

Appendix 1

Single Site Reports

Part 5 Tamaki Estuary

Explanatory notes

This appendix provides a summary of the sediment chemistry and particle size distribution data for each monitoring site. The appendix has been divided according to “Marine Reporting Areas” (MRAs):

- Part 1: Central Waitemata Harbour
- Part 2: Upper Waitemata Harbour
- Part 3: East Coast Bays
- Part 4: Hibiscus Coast
- Part 5: Tamaki Estuary
- Part 6: Tamaki Strait
- Part 7: Manukau Harbour

The summaries are given as “Single Site Reports” (SSRs), in which the key physical and chemistry data are provided in 2 pages:

1. The first page provides a brief description of the site: its location; classification in terms of sediment and contaminant transport/accumulation – “Settling Zone” (SZ) or “Outer Zone” (OZ), as described in ARC Technical Publication TP 170 (ARC 2002); key physical characteristics; notable features and relevant monitoring information (e.g. location of nearby sites).
2. The second page gives a summary of the sediment contaminant and sediment texture data: results from each year of monitoring for Cu, Pb, Zn, “high molecular weight” PAH (HWPAP), total organic carbon (TOC), and “mud content” (defined below). The contaminant results have been compared with sediment quality guidelines (the ARC “Environmental Response Criteria”, ERC). Indicative trends over time (see below), and a brief interpretative summary on key features of the data, have also been given.

Plots and summary statistics include all data reported to end of 2010, unless otherwise stated (e.g. occasional clear outlier removed before plotting & analysis). Where replicate analyses have been performed, data have been summarised as medians.

Trend data given in the SSRs have been determined by linear regression. The trend plots have been fitted with a quadratic curve “line of best fit” as an aid for visually assessing the nature of changes over time in the data series. Trend indicators, using “arrow” symbols, have been used to show the magnitude and direction of trends. No statistical significance associated with these trends is given (this is discussed in detail in the body of the Status and Trends Report). The trend indicators should be interpreted as follows:

- $<\pm 1\%$ per annum change probably indicates no (or very little) trend;
- $\pm 1\text{--}2\%$ per annum indicates a small, or emerging, trend. Changes of this magnitude could be largely associated with analytical and/or sampling variation, so trends in this range may not have any “real world” significance; and
- $>\pm 2\%$ indicates a stronger trend, equivalent to $> \pm 20\%$ per decade, which is probably worth investigating further to better understand possible causes.

Mud content is given as the % of the $<500\text{ }\mu\text{m}$ fraction of the sediment that is $<63\text{ }\mu\text{m}$. Where this has been determined by more than one method in any year, the average of the values has been used.

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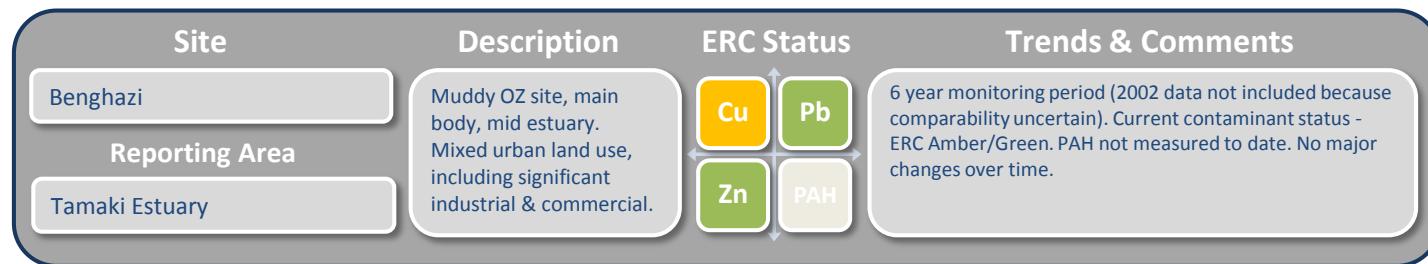
1.1 Benghazi

Site	Type	Description & Notes
Benghazi	Muddy OZ	
Reporting Area Tamaki Estuary	Land Use Mature urban	Site is located on a broad intertidal shelf in the middle reaches of the Tamaki Estuary. The sediment here is shallow muddy sand/gravel over hard basement close to shore, increasing in depth & muddiness towards the low tide channel. The site is gritty mud & shell hash. Catchment is mature urban, including industrial, commercial & residential.

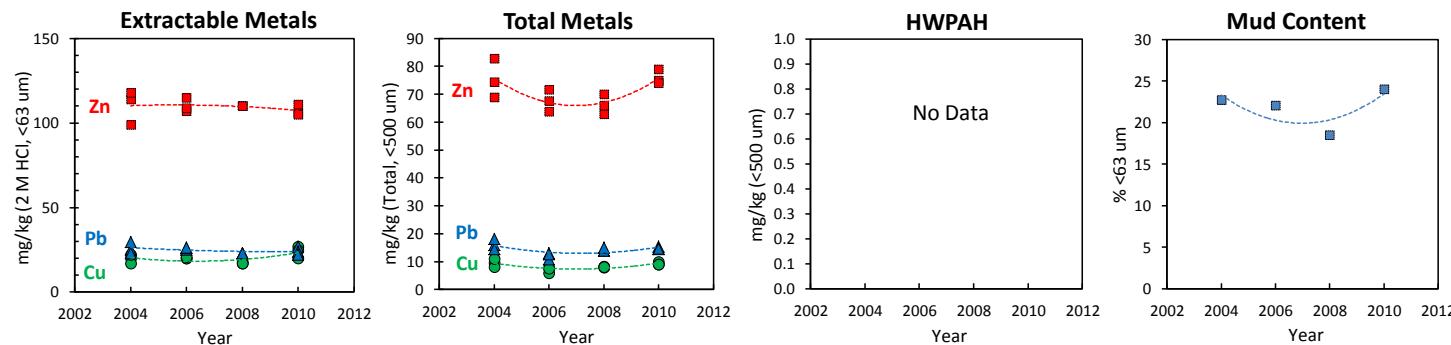


Additional Notes

Site also sampled in 2002 (NIWA for ACC/Metrowater) from a site approx. 100 m closer to shore than the RDP site shown above (sampled 2004, 2006, 2008, 2010 - see annual RDP reports).



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	22.7	no data	20.0	25.1	114	9.6	15.9	74	no data	no data
2006	22.1	no data	20.0	26.0	109	7.5	12.7	68	no data	no data
2008	18.5	no data	17.0	23.0	110	8.1	14.0	66	no data	no data
2010	24.1	no data	25.0	24.0	106	9.0	14.6	75	no data	no data
Median	22.4	no data	20.0	24.6	110	8.2	14.5	71	no data	no data
Trend (absolute units per year)	0.0	no value	0.5	-0.4	-0.5	0.0	-0.1	0.0	no value	no value
Trend (% of median per year)	⇒ 0.1	no value	↑ 2.5	↓ -1.6	⇒ -0.4	⇒ 0.2	⇒ -0.6	⇒ 0.0	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

Trend Indicators

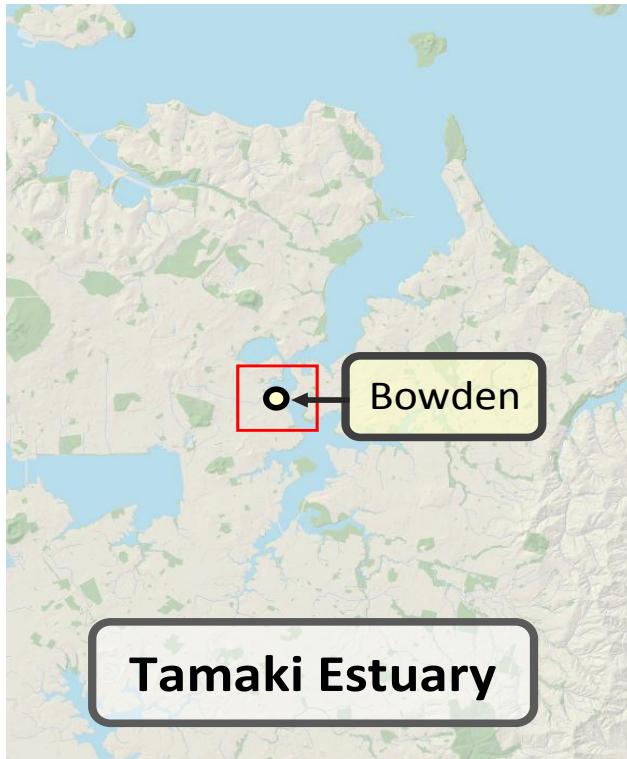
⇒ < ±1% ↘ ↗ ±1 - 2% ↑ ↓ > ±2%

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction

Average annual rate of change, as % of median per year

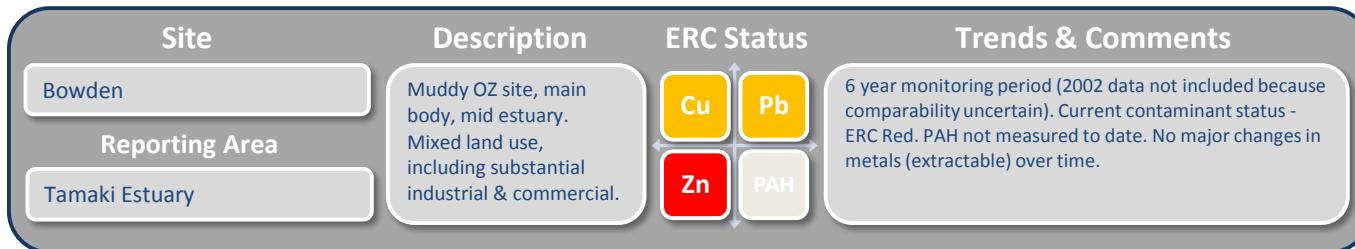
1.2 Bowden

Site	Type	Description & Notes
Bowden	Muddy OZ	
Reporting Area	Land Use	
Tamaki Estuary	Mature urban	Site is located on a narrow intertidal mud flat in the middle reaches of the Tamaki Estuary, approximately 400 m upstream of the SH10 bridge. The sediment here is mud over hard basement, increasing in depth towards the low tide channel. Catchment is mature urban, bordered by high density industrial & commercial.

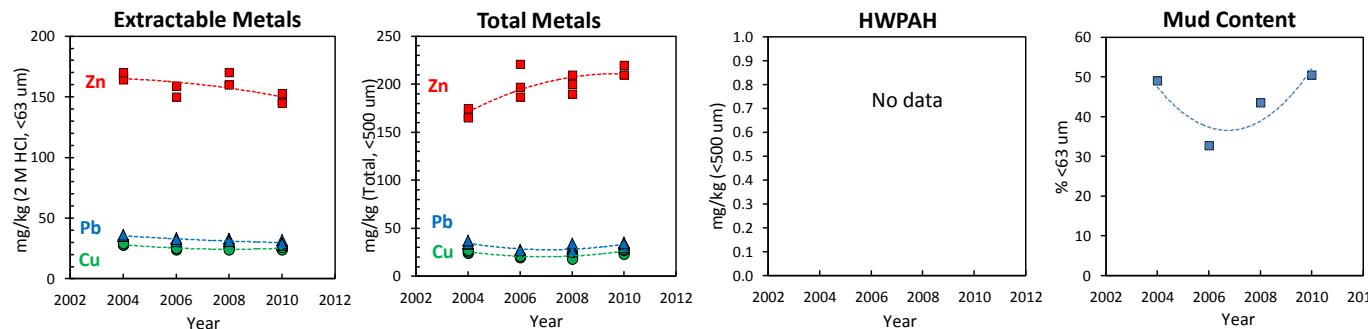


Additional Notes

Site also sampled in 2002 (NIWA for ACC/Metrowater) from a site approx. 200 m upstream of the RDP site shown above (sampled 2004, 2006, 2008, 2010 - see annual RDP reports).



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (%,<500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	49.0	no data	28.0	35.3	167	25.8	34.3	166	no data	no data
2006	32.7	no data	25.0	32.7	159	20.4	27.1	197	no data	no data
2008	43.5	no data	25.0	31.0	160	22.0	29.0	200	no data	no data
2010	50.5	no data	25.0	29.0	146	27.0	34.0	210	no data	no data
Median	46.3	no data	25.0	32.4	160	23.6	31.9	199	no data	no data
Trend (absolute units per year)	0.8	no value	-0.5	-0.9	-2.5	0.1	-0.2	6.6	no value	no value
Trend (% of median per year)	↗ 1.7	no value	↘ -1.9	↓ -2.9	↘ -1.6	↗ 0.5	↗ -0.5	↑ 3.3	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction

Trend Indicators

↗ < ±1%

↘ ↗ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

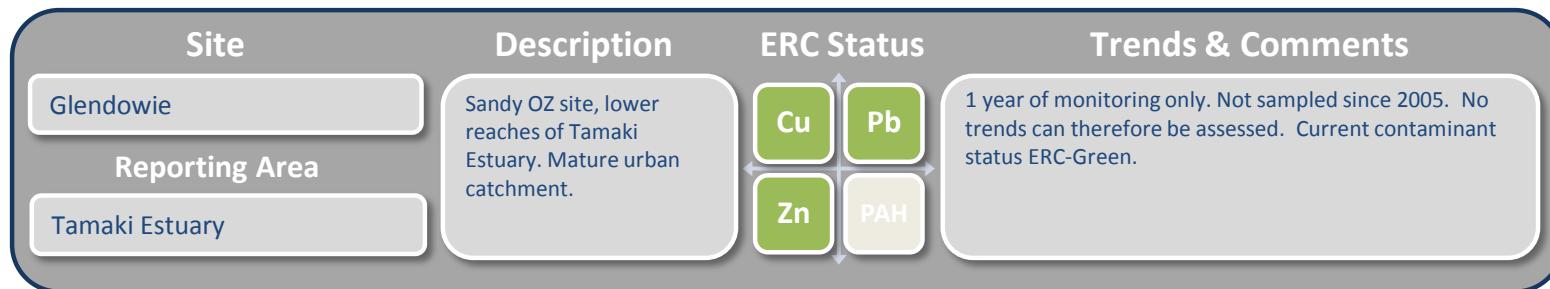
1.3 Glendowie

Site	Type	Description & Notes
Glendowie	Muddy OZ	
Reporting Area	Land Use	
Tamaki Estuary	Mature urban	Site is located on a broad intertidal sand flat in the lower reaches of the Tamaki Estuary, south of the Tahuna Torea spit. The sediment texture here is not documented but metals' data suggest muddy sand. Neighbouring catchment is mature urban (residential).

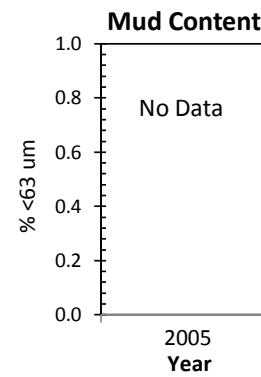
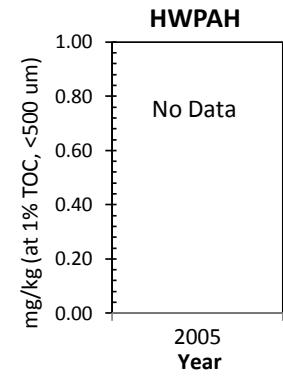
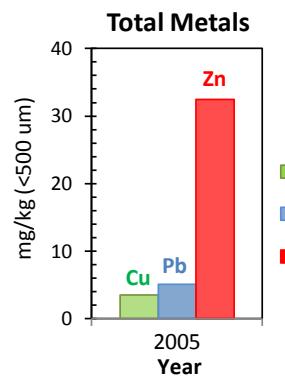
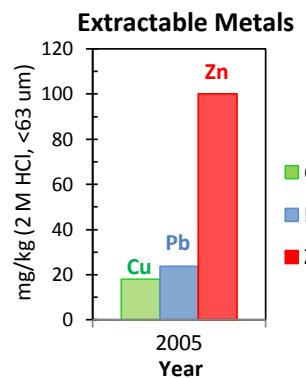


Additional Notes

Site sampled in 2005 (for BHM validation?).



Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	18.0	23.8	100	3.5	5.0	33	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

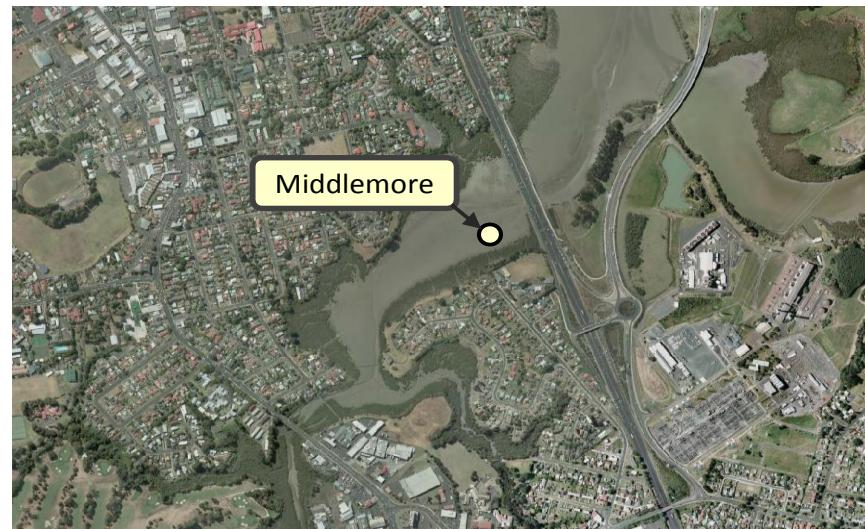
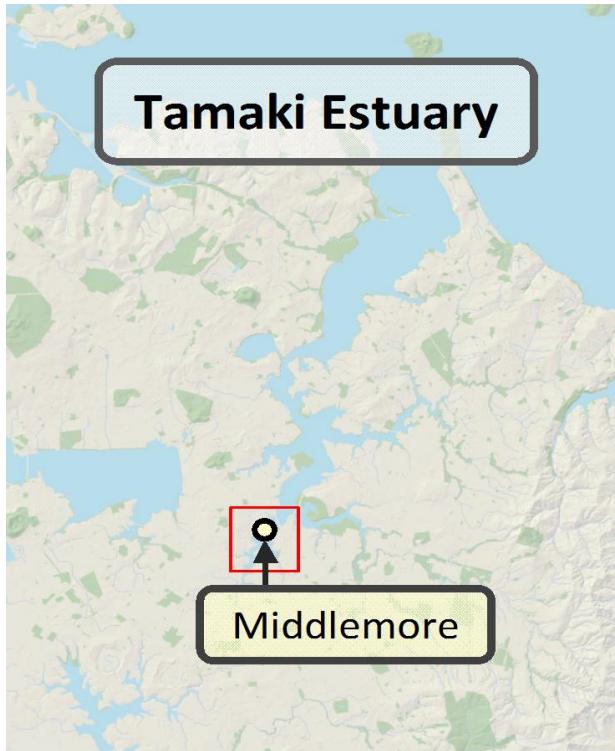
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

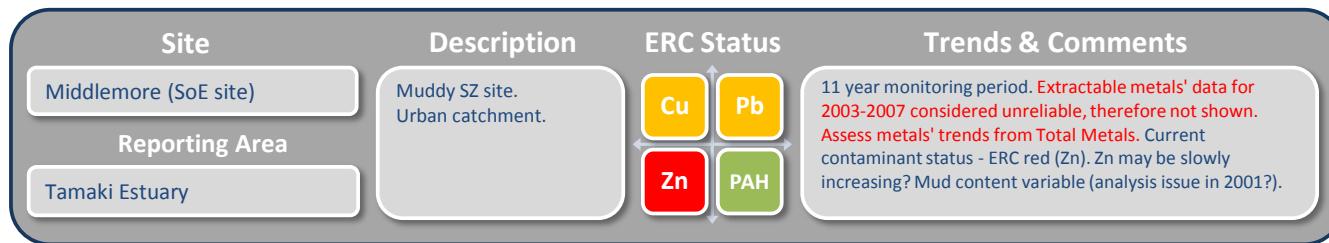
1.4 Middlemore (SoE)

Site	Type	Description & Notes
Middlemore	Muddy SZ	
Reporting Area Tamaki Estuary	Land Use Mature urban	Site is located on a mudflat in the upper reaches of Tamaki Estuary, approx. 150 m upstream of the SH1 bridge. The sediment texture here is mud. Mangroves line the inlet.

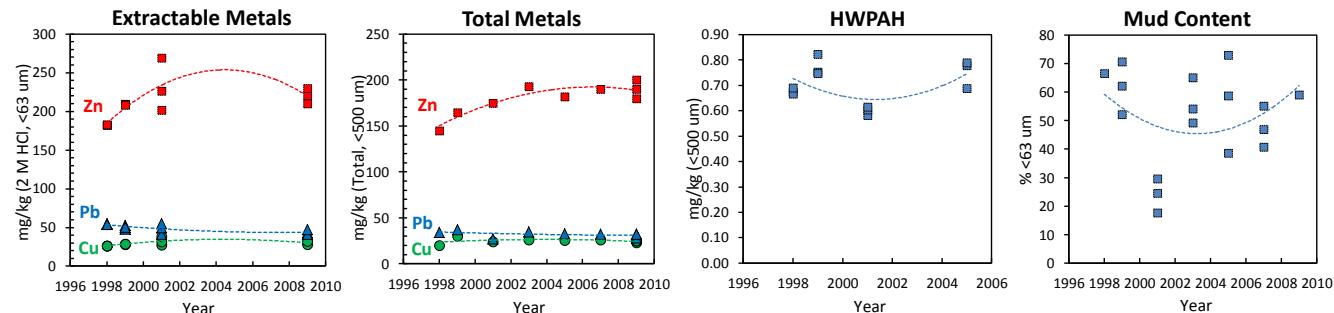


Additional Notes

SoE site, sampled biannually since 1998. Bulk reference QA sediment taken in 2011 from between the SoE site and the SH1 bridge.



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	66.7	no data	26.3	54.3	182	19.8	34.2	145	0.674	no data
1999	62.2	no data	28.6	50.5	209	30.3	37.4	165	0.753	no data
2001	24.5	no data	31.9	49.5	226	24.1	27.1	175	0.605	no data
2003	54.2	1.35	no data	no data	no data	26.0	34.5	193	no data	no data
2005	58.7	1.47	no data	no data	no data	25.8	32.6	182	0.779	0.530
2007	46.9	1.60	no data	no data	no data	26.0	32.0	190	no data	no data
2009	59.0	no data	30.0	43.0	220	25.0	32.0	190	no data	no data
Median	54.2	1.47	28.4	50.0	209	25.0	32.0	182	0.690	0.530
Trend (absolute units per year)	0.0	0.07	0.2	-0.8	2.2	0.0	-0.3	3.1	0.005	no value
Trend (% of median per year)	➔ 0.0	↑ 4.4	➔ 0.8	⬇ -1.6	➔ 1.0	➔ 0.0	➔ -1.0	➔ 1.7	➔ 0.7	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction

Trend Indicators

➔ < ±1%

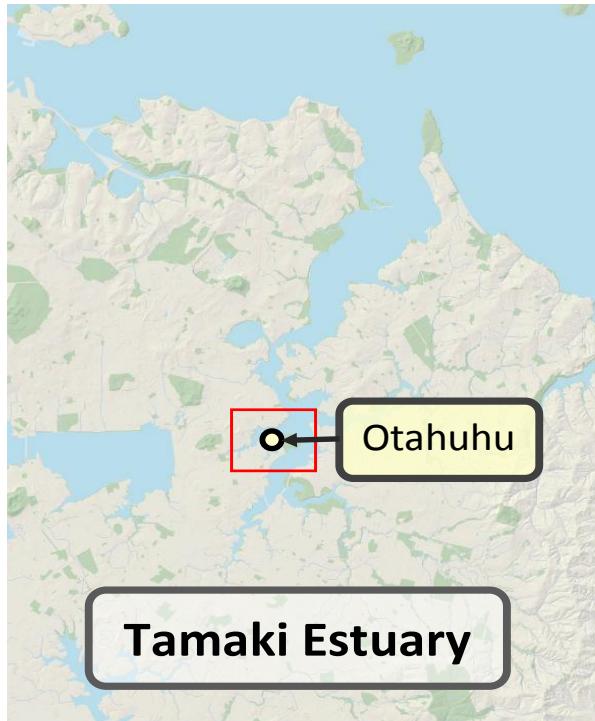
➡ ↗ ±1 - 2%

↑ ↘ > ±2%

Average annual rate of change, as % of median per year

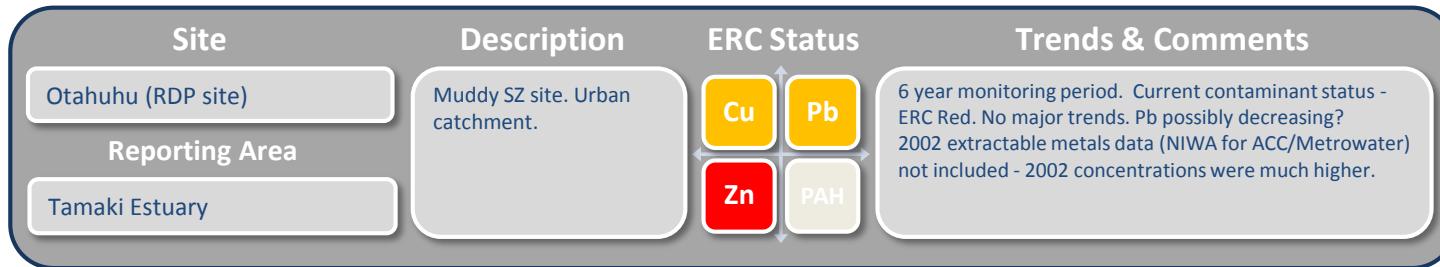
1.5 Otahuhu

Site	Type	Description & Notes
Otahuhu	Muddy SZ	
Reporting Area	Land Use	
Tamaki Estuary	Mature urban	Site is located on a mudflat in the lower reaches of Otahuhu Creek, approx. 500 m from the confluence with the Tamaki Estuary. The sediment texture here is deep smooth mud. Mangroves line the inlet.

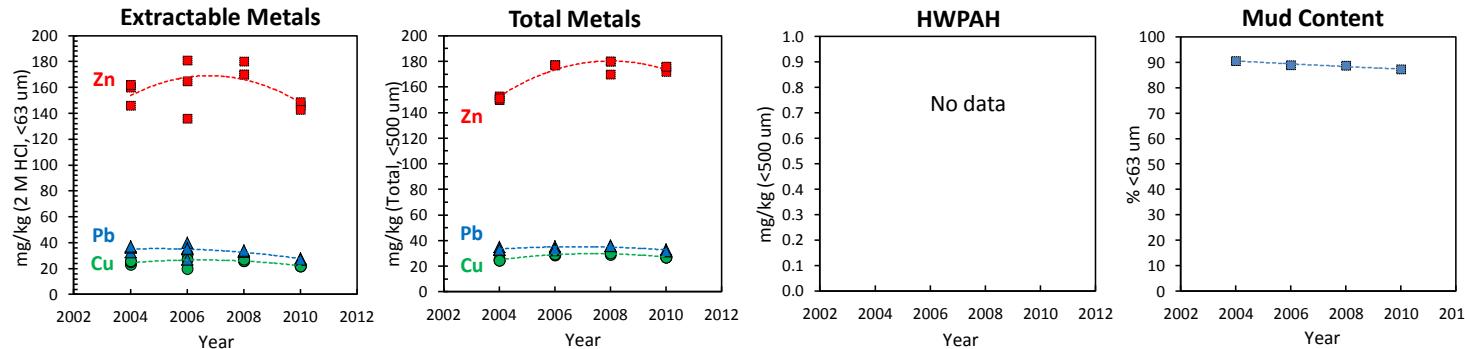


Additional Notes

Sampled first in 2002 from a site ca. 50 m from the RDP site sampled 2004, 2006, 2008, & 2010 (i.e. essentially same location).



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPAH (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	90.7	no data	25.0	36.3	160	24.6	33.2	151	no data	no data
2006	89.0	no data	27.0	35.7	165	29.0	33.4	177	no data	no data
2008	88.7	no data	26.0	33.0	170	30.0	36.0	180	no data	no data
Median	88.8	no data	25.5	33.0	161	27.8	33.3	176	no data	no data
Trend (absolute units per year)	-0.5	no value	-0.4	-1.3	-0.9	0.3	-0.1	3.5	no value	no value
Trend (% of median per year)	➡ -0.6	no value	⬇ -1.5	⬇ -3.8	➡ -0.5	➡ 1.2	➡ -0.3	➡ 2.0	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 μm and <500 um fraction data. Settling Zones - the <500 μm fraction

Trend Indicators

➡ < ±1% ⬇ ⬆ ±1 - 2% ⬆ ⬇ > ±2%

Average annual rate of change, as % of median per year

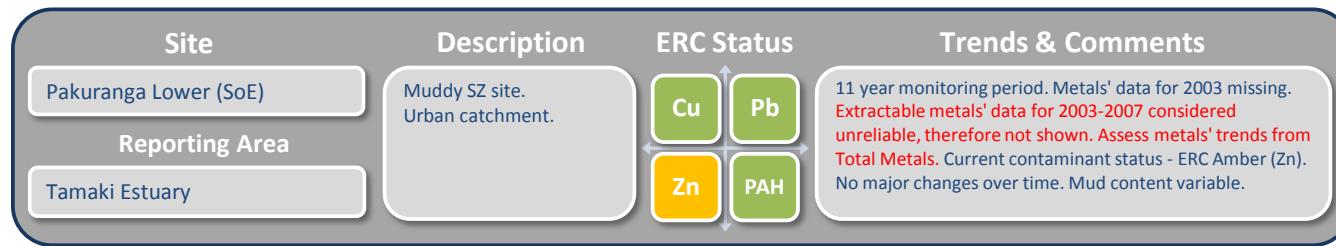
1.6 Pakuranga Lower (SoE)

Site	Type	Description & Notes
Pakuranga Lower	Muddy SZ	
Reporting Area	Land Use	
Tamaki Estuary	Urban	Site is located on a broad mudflat in the lower reaches of the Pakuranga Creek estuary, approximately 500 m from the mouth. The sediment is muddy. Upstream catchment is mix of residential, and intensive commercial/industrial.

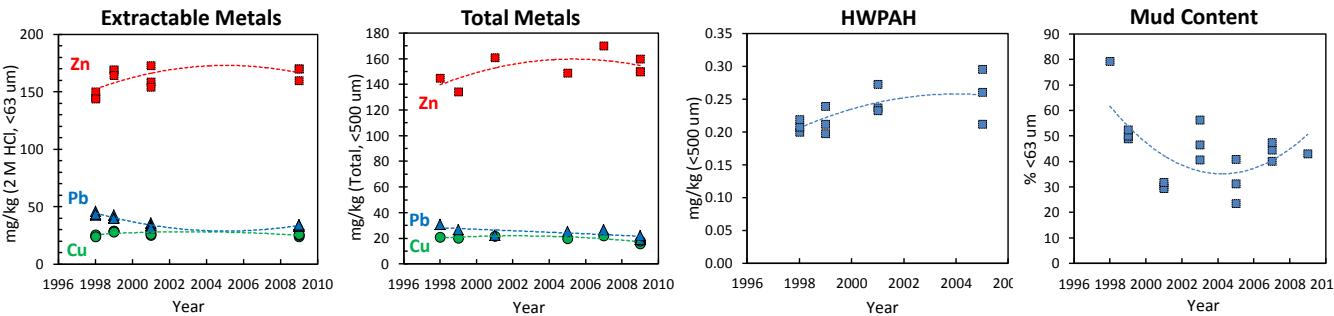


Additional Notes

SoE site, sampled biannually since 1998, except 2003.



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (%,<500 um)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	79.3	no data	24.5	43.6	145	20.9	30.9	145	0.208	no data
1999	50.0	no data	28.6	40.8	169	20.4	26.7	134	0.212	no data
2001	30.4	no data	26.1	33.2	159	21.6	22.4	161	0.237	no data
2003	46.6	1.30	no data	no data	no data	no data	no data	no data	no data	no data
2005	31.3	1.08	no data	no data	no data	20.0	25.4	149	0.260	0.235
2007	44.6	1.30	no data	no data	no data	22.0	27.0	170	no data	no data
2009	43.1	no data	25.0	34.0	170	17.0	21.0	150	no data	no data
Median	43.1	1.30	25.7	37.8	162	20.2	23.9	150	0.226	0.235
Trend (absolute units per year)	-1.4	-0.02	-0.1	-0.8	1.0	-0.3	-0.6	1.1	0.007	no value
Trend (% of median per year)	↓ -3.2	↘ -1.3	➡ -0.5	↓ -2.1	➡ 0.6	↘ -1.6	↓ -2.5	➡ 0.8	↑ 3.0	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction

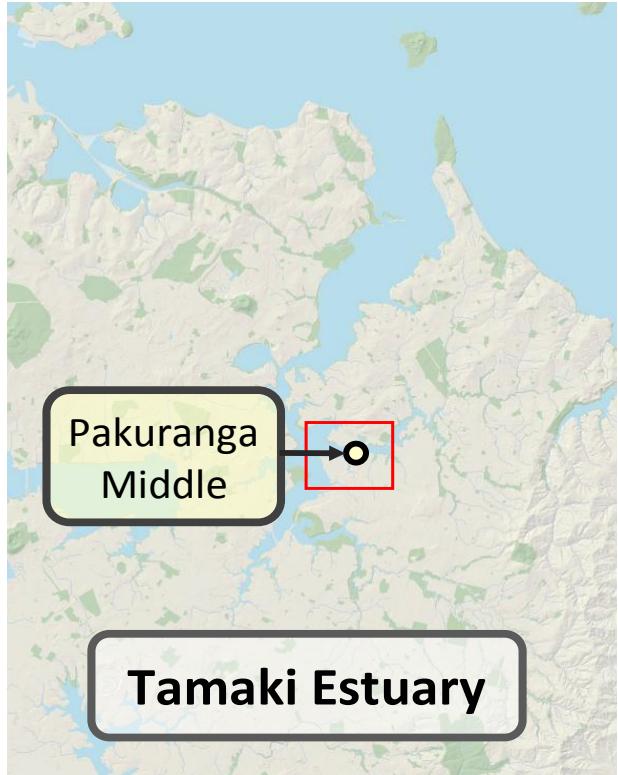
Trend Indicators

➡ < ±1% ↘ ↗ ±1 - 2% ↑ ↓ > ±2%

Average annual rate of change, as % of median per year

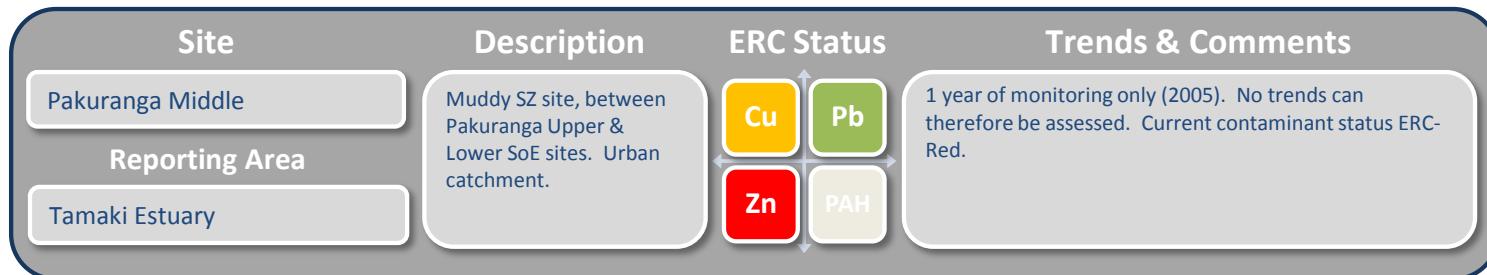
1.7 Pakuranga Middle

Site	Type	Description & Notes
Pakuranga Middle	Muddy SZ	
Reporting Area	Land Use	
Tamaki Estuary	Urban	Site is located in the middle reaches of the Pakuranga Creek estuary, mid-way between the mouth and Ti Rakau Drive Bridge. The sediment texture not reported, but likely to be muddy. Catchment is mix of residential, and intensive commercial/industrial (southern area).

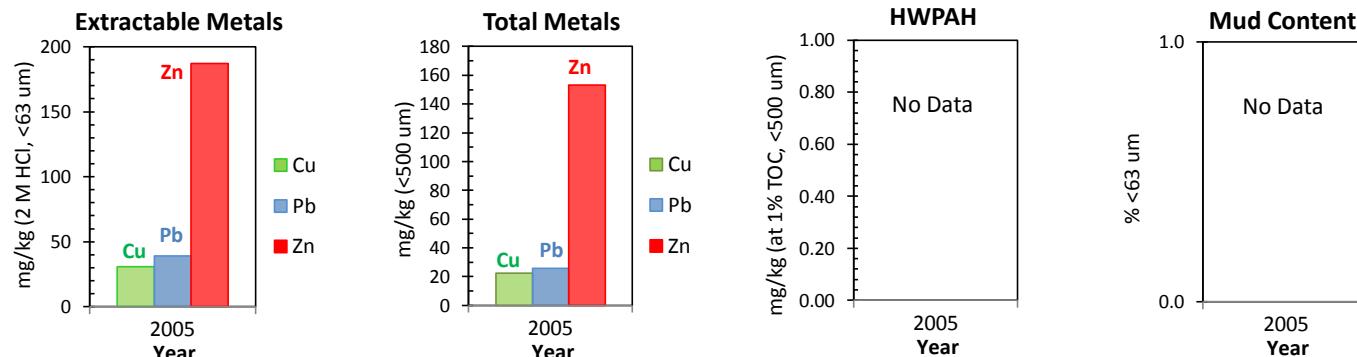


Additional Notes

Sampled in 2005 (for BHM validation?).



Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (%,<500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2005	no data	no data	31.0	39.2	187	22.6	25.8	153	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

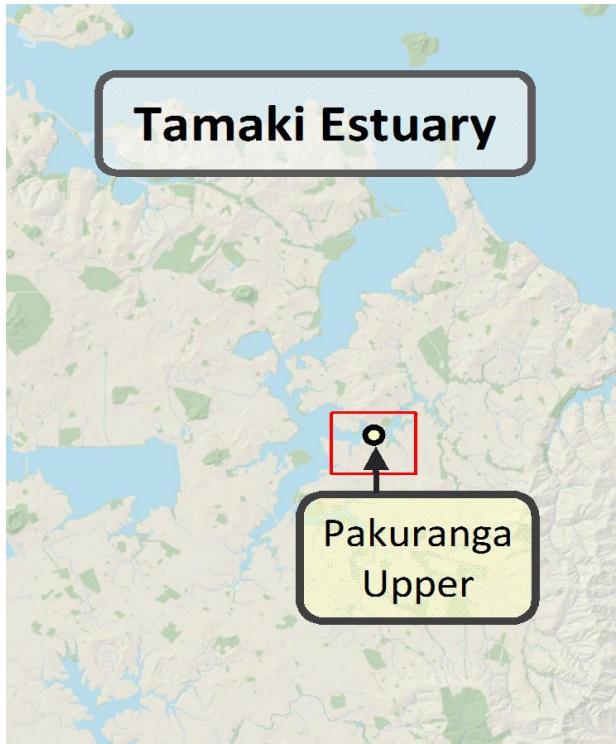
Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction

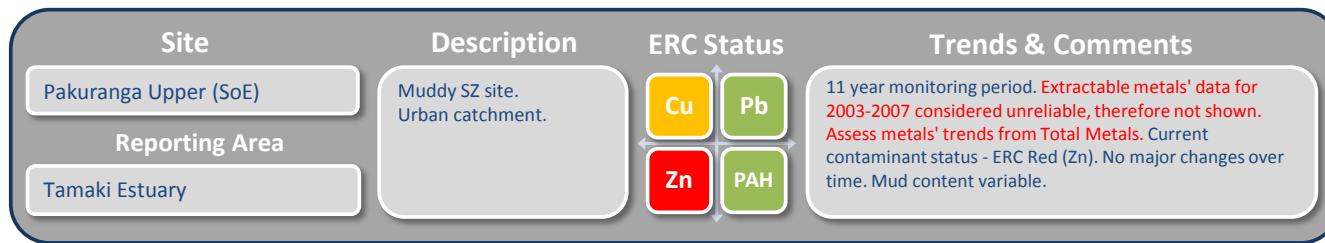
1.8 Pakuranga Upper (SoE)

Site	Type	Description & Notes
Pakuranga Upper	Muddy SZ	
Reporting Area Tamaki Estuary	Land Use Urban	Site is located on a narrow mudflat in the middle reaches of the Pakuranga Creek estuary, approximately 300 m below the Ti Rakau Drive bridge. The sediment is muddy. Upstream catchment is mix of residential, and intensive commercial/industrial.

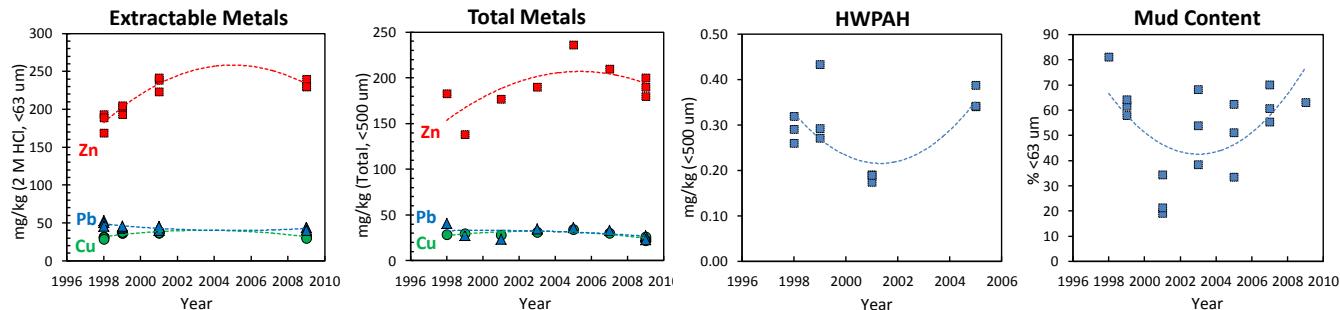


Additional Notes

SoE site, sampled biannually since 1998. Mangroves encroaching on site. Significant erosion evident near LT channel.



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (%,<500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPah (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
1998	81.1	no data	31.0	50.8	189	28.8	41.0	183	0.291	no data
1999	61.7	no data	36.5	44.2	203	29.8	27.5	138	0.293	no data
2001	21.4	no data	36.8	45.1	239	28.1	23.4	177	0.190	no data
2003	53.9	1.74	no data	no data	no data	31.0	34.9	190	no data	no data
2005	51.1	2.36	no data	no data	no data	34.4	36.4	236	0.342	0.145
2007	60.7	2.10	no data	no data	no data	30.0	33.0	210	no data	no data
2009	63.2	no data	32.0	44.0	230	24.0	26.0	190	no data	no data
Median	57.9	2.10	34.8	44.7	214	28.8	27.5	190	0.292	0.145
Trend (absolute units per year)	0.4	0.09	-0.2	-0.4	3.7	-0.4	-0.6	2.9	0.006	no value
Trend (% of median per year)	↗ 0.7	↑ 4.4	↗ -0.5	↗ -0.9	↗ 1.7	↘ -1.5	↓ -2.2	↗ 1.5	↑ 2.2	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19-34 Pb 30-50 Zn 124-150 PAH 0.66-1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 um and <500 um fraction data. Settling Zones - the <500 um fraction

Trend Indicators

↗ < ±1%

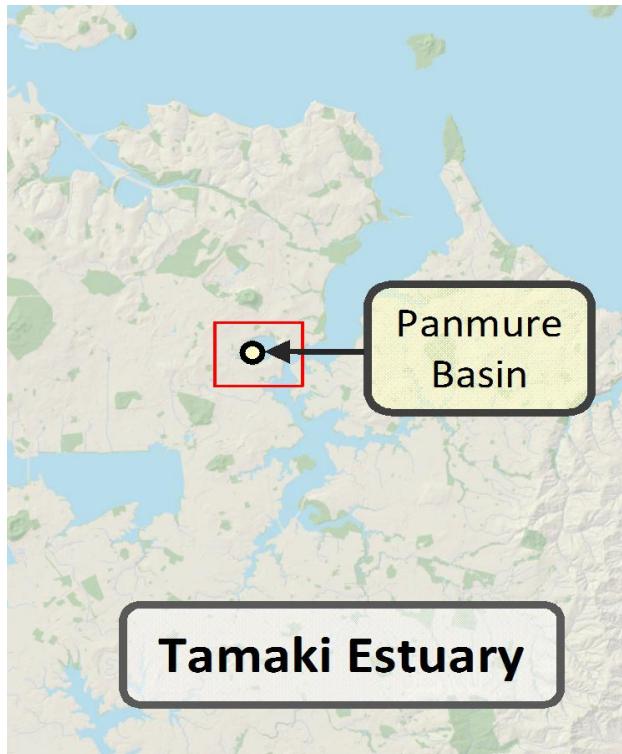
↘ ↗ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

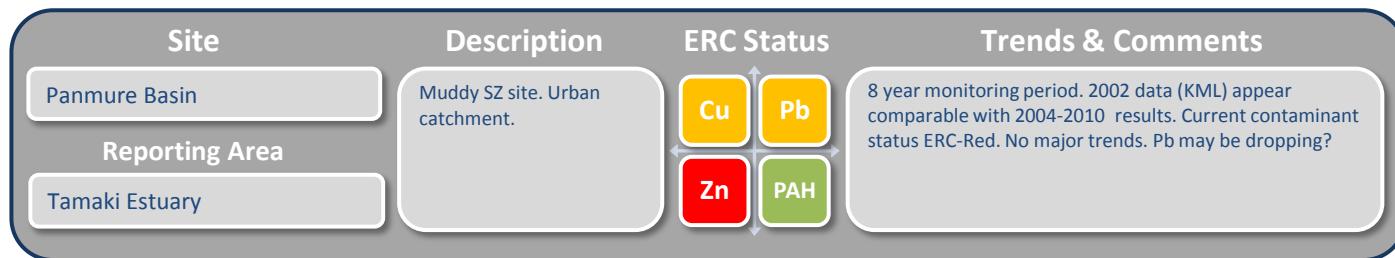
1.9 Panmure Basin

Site	Type	Description & Notes
Panmure Basin	Muddy SZ	
Reporting Area Tamaki Estuary	Land Use Urban	Site is located on a broad mudflat in the south west end of Panmure Basin, approximately 150 m from shore. The sediment is deep soft mud. Surrounding catchment is mix of urban residential, commercial & light industrial.

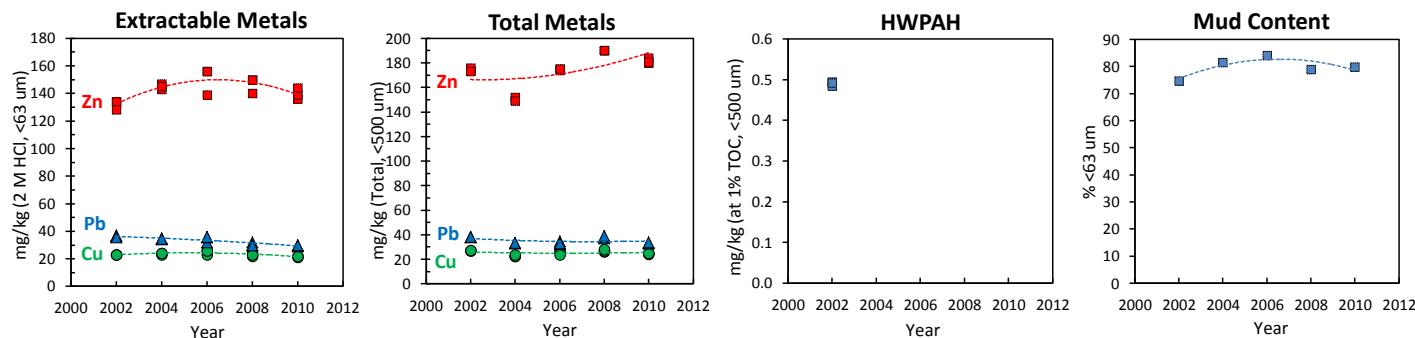


Additional Notes

First sampled in 2002 (KML 2003) from a site approximately 30 m further from shore than later RDP site (i.e. essentially same site location).



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2002	74.7	1.32	23.0	36.5	134	27.1	38.2	174	0.650	0.492
2004	81.6	no data	24.0	34.6	145	22.6	33.2	149	no data	no data
2006	84.1	no data	26.0	35.6	156	25.6	33.1	175	no data	no data
2008	78.9	no data	23.0	30.0	150	27.0	38.0	190	no data	no data
2010	79.9	no data	22.0	30.0	139	25.0	33.0	181	no data	no data
Median	79.9	1.32	23.0	34.0	143	25.6	34.0	175	0.650	0.492
Trend (absolute units per year)	0.4	no value	-0.2	-0.9	0.9	0.0	-0.2	2.7	no value	no value
Trend (% of median per year)	0.5	no value	→ -0.7	↓ -2.5	→ 0.6	→ -0.1	→ -0.7	↗ 1.6	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 um fraction data. Settling Zones - the <500 µm fraction

Trend Indicators

→ < ±1%

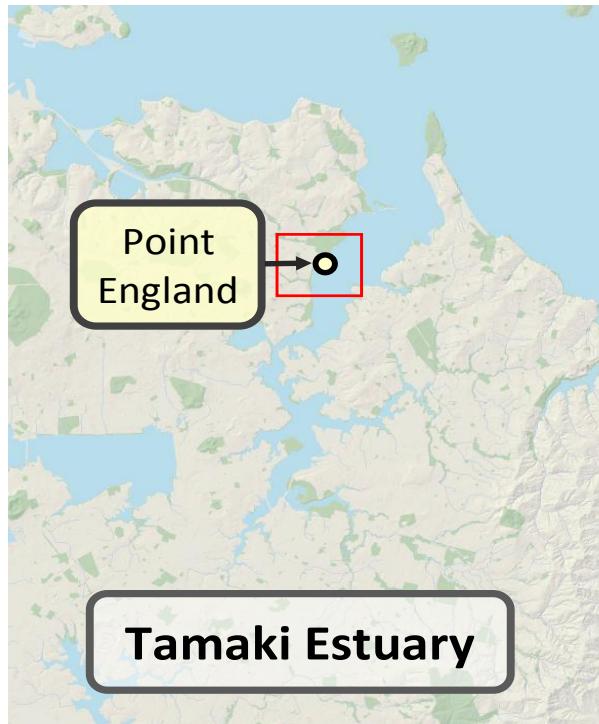
↖ ↗ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

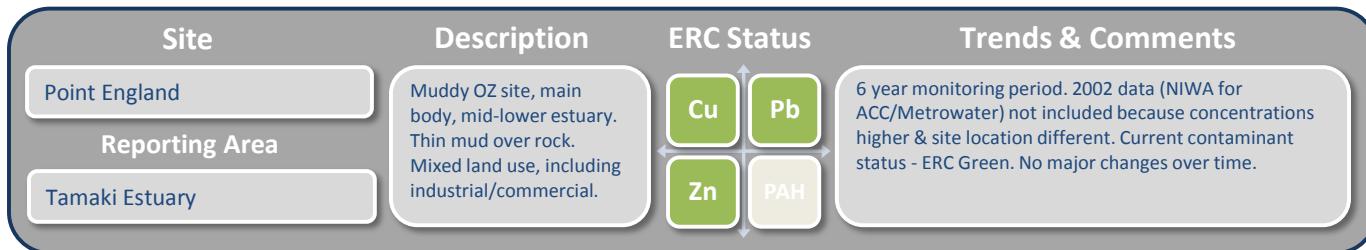
1.10 Point England

Site	Type	Description & Notes
Point England	Muddy OZ	
Reporting Area	Land Use	
Tamaki Estuary	Mature urban	Site is located on a broad shelf in the mid-lower Tamaki Estuary. The sediment texture here is a thin layer of mud over hard basement. Immediate catchment is largely residential, with established intensive commercial/industrial in the wider catchment.

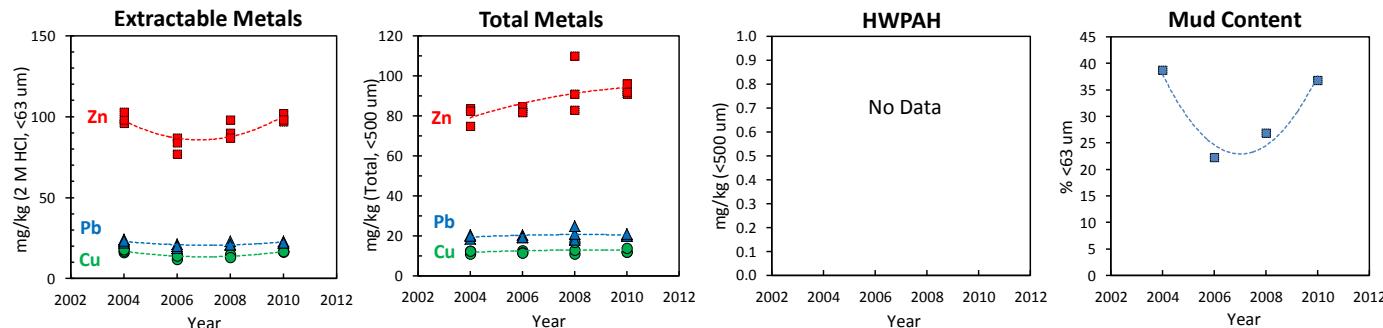


Additional Notes

Sampled first in 2002 (NIWA for ACC/Metrowater) from a site ca. 300 m downstream (north) of the RDP site sampled 2004, 2006, 2008, & 2010. Soft sediment depth insufficient for ecology coring.



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (% <500 um)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPAH (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	38.7	no data	17.0	23.4	98	12.6	20.0	82	no data	no data
2006	22.2	no data	14.0	20.0	84	11.7	19.4	82	no data	no data
2008	26.9	no data	14.0	21.0	90	13.0	21.0	91	no data	no data
2010	36.8	no data	16.8	22.0	98	12.0	20.0	92	no data	no data
Median	31.9	no data	15.5	22.0	97	12.3	20.0	84	no data	no data
Trend (absolute units per year)	-0.1	no value	0.0	-0.1	0.5	0.2	0.2	2.5	no value	no value
Trend (% of median per year)	→ -0.2	no value	→ -0.2	→ -0.3	→ 0.5	↑ 1.4	→ 0.9	↑ 3.0	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fraction data. Settling Zones - the <500 µm fraction

Trend Indicators

→ < ±1%

↔ ±1 - 2%

↑↓ > ±2%

Average annual rate of change, as % of median per year

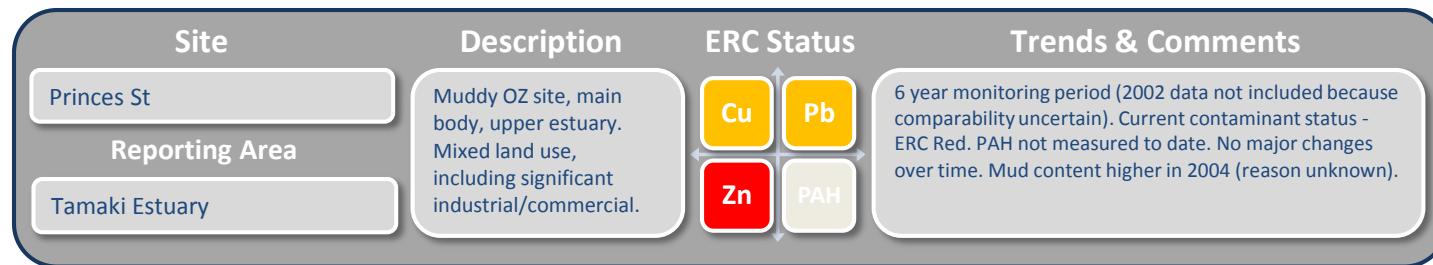
1.11 Princes

Site	Type	Description & Notes
Princes St	Muddy OZ	
Reporting Area	Land Use	
Tamaki Estuary	Mature urban	Site is located on a narrow mudflat in the upper Tamaki Estuary. The sediment texture here is gritty mud over hard basement. Immediate catchment is largely residential, with established & new intensive commercial/industrial on opposite side of estuary.

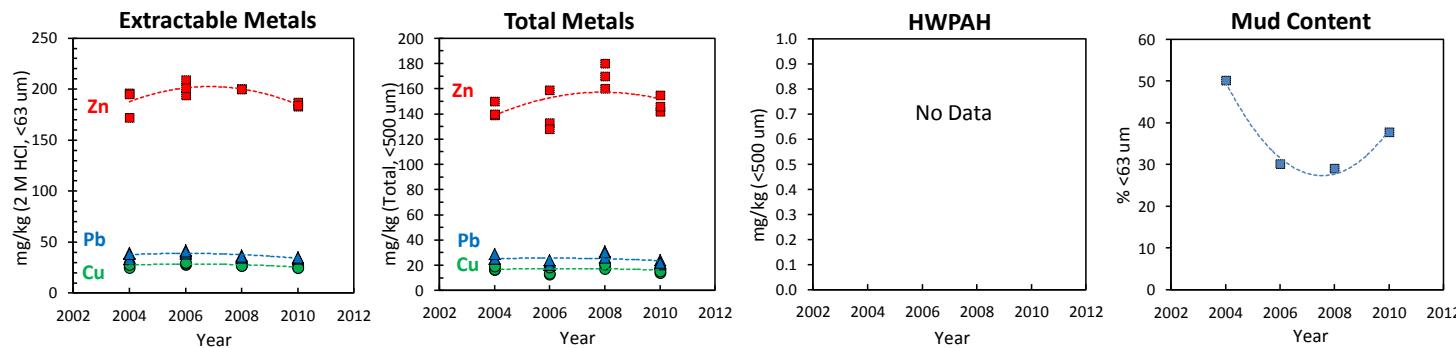


Additional Notes

Sampled first in 2002 (NIWA for ACC/Metrowater) from a site ca. 50-100 m downstream of the RDP site sampled 2004, 2006, 2008, & 2010. Site area subject to human disturbance from boats and local users. Marker peg usually missing.



Changes in sediment chemistry over monitoring period. "Line of best fit" (quadratic smoothing) shown.



Annual median concentrations & indicative trends (by linear regression). Colours refer to ERC (see footnotes).

Year	Mud Content % <63 um	Organic Carbon TOC (%,<500 um)	Extractable Metals (mg/kg, <63 um)			Total Metals (mg/kg, <500 um)			HWPah (mg/kg, <500 um)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2004	50.2	no data	28.0	38.5	195	16.9	25.2	140	no data	no data
2006	30.2	no data	29.0	40.8	201	13.4	20.6	133	no data	no data
2008	29.1	no data	27.0	36.0	200	21.0	30.0	170	no data	no data
2010	37.8	no data	25.0	35.0	184	15.0	22.0	146	no data	no data
Median	34.0	no data	27.5	36.5	196	17.0	24.7	148	no data	no data
Trend (absolute units per year)	-1.9	no value	-0.3	-0.6	-0.5	-0.1	-0.3	2.2	no value	no value
Trend (% of median per year)	↓ -5.7	no value	↓ -1.2	↓ -1.6	→ -0.3	→ -0.5	↓ -1.1	↑ 1.5	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 um fraction data. Settling Zones - the <500 µm fraction

Trend Indicators

→ < ±1%

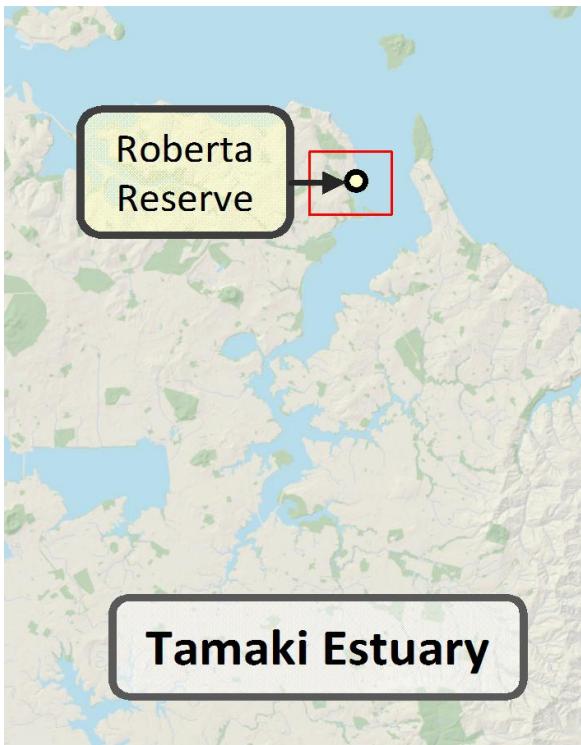
↔ ±1 - 2%

↑ ↓ > ±2%

Average annual rate of change, as % of median per year

1.12 Roberta Reserve

Site	Type	Description & Notes
Roberta Reserve	Sandy OZ	Site is located on a broad intertidal sand flat in the lower reaches of the Tamaki Estuary, north of the Tahuna Torea spit. The sediment texture here is sand, over hard rock basement. Neighbouring catchment is mature urban (residential).
Reporting Area Tamaki Estuary	Land Use Mature urban	

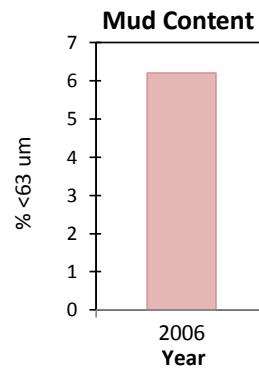
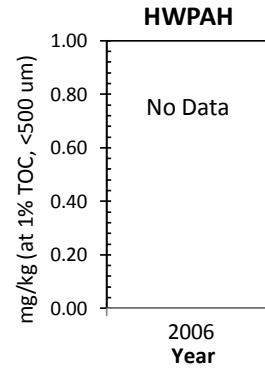
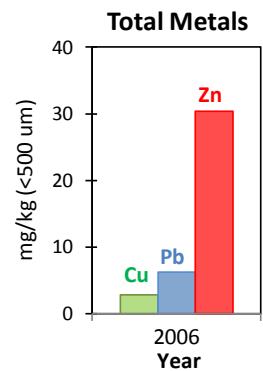
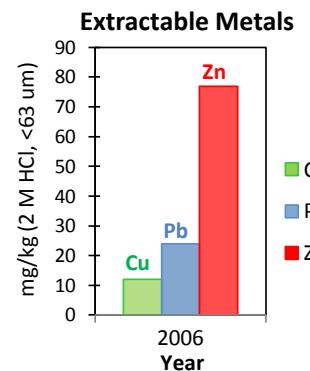


Additional Notes

Site located well off shore as sediment depth too shallow for ecology closer in-shore. General location also sampled in 2002 (NIWA for ACC/Metrowater) from a site approximately 180 m south west of RDP site (on opposite side of stream channel).

Site	Description	ERC Status	Trends & Comments
Roberta Reserve (RDP)	Sandy OZ site in lower reaches of Tamaki Estuary. Urban catchment.	Cu Pb Zn PAH	1 year of monitoring only (2006). No trends can therefore be assessed. Current contaminant status ERC-Green.
Reporting Area			
Tamaki Estuary			

Sediment chemistry summary



Annual median concentrations. Colours refer to ERC (see footnotes).

Year	Mud Content % <63 µm	Organic Carbon TOC (% <500 µm)	Extractable Metals (mg/kg, <63 µm)			Total Metals (mg/kg, <500 µm)			HWPah (mg/kg, <500 µm)	
			Cu	Pb	Zn	Cu	Pb	Zn	mg/kg	at 1% TOC
2006	6.2	no data	12.0	24.0	77	2.8	6.3	30	no data	no data
Trend (absolute units per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value
Trend (% of median per year)	no value	no value	no value	no value	no value	no value	no value	no value	no value	no value

Environmental Response Criteria (ERC)

Cu <19 Pb <30 Zn <124 PAH <0.66

Cu 19–34 Pb 30–50 Zn 124–150 PAH 0.66–1.7

Cu >34 Pb >50 Zn >150 PAH >1.7

ERC: For Outer Zones - the greater of the <63 µm and <500 µm fractions. Settling Zones - the <500 µm fraction