Department of Planning and Environment

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Westmead Private Hospital

Flood Planning Advice Report

Anthea Sargeant (Chair)
Peter Cochrane
Prof Richard Mackay, AM

30 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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Westmead Private Hospital

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Contents

Defined terms

Term	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARR	Australian Rainfall and Runoff Guidelines
Council	City of Parramatta Council
Department	Department of Planning and Environment
Flood Emergency Response Plan	Westmead Private Hospital Flood Emergency Detailed Response Plan (dated 21 July 2022), a sub plan Emergency Response and Disaster Plan 2022 (dated June 2022, prepared by Ramsay Health Care).
Flood Inquiry	NSW Flood Inquiry (July 2022)
Flood Report	Report prepared by Cardno titled, *Stage 4 Planning Proposal Flood Assessment, Westmead Private Hospital* (dated 25 February 2021)
FSR	Floor Space Ratio
IFD	Intensity Frequency Duration
INSW	Infrastructure NSW
Panel	Flood Advisory Panel
PLUS	Department's Planning and Land Use Strategy division
PLUS Request	PLUS request to the Panel, dated 10 January 2023 – see Section 1.1.
Planning Proposal	The Westmead Private Hospital Planning Proposal – PP-2021-7031
PLEP	Parramatta Local Environment Plan
PMF	Probable Maximum Flood
Proponent	Ramsay Health
SES	NSW State Emergency Service
Site	Westmead Private Hospital (shown outlined in red Figure 1)
TAG	Flood Technical Advisory Group
TfNSW	Transport for NSW

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**).
2. A Technical Advisory Group (**TAG**) was also established to deliver expert technical advice to Panels in accordance with the TAG terms of reference (dated 12 December 2022) and at the direction of Panels. The advice of the TAG is not binding on the Panels nor 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. On 11 November 2021, the City of Parramatta Council (**Council**) lodged the Planning Proposal, PP-2021-7031 (**Planning Proposal**), to the Department for a gateway determination. The Department issued the gateway determination with conditions on 24 December 2021. The Planning Proposal is at the pre-exhibition stage, following the submission of additional information by Council, in accordance with Condition 1 of the Gateway determination. The Planning Proposal seeks to amend the Parramatta Local Environment Plan 2011 (**PLEP**) to amend height and floor space ratio (**FSR**) limits on the Westmead Private Hospital site.
4. On 10 January 2023, the Panel received a request for advice from PLUS (**PLUS Request**) in relation to the Planning Proposal, which is detailed in Section 1.1 below.
5. Executive Director within the Department, Anthea Sargeant (Chair), and independent members Peter Cochrane and Prof Richard Mackay AM, were appointed to constitute the Panel with respect to this request.

1.1 Advice request

6. PLUS requested that the Panel provide advice and recommendations on how to proceed with the Planning Proposal. Specifically, the Panel was to advise whether the proposal adopts a tolerable, risk-based flood planning level considering a range of flood scenarios, existing and approved development, and existing and approved evacuation routes, ensuring new development in line with individual and cumulative evacuation capacity.

1.2 Material considered by the panel

7. In this review, the Panel considered a range of material (**Material**) detailed in Appendix A.
8. The Panel requested the TAG provide technical advice on specific flood-related risks of the Planning Proposal, 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 Planning Proposal adopts a tolerable, risk-based flood planning level considering the documentation as listed in Appendix A.
9. The TAG's advice is summarised in the Technical Advice Report dated 18 May 2023. The TAG advice comprises a compilation from several independent experts.
10. The Panel additionally sought advice from relevant agencies including the NSW State Emergency Service (**SES**), Infrastructure NSW (**INSW**), Transport for NSW (**TfNSW**) and the Department's Chief Engineer.

1.3 The Panel's meetings

11. As part of its advice, the Panel met with the stakeholders as set out in Table 1.

Table 1 Panel's Meetings

Meeting	Date
Site Inspections	1 May 2023
PLUS	3 May 2023
Proponent	3 May 2023
Council	4 May 2023
Department's Chief Engineer	4 May 2023

2 Planning Proposal

2.1 Site and locality

12. The extent of the Westmead Private Hospital Stage 4 proposal currently under consideration by the Department can be seen outlined in red in Figure 1 (the **Site**). The Planning Proposal area shown in Figure 1 is approximately 20,256 m^2 in size, bounded by Mons Road to the east, Darcy Road to the south, and Milson Park to the northwest, and is part of the broader Westmead Health and Innovation Precinct. The Site is approximately 2 km northwest from the Parramatta central business district.

13. The Site is currently zoned B4 Mixed Use, with a maximum building height of 12 m, and a maximum **FSR** of 1.5:1. Use as a hospital is permissible in this zone, with consent.

14. Milsons Creek flows from the local catchment south of the site and is encapsulated underneath the hospital. It then flows northwest from the site into Toongabbie Creek, which forms part of the Parramatta River Catchment.

2.2 Strategic context

15. Westmead Private Hospital is located within the broader Westmead Health and Innovation Precinct. This is the largest concentration of health and hospital services in Australia and includes four major hospitals, four significant medical research institutes, two university campuses, and the largest pathology service in NSW. The precinct is identified across state, regional and local plans, and strategies, including:

- *Metropolis of Three Cities Central City District Plan* (Greater Cities Commission),
  - One of four innovation districts identified as catalysts for economic growth across the Six Cities Region,
- *NSW State Infrastructure Strategy 2018-2038* (Department of Planning & Environment),
- *Future Transport 2056 Strategy* (Transport for NSW),
- *Draft Westmead Place Strategy* (Department of Planning & Environment),
- *Local Strategic Planning Statement* (City of Parramatta Council).

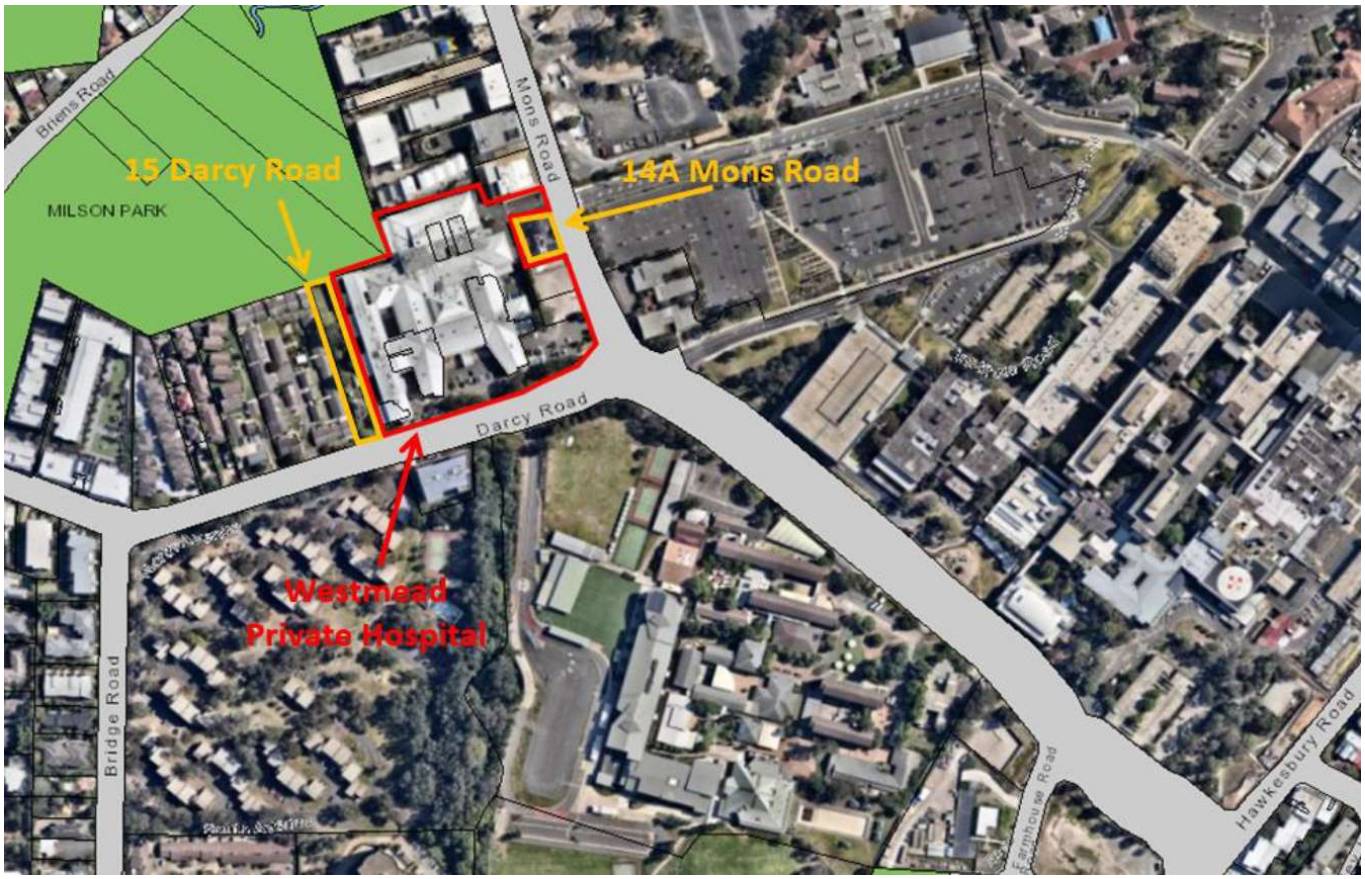


Figure 1. Westmead Private Hospital Planning Proposal Boundary (Planning Proposal, 2022)

2.3 Background of Planning Proposal

16. Table 2 below provides a brief history of the Planning Proposal to date.

Table 2. Timeline of Westmead Private Hospital Stage 4 Planning Proposal

Date	Proposal Stage	Comment
2017	Westmead Private Hospital redevelopment commenced	Stage 1 of the Westmead Private Hospital redevelopment commenced.
November 2021	Submitted	Planning Proposal for Stage 4 works submitted to the Department for gateway assessment and determination.
24 December 2021	Gateway Determination Issued	Gateway Determination issued subject to conditions including that Council address section 9.1 Direction 4.3 Flood Prone Land – to understand the full impact of flooding on the site for sensitive uses.
10 August 2022	Additional modelling submitted	Council submitted additional modelling and documentation addressing the conditions raised and highlighting a number of concerns.
Current	Department – Pre-Exhibition	Council submitted additional information as per Condition 1 of the Gateway determination.

2.4 Planning Proposal

17. The Planning Proposal is seeking to amend the PLEP as follows:

- Increase the maximum height of the Buildings Map from 12 m to part 18 m and part 68 m which equates to 17 storeys approximately (refer Figure 2).
- Increase the maximum FSR Map from 1.5:1 to 2:1 (refer Figure 3).

18. Table 2 shows the particulars of the expansion proposed between the various stages of the overall redevelopment of Westmead Private Hospital.

Table 2 Redevelopment Details (Westmead Private Hospital Planning Proposal, 2021)

Particular	Existing	Stage 3	Stage 4	Increase from Stage 3 to 4
Overnight beds	191 beds	219 beds	533 beds	314 beds
Procedural rooms	23 rooms	25 rooms	25 rooms	0
Consulting rooms	15 rooms	28 rooms	41 rooms	13 rooms
Emergency Department bays	0 bays	0 bays	14 bays	14 bays
Car parking	349 spaces	398 spaces	766 spaces	368 spaces

Figure 2. Proposed changes to height of buildings controls

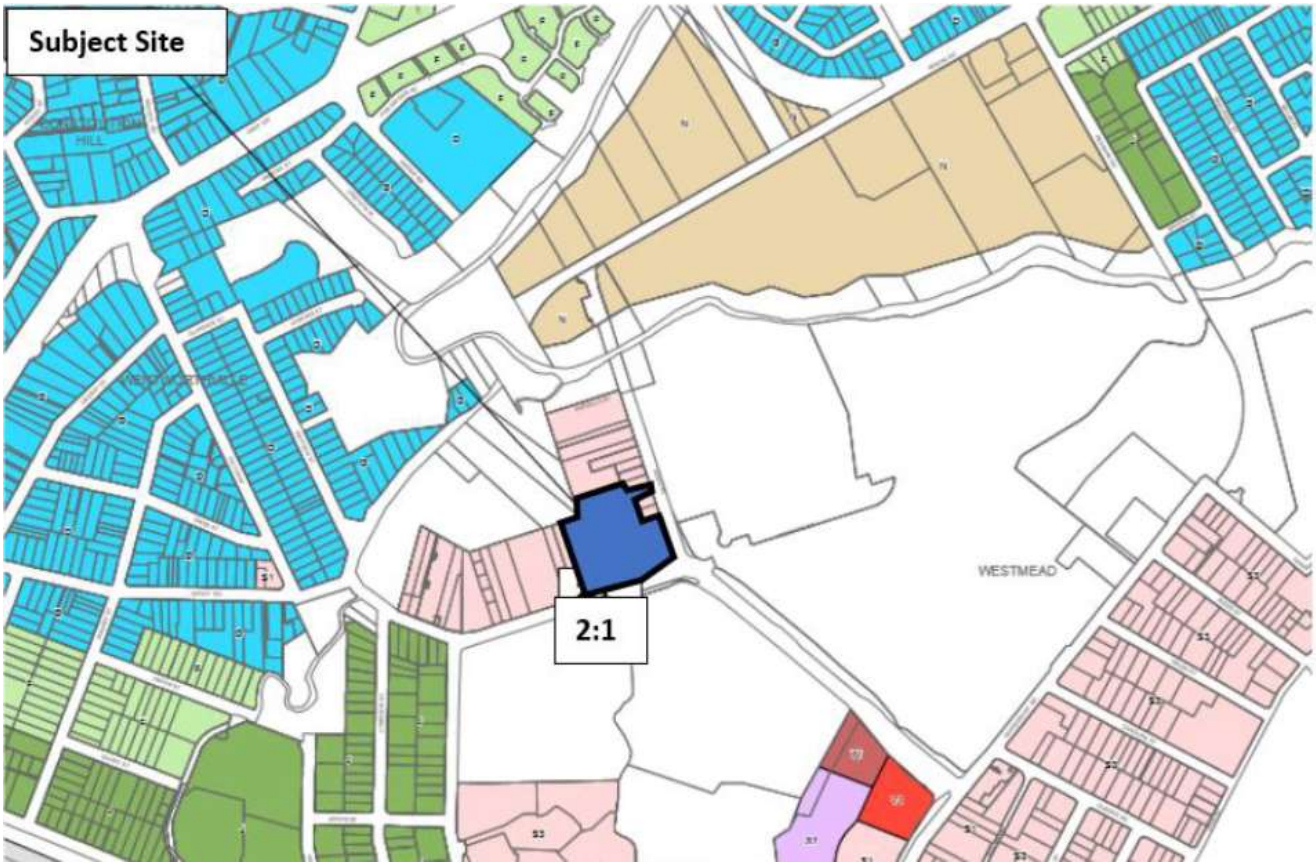


Figure 3. Proposed changes to FSR

3 The Panel's consideration

3.1 Key Issues

19. The following section outlines the key issues identified and considered by the Panel in response to the PLUS Request.

3.1.1 Flood Modelling

Council Comments

20. In its meeting with the Panel on 4 May 2023, Council noted:

- There is potential for longer inundation durations at the site compared to the modelling prepared by the Proponent. Council does not accept that flooding would necessarily occur as a single event, nor that the duration occupants would be required to shelter in place is limited to 4.5 hours.

21. In its written response to questions taken on notice, provided 12 May 2023, Council advised:

- An additional 20% increase in rainfall intensities is expected due to climate change impacts, as well as a probable increase in intense storm frequencies and durations (p.4).

- Council is currently undertaking comprehensive flood modelling for the LGA, which indicates the potential for storms to produce flooding that last longer than the 4.5 hours modelled in its Stage 4 Planning Proposal Flood Assessment, Westmead Private, prepared by Cardno, 2021 (Flood Report). Council's modelling indicates that storms lasting longer than 12 hours would produce floods higher than the 1% Annual Exceedance Probability (AEP) level up to the Probable Maximum Flood (PMF) (p.4).
- Council's records for the Marsden Street Weir during a significant storm and flooding event, in April-May 1988, indicate the potential for flooding events with extended durations with multiple flood peaks over the course of three days.
- The substantial stormwater canal underneath the building which contains Milsons Creek is of key concern, noting that significant flow rates of water are expected for the 1% AEP event and up to a PMF, which are likely to generate dangerous flood hazard conditions. Council noted the potential for the Milsons Creek culvert entry to become blocked in severe storms, with these significant flows diverted to the roadway, and around and through the hospital itself (p.5).
- Recent updates to Council's geographic information system regarding cross sections of the canal and resulting flood water flows, indicates these flows are significant and have not been appropriately captured in the Flood Report (p.5).

PLUS Comments

22. In its meeting with the Panel on 3 May 2023, PLUS made the following comments regarding the planning proposal:
    - PLUS advises it will form further views on whether the proposal has adequately considered climate change and whether flood modelling is sufficient following receipt of the Panel's advice and further work through the planning proposal process.

Proponent Comments

23. In its meeting with the Panel on 3 May 2023, the Proponent made the following points regarding the modelled flood levels and durations, and structural integrity of the proposed new building:
    - The PMF event is controlled by backwater flooding from Toongabbie Creek, with a critical duration of 3-4 hours, rather than local catchment flooding of Milsons Creek. These mechanisms for flooding are considered in the Flood Report.
    - The flood hazard rating is H5 at PMF levels for some parts of the Site, because of the depth of inundation, rather than the predicted water velocity. This rating indicates that all buildings are vulnerable to structural damage.
    - There is the potential for the modelled peak and duration of flooding to vary depending on the level of antecedent rainfall, and whether a large rainfall burst is embedded in a longer event. This may also influence the resultant flooding behaviour.
    - These variations have the potential to result in a longer critical flooding duration than the 4.5 hours detailed in the Flood Report.
    - The PMF level may change due to climate change impacts on rainfall intensities. However, this is unlikely to rise by more than 1 m due to the small size of this catchment.
    - Floor 1 of the hospital, which is the first habitable floor, and is the first level to which occupants will evacuate to in an extreme flood event, is currently located more than 1 m higher than the current PMF.
24. Following the meeting, in its written response to questions on notice from the Panel provided 11 May 2023, the Proponent advised:

- That while the 4-hour PMF event generates the highest flood peak, there are other events that may result in longer critical duration of isolation, with slightly lower peaks. The Proponent advises that the duration of unsafe conditions may extend to 6 hours. However, these unsafe conditions are not expected to extend beyond this timeframe.

TAG Advice

Flood Impact Assessment:

25. The TAG considers that the Proponent's Flood Report is likely to be unrepresentative, as it does not include an appropriate consideration of climate change and has not been amended to address the Proponent's peer reviews.
26. The TAG considers that if the modelling was updated to address these matters this would likely materially affect the flood heights for each flood scenario.
27. TAG members note that the flood modelling did not include all the flooding scenarios recommended by the Flood Inquiry, e.g. 0.02% AEP.
28. TAG members advise that PMF modelling is highly uncertain, and the 3-to-4.5-hour durations modelled were likely chosen as they cause the highest flood levels. TAG members consider that longer and shorter duration PMFs are plausible. However, additional modelling is required to quantify the range in uncertainty.
29. Regarding the PMF height, TAG members note climate change is anticipated to influence the PMF. However, given that the PMF level (without incorporating climate change) is 18.6 m AHD, and the first habitable floor (Floor 1) soffit height is 19.45 m AHD, there appears to be a reasonable level of tolerance for climate change for the Floor 1 height.

Flood Modelling:

30. The TAG agreed that updated flood modelling is required to consider the impact of climate change and the peer reviews on flood behaviours and hazards. Specifically considering:
    - modelling of additional flood scenarios as detailed in the Flood Inquiry, e.g. 0.02% AEP,
    - modelling of flooding events for the local catchment, up to the PMF,
    - more accurately assess the impacts of climate change, including the:
        - use of Australian Rainfall and Runoff 2019 guidelines (**ARR**) Intensity–Frequency–Duration,
        - rainfall intensity, including the Probable Maximum Precipitation (PMP),
        - flood frequency, heights, durations, and hazards,
        - use of a range of flood modelling products, to better understand the broad range of climate change impacts to flooding predictions.
    - revised modelling to address the recommendations from the Water Technology review of the Flood Report.

Flood Hazard and Behaviour:

31. Regarding flood hazards, the TAG members note the site will place highly vulnerable people in a high hazard flood area and that the impact of climate change may increase the hazard level.
32. Some TAG members note additional modelling of the hazard rating from the local catchment is required given how rapidly flood waters may rise in this type of flood event.
33. The TAG notes the site will be surrounded by dangerous water (up to hazard level H3 (1% AEP) and up to H5 (for a PMF event)) making offsite evacuation too dangerous. As such, the site would rely on sheltering in place, discussed in Section 3.1.2 below.

Cumulative Hydraulic Impacts:

34. Regarding cumulative impacts or the displacement of flood water offsite the TAG found that the modelling provided predicts no offsite impacts for the modelled 1% AEP or the PMF event.

Agency Comments

35. In its advice provided to the Panel on 19 May 2023, SES noted:

- Additional modelling is required to address the Flood Inquiry recommendations, including:
  - longer storm durations for the full range of flood events e.g. 5%, 0.2% AEP etc.,
  - the use of the current ARR 2019 Intensity Frequency Duration (IFD) rainfall curves and guidance, instead of the superseded ARR 1987.
- Regarding climate change, there is no consideration of climate change impacts on the PMF. Climate change is likely to result in a higher flood peak, longer-duration events, increased flood hazards and more frequent inundation. This would therefore have implications for the assessment of flood risk to the hospital.
- Regarding the modelled 4.5-hour PMF duration, it advised that further modelling should be completed to understand longer duration events as well as the possibility of successive storms.
- Regarding the hazard posed by the flood waters on the site, the SES notes the site is predicted to have (p.3) "*high hazard flooding with depths of 4 m across the site in a PMF, that is unsafe for people and vehicles and all buildings are vulnerable to structural damage*."

36. In its advice provided to the Panel on 15 May 2023, INSW noted:

- The design has been informed by the flood behaviour, ensuring no impact on adjacent properties in the 1% AEP flood event and PMF.
- The Proponent should reconfigure access to the site to ensure it is flood free for the 1% AEP flood as a minimum, and for as large an event as possible. INSW advised that to achieve this, modelling of events between the 1% AEP and PMF should be undertaken.
- Sensitive hospital functions such as ambulance triage and emergency department concierge need to be located above the PMF.
- The Proponent is required to model flood scenarios to determine the impact of climate change on flooding and use the appropriate climate change scenario to determine relevant flood levels.

37. TfNSW did not provide any comments on flood modelling in its advice provided to the Panel on 15 May 2023.

Panel consideration of flood impact assessment

38. The Panel notes that the site straddles the channelised canal of Milsons Creek that discharges into the nearby Toongabbie Creek. The Panel acknowledges that this is an existing circumstance of the Site which contributes to the Site being highly flood prone, and this Planning Proposal does not seek to change the land use, rather to intensify development.

39. The Panel shares the Council's, TAG's, SES's and INSW's concerns with the Flood Report and considers that it does not appropriately account for the impacts of climate change. The Panel considers that climate change would materially change the predicted flood behaviours on the site, including but not limited to, flood heights, durations, and velocities and therefore it is critical that the Flood Report is appropriately updated to address climate change.

40. The Panel is also concerned that outdated rainfall data has been used in the Flood Report. The Panel notes the SES's concerns with the Flood Report regarding the use of the superseded ARR guidelines (1987). The Panel notes the Water Technology Peer Review (p.11) states "*The ARR 1987 Intensity Frequency Duration (IFD) dataset was used for this assessment with a 1% AEP*" and it recommends (p.12) "*The ARR 2019 IFD and guidelines for flood estimation are industry standards which should be applied in any flood modelling and drainage investigations*".

41. The Panel also notes the TAG recommended that the Flood Report should be updated to address the Water Technology peer review and the ARR 2019. Consequently, the Panel agrees with the SES and the TAG and considers that the use of outdated rainfall data further undermines the reliability of the predictions within the Flood Report, which is compounded by modelling that does not take climate change into account.

42. Regarding the hazard rating of flood waters impacting the site, the Panel shares the concern of the Council, SES, and the TAG that this proposal would potentially expose highly vulnerable people to hazardous flood waters of up to H3 (unsafe for children and elderly) in a 1% AEP and H5 (unsafe for people and vehicles) in a PMF. The Panel is also concerned that these hazard ratings are likely to be higher if climate change and the latest ARR 2019 rainfall data were used.

43. The Panel recommends the Flood Report is updated to accurately understand the risk posed by flood waters to the site, including updating modelling to:

- consider the potential impacts of climate change through a range of flood modelling products, to better understand the broad range of climate change impacts to flooding predictions including rainfall intensity, the PMP, flood frequency, heights, durations, and hazards,
- address the recommendations in the Water Technology Peer Review,
- use ARR 2019 guidelines and Intensity–Frequency–Duration rainfall curves, and
- address Council's updated flood modelling.

3.1.2 Evacuation

Council Comments

44. In its meeting with the Panel on 4 May 2023, Council noted the associated constraints regarding evacuation and advises:

- Westmead Private Hospital would be surrounded in all directions by hazardous floodwaters in severe flood events. This will result in the front and side entrances being unsafe for people and vehicles, particularly noting the presence of sick, frail, disabled and vulnerable people attending the hospital. Therefore, off-site evacuation is not seen by Council as a viable evacuation option (p.5).
- Council considers there are several key issues with the shelter in place strategy, given the vulnerability of the occupants. Further, Council considers the maximum shelter in place duration stated by the Proponent of 4.5 hours is potentially underestimating the actual emergency duration (see paragraph 21).

PLUS Comments

45. In its meeting with the Panel on 3 May 2023, PLUS noted the following general comments:

- There are practical barriers to safe and effective offsite evacuation.
- The existing traffic conditions around the Westmead Private Hospital site display significant congestion. In light of this, additional traffic generated from people attempting to evacuate during a flooding event, would be likely to contribute to already congested traffic conditions.

- There is insufficient information for PLUS to have confidence that staff and visitors would adhere to the shelter in place strategy, rather than accessing their vehicles to evacuate and thereby prevent them being flood-damaged.

Proponent Comments

46. In its meeting with the Panel on 3 May 2023, the Proponent noted regarding the feasibility of horizontal (off-site) evacuation:
    - Due to the low response times available in the event of flooding, driven by the rapid rise of floodwaters, off-site evacuation from the site is not feasible, particularly considering the likely low levels of mobility for many occupants.
    - Vertical evacuation in the form of retreat from the Ground Floor of the hospital is a primary aspect of the flood response for the site.
47. Following the meeting, in its written response to questions on notice, provided 11 May 2023, the Proponent further advised on the vertical evacuation and shelter in place strategy:
    - Regarding consistency with the Department's Draft Shelter in Place Guidelines (which were exhibited after the Flood Emergency Response Plan was finalised), it is acknowledged that horizontal off-site evacuation is preferred by SES prior to streets being cut by floodwaters.
    - Due to the relatively short period of time in which flood waters would rise, off-site evacuation would potentially need to be commenced prior to the start of an extreme storm, or before observing additional flow in watercourses and based on rainfall forecasts. Accordingly, people commencing evacuation once floodwaters are observed would likely encounter unsafe conditions.
    - Detail would be provided in the State Significant Development Application stage regarding the procedures to ensure adherence to the shelter in place strategy. This would include updating the Flood Emergency Response plan to prevent vehicles from evacuating the car park during a flood event.

TAG Advice

48. The TAG notes that the primary evacuation strategy is to shelter in place, by evacuating the ground floor and ground level car park up to the first habitable floor, Floor 1, as detailed in the Flood Emergency Response Plan.
49. The TAG raise concerns with the vulnerability of occupants and the predicted rapidly rising flood waters leading to a situation where there is a risk to life. The TAG considers this risk is exacerbated by an over reliance on staff to monitor gauges and flood warning systems ahead of an emergency, and by the limits of relying on only one (vertical shelter in place) evacuation strategy.
50. The TAG has also raised concerns regarding the continuation of essential utility services during a flooding emergency, noting that while some services like power are located above the PMF, other critical services like telecommunications, sewer and water are not.
51. The TAG members have identified several issues with the supplied documentation and consider that important improvements are needed for this strategy to work successfully. These are:
    - Identifying and addressing the need to work with patients of low to no mobility,
    - Reducing reliance on human compliance with the shelter in place strategy and for staff to monitor flood gauges and other critical information,
    - Including details of how essential services would be maintained, and
    - Updating to appropriately address relevant guidelines, such as:
        - Parramatta City Council Floodplain Matrix,

- Draft Shelter-in-Place Guideline (Department, 2023),
- Support for Emergency Planning – Flood Risk Management Guide (Department, 2022), and
- Evacuation Management Guideline (Resilience NSW, 2021).

Agency Comments

52. In its advice provided to the Panel on 19 May 2023, the SES cautioned that:
    - For a flood event which would impact the ground floor, there is not enough time to evacuate.
    - The time in which it would take for floodwaters to rise from the trigger level (14.4 m AHD) to the ground level (16.4 m AHD) is around one hour and is less for the ground floor carpark (p.6).
    - There is insufficient time for the nominated decision makers in the Flood Emergency Response Plan to decide the course of action, communicate the required action, for affected people to process and act on the decision and finally for the evacuation movement to occur (p.6).
53. SES also noted several concerns with the shelter in place strategy, including:
    - If there are many people trapped in the building or if secondary risks emerge (e.g. no sewer service, power, water, or food), this may result in the need for mass rescue. The SES state (p.5) that the mass rescue of people cannot be relied upon and has several risks, including:
        - Insufficient number of flood rescue boats for the number of people, (which the SES experienced in Sydney and Wollongong during flash floods on 9 February 2023).
        - Insufficient air lift capacity,
        - Severe weather which makes rescue by boat or air more difficult (e.g. wind and waves),
        - Exposure to contaminants, poisons, diseases, debris, etc.
    - Evacuation of hospitals and aged care can be complex and is known to be associated with an increased rate of mortality in patients and nursing facility residents[1].
    - That PMF flood events are likely to last longer than the 4.5 hours modelled in the Flood Report, and that the shelter in place duration would likely be longer.
    - The Flood Emergency Response Plan is too technical, requiring simplification and updating (p.6).
54. In its advice provided to the Panel on 15 May 2023, INSW noted the Flood Emergency Response Plan:
    - Currently contains significant amounts of engineering detail, and should be abridged and put into an easy-to-read format, containing only information required for an emergency response, including:
        - Photos and directions on how to read the water level gauges referenced,
        - Easy to follow instructions for using FloodSmart Parramatta,
        - Concise instructions for emergency management staff to follow during a flood event for existing and proposed facilities.
    - Detail should be provided regarding how the water level gauges relied upon in the emergency response are operated and maintained.

[1] Rojek A, Little M. Review article: evacuating hospitals in Australia: what lessons can we learn from the world literature? Emergency Medicine Australasia.

- Additional details should be provided including a risk assessment of the additional development, in light of the introduction of ICU beds and an emergency ward.

55. In its advice provided to the Panel on 17 May 2023, TfNSW noted:

- Due to the constrained nature of the existing road network in the precinct, TfNSW advised that State Significant Infrastructure is targeted towards public and active transport, and that any flood evacuation measures will need to consider alternative means of emergency management, including shelter in place.
- TfNSW regards the commitment of Council to engage an independent consultant (Molino Stewart) to undertake a flooding assessment of the proposal, including reviewing and assessing risks to occupants, as satisfactory, given the flood risk of this location and the nature of the site.

56. In his response to agenda questions in the meeting with the Panel, 4 May 2023, provided as a written draft on 10 May 2023 and confirmed on 29 May 2023, the Department's Chief Engineer notes that the duration of a flood emergency may be longer than the duration of inundation. The Chief Engineer noted (p.2) that whereas floodwaters in an extreme event may peak in 4.5 hours or less, that the overall flood emergency would last longer and significantly affect the wider community. As such, the shelter in place duration may well be far greater than 4.5 hours.

Panel considerations

57. The Panel shares the concerns of the SES and the TAG regarding rapidly rising flood waters posing a high risk to the safe vertical evacuation of the ground flood building and the carparks. The Panel also notes the Proponent acknowledges that flood water would rise rapidly.

58. The Panel shares the concerns of SES, the TAG, Council and PLUS regarding the vulnerability of patients and the staff caring for them and considers the evacuation of people who are less mobile or immobile as a key risk for a safe evacuation from the ground floor and lower levels.

59. The Panel notes that the TAG have identified shortcomings in the Flood Report (see paragraph 25 - 34), and that accurate flood predictions may result in flood waters that are higher, faster and rise more quickly.

60. The Panel notes that TAG considers this risk is exacerbated by an over reliance on staff to monitor gauges and flood warning systems ahead of an emergency, and by the limits of relying on only one (vertical shelter in place) evacuation strategy.

61. The Panel notes that SES, INSW and the TAG have identified critical short comings in the Flood Emergency Response Plan, in particular being overly reliant on human behaviours in an emergency, little acknowledgment of low mobility or immobile patients, requiring staff to monitor flooding information and is overly complex and needs simplification.

62. Given the above, the Panel is concerned that the combination of the shortcomings in the Flood Report and the Flood Emergency Response plan combined with the vulnerability of patients and how quickly floodwater may rise, is likely to result in a high risk to life.

3.1.3 Mitigation Measures

Council Comments

63. In its meeting with the Panel on 4 May 2023, in relation to the design resilience and continuity of utility services during a flood event, Council noted:

- Regarding the structural integrity of the proposed new building, a new structure could theoretically be designed to withstand the flood forces. However, Council did raise concerns with the durability of the existing structures in an extreme flood event, with their role in supporting the new development unclear (p.6).
- Regarding the duration of shelter in place, given the likely level of damage to the site and surrounds in the aftermath of a severe flood, including damage to transport links and essential services, any shelter in place refuge may potentially need to be in use for days following a flood event (p.5).
- Insufficient detail has been provided regarding the design resilience to demonstrate the continuation of back-up essential services such as power, water, and sewer services in the event that these are cut off in flooding, and whether back-up services would have capacity for longer durations of isolation in extreme events, noting the size and nature of this proposed development (p.5).
- The mitigation measures proposed rely upon the responsibility of the hospital operator in perpetuity, which Council does not consider is appropriate to adequately manage risk (p.3).

64. Following the meeting, in its written response to questions on notice from the Panel, provided 12 May 2023, regarding other shelter in place strategies in the Parramatta LGA, Council advised that while shelter in place strategies are used elsewhere in the Parramatta LGA where evacuating horizontally faces challenges or constraints, Council is not aware of any shelter in place strategies based on a 4.5-hour duration (Council, p.3).

PLUS Comments

65. In its meeting with the Panel on 3 May 2023, PLUS noted that it does not yet have a view on the suitability of the shelter in place strategy and the 4.5-hour duration modelled by the Proponent. However, it was noted that given the nature of the hospital and its occupants any assumptions will need to be revisited.

Proponent Comments

66. In its meeting with the Panel on 3 May 2023, the Proponent's written response to agenda questions regarding how the site would maintain essential services during a flood event indicated:
    - "*Key services infrastructure has all been located on Level 1 above the PMF Level*." Back-up power will be provided to ensure there is capacity for a minimum of 24 hours without mains power supply available "*to guarantee there is no disruption to life-saving medical equipment, and areas that require essential power supply*". This is a requirement as per the relevant health guidelines (AS3009) (p.16).
    - Regarding the structural integrity of the proposed building in extreme flood events, the foundations of the proposed building would not likely require additional engineering. However, this will be further considered in detailed design processes. Additionally, the Proponent advised that the floodwaters in an extreme event are expected to inundate and flow through the ground floor level. The differential of the internal and external hydraulic force of the water on the building would equalise in this case where water flows through rather than around it.

67. Following the meeting, in its response to the Panel's further questions on notice, regarding the structural integrity of the building and maintaining essential services during a flood event, the Proponent further advised:
    - The Westmead Private Hospital Stage 4 works propose that Floor 1 is the floor to which occupants retreat to from the ground level and shelter in place. This floor is at 1.55 m above the current PMF level (p.9).

- Regarding the duration of isolation expected, the Proponent acknowledged the potential for longer PMP storms which could generate a lower PMF level yet inundate the site for a longer duration than 4.5 hours. This increase in duration may extend the isolation period up to 6 hours (p.10).
- The Proponent contends that potential for isolation duration up to 6 hours, as well as the fact that habitable levels are located above the PMF, is consistent with the Department's Draft Shelter in Place Guidelines (p.8).
- Details regarding access to on-site systems to provide power, water, and sewer services during and beyond the event for the full range of flooding is to be provided in the design process at a later stage (p.8).
- Regarding consideration given to potential increases in frequency and depth of flooding, the Flood Emergency Response Plan responds to flood events regardless of how they originate, and as such, it accommodates any change in the frequency or depth of flooding which may be associated with climate change impacts (p.9).

TAG Advice

68. The TAG noted the primary mitigation measure is to design the building to withstand flooding and to locate the majority of the new building and carpark above the PMF.

69. The TAG identified that given the highest hazard rating (H5) of flood waters impacting the site, the Proponent should seek advice regarding the structural engineering design requirements to ensure the building can be appropriately built. The TAG also notes that flood water levels are likely higher given climate change impacts (paragraph 26).

70. The TAG acknowledges that the Flood Model determines that there would be no displacement of flood waters off-site and raised no further issues regarding the displacement of flood waters from the building design.

Agency Comments

71. In its advice provided to the Panel on 19 May 2023, SES noted:

- The Proponent's information indicates bollards, flood doors, and flood barriers would be used to mitigate the flood risks. However, there is still the residual risk that these are not maintained, malfunction, fail, or topple resulting in rapid inundation at dangerous velocities (p.7). Further, the SES note limitations with the flood protection measures noting these (p.7) "*would be practical only to a level of 500 mm above the ground floor, which is still less than the 1% AEP plus freeboard without factoring in climate change, and 2.6 m below the PMF*."
- Regarding back-up power supply and essential services, these must be located above the PMF level, and must remain operational throughout a flood event.
- The current substation is located at ground level, and it would be relocated as part of the Stage 4 development. However, it is unclear if the remainder of the essential services are able to be maintained and / or relocated.

72. In its advice provided to the Panel on 15 May 2023, INSW noted:

- Key infrastructure including the substation and related equipment would be relocated above the PMF, which is critical in allowing the facility to function during a flood event.
- Sensitive services proposed should all be located above the PMF, including Ambulance Triage and the Emergency Department Concierge.

73. In its advice provided to the Panel on 17 May 2023, TfNSW provided no advice regarding mitigation measures, outside of evacuation (see paragraph 55).

74. In his response to agenda questions in the meeting with the Panel, 4 May 2023, provided as a written draft on 10 May 2023 and confirmed on 29 May 2023, the Department's Chief Engineer, noted:

- Regarding the design of the new building within the site (p.2) "*the proposed structure will be a comprehensively engineer[ed] structure, that will be designed in accordance with well-established engineering principles and, where applicable, Australian and International Engineering codes and standards. The buildings of the Project will encounter during its design life, numerous types of loads. These types of loads will vary in their size and the nature of application to the building. The buildings will be subject to flooding loads, floor loads from various pieces of equipment placed into the building, external wind loads, and many other load combinations making up the building design loads (including the regular large westerly winds that blow across the Westmead district). When designed, the building will be able to maintain structural integrity during a flood event. The integrity of the structure would not be compromised during a flood*."
- Regarding essential utility services, the Department's Chief Engineer noted:
  - The hospital is anticipated to have an uninterrupted power supply that is independent of the grid.
  - The nature of the Sydney sewerage system is such that, while components of the external treatment system may fail, wastewater would still flow away from the hospital.
  - Water supply to the hospital would be via the underground Sydney Water piped network. If this network is compromised then the entire district would be compromised, and the issue would not be isolated to the hospital site.

Panel consideration

75. The Panel notes the Proponent's advice, as well as advice from the TAG and the stakeholders, that for the shelter in place strategy to effectively minimise the risk to life, many complex systems must work in a co-ordinated manner in a high risk and dynamic situation.

76. The Panel notes the SES, the TAG and Council concerns regarding the vulnerability of patients and the need to move them quickly away from rapidly rising flood waters.

77. The Panel acknowledges the concerns of the SES, Council and PLUS, regarding the susceptibility of critical services that must be maintained during a flooding disaster. While the Proponent advises all critical services would be above the PMF, it is proposed that this information will be supplied at the development application stage.

78. The Panel acknowledges that the building design is typically a matter for the development application stage in the planning process. However, given the:
    - predicted hazard of the flood waters impacting the site, which may have been underestimated (paragraph 25),
    - reliance on the structural integrity of the building during PMF conditions,
    - vulnerability of hospital patients,
    - critical need to maintain essential utility services (power, water, sewer, lifts, and medical gases),
    - reliance of the shelter in place strategy on built systems and human behaviour, and
    - constraints on rescue operations were the proposed systems supporting the 'shelter in place' strategy to fail.

    The Panel considers the Proponent needs to demonstrate that these critical design elements are feasible and can be readily achieved prior to exhibition of the Planning Proposal.

4 Panel Advice

79. The Panel has undertaken a review of the Planning Proposal as detailed in the PLUS Request. In doing so, the Panel has considered the Material listed in Appendix A, including submissions and additional information submitted by Council, the Proponent, and PLUS, as well as the advice provided by the TAG, Department's Chief Engineer, and NSW Government agencies.

80. The Panel acknowledges the strategic context of the Westmead health and technology precinct. The Panel accepts that this Planning Proposal would contribute to the strategic objectives of increasing the capacity of hospital services in this rapidly growing area.

81. The Panel is mindful that flooding is not a new matter and is a risk that has already been factored into deliberations, strategic land use planning, and decision making up to this point. However, the Panel recognises there are challenges to be resolved for the Planning Proposal in response to greater awareness of flood risks and land use planning issues identified by the Flood Inquiry.

82. The Panel recognizes the site is flood prone, and that development of critical services, facilities, or infrastructure at this type of location does not align with Flood Inquiry recommendations. However, this is a legacy issue as the Planning Proposal does not seek to change the land use, but rather to intensify existing use and development.

83. The Panel considers the current Flood Report does not accurately account for climate change and has used outdated rainfall data (ARR 1987). Consequently, the Panel agrees with the SES and the TAG and considers that the lack of climate change modelling and use of outdated rainfall data undermine the reliability of the predictions within the Flood Report.

84. Regarding the shelter in place strategy as detailed in the Flood Emergency Response Plan, the Panel notes that the SES, INSW and the TAG have identified critical short comings. This includes being overly reliant on human behaviours in an emergency, little acknowledgment of the lack of mobility of the patients and requiring staff to monitor flood gauges. Further, the Plan is overly complex and needs simplification.

85. The Panel is concerned that the Proposal in its current form would pose a high risk to life. This is due to the combination of the shortcomings in the Flood Report and the Flood Emergency Response Plan, the vulnerability of patients, and the limited warning times for rapidly rising flood waters.

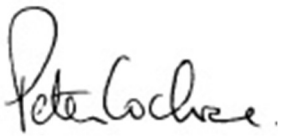
86. Consequently, the Panel recommends that the Planning Proposal should not proceed to exhibition until the following information has been submitted to PLUS for consideration and is regarded as satisfactory:

- Updated flood modelling, using a range of flood modelling products, that:
  - accurately accounts for climate change and explicitly details the climate change assumptions used in the modelling,
  - uses ARR 2019 guidelines for rainfall data,
  - models additional scenarios between the 1% AEP and the PMF, including but not limited to the 0.5%, 0.2% and 0.02% AEPs,
  - includes modelling of the local catchment that clearly details the rate of flood water rising for different flooding scenarios and the resultant flood warning times available for the site,
  - considers Council's updated flood modelling for the LGA.
- Update Flood Emergency Response Plan which:

- accounts for the information in the updated flood modelling, in particular accurate flood warning times,
- acknowledges and accounts for human behaviours in an emergency, such as noncompliance with evacuation instructions, or failure by staff to read flood gauges, or issue clear and direct advice to evacuate,
- acknowledges that many patients would have low or no mobility, and account for measures to address this,
- acknowledges the time required to shelter in place may be far longer than 4.5 - 6 hours,
- has been simplified to ensure it is user friendly, less technical and can be readily understood by a diverse audience in a high pressure scenario,
- appropriately address relevant guidelines, including:
  - Parramatta City Council Floodplain Matrix,
  - Draft Shelter-in-Place Guideline (Department, 2023),
  - Support for Emergency Planning - Flood Risk Management Guide (Department, 2022),
  - Evacuation Management Guideline (Resilience NSW, 2021).

- Provide further information and assurance demonstrating that the proposed new building at the Site can be feasibly designed to withstand hazardous flood water impacting the site, including under the most extreme conditions identified by the updated flood modelling. This information should include consideration of its structural design principles and how critical utility services (power, water, sewer, lifts, and medical gases), would be maintained for the full duration of isolation possible in a PMF. This needs to include further information on how the existing buildings and the new buildings would interact regarding the provision of essential services.

Anthea Sargeant
(Chair)
Department
Executive Panel
Member



Peter Cochrane
Panel Member

Prof Richard Mackay, AM
Panel Member

Appendix A – Material Considered by the Panel

Attachment ID / Date	Name	Author
Attachment 1	Correspondence – Flood Advisory Panel Referral Letter	Department
Attachment A	IPC Advanced Data Report – 12A Mons Road, Westmead	IPC
Attachment B	Planning Proposal	City of Parramatta
Attachment C	Council Report & Resolution Dated 25 October 2021	City of Parramatta
Attachment D	LPP Report & Minute dated 21 September 2021	Local Planning Panel
Attachment E	Urban Design Report	Various
Attachment F	Transport Impact Assessment (October 2019)	Ason Group
Attachment G	Flood Report (February 2021)	Cardno
Attachment H	Aviation Advice (February 2021)	Aviation Projects
Attachment I	Architectural Plans (February 2021)	STH
Attachment J	Gateway Determination Report	Department
Attachment K	Gateway Determination issued 24 December 2021	Department
Attachment L	Council Officer Responses to Gateway Conditions	City of Parramatta
Attachment M	Condition 1A and B Proposed KYS	Unknown
Attachment N	Condition 1C – Combined Architectural Plans and GFA Calcs	STH
Attachment O	Condition 1C – Combined Architectural Plans and GFA Calcs	STH
Attachment P	Condition 1C – Proponent Letter of Justification FSR – Willowtree Planning	Willowtree Planning
Attachment Q	Condition 1F – Westmead Private Hospital Flood Review Final	Molino Stewart
Attachment R	Condition 1F – Flood Emergency Response Plan	Ramsay Health Care
Attachment S	Condition 1F – Appendix A – Technical Review	Water Technology
Attachment T	Condition 1F – Appendix B – Cardno Response Nov 21	Cardno
Attachment U	Condition 1F – Appendix C – Review of Statutory Framework Dec 21	GLN
Attachment V	Condition 1F – Appendix D – Further comments from Cardno Jan 22	Cardno
3 May 2023	Council Response to Flood Advisory Panel Questions	City of Parramatta
12 May 2023	Council Response to Flood Advisory Panel Questions on Notice	City of Parramatta
11 May 2023	Compilation of Proponent Responses to Flood Advisory Panel Questions on Notice – Stantec Erilyan	Willowtree Planning
19 May 2023	SES Advice	SES
15 May 2023	INSW Advice	INSW
17 May 2023	TfNSW Advice	TfNSW
18 May 2023	Technical Advisory Group – Advice Report, Westmead Private Hospital	TAG
29 May 2023	Department's Chief Engineer Advice	Department