- With respect to consideration of a range of flood events, the TAG notes the 1% AEP, 0.5% AEP, 0.2% AEP, and PMF flood events have been considered in the submitted material. However, the 0.02% AEP event has not been considered by the submitted material as recommended by the Flood Inquiry.
- The TAG recommends further modelling assessing the 0.02%, calibrated with recent flood events and the interim results.

37. *Climate Change:*

- TAG members note that climate change impacts were not adequately considered in the submitted documents, with relation to the backwater flooding from the Hawkesbury River.

- The TAG notes the Interim Results, calibrated to recent flood events, indicate significantly higher flood levels compared to earlier reports. As a result, the TAG is of the view that the submitted flood risk assessment is likely to underestimate flood risk for the site.
- The TAG recommends further consideration of climate change impacts, including for the Hawkesbury-Nepean catchment.

38. *Flood Hazard and Behaviour:*

- The TAG members agree that ‘risk to life’ does exist because of the Proposal, due to the increased number of people living and working in the floodplain. The TAG notes the lack of hazard mapping as a key deficiency in the flood impact assessment modelling.
- The TAG also notes that given the significant likelihood of a 1% AEP event occurring within a typical building design life, the use of the 1% AEP planning level for residential developments underestimates the level of risk and does not believe that it is tolerable to apply the 1% AEP as an appropriate flood planning level as presented in the submitted material.
- The TAG recommends the preparation of hazard mapping to appropriately assess risk to life.

39. *Cumulative Hydraulic Impacts:*

- The TAG recommends further assessment of the cumulative impacts of mitigation measures for the full range of flood events and to identify risk to property.

Panel Advice

40. The Panel acknowledges the modelling undertaken for the proposal pre-dates the Interim Results, the FEM, and the Flood Inquiry.
41. The Panel is concerned about the currency and adequacy of the flood impact assessment undertaken in relation to the Proposal. In particular, the Panel notes that the Interim Results, indicate potential increases in flood levels because of more precise modelling, and considering climate change, indicate an increase in the level of the 1% AEP for the MPN area of 0.75m by 2060.
42. The Panel shares the concerns of the TAG that the lack of hazard mapping is a key deficiency in the flood impact assessment for the precinct. The known ‘risk to life’ from agency advice indicates the precinct may be exposed to significant flood depth during extreme flood events and experience hazard ratings of up to H5-H6 for sections of the precinct (see paragraph 35).
43. The Panel shares the concerns of the TAG that the current modelling undertaken for the MPN has not adequately considered climate change and is likely to underestimate flood levels and ‘risk to life’ as a result.
44. The Panel shares council’s concerns regarding land use of below the 1% AEP flood planning level in MPN. Consideration should be given to the relocation of recreational land uses to lower areas that are subject to higher flood risk. This is consistent with the recommendations from the Flood Inquiry.
45. The Panel recommends further information is required to provide greater certainty that there is no increased ‘risk to life’ from the proposal, including modelling that reasonably considers the potential impacts of climate change, cumulative impacts of proposed compensatory cut and fill measures, hazard mapping for all modelled flood events, and is calibrated against recent flood events and the Interim Results.

3.1.2 Flood Evacuation

Landowner Group Comments

46. At its meeting with the Panel on 8 March 2023, the Landowner Group indicated:
- MPN is positioned over an elevated 'spine' of land allowing for continuous rising grades for pedestrian evacuation of the precinct under flood conditions. Roadways will be developed on a rising road grade to allow safe pedestrian access to community facilities located above the PMF.
 - The assumption of 600 vehicles/lane/hour (v/l/hr) made in the FEM is a conservative figure based on the capacity of rural roads and does not consider proposed road upgrades and long-term trends in the reduction of vehicle ownership.
 - The following upgrades would be required to ensure evacuation capacity for MPN:
 - Upgrade lane capacity evacuating east on Richmond Road to three lanes
 - Widening of the on-ramp from Richmond Road onto the Westlink M7 to cater for congestion
 - Upgrade Richmond Road Eastern Creek Crossing to allow two lanes to continue on Richmond Road.
 - Widening Richmond Road to six lanes would provide sufficient capacity for flood evacuation of Marsden Park North. A recent WestInvest announcement has confirmed funding for the widening of Richmond Road to six lanes between Townson Road and the on-ramp onto the Westlink M7.
 - TfNSW have identified \$190 Million in regional road upgrades for the NWGA that would enable rezoning of MPN to proceed.
 - The WestInvest announcement for Richmond Road indicates there is funding to support the rezoning of the MPN precinct.
 - Contraflow could be feasibly achieved on Richmond Road to ensure there is evacuation capacity for MPN.

Council Comments

47. At its meeting with the Panel on 8 March 2023, council noted:
- For MPN to have effective flood evacuation capacity the following local road network upgrades would be required:
 - Richmond Road would need to be raised towards the M7
 - upgrade of Garfield Road East and Garfield Road West
 - development of the Castlereagh Connection.
 - The delivery of the precinct needs to be staged in coordination with the development of evacuation infrastructure.
 - A reduction in yield accompanied with a larger individual lot size would be a favourable outcome.
48. In additional information provided to the Panel on 28 March 2023, council noted:
- There is a lack of mass transport systems servicing the NWGA Precincts forcing residents to rely on their vehicles.
 - There is currently a lack of clarity regarding the location and timing of regional network upgrades to provide critical flood evacuation routes. These include:

- The Castlereagh Connection between the Westlink M7 Motorway and South Creek
- The Outer Sydney Orbital
- Garfield Roads and Bandon Road upgrades.
- Development density has exceeded the capacity of corresponding infrastructure to date in the NWGA.

PLUS Comments

49. At its meeting with the Panel on 6 March 2023, PLUS noted:

- Regarding Flood Inquiry recommendation 19, the evacuation capacity for the MPN needs to be reconsidered.
- Regarding Flood Inquiry recommendation 21, the development at MPN will be limited by evacuation capacity.
- A larger suite of road upgrades to Richmond Road, Garfield Road, and other Services would be needed to achieve the evacuation of the proposed dwelling numbers.
- According to the FEM, future road networks do not have the required capacity for the planned dwelling yield. A reduced dwelling yield of 1,700 dwellings below the PMF could be sustainably evacuated subject to a suite of substantial, but currently unfunded, upgrades to the regional road network.
- Regional road networks would require significant committed upgrades to support any increased development to MPN.

Agency Advice

50. In its meeting with the Panel on 21 March 2023, TfNSW noted the following:

- TfNSW have concerns about the cumulative impacts of the proposed development at MPN and surrounding precincts on the evacuation capacity of higher risk areas of the catchment, such as Richmond and Windsor. TfNSW noted that many of these westerly suburbs in the Hawkesbury-Nepean Valley also rely on Richmond Road as a primary evacuation route and would be significantly impacted by congestion resulting from additional development at MPN.
- The proposed upgrade to the bridge over South Creek on Richmond Road, subject to NSW Government funding commitments, has been designed as an evacuation corridor with rising egress for a 0.2% AEP flood event.
- The planned widening of Richmond Road to six lanes will only deal with existing traffic demands and not with any additional flood evacuation demands.

51. WestInvest funding for the upgrade of Richmond Road between Townson Road and the Westlink M7 has been committed. However, this funding will likely not prove sufficient and will not commence for several years to come. In further advice provided to the Panel on 28 April 2023, TfNSW noted the following:

- The key points expressed in the meeting between the Panel and TfNSW were reiterated.
- TfNSW raised concerns with the Landowner Group' proposal to raise developable land to the 0.2% AEP flood level. TfNSW note that the proposed balanced cut and fill approach could reduce flood storage in the Windsor/Richmond floodplain and could increase the flood risk for the broader floodplain (TfNSW, p2).

- The adopted figure of 600 v/l/hr in the FEM appropriately estimates lane capacity for Richmond Road. This figure was first set in the Hawkesbury Nepean Flood Strategy in 1997 and has since been peer reviewed against internationally observed rates in large scale evacuations. Considering likely weather conditions, factoring in possibility for accidents and other obstructions, it is reasonable to use a conservative figure such as 600 v/l/hr for lane capacity in evacuation in the FEM (TfNSW, p2).
- There are considerable issues with the implementation of contraflow on Richmond Road including (TfNSW, p3):
 - The number of intersections on Richmond Road between the interchange with the Westlink M7 and Blacktown slowing and congesting contraflow
 - The risk to vehicles during mass evacuation without physical barriers in place
 - The risk to emergency service vehicles which must be able to readily deploy into the evacuation areas to assist and make rescues.

52. In advice provided to the Panel on 6 March 2023, INSW noted:

- There is not sufficient detail to determine the local evacuation capacity from the submitted documentation as the local centres are conceptual and capacity is undefined (INSW, p10).
- A flood evacuation report was prepared on behalf of the Department by StanTec (dated 3 July 2018) separately to the proposal. The StanTec report indicates that flood evacuation should be possible. However, INSW consider this report to be preliminary with limited consideration of the cumulative impact of regional flood evacuation (INSW, p2).
- INSW also noted the StanTec report did not consider the Richmond Road bridge crossing over South Creek is planned to be raised. While the raising the bridge reduces the risk to life for evacuating traffic from the Richmond/Penrith areas, it increases the risk to life for MPN, which is now competing for Richmond Road with those evacuating from the Richmond area (INSW, p6).
- Modelling undertaken by INSW in the FEM indicates that a dwelling yield of 1,700 dwellings as projected for 2026, would have a limited impact on the flood evacuation risk for the region. However, the full dwelling yield of 4,300 dwellings projected for 2041 would double the number of people unable to evacuate in comparison to the base case (INSW, p2).

53. In advice provided to the Panel on 23 March 2023, SES noted:

- Existing flood modelling indicates that the broader precinct has rising road access during a range of flood events. However, according to the Interim Results part of MPN becomes an isolated flood island during the PMF. It is recommended rising road access is maintained throughout the full range of flood events (SES, p2).
- Given the flood hazard and the duration of the flooding, shelter in place is not an option for this area (SES, p3).
- Climate change is not considered in the currently available flood modelling for MPN. However, it is noted the Interim Results project a rise of 0.75m by 2060 because of climate change factors (SES, p3).
- Upgrades proposed to raise Richmond Bridge over South Creek would increase the evacuation capacity for more westerly suburbs, however, this would also extend the congestion affecting the evacuation of MPN under a greater range of flood events (SES, p5).

- Managing evacuations is complex and response to evacuation is variable. Adding additional people would further result in increased complexity and reliance on human behaviour (SES, p8).

TAG Advice

54. *Evacuation Modelling:*

- The TAG identified that the proposal relies on the effective evacuation of the precinct as a primary control to risk to life. The TAG note that compliance to evacuation is highly variable as there is no guarantee that people will evacuate the site.
- The TAG notes that NSW Government evacuation modelling indicates the evacuation capacity of the precinct as proposed is insufficient.
- The TAG defers to NSW Government agency advice regarding the capacity of the regional road network to cater for day-to-day traffic and flood evacuation needs, as well as appropriate dwelling yields and commentary on the findings of the FEM.

Panel Advice

55. The Panel agrees with the concerns raised by TfNSW regarding the cumulative impact of the MPN development on the evacuation of the broader Hawkesbury-Nepean Floodplain.
56. The Panel notes that upgrades to Richmond Road are not likely to provide the additional evacuation capacity required as funding for road upgrades remains uncertain and additional proposed lanes are only based on addressing existing congestion issues.
57. The Panel notes that there were several views on the viability of contraflow as a feasible evacuation management strategy for Richmond Road. Further investigation is required to understand the suitability of Richmond Road for contraflow under flood evacuation scenarios.
58. The Panel acknowledges that pedestrian evacuation to higher ground would be possible via routes of rising egress but raises concerns about the shelter in place or services that would be available to evacuees and the length of time that people could be prevented from returning to their homes.
59. In any event the Panel recommends the Precinct rezoning prioritise the development of continuous rising egress roadways to Richmond Road above the PMF, noting a likely increase in the PMF in the light of the Interim Results.
60. The Panel notes that recent developments in the vicinity of the Marsden Park North Precinct such as Marsden Park have significantly exceeded their proposed dwelling density, which has increased congestion and regional evacuation capacity constraints.
61. The Panel notes the Landowner Group's challenges to assumptions made in the FEM. However, the Panel also notes that the FEM is based on best practice flood modelling and sound evidence available to the NSW Government at the time. The broader conclusions for flood risk and regional evacuation capacity remain reliable and relevant.
62. In summary, the Panel provides the following advice on land below a revised PMF:
- The Panel supports a limited rezoning of 1,700 dwellings to align with the regional evacuation capacity identified for MPN in the FEM, given there is capacity to deliver those without unreasonably increasing 'risk to life'.

- The Panel notes there is a portion of the rezoning proposed above the PMF (2,124 dwellings), but the Material before the Panel indicates there is uncertainty about where the revised PMF level is and could be up to 3.9m higher when considering the Interim Results. Therefore, until the revised PMF line is confirmed through the revised Hawkesbury Nepean Regional Flood Study, the Panel can only support a total of 1,700 dwellings at this time.
- Once a revised PMF is adopted, then there is no limit on the number of dwellings that can be provided above that flood planning line, from a flooding perspective.
- To progress additional dwellings below the new PMF, additional modelling should be undertaken (modelling the range of flood events, using the updated flood study data, considering climate change, cumulative impacts, and hazard mapping), to inform a risk-based assessment that will determine an appropriate location for those dwellings.
- Consideration should be given to relocating recreational areas to lower areas that are subject to higher flood risk. This is consistent with the recommendations from the Flood Inquiry.
- Following additional flood modelling and hazard analysis land below the PMF can be rezoned for a maximum capacity of 1,700 dwellings, inclusive of any dwellings that have been delivered between the old and the revised PMF lines, subject to a hazard assessment being undertaken to determine the appropriate location of dwellings subject to other flood risks, such as building damage.
- Additional dwellings above the 1,700 cap, below the revised PMF is dependent on road network improvements that adequately increase available evacuation capacity.

3.1.3 Mitigation Measures

Landowner Group Comments

63. At its meeting with the Panel on 8 March 2023, the Landowner Group indicated:
- Raising land within MPN to the 0.2% flood level through balanced cut and fill would result in a reduction in annualised 'risk to life' and would remove the need to evacuate the MPN precinct for flood events up to and including the 0.2% flood event.
 - On site infrastructure servicing would be built to withstand flooding.
 - Essential trunk services such as water, electricity and sewage would be located above the PMF.
 - Building and design controls will ensure new development responds to flood risks.
 - Assurance of safety will be achieved through an Evacuation Management Plan/Strategy which will include improved warning systems.
 - A staged development approach is considered appropriate to facilitate future development, with infrastructure being delivered to allow the staged release of housing.
64. In a letter sent to the Landowner Group on 28 March and provided to the Panel on 8 March 2023, the J. Wyndham Prince noted:
- The trunk electricity supply to the region originating from the Vineyard Bulk Supply Point (VBSP) is located above the 0.02% AEP flood planning level varying between 23-27m AHD.

- The telecommunications services for the precinct come from the Riverstone telephone exchange, which is located at approximately 42m AHD, above the 0.02% AEP flood planning level.
- Water supply for the MPN precinct will require an extension from existing carrier mains in Richmond Road. The water supply system for MPN is flood resistant under a range of flood events.
- The Sewer network for MPN will require the construction of at least one Sewerage Pumping Station (SPS). The sewer network is relatively flood resistant but could be improved by moving the SPS above the 1% AEP flood planning level.

Council Comments

65. Council did not comment on any proposed mitigation measures during their meeting with the Panel on 8 March 2023.

PLUS Comments

66. At its meeting with the Panel on 6 March 2023, PLUS noted:
- Any development within the precinct would need to be delivered in accordance with the provisions of the local Blacktown City Council Growth Centre Precincts Development Control Plan 2010 which includes a series of building constraints within flood prone land.

Agency Advice

67. In its meeting with the Panel on 21 March 2023, TfNSW noted the following:
- The planned upgrades for the bridge over South Creek will be designed for a 0.5% AEP flood event in keeping with surrounding landforms. However, the raised crossing at South Creek would result in a longer period of congestion from westerly suburbs affecting evacuation capacity from MPN.
 - Shelter in place is not suitable for the Precinct due to the potential for building damage and the possibility of losing key services for extended periods of time.
68. In advice provided to the Panel on 23 March 2023, SES noted:
- Based on the hazard many of the buildings would be exposed to in floods up to the PMF there is limited scope to significantly mitigate against the increased risk to property in the area (SES, p6).

TAG Advice

69. *Mitigation Measures:*
- The TAG notes that there are no options for physically altering the extent of the floodplain (i.e through flood protection or releveling) that would be consistent with the recommendations of the Flood Inquiry.
 - The TAG notes, there are some options for building controls to reduce flood damage to property and infrastructure. However, property damage is still likely regardless of what mitigation measures are enacted due to the substantial height difference between the 1% AEP and the PMF flood event of 9.4m.
70. *Balanced Cut and Fill:*
- The TAG advises that the proposed balanced cut and fill approach does not appear to substantively affect downstream or upstream flood risks. However, the TAG note that mitigation measures such as balanced cut and fill should be based on revised flood modelling including a more comprehensive consideration of climate change.

- The TAG recommends any issues relating to balanced cut and fill can likely be addressed at subsequent planning stages.

71. Site specific evacuation plans and strategies:

- The TAG did not comment on the merit of site-specific emergency evacuation plans as these were not addressed in the provided material, including the discussion paper.

Panel Advice

72. The Panel notes that the Landowner Group proposes the use of evacuation management plans and strategies to assist the safe evacuation of MPN. The Panel recommends reduced reliance on site specific emergency evacuation plans as it could add significant complexity into an already complex regional evacuation scenario.
73. The Panel acknowledges that raising the site to the 0.2% AEP flood planning line would lift more people out of flood risk under flood events up to the 0.2% AEP.
74. The Panel also notes that offers to raise the site to 0.2% AEP have been made in the Panel's meetings with the Landowner Group (see Paragraph 63), with little or no detail provided in the submitted documents. The Panel is unable to confirm, based on this information, that the proposed cut and fill would be implemented consistently by the various landholders represented by Landowner Group. Furthermore the 0.2% AEP flood level needs to be revised in the light of the Interim Results before it is established as the FPL. Adequate freeboard would need to be included in the light of potential climate change impacts on flood levels.
75. As such, the Panel recommends, in keeping with TAG advice, further investigation into the proposed compensatory cut and fill of the site to ensure floodplain storage and conveyance impacts are effectively managed.
76. The Panel considers trunk utilities servicing (electricity, water, sewer, telecoms etc.) can likely be accommodated with little risk to flood outages if located above a revised 0.2% AEP flood event.

4 The Panel's Advice

77. The Panel has undertaken a review of the MPN proposal as requested by PLUS. In doing so, the Panel has considered the Material listed in Appendix A, meetings with and submissions by council, the Landowner Group and PLUS, as well as the advice provided by the TAG and Government agencies.
78. The Panel acknowledges the Site's strategic location within the NWGA, and that it is also within the Hawkesbury-Nepean catchment. Therefore, flooding is not a new matter and has been factored into strategic planning and decision making to this point. However, the Panel is concerned about the currency and certainty of the flood levels and risk assessment in the submitted Material and therefore found there are significant challenges to be resolved for MPN from a flood risk perspective.
79. In this regard, the Panel has formed the view that the Rezoning has potential to contribute to the strategic context identified by both the NSW Government and Council. However, it should be rezoned in stages to ensure the flood risks are based on the best available evidence and modelling, are properly understood and commensurate with evacuation capacity and infrastructure capacity to not exacerbate the risk to life posed to other areas of this catchment.
80. The Panel supports the full rezoning of land above a revised PMF when it has been set and adopted in the *Hawkesbury Nepean Regional Flood Study*. In the interim the Panel supports the limited rezoning for up to 1,700 dwellings above the currently defined PMF. Further rezoning below the revised PMF once adopted can proceed with a maximum capacity of 1,700 dwellings. Additional dwellings below the revised PMF must be considerate of updated flood and hazard modelling as well as the delivery of appropriate evacuation infrastructure. Detail on the additional assessment required can be found in paragraph 81 below and the exact sequence of conditions to proceed with the rezoning can be found in paragraph 82 below.
81. In summary, the Panel provides the following advice:
- **The flood modelling should be updated** to include:
 - modelling of a 0.02% flood event and revised flood levels for modelled events including the 1% and PMF
 - consideration of the impacts of climate change on flood levels and hazards within the Hawkesbury-Nepean catchment, including consideration of increased rainfall intensity and duration
 - the findings of the Interim Results (April 2022), which highlights potential increases to flood levels for all flood events.
 - **Flood hazard modelling is required** including:
 - hazard mapping for all modelled events
 - analysis of the cumulative impacts of any proposed cut and fill for all modelled flood events.
 - **The rezoning should be staged** to ensure development is released commensurate with updated flood modelling, improved evacuation capacity and delivery of associated infrastructure. Further detail of staging outlines in paragraph 82 below.
 - **Mitigation measures**, should be updated to:

- reduce the reliance on emergency evacuation plans, as this form of risk management and community protection is not suitable and would add complexity into an already complex regional evacuation scenario
- cumulative impact assessment of the proposed compensatory cut and fill to 0.2% AEP
- take a more conservative approach to shelter in place, considering location, duration, and the availability of essential services to support such an arrangement.
- Further assessment should be undertaken in relation to the **economic impacts from flooding**.
- Public recreation land uses should be shifted to lower land that is subject to higher flood risk.

82. The Panel recommends, in relation to flood and evacuation matters, the Department proceed with Marsden Park North Precinct rezoning under the following conditions in the following sequence:

- I. Proceed with rezoning for up to 1,700 dwellings above the currently defined PMF.
- II. Once a revised PMF has been adopted from the Interim Results/ revised Hawkesbury Nepean Regional Flood Study, all dwellings proposed above the revised PMF may proceed (no limit on the number of dwellings above the new PMF from a flood perspective).
- III. To progress additional dwellings below the new PMF, updated flood modelling and hazard analysis is required for a range of flood events within the MPN Precinct (including 1% AEP, 0.2% AEP, 0.02% AEP). This will inform a risk-based approach to the location of dwellings below the revised PMF.
- IV. Rezoning of any further dwellings below the revised PMF can proceed with a cap of 1,700 dwellings. The location of development is to be determined by the updated flood modelling and hazard analysis.
- V. Public recreation land uses should be shifted to lower land subject to higher flood risk.
- VI. The provision of dwellings beyond the 1,700 cap, below the new PMF line, is dependent on the provision of additional commensurate evacuation capacity.



Anthea Sargeant (Chair)
DPE Executive Panel Member



Dianne Leeson
Panel Member



Peter Cochrane
Panel Member

Appendix A - Material Considered by the Panel

Attachment ID / Date	Name	Author
NILL	BCC – Growth – Centre – Precincts – DCP – March - 2022	Blacktown City Council
NILL	HNVRFS Final Jul19-Vol-Ch10 Climate Change	WMA Water
NILL	HNVRFS Overview Report Jul19 web	Infrastructure NSW
IRD22 37287	Letter to Panel regarding the State-led rezoning of Marsden Park North	DPE
06.09.2018	Marsden park north biodiversity and riparian corridors assessment - 2018 09 06	EcoLogical
06.09.2018	Marsden park north built heritage and archaeological assessment part 2 - 2018 09 06	URBIS
06.09.2018	Marsden park north bushfire assessment 2018 09 06	EcoLogical
06.09.2018	Marsden park north community facilities and open space assessment 2018 09 06	URBIS
06.09.2018	Marsden park north consolidated site investigation part 1 2018 09 06	SESL Australia
06.09.2018	Marsden park north consolidated site investigation addendum part 1 2018 09 06	SESL Australia
06.09.2018	Marsden park north environmental assessment and remediation strategy part 1 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 2 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 3 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 4 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 5 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 6 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 7 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 8 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 9 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 10 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 11 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 12 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 13 2018 09 06	Cardno
06.09.2018	Marsden park north environmental assessment and remediation strategy part 14 2018 09 06	Cardno
06.09.2018	Marsden park north infrastructure assessment part 1 2018 09 06	J. Wyndham Price
06.09.2018	Marsden park north infrastructure assessment part 2 2018 09 06	J. Wyndham Price
06.09.2018	Marsden park north infrastructure assessment part 3 2018 09 06	J. Wyndham Price
06.09.2018	Marsden park north infrastructure assessment part 4 2018 09 06	J. Wyndham Price
06.09.2018	Marsden park north infrastructure assessment part 5 2018 09 06	J. Wyndham Price
PLUS IN (07.03.2023)	Marsden Park North Scheduled Land Lots	PLUS
Council IN (28.03.2023)	Response – Flood Advisory Panel – Marsden Park North - Questions on Notice	Council
Council IN (28.03.2023)	Flood Advisory Panel – Marsden Park North Attachment 1 – ILP – 2023 03 27	Council
Landowner Group IN (08.03.2023)	Marsden Park North – Flood Advisory Panel Presentation – FINAL 2023 03 08	Landowner Group
Landowner Group IN (08.03.2023)	Letter to MPN PAP Group	Landowner Group
Landowner Group IN (08.03.2023)	Marsden Park North – Flood Advisory Panel Presentation – FINAL 2023 03 22 – Session #2	Landowner Group
Landowner Group IN (16/05/2023)	Additional Information MPN Federal Budget	Landowner Group
TfNSW IN (28.04.2023)	Marsden Park North and West Schofields – TfNSW meeting agenda and minutes	TfNSW
TfNSW IN (28.04.2023)	TfNSW Advice	TfNSW
INNSW IN (06.03.2023)	INNSW Advice	INNSW
SES IN (23.03.2023)	SES Advice	SES