Powerhouse Parramatta: State Significant Development

34-54 and 30B Phillip St Parramatta and 338 Church St Parramatta
Development Application and Environmental Impact Statement: SSD-10416

Re Flood Risk Issues and Impacts Response to Submissions (RTS) and EIS

Response from Molino Stewart and Kylie Winkworth for Powerhouse Museum Alliance

1 Molino Stewart's *Parramatta Powerhouse RTS Review – Flood*, November 2020; and *Flood Risk Review,* July 2020

Museum experts in the Powerhouse Museum Alliance (PMA) have long standing concerns about the unexplained selection of the Phillip St site on the Parramatta River for the Powerhouse Parramatta development. These concerns have grown since the winning competition design was announced, and following the 9 February 2020 flood. The PMA believes that there is a poor understanding of flood risk issues to people and to the museum's collections and infrastructure from the development.

To better understand the flood risk issues of both a riverine and overland flood, I commissioned Molino Stewart to provide an expert flood risk review of the EIS reports and architectural plans for the Powerhouse Museum Alliance. Their report *Parramatta Powerhouse EIS Flood Risk Review* July 2020 was submitted to the EIS. Following the release of the Response to Submissions, the Powerhouse Museum Alliance asked Molino Stewart to review the RTS report, design modifications and technical appendices. Their new report is attached. It should be read in conjunction with their earlier July 2020 *Flood Risk Review.*

Molino Stewart are the leading consultants in flood plain risk management and planning, with particular expertise advising on flood planning and flood risk issues in the Parramatta River catchment and the Parramatta CBD.

The PMA is pleased to note that the RTS outlines notable modifications to the design of the undercroft, and the proposed use and public access to this space, (MS RTS Review 3.1). Flood evacuation routes are improved by separating overland flow paths from pedestrian paths (MS RTS Review 3.7). And there is more detail on the emergency power supply and the Flood Emergency Response (MS RTS Review 3.4 and 3.8). These changes vindicate the criticisms of the winning design of the architectural competition, the EIS designs, and analysis by the PMA, by Molino Stewart in their *Parramatta Powerhouse EIS Flood Risk Review* July 2020, and by the City of Parramatta Council (CoPC), among other agencies.

In a covering email Steven Molino notes *in summary, they have done a good job in improving the design to lessen risk to life and other information provided gives a clearer picture about building design and flood modelling. However, the results of the flood risk assessment are highly sensitive to some key assumptions used in the modelling. Using assumptions applied by Parramatta Council to all other developments in the CBD, the project would fail on all tests. Using the less conservative assumptions adopted by ARUP, most of the risks are likely to be acceptable with the exception of the risks to collections which are indeterminate. I say they are indeterminate because all the focus so far*

has been on the chance of floodwaters entering the building. No one has actually determined what would happen to the contents if it does and, taking into consideration the values attached to the building contents, what would be an acceptable probability of collections and items being damaged.

2 Molino Stewart RTS Review - Flood

Key points and issues of continuing concern arising from the Molino Stewart *Parramatta Powerhouse RTS Review- Flood* November 2020 include:

- The provision of more detailed information about the design and flood modelling assumptions has allowed a better assessment of the flood risks to people and property, (6).
- Even using the least conservative assumptions, there is a greater than 12% chance of flood waters entering the ground floor of the museum during its 100 year design life, (5.2; 6)
- The RTS Report and Appendix J now make it clear that the undercroft space is necessary for flood conveyance, allowing the flood waters to flow downstream through the undercroft; (the EIS had stated the space was for flood storage) 3.1.
- Redesign of the undercroft and its connections to the podium level has reduced to risk to life for people outside the building (5.3.1).
- Questions remain about the reliability of the lockable retractable mesh screens to the undercroft, and risks to neighbouring properties and the museum should these fail to be opened prior to a flood (5.1.1; 5.3.3.a; 6).
- Assumptions used by Arup in modelling overland flows are not as conservative as the City of Parramatta Council's adopted model which assumes a 100% blockage of underground pipes, (4.3.1; 4.3.3 and 4.4.4).
- Molino Stewart's RTS Review concurs with the CoPC's concerns about the development's reliance on underground pipes to convey overland flows away from Phillip St, with potential increased flood risks to the neighbouring property of 32 Phillip St (4.3.3; 5.1.2; 6).
- The assumed degree of blockage of underground pipes has consequences for calculations around the flood immunity of the museum development and its impact on neighbouring properties, particularly for overland flows (4.3.4).
- This must be resolved, as impacts are highly sensitive to this factor (4.3.1; 4.3.3; 4.3.4; 5.1.3.c).
- If the CoPC's standards of 100% blockage are used then the Powerhouse Parramatta could **flood as frequently as a 5% AEP (1 in 20) event**, or more (4.3.4).
- The Powerhouse Museum's collections displayed in the P1 ground flood presentation space are at risk of damage in a flood event, (5.2; 6).
- While Appendix J considers this may only be a 1 in 800 chance each year, or a 12% over the 100 year life of the building, the likelihood of flood damage is **not low**, as stated in appendix J, 8.3.2, and may not be an acceptable frequency given the value of the items and the damage they might sustain
- The above is based on the assumption of no blockage of the underground pipe network. This is optimistic. If the CoPC's assumptions are used the flood immunity is probably not even 1 in 20 per year, and the collections could be damaged several times during the life of the project (5.2).
- The available warning time for an extreme riverine flood event may be as little as two hours, (5.2).

- However the building is more likely to be impacted by overland flows than riverine flooding. In this case there may be virtually no warning that overland flows are likely to enter the building. Large items in the P1 space will not be able to be moved out of reach of the floodwaters at short notice, (5.2).
- In the event of floodwaters entering the ground floor and disabling the electrical substations, Appendix J states the building will have backup generator capacity to supply emergency lighting and power services for up to 10 hours. It does not appear that the power would maintain climate control in presentation spaces.
- The RTS Appendix A, section 3 MS7, p.54 states *there would not be any presentation spaces in the museum requiring AA climate control. Presentation Space 5 is the only space with A/B climate control*. This contradicts requirements in the Stage 2 Design Brief. Clarification is needed on climate control standards and the acceptable chance of damage to collections from flood waters and humidity (5.2, 5.2.1.d and e; 6).
- A risk framework is required for the collections and a design review is needed to determine how that can be achieved, **if at all**, based on the blockage factors and freeboard values which have been accepted as appropriate for the estimated flood levels at the site, (5.2.1,f).
- The building's fire safety systems are below 2.5m AHD and would likely be disabled by flood waters. If there were a fire in the building during a flood it is not clear if the fire suppression systems would function, while people may not be able to safely evacuate, (5.3.3.b; 6).
- Risks to life and the museum's collections are highly sensitive to assumptions about drainage network blockage and freeboard. A 12% chance of flooding in the 100 year life of the building may be acceptable, but may not be given the value of the items and the damage they might sustain. More frequent flooding, as calculated by alternative blockage and freeboard assumptions, is less likely to be acceptable, (5.3.3,c; 6).

3 Winkworth Flood Risk Comments on the EIS/ RTS

3.1 From the outset the whole question of flood risk on this site has been viewed as a building design issue not a matter of public safety and the appropriateness of choosing to build a major community/ education/ museum building in a high risk flood zone. The unexplained location of the museum on this site is entirely discretionary. Contrary to the SEARs requirements, the EIS/ RTS does not demonstrate that it has investigated *all remaining feasible alternatives and comparatively analyses their respective social impacts and benefits.* There are other sites for the museum in Parramatta, notably the Fleet St/ Cumberland Hospital Precinct. This site would pose minimal risks to the museum's collection, its building infrastructure and visitors.

3.2 This Powerhouse Precinct building will act as a viewing platform for flood events. People will gather to watch the flood water rushing under the museum through the undercroft. There are few details in the EIS/ RTS on how the museum will keep visitors safe across two highly permeable buildings with multiple doors and open access around the site. Consideration of public risk and flood emergency issues has been deferred until the completion of a Flood Emergency Management Plan (FEMP), kicking the public safety can down the road.

3.3 The appropriateness of selecting this flood-prone site for a museum use has not been explained or addressed in either the EIS or RTS. This is a building that is so exposed to flooding that the

undercroft is required for the conveyance of floodwaters, so the **floodwaters can flow underneath the museum**. Such is the risk and volume of water that the size of the undercroft has been enlarged after the EIS. The undercroft was not part of the competition-winning design. This raises questions about the competence of the early planning and site selection, the design jury's decision, and whether the design for a museum with floodwaters flowing underneath the building constitutes design excellence. Infrastructure NSW has not released the 2016 site selection reports or responded to questions seeking this information during the EIS and RTS phases. The safety of the museum's visitors and collections should have been the highest priority consideration in the site selection and design competition.

3.4 The Powerhouse Parramatta is required to have a design life of 100 years. Using Arup's modelling the **best case scenario** is that there is a 12% chance of floodwaters entering the ground floor of the museum over this 100 year period; Appendix J. Using the CoPC modelling, flooding could be as frequent as a 5% AEP (1 in 20) event, or even more frequent, ((MS 4.3.4). A Probable Maximum Flood (PMF) of 11.5 AHD would be 4m deep in the building. A flood with a 1 in 500 chance of occurrence per year has a 1 in 6 chance of occurring in the next 80 years.[1] With climate change driving more variable and extreme climate events it is difficult to understand why the NSW Government is investing $1b in a new museum on this site, knowing the building will be subject to flooding and put people and the museum's collections at risk.

3.5 None of the EIS/ RTS planning reports have addressed public safety with the high intensity uses planned for the Powerhouse Precinct, the 24x7 operation for 2 million visitors a year, a night-time entertainment precinct with young people and alcohol, and up to 10,000 people at any one time across two buildings and terraces, and multiple commercial hire events which add layers of risk and complexity. The EIS did not contain a summary of relevant information from the Stage 2 Design Brief which underpinned the selection of the competition winner, the design and facilities in the building, and which outlines how the building and precinct will be used. The development is no longer the science and innovation museum concept that was endorsed by Cabinet in April 2018. It has undergone a radical shift to a combined arts, education and entertainment precinct. The primary Ethos Urban EIS report and the Response to Submissions Report do not describe the range of activities, uses and facilities spelt out in the Stage 2 Design Brief.

3.6 Of note the Stage 2 Design Brief requires a development for the following:

- The two buildings will be completely porous with multiple doors, and open terraces accessible to the river bank
- The Precinct and building will host 2 million visitors in its first year
- It will operate 24 x 7 including as a night time entertainment precinct with 10 cafes and bars
- There may be multiple large events across the two buildings for up to 10,000 people at any one time
- The P1 space will be used for major concerts and the exhibition of large objects
- There may be 5,000 people in the P1 space and terrace and another 5,000 on the riverbank
- The facility will host major community festivals, conferences, a cooking school and immersive digital experiences
- The development will include a cinema and digital production studio, a school dormitory, and 40 apartments
- Live performances may be held in all presentation spaces

- Every space is available for commercial hire
- The facility will host international travelling exhibitions and have museum objects on high rotation[2]
- The presentation spaces P 3, P4, and P5 are required to meet international museum standard environmental conditions, meaning that temperature and humidity variations are tightly controlled; p131.

3.7 There is a serious anomaly between the Stage 2 Design Brief and the EIS/RTS around the climate control requirements in the building. Questions to DPIE and INSW about the proposed climate control standards for each of the presentation spaces have not been answered. The MAAS CEO told the current Legislative Council Museum Inquiry that all the presentation spaces will meet international museum standards for climate control.[3] However the RTS Appendix A, section 3 MS7, p.54 states *there would not be any presentation spaces in the museum requiring AA climate control. Presentation Space 5 is the only space with A/B climate control*. Either the MAAS CEO is unaware of the planned environmental standards in the building, which is supposed to be a museum, or the RTS/EIS is wrong. It is noted that MAAS is not the client in the Powerhouse Parramatta development. The client is INSW. This raises the question as to whether **INSW is building a museum, or the development is designed as a flexible arts, performance and entertainment centre not intended to show the MAAS collections or host international travelling exhibitions**.

3.8 The risks to collections exposed to a flood of the Powerhouse Parramatta development have not been adequately addressed in the EIS/ RTS. In dozens of reports across thousands of pages, the flood risks to the collections are dealt with in just one paragraph.

> The museum will house valuable collections. The design of the building has reflected the value of these collections by creating a ground floor level that would have an immunity of approximately 1 in 800 AEP (or 0.12%) including an allowance for freeboard. Only Presentation Space 1 will be located on this ground floor. All other presentation spaces within museum will be located on floors that sit above the PMF level. During flood events, some presentation spaces could be closed so that the humidity of the air in those presentation spaces can be maintained with air conditioning. Given the small fraction of presentation spaces below the PMF level, the warning time available for river flooding and the low probability of flooding of the ground floor, the likelihood of flood damage to the collections housed in the museum would be low. Appendix J, 8.3.2, p. 58.

3.9 As noted by Molino Stewart, in the event of floodwaters entering the ground floor and disabling the electrical substations, Appendix J states the building will have backup generator capacity to supply emergency lighting and power services for up to 10 hours. With water in the building, 10 hours of back-up power will not be adequate to maintain climate control systems in the presentation spaces. The submission from the Australian Institute for the Conservation of Cultural Materials (AICCM) to the current Legislative Council Museum Inquiry draws attention to the flood risks for collections and climate control systems.[4] Flood damage to the electrical substations would likely take weeks to repair and leave the museum's collections vulnerable to damage from uncontrolled temperature and humidity fluctuations and possible mould infestations. The suggestion of closing presentation spaces in flood events is unlikely to control damaging spikes humidity and temperature.

3. 10 The Stage 2 Design Brief specified that *the majority of Presentation Spaces should be designed to be above the overland PMF (RL 11.3) to ensure they are suitable for display of some Museum Collection items*.[5] Nevertheless the P1 space on the ground floor of the eastern building is designated for the museum's large and very large objects. These may include some of the museum's most significant objects. The finished floor level is just 7.5 AHD. This means it only has flood immunity up to the 1% AEP. This risk may be acceptable for a commercial or residential building with replaceable fittings and fixtures. It is not acceptable for a museum housing irreplaceable collections and expensive infrastructure. The museum's large and very large objects could not be relocated in a major flood event when public safety would properly be the focus of attention. Flood waters in the P1 space may wash large objects off plinths and other items out of showcases.

3.11 Dr John Macintosh notes in his submission to the Legislative Council's 2019 Museum Inquiry, *standard contemporary practice uses the assessed line of inundation of the PMF (Probable Maximum Flood) to demarcate the extent of flood hazard. That is, the location must be sited outside the PMF flood extents to avoid flood hazard.*[6] The reliance on using the level of a 100 year ARI as a guide to siting or planning a public museum is wrong in terms of visitor safety and the collections. As noted, a PMF would be 4m through the ground floor of the building. More extreme weather events are increasing as the climate warms. A senior SES official has warned that a super cell event over the Parramatta CBD could inundate the area in just nine minutes.[7] Molino Stewart notes the available warning time for an extreme riverine flood event may be as little as two hours, (5.2). There may be virtually no warning of an extreme overland flood event. In a major flood it is difficult to see how the museum could manage thousands of visitors spread across two porous buildings, open terraces, an undercroft and riverbank, with just nine minutes notice. We saw what this means in the searing footage of the supercell flash flood in Toowoomba and Grantham.

3.12 Parramatta Council's Floodplain Risk Management Policy requires that developments with high sensitivity to flood risk (e.g. "critical" and "sensitive" land uses) are sited and designed to provide reliable access and minimise risk from flooding - in general this would **not be anywhere within the extent of the Probable Maximum Flood**.[8] Sensitive uses and facilities include community and education facilities such as the proposed Powerhouse Parramatta development. In my view the development is not consistent with Parramatta Council's DCP and LEP, nor with Council's Floodplain Risk Management Policy, see 3.6, 3.7, 3.8. Council's Flood Plain Matrix Planning and Development Controls, table 2.4.2.1.2 indicate that a museum use in unsuitable for all three levels of flood risk, part 2.4. The project is obviously a dramatic intensification of the development and use of a high flood risk precinct, contrary to 2.4.2.1, objective 0.5, and 0.8 and Design Principles P.1, and P.3 in the DCP.

3.13 One of the primary obligations of a museum is the safe custodianship of its collection from one generation to the next. Year on year, the government and the community invests lot of money in keeping collections safe, in good condition, in buildings that we expect to be well designed and fit for purpose. Public confidence in a museum relies in part on its care and management of the collection. The discretionary siting of new museum in a location where the ground floor is likely to flood, and the floor below is designed for the conveyance of high velocity food waters, is contrary to all prudent museum planning. A flood in the museum poses risks to the collection and to the museum's reputation. The impact of these risks on the facility's capacity to host international travelling exhibitions is unknown. Of note, MAAS has had little control over the concept and development of

this project from the time it was first proposed that the Powerhouse would be moved to Parramatta. It had no say in the site selection. And it is not the client in this infrastructure project. The development may not actually be a museum. But if it is intended to operate as a museum for the next 100 years, project is taking reckless and unnecessary risks with the $1b infrastructure investment, and in locating the collection in a flood prone building.

Kylie Winkworth
Museum and heritage expert
Powerhouse Museum Alliance

The Powerhouse Museum Alliance has always supported a new museum in Parramatta. Its three main goals are:

- The Powerhouse Museum must remain intact at Ultimo as the flagship museum for MAAS, where it has been part of the education, design and creative life of Sydney since 1893. The MAAS Trust must retain control over the museum's property and collection.
- Parramatta should have a new museum or cultural facility that is unique to its cultures, place and stories, based on community cultural priorities and transparent consultation.
- The government should prepare a fair and equitable museum plan for NSW, which supports museums and communities in Western Sydney and regional NSW, **and** landmark museums in Sydney.

https://powerhousemuseumalliance.com/

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[1] Molino Stewart, *Parramatta Powerhouse EIS, Flood Risk Review*, July 2020, 4.2.1, p.25. https://www.parliament.nsw.gov.au/lcdocs/submissions/68636/0137b%20Ms%20Kylie%20Winkworth%20-%20attachment%201.pdf

[2] Stage 2 Design Brief, p.128, 152, 182, 186 https://maas.museum/new-powerhouse/competition-process/

[3] **Ms HAVILAH:** I am not sure where you got those figures from, but they are incorrect. There will actually be 18,000 square metres of exhibition and public space in Parramatta. The overall museum will be 30,000 square metres. All of the exhibition spaces will be climate controlled to international standard and the whole of the museum has actually been engineered to be able to present the Powerhouse collection.
Mr DAVID SHOEBRIDGE: In terms of the 19,800 square metres that was in the initial plans for the Parramatta facility, is it your evidence that all of that—all of the public exhibition spaces—will be engineered to a standard that has them at the museum standard for climate-controlled exhibitions?
Ms HAVILAH: All of the exhibition spaces at Powerhouse Parramatta will be designed to international museum standard, including climate control. I am happy to take it on notice so I can give you those accurate detailed figures.
https://www.parliament.nsw.gov.au/lcdocs/transcripts/2405/Transcript%20-%20Museums%20and%20cultural%20projects%20-%2029%20July%202020%20-%20Corrected.pdf, p.34

[4] https://www.parliament.nsw.gov.au/lcdocs/submissions/67878/0077%20Australian%20Institute%20of%20Conservation%20of%20Cultural%20Materials%20(AICCM)%20%20NSW%20Division.pdf

[5] Stage 2 Design Brief, p.249 https://maas.museum/new-powerhouse/competition-process/

[6] https://www.parliament.nsw.gov.au/lcdocs/submissions/59449/0174%20Dr%20John%20Macintosh.pdf

[7] https://www.smh.com.au/national/nsw/nine-minutes-to-flee-parramatta-s-catastrophic-flash-flooding-warning-20190214-p50xtv.html

[8] Parramatta City Council Floodplain Risk Management Policy, 2014, 1.b.