Te Awa Kairangi (Hutt Estuary) Sediment Plate Monitoring 2023/2024

Report prepared for Greater Wellington by Salt Ecology

Greater Wellington
Te Pane Matua Taiao

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TE AWA KAIRANGI (HUTT ESTUARY): 2023/2024 INTERTIDAL SEDIMENT MONITORING SUMMARY

Salt Ecology Short Report 033. Prepared by Hayden Rabel for Greater Wellington Regional Council, March 2024.

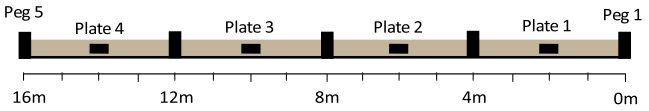
OVERVIEW

Since 2010, Greater Wellington Regional Council has undertaken annual State of the Environment (SOE) monitoring in Te Awa Kairangi (Hutt River Estuary) to assess trends in the deposition rate, mud content, and oxygenation of intertidal sediments. Monitoring is conducted at a single site in the only remaining intertidal flat in the lower estuary (Fig. 1) with the most recent results collected on 15 December 2023 summarised here.

Fig. 1. Location of Te Awa Kairangi monitoring sites.

METHODS

Estuary sedimentation was measured using the 'sediment plate' method, as described in Robertson and Stevens (2010). The approach involves measuring the sediment depth from the surface to the top of each of four buried concrete plates, configured as follows:



Measurements are averaged across each plate (n=3) and used to calculate a mean annual sedimentation rate for the site. As year-to-year sedimentation changes can be highly variable, a 5-year rolling mean sedimentation rate is reported where sufficient data are available.

A composite sample of the surface 20mm of sediment is simultaneously collected, and analysed for particle grain size (wet sieve, Hill Labs). This approach allows changes in sediment muddiness to be determined even where there are no changes in sediment depth.

Sediment oxygenation is an ancillary biological health variable that is visually assessed in the field by measuring the depth at which sediments show a change in colour to grey/black, commonly referred to as the apparent Redox Potential Discontinuity (aRPD). Replicate measurements taken adjacent to each plate are averaged and compared to condition ratings of ecological state shown in Table 1.

RESULTS

Sedimentation rate

Sediment depths in Te Awa Kairangi decreased for another consecutive year, with a five-year mean sedimentation rate of -4.0 mm/yr, corresponding to a 'Very Good' condition rating (Tables 1-3, Fig. 2). This trend of erosion, starting 2020-2021, has almost reversed the large deposition occurring from 2015 to 2019, however, ten-year mean sedimentation is still rated as 'poor'.

Fig 2. shows a cyclical pattern of erosion and deposition since monitoring began in 2010; with the most recent results showing a trend of net annual erosion over the past four years.

Table 2. Indicator values and condition ratings from the Dec-2023 survey.

Indicator	Site A
Sedimentation rate (last 5 years)[1]	-4.0
Sedimentation rate (last 10 years)[1]	2.0
Mud content (%)	14.5
aRPD (mm)	35

[1] Average mm/yr over the n-year period.

Table 1. Summary of condition ratings for sediment plate monitoring.

Indicator	Unit	Very Good	Good	Fair	Poor
Sedimentation rate[1]	mm/yr	< 0.5	≥0.5 to < 1	≥1 to < 2	≥ 2
Mud content[2]	%	< 5	5 to < 10	10 to < 25	≥ 25
aRPD[3]	mm	≥ 50	20 to < 50	10 to < 20	< 10

Condition ratings derived or modified from: [1]Townsend and Lohrer (2015), [2]Robertson et al. (2016), [3]FGDC (2012) - references in Stevens (2022).

In Te Awa Kairangi, high river flows can cause scouring of the tidal flats, which has been observed on occasion during monitoring. The Te Mome Stream channel, which discharges across the tidal flats near the site, also has a localised influence on sediment movement and partially explains the variance between plates within years.

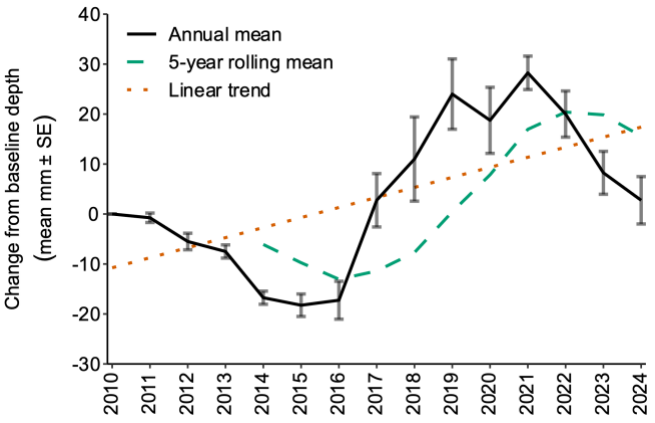


Fig. 2. Change in mean sediment depth over buried plates (±SE) relative to baseline year (Jan 2010), Hutt Estuary.

Sediment mud content and oxygenation

Mean sediment mud content in December 2023 was 14.5%, corresponding to a condition rating of 'fair' (Table 3). Long-term mud content results continue to highlight a weak, but expected, relationship with sediment rates where periods of sediment erosion remove surficial muddy sediments and are correlated with low mud contents.

The average aRPD depth was 35mm in December 2023, a condition rating of 'good' (Table 3). This level of oxygenation is partially maintained by the presence of crabs and burrowing organisms, which turn over surface sediments and create voids that allow air and water to transfer oxygen to underlying sediments, but also by the relatively low mud content meaning seawater (and air at low tide) is able to penetrate interstitial spaces, a process limited in muddy sediments.

Moderately well-oxygenated sandy sediment at Site A, December 2023.

Table 3. Sedimentation rate, grain size (%) and aRPD (mm) results compared to Table 1 condition ratings.

Year	Sed rate mm/yr	Gravel %	Sand %	Mud %	aRPD mm
2014	-9.1	3.6	74.5	21.9	15
2015	-1.5	10.1	77.6	12.3	15
2016	1.0	8.8	74.8	16.4	8
2017	19.7	5.5	71.3	23.2	13
2018	8.4	7.8	68.4	23.8	15
2019	13.0	9.5	66.7	23.8	20
2020	-5.3	9.1	73.7	17.2	25
2021	10.6	9.8	77.9	12.3	30
2022	-7.4	12.0	70.6	17.4	16
2023	-12.1	5.8	85.2	9.0	30
2024	-5.9	13.0	72.5	14.5	35

Note: Grain size results are based on a single composite sample.

CONCLUSIONS

Sediment quality data at the monitoring site in Te Awa Kairangi suggests site conditions are variable, with increases in deposition and mud content evident from 2017-2019 being followed by a general decrease in mud content and an increase aRPD depth. These improvements should have a positive impact on macrofaunal communities and ecosystem health, however, the large transitions between sediment erosion and deposition are likely to disturb all but the more tolerant infauna species.

Note that while recent results indicate a period of erosion and an improvement in sediment condition at the intertidal flat monitoring location, most fine sediment from catchment sources is likely to deposit in subtidal basin areas which are not currently monitored.

RECOMMENDED MONITORING

Continue annual monitoring of sediment rate, aRPD and grain size to measure intertidal sediment deposition and temporal change. Report results annually via a summary card report, with detailed reporting undertaken ~5 yearly in conjunction with fine scale monitoring.

REFERENCES

Robertson BM, Stevens LM. 2010. Hutt Estuary: Fine Scale Monitoring 2009/10. Prepared for Greater Wellington Regional Council. 24p.

Stevens LM. 2022. 2021/2022 Hutt Estuary: Intertidal Sediment Monitoring Summary. Salt Ecology Short Report 014, prepared for Greater Wellington Regional Council, February 2022. 2p.

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