# FLOOD INUNDATION & RISK ASSESSMENT REPORT PROPOSED SUB DIVISION 337 LOWER PLATEAU RD BILGOLA PLATEAU

### ADDENDUM

Job No 211203 Mar 2024 Prepared by Lucas Molloy BE CPEng NER

#### **INTRODUCTION**

This Addendum (to the *Flood Inundation & Risk Assessment Report Proposed sub division 337 Lower Plateau Rd Bilgola Plateau* by Barrenjoey Consulting Engineers <sub>pty ltd</sub> dated March 2023) has been prepared in respect to Northern Beaches Councils request for further information dated 23 July 2023 (refer excerpt Appendix A). The proposed development is a 3 Lot residential sub division as detailed in the architectural plans by *Gartner Trovato Architects*. The expected flooding is associated with the natural watercourses that flow through the site, the watercourses collecting runoff from the ~8Ha catchment that extends to Plateau Park and Bilgola Plateau Public School above. Barrenjoey Consulting Engineers <sub>pty ltd</sub> maintain that the proposed development and indicative house designs will satisfy the intent of Northern Beaches Councils Water Management for Development Policy Section 10 Flood Risk Management and Pittwater 21 DCP Section B3.11 Flood Prone Land. And that Council should review/assess the development in respect to the detailed survey information and the analysis within this addendum.



1% Flood Extents (Northern Beaches Council Flood Information Report - Comprehensive)



Proposed subdivision plan (Gartner Trovato Architects)

#### **ANALYSIS**

The Council supplied *Flood Information Report – Comprehensive* details that the 1% AEP flood depths vary between 0.13m (pt 8) and 0.59m (pt12) and that the floodpath extents would be apprx. 6m in width, (refer excerpt Appendix B).

It is our opinion the Council supplied *Flood Information Report – Comprehensive* contains anomalies relevant to the "indicative ground level spot heights" (as sourced by Airborne Laser Survey) and the detailed site survey data (Level and Data Survey by Jaques Stutchbury Ref 11342/21), that significantly affect the depiction of flood conveyance on the site. The well-defined natural watercourses that flow through the site are not subject to a detailed analysis within the *Flood Information Report – Comprehensive* resulting in inaccurate and misleading flood extents / WLs etc, for example –

Flood Level Pt 2 (of the Council supplied Flood Information Report, refer excerpt Appendix B).

The predicated 1% AEP WL 78.33 with a depth of 0.22m (that corelates to a NGL of 78.22m, actual NGL 76.20m). Noting that interpreting the predicted ~ 6m flow width, the flood path depth would exceed 1.5m resulting in potential flowrates of apprx. 10m<sup>3</sup>/s, well in excess of the predicted flows for a 1% AEP event.

Compared to the detailed site survey data, at Flood Level Pt 2, depicting a formed watercourse apprx. 0.43m in depth / 1.25m in width / sloping at 15% (refer Appendix C). Resulting in a flowrate capacity of apprx. 1m<sup>3</sup>/s that being within 1% AEP expectation.

Barrenjoey Consulting Engineers <sub>pty ltd</sub> have analysed critical points and cross sections of the proposed development (refer Appendix D) using flow depths as per the *Flood Information Report* – *Comprehensive* and the detailed survey information as per the *Level and Data Survey by Jaques Stutchbury Ref 11342/2.* 

This analysis confirms the findings of the *Flood Inundation & Risk Assessment Report Proposed sub division 337 Lower Plateau Rd Bilgola Plateau* by Barrenjoey Council Engineers <sub>pty ltd</sub> dated March 2023 in that –

The proposed subdivision if carried out in accordance with recommendations within this Flood Inundation & Risk Assessment Report by Barrenjoey Consulting dated Mar 2023 will satisfy the intent of Northern Beaches Councils Water Management for Development Policy Section 10 Flood Risk Management and Pittwater 21 DCP Section B3.11 Flood Prone Land.

Noting the proposed subdivision access driveway will be suspended (and supported) well clear of the predicted flood extents.

It is our opinion the proposed residential buildings (as detailed in the attached architectural plans, subject to future DA submissions and review) will also accommodate the requirements of Northern Beaches Councils Water Management for Development Policy Section 10 Flood Risk Management and Pittwater 21 DCP Section B3.11 Flood Prone Land.

### **RESPONSE TO COUNCILS REQUEST FOR FURTHER INFORMATION**

From Northern Beaches Councils request for further information dated 23 July 2023 -

Flooding

The development is not compliant with Clause 5.21 of the Pittwater LEP and prescriptive controls and Clause B3.11 of the Pittwater DCP.

5.21(2) of the PLEP:

Due to the flood function and flood behaviour, as well as the scale of development, Council's flooding DA referral body is not satisfied that the development:

(a)is compatible with the flood function and behaviour on the land, and BCE response - The development <u>will be</u> compatible with flood function and behaviour as all structures are to be suspended beyond / out of / above the 1% AEP ie the existing natural watercourses (+1m buffer)

(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and

BCE response - The development <u>will not</u> adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties as all structures are to be suspended beyond / out of / above the 1% AEP ie the existing natural watercourses (+1m buffer)

(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

BCE response - The development <u>will not</u> adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses as all structures are to be suspended beyond / out of / above the 1% AEP ie the existing natural watercourses (+1m buffer) and by conditioning (within the DA approval and implementing) conventional sediment and erosion control measures (as per *Landcom publication Managing Urban Stormwater: Soils and Construction - Volume 1, 4th Edition (2004).*)

B3.11 of the PDCP

In regard to prescriptive control C5 – The applicant has not demonstrated that future development can be undertaken in accordance with the following DCP prescriptive controls:

A1 - As per the indicative designs, there is potential adverse impacts on flood levels and velocities. This includes in the PMF, which is applicable because the development is likely to have a significant impact on the PMF. The existing site layout of one large dwelling for the lot located outside of the high flood risk precinct is seen as the appropriate siting to minimise flood exposure, rather than a total of 3 buildings, 2 of which heavily impacted by flooding.

BCE response - There <u>will be no</u> potential adverse impacts on flood levels and velocities with all structures of the indicative designs being suspended above / beyond / out of the PMF flood extents ie the existing natural watercourses (+ 1m buffer).

A2 - The indicative designs appear to show buildings and structures in the 1% AEP Flood area which would cause loss of floodway or loss of flood storage.

BCE response - The indicative designs <u>does not</u> show buildings and structures in the 1% AEP Flood area with all structures of the indicative designs being suspended above / beyond / out of the 1% AEP flood extents ie the existing natural watercourses extent (+1m buffer) which <u>will not</u> cause loss of floodway or loss of flood storage.

C1 - It has not been demonstrated that the indicative designs can be constructed in accordance with this control, while the building heights remain within the allowable envelope. 1% AEP flood levels including Climate change plus freeboard should be used for floor levels as per B3.12.

C3 - All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site. The 3 lot proposal is not commensurate with this prescriptive control. It has not been demonstrated how there will be no obstruction of the floodway caused subsequent building of structures. There also appears to be blockage of areas in the 1% AEP flood area. BCE response - The development can be designed and constructed as not to impeded the floodway or flood conveyance on the site with all structures of the development being suspended above / beyond / out of the 1% AEP flood extents ie the existing natural watercourses extents (+1m buffer). As a result there will be no obstruction of the 1% AEP flood areas in the 1% AEP flood areas in the 1% AEP flood areas watercourses extents (+1m buffer). As a result there will be no obstruction of the floodway caused subsequent to building of structures and no blockage of areas in the 1% AEP flood area areas in the 1% AEP flood areas in the 1% AEP flood area areas in the 1% AEP flood area areas in the 1% AEP flood area areas in the

#### **SUMMARY**

The proposed subdivision if carried out in accordance with recommendations within the *Flood Inundation & Risk Assessment Report* by Barrenjoey Consulting dated Mar 2023 and this Addendum will satisfy the intent of Northern Beaches Councils Water Management for Development Policy Section 10 Flood Risk Management and Pittwater 21 DCP Section B3.11 Flood Prone Land. **The proposed subdivision access driveway will be suspended (and supported) well clear of the predicted flood extents.** 

It is our opinion the proposed residential buildings (as detailed in the attached architectural plans, subject to future DA submissions and review) will also accommodate the requirements of Northern Beaches Councils Water Management for Development Policy Section 10 Flood Risk Management and Pittwater 21 DCP Section B3.11 Flood Prone Land.

The indicative House designs will be suspended (and supported) well clear of the predicted flood extents.

It is to be noted that, due to the many complex factors that can affect a site, the subjective nature of a risk analysis, and the imprecise nature of the science of flood analysis, the risk of persons being injured, to life and property cannot be completely removed. The recommendations within this Report do not remove the risk associated with the predicted flooding event, though lower those risks to an acceptable level reasonably anticipated by the community in everyday life.

Regards BARRANJOEY CONSULTING ENGINEERS pty ltd Molloy (Direc 24 Per Ludas BE ( PEr NER

Appendix A Northern Beaches Councils request for further information dated 23 July 2023 excerpt re flooding

Barrenjoey Consulting Engineers pty ltd Stormwater Structural Civil

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#### Flooding

The development is not compliant with Clause 5.21 of the Pittwater LEP and prescriptive controls and Clause B3.11 of the Pittwater DCP.

#### 5.21(2) of the PLEP:

Due to the flood function and flood behaviour, as well as the scale of development, Council's flooding DA referral body is not satisfied that the development: (a) is compatible with the flood function and behaviour on the land, and (b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and (e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses.

#### B3.11 of the PDCP

In regard to prescriptive control C5 – The applicant has not demonstrated that future development can be an be undertaken in accordance with the following DCP prescriptive controls:

A1 - As per the indicative designs, there is potential adverse impacts on flood levels and velocities. This includes in the PMF, which is applicable because the development is likely to have a significant impact on the PMF. The existing site layout of one large dwelling for the lot located outside of the high flood risk precinct is seen as the appropriate siting to minimise flood exposure, rather than a total of 3 buildings, 2 of which heavily impacted by flooding.

A2 - The indicative designs appear to show buildings and structures in the 1% AEP Flood area which would cause loss of floodway or loss of flood storage.

C1 - It has not been demonstrated that the indicative designs can be constructed in accordance with this control, while the building heights remain within the allowable envelope. 1% AEP flood levels including Climate change plus freeboard should be used for floor levels as per B3.12.

C3 - All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site. The 3 lot proposal is not commensurate with this prescriptive control. It has not been demonstrated how there will be no obstruction of the floodway caused subsequent building of structures. There also appears to be blockage of areas in the 1% AEP flood area.

### Appendix B

Northern Beaches Councils Flood Information Report excerpt



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### Barrenjoey Consulting Engineers pty ltd

Stormwater Structural Civil

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| Flood Levels |                                      |                                  |                                      |                                  |                                    |                                   |                                |                            |                                 |  |
|--------------|--------------------------------------|----------------------------------|--------------------------------------|----------------------------------|------------------------------------|-----------------------------------|--------------------------------|----------------------------|---------------------------------|--|
| ID           | 5%<br>AEP<br>Max<br>WL<br>(m<br>AHD) | 5%<br>AEP<br>Max<br>Depth<br>(m) | 1%<br>AEP<br>Max<br>WL<br>(m<br>AHD) | 1%<br>AEP<br>Max<br>Depth<br>(m) | 1% AEP<br>Max<br>Velocity<br>(m/s) | Flood<br>Planning<br>Level<br>(m) | PMF<br>Max<br>WL<br>(m<br>AHD) | PMF<br>Max<br>Depth<br>(m) | PMF<br>Max<br>Velocity<br>(m/s) |  |
| 1            | 79.95                                | 0.36                             | 79.98                                | 0.40                             | 1.23                               | 80.48                             | 80.16                          | 0.57                       | 2.05                            |  |
| 2            | 78.30                                | 0.19                             | 78.33                                | 0.22                             | 1.33                               | 78.83                             | 78.45                          | 0.35                       | 2.40                            |  |
| 3            | 76.83                                | 0.19                             | 76.85                                | 0.20                             | 0.80                               | 77.35                             | 76.95                          | 0.30                       | 1.44                            |  |
| 4            | 73.60                                | 0.17                             | 73.63                                | 0.20                             | 1.80                               | 74.13                             | 73.79                          | 0.36                       | 3.14                            |  |
| 5            | 67.95                                | 0.31                             | 67.98                                | 0.34                             | 1.73                               | 68.48                             | 68.21                          | 0.57                       | 2.89                            |  |
| 6            | 78.00                                | 0.29                             | 78.03                                | 0.32                             | 0.99                               | 78.53                             | 78.18                          | 0.48                       | 1.68                            |  |
| 7            | N/A                                  | N/A                              | 77.53                                | 0.16                             | 0.86                               | 78.03                             | 77.59                          | 0.27                       | 1.48                            |  |
| 8            | N/A                                  | N/A                              | 75.97                                | 0.13                             | 0.78                               | 76.47                             | 76.00                          | 0.23                       | 1.35                            |  |
| 9            | 73.77                                | 0.17                             | 73.79                                | 0.18                             | 0.86                               | 74.29                             | 73.77                          | 0.27                       | 1.51                            |  |
| 10           | 67.84                                | 0.20                             | 67.86                                | 0.22                             | 0.98                               | 68.36                             | 67.98                          | 0.34                       | 1.68                            |  |
| 11           | 65.51                                | 0.44                             | 65.57                                | 0.50                             | 1.49                               | 66.07                             | 65.87                          | 0.81                       | 2.33                            |  |
| 12           | 61.17                                | 0.54                             | 61.22                                | 0.59                             | 2.29                               | 61.72                             | 61.54                          | 0.92                       | 3.61                            |  |
|              |                                      |                                  |                                      |                                  |                                    |                                   |                                |                            |                                 |  |

Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)

| ID | CC 1% AEP Max<br>WL (m AHD) | CC1 % AEP Max<br>Depth (m) |
|----|-----------------------------|----------------------------|
| 1  | 80.03                       | 0.45                       |
| 2  | 78.36                       | 0.26                       |
| 3  | 76.87                       | 0.22                       |
| 4  | 73.67                       | 0.24                       |
| 5  | 68.02                       | 0.38                       |
| 6  | 78.07                       | 0.37                       |
| 7  | 77.50                       | 0.18                       |
| 8  | 75.92                       | 0.15                       |
| 9  | 73.70                       | 0.19                       |
| 10 | 67.89                       | 0.25                       |
| 11 | 65.65                       | 0.58                       |
| 12 | 61.29                       | 0.66                       |
|    |                             |                            |

WL - Water Level

PMF - Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event.

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than 0.3m<sup>2</sup>/s, a freeboard of 0.3m may be able to be justified.

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### Appendix C Flood Level Pt2

Flood Level Pt2 Analysis (Barrenjoey Consulting Engineers pty Itd)



## Appendix D

Site, House 1, House 2, House 3 and Driveway Analysis (Barrenjoey Consulting Engineers pty Itd)



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### Barrenjoey Consulting Engineers pty ltd Stormwater Structural Civil



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