



# CIVIL STORMWATER ENGINEERING GROUP

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September 6, 2024  
CSW2024.27

## LETTER OF RESPONSE

To whom it may concern,  
Joe Thompson  
Director Hunter Central Coast Branch  
Regional Delivery Branch

RE: Gateway Assessment – 310 Terrigal Drive, Terrigal.

In response to the email of RFI's provided by the BCS:

1. *The proposal is inconsistent with Ministerial Direction 4.1 Flooding:*
  - *Permit development in floodway*
  - *Permit a significant increase in the development and / or dwelling density of that land*

*CSEG's Response: as demonstrated in the Flood Impact & Risk Assessment report CSW2024.27.REV.03, the subject site is partially inundated by a floodway, and partially inundated by a flood storage area and flood fringe. The proposed development footprint has been proposed mainly within the flood storage and the flood fringe with minor structures within the floodway. Any structures within the floodway are suspended allowing for the minimal obstruction to flows and no changes to flood behavior. This method has demonstrated that the flood risk for all events is close to that of the pre-development assessment.*

*Moreover, despite the proposal of increasing dwelling density, the post development results demonstrated minor increase in afflux but not increase in risk level. The increase in afflux is of minor significance that does not cause increase in risk or change to the flood regime. The intention of not allowing significant density to increase in the ministerial direction is to minimize multiple dwellings being impacted by flood and thereby needing significant assistance. Given that peak flood durations are less than 2 hours and all inhabitable areas are flood free due to vertical nature of the development, our opinion is that vertical density increase neither impacts flood behavior nor does it present additional risk to life and property. Moreover, we are proposing a Shelter-in-Place strategy during peak flood events on account of low duration of peak flood behavior*

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*which means these residents will not need to be evacuated during flood events. Taking this into account, our opinion is that on the balance of merit, proposed 38 unit-density, which are all above flood levels, does not impact flood behavior nor does it present unacceptable risk to life and property.*

*Per above, the proposal demonstrates that the inconsistencies with Ministerial Direction 4.1 Flooding are of minor significance.*

2. The flood impact assessment does not contain the level of detail that is commensurate with the flood risk at the site.

*CSEG's Response: CSEG has modified the Flood impact assessment to a Flood Impact and Risk Assessment Report adopting the following changes:*

- *The report now references the Floodplain Risk Management Manual (FRMM) (2023).*
- *The terminology FPL has been updated to reflect the correct term.*
- *Additional flood models have been completed to assess the 0.5%AEP and the 0.2%AEP.*
- *Flood function maps have been added to the report. These can be found in Appendix A.*
- *CSEG's Flood model has been compared to council's flood model and has demonstrated some differences in results. The results obtained by CSEG indicate an increase in flood levels. The reason being is that CSEG's flood model adopts a 100% blockage factor in comparison to council's blockage factor of 50%. Council's model allows for less restriction of flows.*
- *Mannings roughness utilized in CSEG's flood model is of the same value demonstrated in Council's Flood report. CSEG has also introduced additional flood roughness coefficient, i.e short grass, in accordance with AR&R Book 6. This can be found under section 3.2.4.*
- *CSEG's flood model has been designed with a blockage factor of 1 (100%) on downstream stormwater systems and a blockage factor of 0.5 (50%) on upstream stormwater systems. This provides a conservative approach addressing a worst-case scenario. This is demonstrated in section 3.2.6.*
- *A range of flood events have been assessed up to PMF with a blockage factor of 100% and rise in tailwater levels, allowing us to understand the flood regime during worst case scenario. This is a feasible approach allowing us to propose and adopt stricter measures. Despite this conservative approach, it is found*



*that the proposed development does not alter the flood behavior or increase the flood risk. Therefore, adopting a flood model with lower tail water levels is unnecessary.*

3. There are residual risks associated with using shelter in place as the preferred emergency management response in locations of high risk.

*CSEG's Response: in accordance with the flood results the site is classified H4 low hazard for the 1% AEP and not high hazard. Despite this report addresses risks up to and including the PMF event. The report also:*

- *Addresses flood risk and flood behavior including expected frequency and duration for all flood events, this is found in section 3.6 of the report.*
- *Addresses risk to residents returning home during a flood event, this is found under section 6 of the report.*
- *A detailed proposal of a FERP has also been provided under section 6 of this report. In summary, during all major flood events up to and including PMF, peak flood behavior subsides in less than 2 hours. This allows us to implement a Shelter-in-place strategy which is preferred over evacuation. Our proposed Shelter-in-place strategy is detailed in the accompanying report which clearly demonstrates that a safe refuge during all flood events is available on-site within every resident's individual homes. We are also installing major warning systems to be made available to those residents in case they try to return home during a flood event. The flood report details all warning majors being adopted such as ongoing 24/7 smart screen the lobby with BOM and major event warnings, ongoing education to future residents, installing of flood marker and water level gauges in and around the sites. We believe these measures to be sufficient to ensure that residents know the risk to their life and are aware of flood depths at all times if they try to enter the building.*

4. High flood hazard may compromise the structural integrity of the building in an extreme event.

*CSEG's Response: The flood model was modified to allow for any structures within the floodway to be suspended to allow for water flow underneath. As a result, the flood risk category reduced from H6 to H5. Refer to flood maps under Appendix A.*

*Moreover, a structural letter was obtained from JSBC Consulting confirming that the proposed development can be designed to withstand flood forces based on the modelling results presented by CSEG. A copy of this letter is found in the flood report prepared by CSEG.*

Yours faithfully



**Samir C Hakim**  
Managing Director  
CSEG™

