19 March 2024

WRL Ref: WRL2023082 LR20240319 JTC

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UNSW
Water Research
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Dear Jo,

RE: Bronte SLSC redevelopment – peer review of RHDHV (2024) Revision 4 report

1. Introduction

The Water Research Laboratory (WRL) of the School of Civil and Environmental Engineering at UNSW Sydney is pleased to provide this letter report to Waverley Council (hereafter "Council") for Bronte SLSC – peer review of RHDHV (2024) Revision 4 report.

The review was undertaken by WRL's Principal Coastal Engineer, James Carley.

The following document was reviewed:

- Royal HaskoningDHV and Warren and Mahoney (RHDHV, 2024), "Bronte SLSC Redevelopment: Seawall and Related Elements Detailed Design: Concept Design and Coastal Engineering Assessment Report", Reference: PA3572-RHDV-RP-S1-RP-FC-0001, Revision 04, Dated 28 February 2024

Revision 04 of RHDV (2024) has predominantly responded to a review undertaken by WRL on an earlier version (Preliminary Draft dated 5 December 2023). WRL also reviewed three previous documents associated with this project.

2. Summary of peer review

The document, "Bronte SLSC Redevelopment: Seawall and Related Elements Detailed Design: Concept Design and Coastal Engineering Assessment Report" Revision 04, Dated 28 February 2024 (RHDHV, 2024) was reviewed by WRL's Principal Coastal Engineer, James Carley. The document is of a good professional standard. Revision 04 of RHDV (2024) has predominantly responded to a review by WRL of an earlier version (Preliminary Draft dated 5 December 2023) by WRL.

The proposed upgraded seawall and likely reinforced concrete construction of the proposed new SLSC building is likely to better serve the function of surf life saving at Bronte.

The works proposed are likely to be able to manage coastal hazards for appropriate and foreseeable design events and sea level rise over the next 50 to 70 years subject to additional engineering design – predominantly physical modelling and minor revisions of the calculations made to date. The predominant hazard to be managed will be coastal inundation and wave forces through wave overtopping. For the existing and proposed new SLSC building, the hazards of erosion and recession are/will be managed through the presence of a seawall, provided that the seawall does not fail.

Substantial calculations regarding overtopping have been undertaken in RHDHV (2024), including for 500 year ARI events. These calculations appear to be predominantly sound, with the following caveats.

The extreme wave heights for events having an ARI of 1 to 100 years are well studied and have been published in several credible papers. RHDHV (2024) have used these studies. However, RHDHV (2024) used an unconventional extrapolation to determine the 500 year ARI extreme wave height, and this is likely a major overestimate compared with the more conventional log-linear extrapolations. This overestimate is still only of minor consequence nearshore, due to the depth limitation of wave height there, but may result in an overestimate of the nearshore wave setup. Furthermore, longer wave periods have been adopted in some parts of RHDHV (2024) compared with previous studies of the Sydney wave climate.

RHDHV (2024) undertook wave overtopping and wave force measurements predominantly in accordance with best desktop practice. These are largely sound, but estimate zero wave overtopping of the existing seawall in present day events of up to 100 year ARI. Reliable observations have noted wave overtopping of the existing seawall and minor damage to the present SLSC building on several occasions, in ARI events of approximately 20 to 40 years. This discrepancy (between RHDHV 2024 calculations and observations) is likely due to some ambiguity in how to account for wave setup within the EurOtop (2018) document. It may require professional engineering judgement from RHDHV to rectify this, however, the completion of physical modelling will provide the most reliable answers.

As noted in RHDHV (2024), physical modelling will be required for detailed design to progress, with the calculations presented informing preliminary and concept design. Physical modelling reduces the risk of both underdesign (unanticipated failure) and overdesign (excessive capital cost).

Based on the reviewer's experience in comparable locations, it is likely that an appropriate certifiable detailed design can be developed within the presented concept design if additional design work is undertaken.

For high sea level rise scenarios, the future of a sandy beach at Bronte may require active management, noting that the present SLSC proposal does not significantly change the status quo, except for extending the life of the present situation/seawall alignment.

RHDHV (2024) provided responses regarding compliance with a range of policy documents, namely:

- Coastal Management Act 2016
- State Environmental Planning Policy (Resilience and Hazards) 2021
- Waverley Local Environmental Plan 2012
- Waverley Development Control Plan 2022
- Waverley Council Coastal Risk Management Policy

The RHDHV (2024) responses are credible, however, they are based predominantly on professional opinion, with divergent opinions likely to be held by some others.

3. Detailed peer review of RHDHV (2024)

RHDHV (2024) is of a good professional standard.

Executive Summary
The listed date in several places of “6/6/19” and “18/6/19” is likely 2016.

Executive Summary – Physical modelling
Add: (vi) Minimising the design risk for the project, namely underdesign (unanticipated failure) and overdesign (excessive cost).

Executive Summary – Engineering and maintenance
For high sea level rise scenarios, the future of a sandy beach at Bronte may require active management (such as sand nourishment), noting that the present SLSC proposal does not significantly change the status quo, except for extending the life of the present situation/seawall alignment.

Section 4.1
It would assist many readers if tide datum/chart datum was also listed here.

Section 4.8
RHDHV (2024) presents reasonable arguments for the adoption of a 100 year design event based on the 6 hour duration wave height exceedance. However, in later sections a 1 hour duration appears to have been adopted.

Only water levels up to 100 year ARI have been presented RHDHV (2024), with limited justification, however, structural loads for 500 year ARI wave heights were undertaken.

Section 4.9.2
The extreme wave heights for events having an ARI of 1 to 100 years are well studied and have been published in several credible papers. RHDHV (2024) have used these studies. However, RHDHV (2024) used an unconventional extrapolation to determine the 500 year ARI extreme wave height, and this is likely a major overestimate compared with the more conventional log-linear extrapolations. This overestimate is still only of minor consequence nearshore, due to the depth limitation of wave height there, but may result in an overestimate of the nearshore wave setup. Furthermore, longer wave periods have been adopted in some parts of RHDHV (2024) compared with previous studies of the Sydney wave climate.

Section 5.3.3.1
The listed water level of 1.5 m AHD for the June 2016 storm is incorrect.

The wave periods shown in Table 5-3 are different to those shown in other parts of RHDHV (2024). In WRL’s opinion, the values in Table 5-3 are correct.

Section 5.3.3.3
RHDHV (2024) undertook wave overtopping and wave force measurements predominantly in accordance with best desktop practice. These are largely sound, but estimate zero wave overtopping of the existing seawall in present day events of up to 100 year ARI. Reliable observations have noted wave overtopping of the existing seawall and minor damage to the present SLSC building on several occasions, in ARI events of approximately 20 to 40 years. This discrepancy (between RHDHV 2024 calculations and observations) is likely due to some ambiguity in how to account for wave setup within the EurOtop (2018) document. It may require professional engineering judgement from RHDHV to rectify this, however, the completion of physical modelling will provide the most reliable answers.

Table 5-9 presents the data well, however, revised calculations are required to correct for zero predicted overtopping in present day conditions.

Section 5.3.4.1
With a zero crossing wave period (Tz) of approximately 10 s, the R2% level would be reached (or exceeded) by seven waves per hour.

The wave force calculations appear to be sound, but are based on the input of zero overtopping under present day conditions, so may require revision.

Section 6
The use of the foreshore promenade pavement slab as a structural element for the seawall requires caution, because it may be cut or damaged within future works.

Section 7
This section was not reviewed by the reviewer.

Section 8
RHDHV (2024) provided responses regarding compliance with a range of policy documents, namely:

- Coastal Management Act 2016
- State Environmental Planning Policy (Resilience and Hazards) 2021
- Waverley Local Environmental Plan 2012
- Waverley Development Control Plan 2022
- Waverley Council Coastal Risk Management Policy

The RHDHV (2024) responses are credible, however, they are based predominantly on professional opinion, with divergent opinions likely to be held by some others.

An alternative method to examine the impact of the additional infrastructure over the present sandy beach would be to estimate the total square metres of dry sand and the percentage change with the proposed seawall.

4. Summary

Thank you for the opportunity to provide this peer review. Please contact James Carley on 0414385053 should you require further information.

Yours sincerely,

Brett Miller
Director, Industry Research