MEMO

Te Awarua-o-Porirua Whaitua Committee

greater WELLINGTON REGIONAL COUNCIL Te Pane Matua Taiao

TO	Te Awarua-o-Porirua Whaitua Committee, Te Awarua-o-Porirua Project Team
COPIED TO	
FROM	Sheryl Miller/Brent King, Senior Science Coordinators, Science Integration Team
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SUBJECT	Key messages for harbour attributes using expert assessment

Introduction

The pNRP has already set high-level objectives for both fresh and coastal water throughout the region, with the Whaitua process now able to provide finer scale objectives in addition to those. The NPS-FM (2017) recognises that "the management of coastal water and fresh water requires an integrated and consistent approach." While the NPS-FM only requires objectives be set for freshwater, the RMA and National Coastal Policy Statement allow regional councils to make objectives for coastal water. Given the value of the harbour to the community, the Committee may wish to use this process to set finer scale objectives for the coastal environment.

Expert assessments and harbour modelling

The expert assessment below provides preliminary assessments of the current state and potential scenario changes for several harbour attributes. This preliminary assessment can be used to continue exploring draft objectives and consequences for the harbour at the upcoming workshop on 31 May 2018.

Modelling of the harbour attributes is underway, but not expected to be available until August 2018. At that time the modelling results will be used to verify the expert analysis presented in this memo and ensure the objectives we set at the committee workshop are achievable when the modelling is completed.

Te Awarua-o-Porirua information on six harbour attributes and scenario results using expert assessment

	Annual ave. sedimentation rate				% area with soft mud				Copper				Zinc				Macroalgae (intertidal only)				Invertebrates			
Grouping	Current state	BAU	Improved	Water sensitive	Current state	BAU	Improved	Water sensitive	Current state	BAU	Improved	Water sensitive	Current state	BAU	Improved	Water sensitive	Current state	BAU	Improved	Water sensitive	Current state	BAU	Improved	Water sensitive
Pauatahanui intertidal	C	C	C↑	C↑	C	C	B	B	A	A	A	A	A/B	B/C↓	A/B	A/B	C	C	C	C	B	B	B↑	B↑
Pauatahanui subtidal					D	D	D↑	D↑↑	A	A	A	A	B	B	B	B↑	N/A				C	C	C	C
Onepoto intertidal	B	B	A	A	B	B	B	B	A	A	A	A	A	A	A	A	C	C	C	C↑	B	B	B↑	B↑
Onepoto subtidal					D	D	D↑	D↑↑	B	B	B	B↑	C	C	C	C↑	N/A				C	C	C	C↑

Band	Description
A	Reflects relatively natural levels
B	Minor stress
C	Moderate stress and risk of losing sensitive species
D	Significant, persistent stress with likely loss of expected species
↑ or ↑↑	Relative improvement with band

Key messages

Annual average sedimentation rate

Sedimentation rate is currently C band in the Pauatahanui Inlet and B band in Onepoto Arm. The relatively straight shape of Onepoto Arm is assumed to provide greater flushing of the arm and a lower sedimentation rate.

The scenarios are expected to improve (reduce) the sedimentation rate in both arms. Onepoto Arm may reach an A band while Pauatahanui will likely improve within the C band. Most improvement comes with the reduced sediment load from the improved scenario and little further change with the water sensitive scenario. Existing high levels of sediment in the harbour and the limited flushing of this through time is expected to constrain the amount of improvement despite the reduction in incoming sediment loads from the catchment under the improved and water sensitive scenarios. This is particularly the case on the northern and southern sides of Pauatahanui Inlet where wind-driven currents transport sediment between intertidal and subtidal basins.

% area of soft mud

Intertidal areas are less muddy than the subtidal areas, though some intertidal areas have higher mud content due to tide/wind/wave transport. The scenarios are expected to reduce the extent of mud across the harbour, although not enough to change bands in most places. Like the sedimentation rate, reduced incoming sediment from the scenarios reduces the area of mud, but the high levels of existing mud, particularly in the subtidal areas, limit the potential for improvement.

Sediment metals

Copper and zinc levels are typically either A or B band and below the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) trigger values. Onepoto has some localised 'hotspots' where metal concentrations exceed ANZECC guidelines and the subtidal area has higher levels for both metals.

Copper is unlikely to change with the scenarios.

Zinc may increase under BAU in Pauatahanui Arm. The improved and water sensitive scenarios are likely to maintain current or provide improvements within the band for all of the harbour. These come from reductions in incoming metals and sediment, but metals already in the subtidal sediments limit the potential for improvement in those areas.

Macroalgae

Macroalgae is currently assessed as C band. There are periodic blooms of sea lettuce and Gracilaria, though these are not currently considered to be major problems. Algae growth is largely driven by nitrogen, though much of this is bound to deeper sediment and not available.

Reductions in sediment, nitrogen and wastewater overflows from the improved and water sensitive scenarios are expected to reduce the risk of problematic macroalgae blooms though the overall assessment remains in C band.

Invertebrates

Currently B band for intertidal areas and C band for subtidal in both arms. Physical disturbance and mud are drivers of these results, with the high mud in subtidal areas driving the lower band in the subtidal areas.

Sediment reductions with the improved and water sensitive scenarios might provide improvements within the band for intertidal areas, but the existing mud and expectation that this will not flush out in time from the subtidal areas limits the opportunity for improvement in those areas.

How we assessed it

These are preliminary assessments based on observed/monitored data for each attribute and expert assessment of how each attribute might change based on the scenario changes and freshwater modelling results of each scenario. The assessments were done by Leigh Stevens from Salt Ecology and Megan Oliver, Team Leader Aquatic Ecosystems and Quality, GW. This approach is similar to the freshwater ecological assessments carried out and presented at the previous Committee meeting.

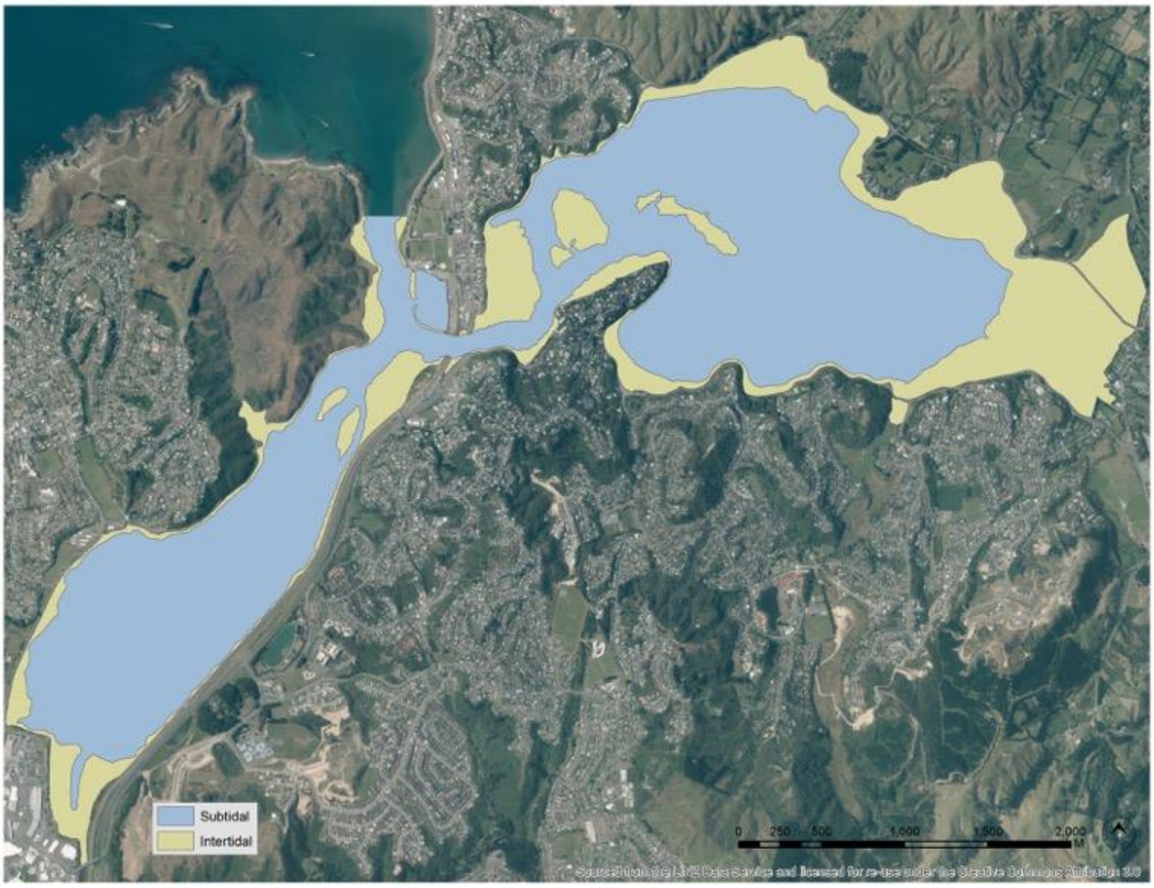
The NZ Estuary Trophic Index (ETI) has been used to inform the thresholds used as part of the assessment approach. This provides a nationally consistent approach to assessing estuarine ecological health and human impact. It is still under development and thresholds may change in the future, but this assessment is based on best expert advice using the information currently available.

Modelling of the harbour attributes is underway, but its start was delayed and is not expected to be available until August 2018. At that time the modelling results will be used to verify the expert analysis presented in this memo and ensure the objectives set at the committee workshop are achievable when the modelling is completed.

Where we assessed

This assessment covers both arms of the harbour, where monitoring is currently focused and the experts are familiar with the drivers of conditions such as tides, wind, waves and contaminants carried with freshwater inflows. Within each arm, two main environment types have been described:

- Intertidal – shallower areas that are exposed at low tide (yellow part of map)
- Subtidal – deeper areas that are always underwater. The harbour has a large subtidal area; 80% of Onepoto Arm and 60% of Pauatahanui is subtidal (blue part of map)



Map of Te Awarua-o-Porirua Harbour showing intertidal (yellow) and subtidal (blue) areas in both arms (courtesy Leigh Stevens, Salt Ecology).

Attributes assessed

The assessment covered six attributes relevant to the ecological health of the harbour, for which there is monitoring data and the experts were able to make an assessment of likely changes from the scenarios.

Attribute	What is it and why is it important?
Annual average sedimentation rate	Layers of sediment are deposited on the bottom of the harbour over time and larger particles (e.g. shell and gravel) settle faster than smaller particles (e.g. mud). Sedimentation rate is the rate at which sediment is accumulating on the bottom of the harbour. A single rate is given for the intertidal and subtidal zones because sediment moves back and forth between both depending on input sources and wind and wave action. High deposition can alter and degrade habitat, change flow and depth (infill), smother invertebrates and seagrass, and reduce water clarity. These potential changes will impact food/kaimoana gathering, how healthy the harbour is and whether it is safe for recreational purposes.

Attribute	What is it and why is it important?
% area of soft mud	Mud is very fine sediment that feels smooth or “slimy” when you work it between your fingers or toes. The attribute reflects the extent of muddy sediments across the harbour and the degree to which the extent of these areas are changing. High levels of mud affect the types of animals and plants that are able to live and thrive within the sediment on the bottom of the harbour. Extensive areas of mud can cause stress and risk of loss of sensitive species from the harbour, which can affect fish and bird species that feed on them.
Sediment metals • Copper (Cu) • Zinc (Zn)	The attribute refers to levels of metals in sediment in the harbour. Metals can be directly toxic to animals that absorb/ingest them from the sediments and they can also bio-accumulate as larger species eat these smaller ones.
Macroalgae (intertidal only)	The “macroalgae” attribute uses an index called “Ecological Quality Rating” or EQR, to reflect multiple underlying metrics. This incorporates the coverage of intertidal areas by macroalgae species, (red and green seaweeds), the degree to which these species are entrained within the sediments and the density of the algae. In simpler terms, the more lush and well-rooted the algae are, the worse the attribute state. Some level of cover is valuable to the ecology of the harbour, however, frequent, extensive and persistent macroalgae blooms have a range of adverse effects, including: • Reduce light for desirable species • Smother shellfish beds and other desirable species • Reduce waves and currents causing mud to accumulate
Invertebrates	Invertebrates have differing tolerance to natural and man-induced disturbances in coastal and estuarine environments. Similar to freshwater macroinvertebrates, the different types of invertebrate species (sensitive through to generalists) found give an indication of health of the harbour. Indices of marine invertebrate health are still under development and we do not have an MCI equivalent for the marine environment yet. Rather, we have several emerging indices, one of which is the NZ-AMBI, which reflects the degree to which the invertebrate community is either sensitive or tolerant of muddy, nutrient-rich conditions.

References

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