greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

MEMO

TO Shannon Watson

FROM Dr Iain Dawe

DATE 13 May 2019

FOR YOUR INFORMATION

Eastern Bays shared pathway consent – Assessment of AEE for coastal processes and beach renourishment

I have reviewed the following reports to assess the impacts of the proposed construction works on the coastal process and natural hazards of the eastern harbour bays area:

1. Appendix E - Eastern Bays Shared Path: Coastal Physical Processes Assessment, prepared by NIWA
2. Appendix F - Eastern Bays Shared Path Project: Consent Level Beach Nourishment Design and Effects Assessment, prepared by Tonkin and Taylor
3. Appendix R - Proposed Resource Consent Conditions

On balance I am satisfied there won't be any unintended consequences from coastal hazards (either causing or exacerbating) or interruption of coastal processes from the proposed works, with the exception of the potential for beach renourishment material overwhelming the seagrass beds in Lowry Bay. As stated in the NIWA AEE, this is caveated on the work following best practice construction techniques and detailed design for coastal protection structures.

I am uncomfortable with the extent of reclamation and loss of CMA and would like to see every effort to offset this loss with the recommended mitigation measures, appropriate consent conditions and monitoring and follow up. These types of projects lead to cumulative loss of our coastlines to hard engineered structures. With regards to the seagrass beds, the main recommendation is to ensure a gradual introduction of sediment and with adequate monitoring post nourishment, coupled with adaptive consent conditions that can enable a stop and reassessment of the works if so required.

I will touch on what I consider the six main considerations and potential effects from the project from a coastal hazards and process perspective, covering:

1. Coastal hazard effects including flooding and erosion from wave reflection and overtopping and edge effects;
2. Reclamation and encroachment into the coastal marine area including below MHWS;

3. Potential impacts on nearshore hydrodynamics, sediment transport systems and additional turbidity;
4. Resilience to climate change impacts and sea level rise,
5. Beach renourishment to offset seawall encroachment into the CMA, and:
6. Consent conditions and monitoring.

Coastal hazard effects

Coastal defence structures such as seawalls and revetments have the potential to interfere with coastal processes, particularly wave breaking, runup and dissipation and sediment transport and deposition. This can have unintended consequences that can cause or exacerbate coastal hazards including erosion, overtopping and flooding, unwanted edge effects and result in adverse impacts on the beach.

The proposed new double-curved seawalls will have the effect of reducing overtopping hazard and should have the additional benefit of returning sediment to the beach, rather than it being lost from entrainment in water that overtops the wall.

However, overtopping is still expected to occur in the larger storm events with associated water and debris causing flooding and temporary closure of the shared path and Marine Drive. This is an acceptable compromise to building bigger structures that would require a larger footprint and more vertical height. The adaptive design walls will allow additions at a later date when sea level rise contributes to more regular flooding and closure of the road and pathway.

Edge effects are most noticeable when seawalls terminate adjacent a sandy shoreline. The three main places where this occurs is York Bay, Lowry Bay and Point Howard. In addition, there will be a slight change to wave reflection behaviour, caused by the replacement of existing rock revetments with new double-curved seawalls within the Bays. These effects will be mitigated with appropriately engineered transitions, toe protection and tie-ins to existing structures. The change will have a minimal effect on other seawall sections and beaches as they will be suitably engineered to withstand wave reflection and dissipative forces. Minor effects on the structural integrity of adjacent older seawalls can be managed with appropriate phasing of the construction plan.

In the places where sandy and mixed sand and gravel beaches occur, renourishment will be undertaken to offset some the impacts that occur with the presence of seawalls. This will also provide a measure of additional protection from scouring of the foreshore and toes of the walls.

The coastal hazard assessment looked at these potential effects and concluded that over the length of the project the effects from these were no more than minor. I agree with this assessment.

Reclamation and encroachment

One of the main issues for consideration is the level of reclamation or encroachment into the coast and CMA. The total reclamation for this project is 5500 m^2 (300 m^2 of declamation) of which 3200 m^2 is in the CMA. This is not an insignificant amount of reclamation, but it does occur over 4400 m. This works out at between 1.3 – 1.8 m average seaward encroachment per linear metre - 1.3 m at

seawall upgrades and 1.8 m at new seawall builds. This is over a mix of coastal types from rock shore platforms to road edges, small pocket beaches and existing structures. There will be effects from this and in places they are being offset

The argument is made that the net loss of coastal zone area (the area available for coastal physical processes to occur within) is very small relative to the local scale of each embayment and the Eastern Bays coastal zone and that therefore the net effect is negligible, or in some localised areas no more than minor.

From a coastal hazards and processes perspective, the effects of reclamation will be more pronounced on the small beaches of the Bays as opposed to the rocky shores. The impacts on the beaches are summarised in the coastal hazards section above, but briefly relate to reducing the width of the beach and its ability to absorb wave energy, enhancing runup, overtopping and erosion.

The impacts of this are proposed to be offset by beach nourishment at York Bay, Lowry Bay and Point Howard. This will go some way to reducing these effects to no more than minor, but it will need a monitoring programme to ensure the mitigation remains effective and have a plan to allow beach top-ups if required and if not seen to be conflicting with other ecological goals such as protection of the seagrass beds in Lowry Bay.

Whilst there are renourishments proposed in the biggest bays of the project area, some of the smaller pocket beaches and stretches eg, Mahina Bay, that are not part of the renourishment plans could also benefit from a little material being put in them where there will be some reclamation, to offset potential impacts. This doesn't have to be much more than a seaward translocation of the material that is there, rather than building on top of it and locking it up as part of the construction.

In general I agree with the assessment that these reclamation will have a no more than minor effect, but would recommend appropriate monitoring and follow up to ensure the ongoing success of the offsetting and mitigation.

Coastal processes, hydrodynamics and sediment transport

The potential impacts from seawalls on coastal processes, sediment transport and hydrodynamics have been partly covered in the reports and previous sections. Briefly, building a structure in the CMA can push it into deeper water or cause deeper water at high tide and or interfere with wave runup and dissipation. This can cause a change in wave dynamics and sediment transport along the coast and is mainly a problem for the clastic (sand and gravel) beaches and will potentially result in sediment moving offshore slightly as it readjusts to a new equilibrium. The recurved seawalls will probably benefit the foreshore by retaining more sediment in the coast and prevent loss of material out of the system from overtopping. Nearshore transport impacts will be negligible.

The AEE considered the effects on coastal hydrodynamics (ie, waves and currents) and sediment transport processes to be no more than minor. It was considered there was the potential for moderate localised effects within some of the bays related to beach access ways acting like groynes and trapping sediment on one side and causing starvation on the other side. This is proposed to be mitigated by

providing access points at the ends the beach and careful design of the configuration to minimise interruption of sediment transport pathways.

With regards to the potential for the release and reworking of fines by the presence of additional coastal protection works through changes to nearshore hydrodynamics, it was considered to have a minimal effect on nearshore sedimentation rates or suspended sediment concentrations within each bay and the wider Wellington Harbour.

In summary I agree with the overall assessment of the effects being no more than minor. It was recommended by NIWA that a beach management plan be developed with monitoring of the shape and volume of the foreshore with cross-section profiles taking place within each bay before and after construction. This information could then be used to guide adaptive decision making should effects start to appear more than minor. I support this recommendation.

Resilience and climate change

It was stated in the AEE that climate change and sea level rise, will have an increasing and ongoing impact on the east harbour bays. The primary effect will be an increasing frequency of wave overtopping events, and eventually more direct flood events, on the back of rising sea level and land subsidence. Climate change will also alter the physical drivers of storm surge and waves. These changes will contribute to an ongoing risk from coastal hazards to Marine Drive and the shared path.

It was argued this project will provide a benefit of delaying the adverse effects of sea level rise by upgrading the coastal defence structures and increasing the sediment volume within the nourished bays. Ultimately sea level rise will impact on this whole coastline and over the next couple of decades we will see the gradual loss of the beaches and greater impact on the structures and road with more overtopping and flooding and longer road closures.

This project will allow some "buy some time" for Hutt City Council to develop and implement a long term climate change strategy. I agree with this sentiment and that preferably this will be in conjunction with Greater Wellington Regional Council.

Renourishment

The beach nourishment is proposed only along those parts of the shoreline where there are existing high tide beaches at York Bay, Lowry Bay and Point Howard as per table 1.

Table 1: Beach length and minimum proposed nourished length

Bay	Effective Beach Length (m)	Linear Length Nourished (m)	Volume Imported* (incl. 1.3 x overfill) m3	Placed Volume with Linear Placement After Consolidation	Expected Average Volume (m3/lin.m)
Point Howard	120	80	1,600	15.4	10.3
Lowry Bay	450	160	3,200	15.4	5.5
York Bay	150	80	1,200	11.5	6.2

TOTAL	**720**	**320**	**6,000**	-	-

I support the proposed renourishment of these beaches as a way to offset some of the reclamation and impacts on coastal processes from the reduction in beach width. There is a puzzling statement in the assessment that the renourishment is just for amenity purposes. It should be seen as being more than just for amenity. It needs to be recognised for offsetting beach loss and restoration of ecosystems. This is an important recognition because the monitoring and follow up need to be linked to a commitment to reassess and top up the nourishment if warranted, ie, providing it is not causing unintended impacts elsewhere eg, on the seagrass beds.

I agree with the AEE that there is no risk to coastal processes such as erosion, wave reflections, wave overtopping or longshore drift during placement of nourished material as the beach will adjust to the natural profile over a period of weeks to months. Dispersal and aggradation of sediment in deposition areas and long term spread between bays will be at the rate of natural processes, with negligible change to beach slope (therefore reflection/overtopping) and sand composition.

As stated in the reclamation section, some of the smaller pocket beaches not part of the renourishment plans eg, Mahina Bay, could benefit from a little additional material being put in them where there will be some reclamation to offset partial loss of the beach. This could be addressed as part of the construction management plans assessed on a case by case basis during the construction phase. In particular, it needs to be specified in the construction plans that beach sediments are not to be used (as far as practicable) as construction materials eg, backfill, and should be kept aside and retained in the beach system. Because the seawalls will truncate the beach slightly and push the beach further seaward into slightly deeper water, it may be necessary to compensate for this by topping up the sediments with a little additional fill if appropriate from the stock of material being used in the nourishment of the other bay.

Consent conditions and monitoring

I support the consent conditions suggested the beach process AEE report by NIWA. There was however, a difference between monitoring conditions in the NIWA report and the monitoring conditions report as copied below:

Monitoring Condition C.6 (NIWA report Appendix - E)

> *"HCC shall develop a beach management plan which includes monitoring of beach volume via 6 monthly beach profiles (or equivalent elevation surveying techniques) for 5 years in each bay. This is to ensure the actual effect on beach sediment processes are in line with the expectations for generally minor redistribution of beach material and minor changes to beach volume, as well as confirm whether the beach nourishment has been successful in maintaining the same beach area as Eastern Bays Shared Path: Coastal Physical Processes Assessment 109 at present day. The surveying shall commence before construction begins and continue for 5 years after construction ends in each bay. The surveys shall include cross-shore transects from Marine Drive to 3 m below Chart Datum, and at 50 m spacings along each beach. The survey resolution should be of sufficient*

detail to identify significant changes in grade and the presence of key features such as rocky reefs, stormwater outlets, stairs and access ways, as well as determining a MSL shoreline contour. This survey information shall be interpreted after year 2 and year 5 by an experience coastal scientist to assess the changes to see whether the beaches are approaching a new equilibrium in line with expectations, and make recommendations on the requirement for ongoing monitoring, or if the monitoring could cease. However, in the unlikely event that the 2nd year assessment indicates that unanticipated erosion is occurring (i.e. beach in disequilibrium), the beach nourishment consent will still be active (and other bays may be still under construction) and HCC may be able to easily top-up the beach with more fill to compensate for erosion losses. These assessment reports shall be provided to the Greater Wellington Regional Council within 2 months of each survey."

Monitoring Condition 52 (Monitoring conditions report)

"The consent holder shall undertake monitoring of beach volume via 6 monthly beach profiles (or equivalent elevation surveying techniques) to ensure the actual effect on beach sediment processes is in line with the expectations for generally minor redistribution of beach material. The surveying shall commence prior to the Commencement of Construction, and continue for 2 years after construction in that bay is completed. This survey information shall be interpreted at the end of the 2 year period in that bay by an experienced coastal scientist and made available to the Wellington Regional Council.

In the first instance, monitoring condition 52 needs to state that there should to be an immediate post-nourishment survey as a baseline so it can be assessed how the sediment has moved from placement and from the pre-construction beach profile.

With regards to the difference in the length of time suggested for the post-nourishment beach surveys (ie, 5 vs 2 years), a compromise may need to be reached between these two recommendations that balances efficiency and the need to allow sufficient time to capture the changes the beach will undergo as it reaches a new equilibrium. This may require some conferencing between the experts at NIWA and T&T, but three years may strike this balance.

The inner harbour bays have a much lower wave energy environment than the open coast, and sedimentary changes take longer to occur because of this, but at the same time, they also have much smaller beaches with smaller foreshores and sediment volumes. The wave energy reaching the east harbour beaches is predominantly wind waves driven by the weather and climate. Three years should allow a reasonable length of time to capture a range of wind events, storms and seasonal variations that will generate incident wave energy enough to redistribute the sediments across the Bays of the project and allow the beaches time to adjust to the new regime.

Conclusions and recommendations

In summary I am satisfied that the project proposal can satisfy the test of no more than minor effects on coastal processes and hazards providing the work is constructed according to the plans and follows best practice construction methods and design for coastal protection structures.

My recommendations as discussed above pertain to the construction methodology and consent monitoring:

1. Survey immediate post-nourishment and construction and then every six months for three years with an assessment after 12 months, 24 months and 36 months to check on seagrass beds and general distribution of the sediment. It may be worthwhile caucusing this with the experts at NIWA, T&T and Stantec.

2. Include a condition that enables adaptive management to halt works and re-assess if it appears any effects with more than minor impacts are occurring at the construction sites.

3. May need to take advice from the ecologist about the renourishment in Lowry Bay and introduce that in two stages so as to manage the potential effects on the seagrass beds.

4. Include a condition for the construction methodology to minimise the amount of beach sediments that are incorporated into the beach encroachment. In particular, it needs to be specified in the construction plans that beach sediments are not to be used (as far as practicable) as construction materials eg, backfill, and should be kept aside and retained in the beach system. To this aim, it may be beneficial where appropriate to provide a small top up to materials pushed seaward in places like Mahina Bay that are not included in the renourishment plans.

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