



Te Awarua-o-Porirua Harbour Scorecard - 2017

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Background

The two water systems of the harbour (the Pauatahanui Inlet and the Onepoto Arm) once supported a bountiful supply of fish and shellfish. In addition to the marine species, rich forests surrounded the harbour and provided valuable habitat for birds. Flax was abundant in the swamps.

From the 1820s Europeans began to settle in Porirua. From the 1850s onwards, major impacts on the harbour system were caused by forest clearance propelled initially by an increasing demand for timber. Forest clearance proceeded rapidly so that within some 40 years lowland Porirua was transformed from a mostly forested into a mostly pastoral landscape. Interestingly, there is more vegetation around the harbour system now than there was at the end of the 19th Century.

The progressive clearance for pasture resulted in a massive increase in sediment, which started filling the harbours at a rate of 2 – 4mm/year from a pre-European background inflow of 1mm/yr.

The next big effect was urban development. This increase in sediment inputs to the harbour and its subsequent deposition, together with the effects of roads, railways and reclamations, dramatically altered the shoreline and the tidal prism (the amount of tidal water that could move in and out of the harbour system). Sedimentation rates increased substantially so that by the mid 1970s the average rate was estimated to be between 6 and 9mm/yr. In parts of the Pauatahanui Inlet it may have been as high as 10-15mm/yr at some sites. If continued, these rates would result in the Inlet being in-filled and becoming a swamp in 145 - 195 years and the Onepoto Arm in 290 – 390 years. (Gibb, 2009, 2011).

In addition to sediment, urban development added chemical and biological contaminants and nutrients, together with toxins (such as heavy metals and chemicals) from urban run-off and leaking waste water networks. Agricultural chemicals and industrial run off in the post Second World War era added further pollution which is now embedded in harbour sediments and affects its shellfish and fish stocks.

Fortunately, this legacy of contamination is now being addressed by the three authorities responsible for the harbour and its catchments – Porirua City Council (PCC), Wellington City Council (WCC), and Greater Wellington Regional Council (GWRC). Together with Ngati Toa and other organisations and agencies, these authorities have drawn up a *Porirua Harbour and Catchment Strategy and Action Plan*. It is the touchstone and guide towards a brighter future for the harbour. The Strategy sets out objectives and targets designed to arrest the decline in harbour condition and return it to a healthy and resilient state. The Action Plan provides specific methods and activities for implementing the Strategy.

On a further positive note, scientific surveys and research tell us that the harbour still has a solid foundation for a healthy ecosystem. Among these indicators are continuing large numbers of cockles; it is the southern-most nursery for rig (sand shark); resident and migratory birdlife use both arms of the harbour; spotless crane have re-established in the

Pauatahanui Wildlife Reserve; and there are a host of other rare and common fish and birdlife species that live in or use the harbour. Apart from pathogens (disease causing micro organisms), no other harbour contaminants are evident in fish or shellfish

Te Awarua-o-Porirua Harbour and its catchment are significant to the people of Porirua City as well as those across the Wellington region.

- It is the focal point and defining feature of Porirua City
- It is a gateway to Wellington City from the Kapiti Coast and points north.
- It is a much-valued recreational playground for the city and the region
- It is a regionally significant bird and fish habitat and includes a wildlife reserve of national importance
- It is a significant resource for local iwi, Ngati Toa Rangatira.

This scorecard serves to raise awareness and report on long term progress in meeting the objective of the Porirua Harbour and Catchment Strategy for “a healthy catchment, waterways and harbour”.

The Porirua Harbour Trust

The Trust (*Porirua Harbour and Catchment Community Trust* but marketed as the *Porirua Harbour Trust*) was established in 2011 with representation from the three councils, Ngati Toa Rangatira and community members. Two of our key objectives are to:

- Advocate for the sustainable management of the harbour and its catchment; and
- Foster an understanding of ecological and environmental issues within the harbour and its catchment through research, education and community awareness.

The Trust has undertaken to report annually with reference to a set of “State of the Harbour” indicators with the aim of tracking progress towards a healthy harbour. To this end a review panel of two Trust members and an independent observer has been established. The panel considers data available from the Councils as well as the Trust’s own surveys and projects and uses this to report on five key indicators of the health of the harbour.

The review panel comprises:

Grant Baker, Chairperson of the Porirua Harbour Trust
Lindsay Gow, Trustee of the Porirua Harbour Trust
Clive Anstey, Landscape and Resource Planner.

The annual scorecard on the health of the Porirua Harbour will be available at the start of each calendar year.

Executive Summary for 2017

The 2017 “State of the Harbour” scorecard is the fifth for the Trust and reports against the baseline established for each of the five indicators being measured in our first report in 2013.

The Good News:

- We are seeing a strong, coordinated and increasing commitment from councils and agencies for the harbour strategy programme and this indicator continues to receive a **Good** rating.
- The Education programme provided by the Trust and the councils which targets schools across the catchment has achieved extremely well over the last year and is changing the way our children think about our harbour and catchment.
- Recreational Water Quality at all of our major swimming sites in the harbour has improved over previous reports.

The Worrying News:

- Trends across the five indicators show some major concerns with the ecological health of the harbour. These concerns are raised by:
 - The continuing and significant increase in fine mud in the Pauatahanui Inlet;
 - The potentially high and growing levels of nutrient inflows, especially into the Pauatahanui Inlet;
 - The still mostly poor quality of our streams (which languish in the bottom third of all streams in the Wellington region).

The overall picture is a mixed one: the average sedimentation rate now falls within the target set by the Harbour Strategy and Action Plan; but some parts of the harbour, and especially the Pauatahanui Inlet, show worrying indicators and trends.

The inflow of fine mud and nutrients must be slowed. So far, the harbour sediments are still generally well oxygenated despite their often muddy nature. But sooner or later this can change and lead to nuisance algal growths and a noticeable reduction in the health of and life in the harbour.

Catchment management is the only way to deal with this. Policies and programmes need to focus on the sources and related trends in these problems and then on measures (such as accelerated planting and re-vegetation) to slow and, hopefully, stop at its source the causes of this potentially significant damage.

Our key findings for each of the indicators are:

Agency Action:

We are seeing a strong, coordinated and increasing commitment from councils and agencies for the harbour strategy programme and this indicator continues to receive a **Good** rating. There has been a delay in the review of the Harbour Strategy and Action Plan until the Whaitua and the three council Long Term Plan processes and the PCC District Plan reviews are completed. Each of these activities will add context and content to the revised Harbour Strategy and Action Plan. The trust expects to see more specific project-activity reporting with a particular emphasis on priority deliverables and outcome-based results in the new review.

Sedimentation:

Sedimentation rates for 2016/17 were impacted by a series of significant storm events, especially the November 2016 event. This had a significant impact, particularly in the Pauatahanui Inlet of the harbour. The Onepoto Arm (subtidal) and Pauatahanui Inlet (intertidal) both receive an overall rating of **Excellent** over the last three years.

As a result of storm events, the sedimentation rate in Pauatahanui (subtidal) increased dramatically affecting the overall result for the harbour. There is a growing concern about the deposition of fine mud in parts of the harbour and particularly in the Pauatahanui Inlet subtidal areas. The Kakaho Stream area, possibly as a result of slips caused by the November 2016 earthquake and the following storm, deposited a fine mud plume extending 300 metres out from the Kakaho Stream mouth.

Education and Recreational Usage:

The environmental education programmes provided by the Trust and GWRC which targets schools across the catchment has increased the number of schools using the resources from 26 schools out of the 51 schools in the catchment in 2015, to 39 in 2016 and 43 in 2017 a **Good** result. The wider education programme within the catchment, which involves over 20 different education providers, continues to achieve increases in school children engaged in catchment programmes.

Recreational Water Quality at all of our major swimming sites in the harbour has improved over previous reports with none of our top beaches at Plimmerton given a **Poor** rating this year.

Nevertheless, only the Karehana Bay beach which is outside the Harbour, and Pauatahanui Inlet at the Paremata Bridge, get a **Good** - *being suitable for swimming for most of the time*. The other four sites have all been rated **Fair** - *generally suitable for swimming with care*. Three of these sites have improved from **Poor** to **Fair** in the reporting period.

Ecological Health of the Harbour and Streams:

The macroinvertebrate health in the streams measured is slightly better than previous years but only one of the three monitored sites received a **Good** rating over the last three year period. This year Glenside on the Porirua Stream was not monitored.

The Horokiri Stream is rated **Good** for water quality while the Pauatahanui Stream and Porirua Stream (at Wall Place) are rated as **Fair**. Our streams continue to languish toward the bottom of the list for water quality compared against all streams in the Greater Wellington region.

The ecological health of the harbour in the intertidal zone is **Fair** and, while there continues to be an increase in mud, particularly in the sub tidal parts of Pauatahanui Inlet, the sand-dominated habitats appeared to be in good (healthy) ecological condition. The Ecological Quality rating for the overall harbour continues to be rated **Good**.

Waste:

We have not received the result for Waste, large rubbish items collected from the Porirua Stream area of the Onepoto Arm for 2017 and have not rated this indicator this year.

The Scorecard for 2017

This scorecard for the 2017 year is the fourth in an annual series that PHT will produce. The scorecard assesses five indicators related to the harbour and catchment using a five-point scale for each one. (5 being excellent and 1 being poor).

The scores highlight changes in key aspects of harbour and catchment quality, and give an indication each year of progress on the *Strategy and Action Plan*.

The five indicators are:

- 1 **Agency Action** – a review of local authority and agency progress with implementing the *Strategy and Action Plan*;
- 2 **Sedimentation** – a summary of data from the GWRC's sedimentation records from 18 recording plates in the Onepoto Arm and Pauatahanui Inlet;
- 3 **Education and Recreational Usage** – feedback from recreational groups using the harbour waters, water quality records from key beaches and the number of schools involved in the catchment education programme;
- 4 **Ecological Health** – a summary of data from GWRC's records on the quality of major streams entering both arms of the harbour and on harbour quality;
- 5 **Waste** – assessment of the changing volumes of large rubbish items collected from the harbour at the Porirua Stream mouth by the Trust.

An education component was added to the third indicator (Education and Recreational Usage) in our 2015 report which now also measures the uptake of the wider environmental education programme including the Porirua Harbour Trust programme across the 51 schools in the catchment.

The review panel recognizes that data collection in the harbour and catchment has been underway for many years, but only recently has a more comprehensive set of data been collected. The review panel has taken the approach of only reporting on matters with at least three years of comparable data available. This is because data gathered for just one or two years might result in one off events overly influencing the longer-term average.

The review team acknowledges the strong and helpful support received from the environmental science team at GWRC in making the data available.

The criteria for each indicator being measured, the five-point scale explanation and the full results are included in Appendix 1.

1. AGENCY ACTION

What is being measured:

An Annual Review of progress by all agencies against the Porirua Harbour Strategy and Detailed Action Plan

This includes a comparison of what was stated in the Detailed Action Plan with what was funded and planned and achieved through outputs and outcomes.

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Comment
3	3	4	4	4	In the 2017 year, the Trust notes there continues to be a coordinated commitment from councils and agencies for harbour strategy programme projects and activities. But the review of the Strategy has been deferred and its completion and a focus on priority activities is of urgent importance

Comment:

The *Te Awarua-o-Porirua Harbour and Catchment Strategy and Action Plan* has been in place since March 2012 and councils and agencies have continued to include in their annual and long term planning the funding required to carry out the work identified in the plan. The long term, 10 year plans were reviewed in 2015/16 and we are now in the second of the three year cycles.

The Trust was pleased to see affirmative actions by Porirua City and Greater Wellington Regional Councils in current 10 year plans and related activities, and we look forward to this continuing in the upcoming reviews. We also hope that Wellington City Council might include relevant material on its part of the Porirua Harbour Catchment in its forthcoming 10 year plan.

The Trust notes and appreciates the effort put in by GWRC into the production of a special measurement of sedimentation following the November 2016 floods. This is reported on in the Sedimentation Section in this report.

Wellington Water is an increasingly important agency in achieving harbour and catchment outcomes. It manages water treatment and supply, storm water and wastewater service delivery in the Wellington region. It says, on its website wellingtonwater.co.nz that “*an important part of our work is promoting water conservation and sustainability.*” The Harbour and Catchment Action Plan includes a number of specific projects for which Wellington Water is responsible. We note that Wellington Water plans to develop and implement a *Regional Service Plan*. We consider this and other planning mechanisms will be helpful in setting priority actions and projects to advance the Harbour Strategy

The catchment based “Whaitua Committee” has been in place for more than two years. This committee is working to collate community, scientific, economic and geographical information to gain an understanding of the current state of water in their catchment area. The Whaitua process will end up modelling the entire catchment and harbour, and setting limits for water *quality* and *quantity* in the streams and harbour.

The purpose of the Whaitua Committee is to develop a set of environmental goals or a vision for their catchment area which might include setting targets or limits for water as suggested by the National Policy Statement for Freshwater. Some of these recommendations are likely to be included in the Natural Resources Plan for the Wellington Region.

The Te Awarua-o-Porirua Joint Harbour Committee is responsible for setting, reviewing and directing a coordinated cross agency strategy and work plan that sets out harbour and

catchment related activities, responsibilities, priorities and budgetary commitments for the next three years. It has deferred its planned review of the Harbour Strategy until the Whaitua's proposals are decided – likely some time towards the middle of this year (2018). It is also waiting for further work on the review of the Porirua City District Plan and the Greater Wellington Regional Council's Natural Resources Plan. Meanwhile, it continues with the existing Harbour Strategy and its related Action Plan.

For the 2017/18 year, the Committee lists the following highlights (from its 2016/17 Annual Report):

- *Completion or commencement of statutory plans that will:*
 - *strengthen controls over earthworks*
 - *reduce contaminants entering streams and the harbour*
 - *protect or increase catchment vegetation*
 - *protect and improve stream and harbour water quality*
- *Ongoing community and Council restoration programmes*
- *Ongoing programme of stormwater and wastewater network upgrades, including design work for the Awarua Wetland and stormwater diversion*
- *Ongoing upgrade in Wastewater Treatment Plant and waste treatment capacity*
- *Porirua Harbour exhibition at Pātaka Art + Museum youth gallery*
- *First shell shellfish count in the Onepoto Arm of the Harbour*
- *Launch of the public swimming water quality online forecasting tool.*

As noted last year, while these and other deliverables mentioned in the Annual Report show commitment and consistent activity by all agencies, there is no available reporting on the priority and status of each of the projects set out in the Action Plan.

In the Annual Report, the Chair of the Harbour Committee notes that:

“However, further flood events, sedimentation rates and no improvement in water quality indicators are a challenge to intended outcomes and community aspirations. The Greater Wellington Regional Council (GWRC) Science Team Leader, Dr Megan Oliver, has given a frank assessment: “At current levels of activity, Harbour Strategy targets and timeframes will not be met”

This comment underlines the importance of selecting critical priority projects and activities and implementing clear and precise reporting on the status and effectiveness of the activities led by the Strategy and its Action Plan.

The Trust considers that, as part of its Annual Report, the Harbour Committee should produce an itemised status report against each of its project-activity areas. The absence of such information makes it impossible to meet our intentions of reporting on *“a comparison of what was stated in the Detailed Action Plan with what was funded and planned and achieved through outputs and outcomes”*.

The Trust wants to see more specific project-activity reporting with a particular emphasis on priority deliverables and outcome-based results. We will be advocating for this as part of our submissions on the review of the Harbour Strategy and Action Plan.

For the above reasons, we have kept the overall rating for the 2017 year at **4**.

2. SEDIMENTATION

What is being measured:

2.1 Harbour Sedimentation. Indicates the Mean Annual sedimentation rate from the 18 sedimentation sites, (9 in the intertidal and 9 in the sub tidal) in the Onepoto Arm and Pauatahanui Inlet. A separate rating is shown for subtidal and intertidal in each inlet and for the harbour as a whole.

Results for each year: Our rating

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Comment
5	5	5	5	5	Onepoto Arm subtidal
1	5	3	3	3	Onepoto Arm intertidal
3	4	5	3	1	Pauatahanui Inlet subtidal
3	5	5	5	5	Pauatahanui Inlet intertidal
-	4	5	4	3	Harbour Overall

Data used:

To measure sedimentation rates, GWRC has buried 42 concrete plates at 18 sites throughout Porirua Harbour over which annual measurement of sediment deposition are taken, (Subtidal means harbour areas always covered with water; intertidal means areas that are exposed at low tide but covered with water at high tide)

It is important to note that the sedimentation rate in any single year does not necessarily reflect the overall pattern of sedimentation in the harbour. For this reason, the review panel has taken the approach of only using data where a minimum of three years is available to ensure that one off events do not overly influence our reporting, having said that we have specifically commented on measurements taken after the November flood to look at the effect that the flooding had on spreading fine mud in the harbour.

Table 1: Mean annual sedimentation rates for selected locations in Porirua Harbour

(Source: Stevens LM. 2017. *Porirua Harbour: Sediment Plate Monitoring 2016/17.*)

Indicator	Onepoto Arm								Pauatahanui Arm									
	Intertidal			Subtidal					Intertidal					Subtidal				
Site no.	1	2	3	S6	S7	S8	S9	6	7	8	9	10	11	S1	S2	S3	S4	S5
Sedimentation rate (mm) (2012/13)	14.3	12.3	4.3	-	-	-	-14	3.5	9.3	2.0	-0.8	-3.0	-	-	-	-	-	-
Sedimentation rate (mm) (2013/14)	-4.3	-0.3	1.8	0.0	-6.0	-8.0	0.0	-2.0	-4.0	-2.5	4.5	14.8	-30.0	6.6	26.4	8.0	11.0	9.2
Sedimentation rate (mm) (2014/15)	1.5	2.3	2.3	5.0	-92.0	-93.0	4.0	-3.0	-2.0	1.3	-2.5	-5.5	4.0	2.0	18.0	-12.0	-4.0	-10.0
Sedimentation rate (mm) (2015/16)	0.5	7.8	5.0	-16	-2.0	10.0	7.0	-3.5	-5.8	0.0	-5.0	1.8	1.0	8.0	10.0	-	-5.0	-2.0
Sedimentation rate (mm) (2016/17)	-1.5	1.5	5.3	32	7.0	24	-3.0	-4.5	17.8	-7.0	0.3	1.0	-6.0	64	54	90	12	13

From the data, the review team has taken the measurements for the intertidal and subtidal areas of each harbour arm and averaged these each year to arrive at a mean sedimentation rate to indicate what is happening in each part of the harbour on an annual basis. This is then rated

using the criteria as defined in Appendix One to provide an index of risk/condition. The overall target is to have sedimentation at a mean annual rate of less than 1mm per year.

Table 2: Sedimentation Index for each part of the Porirua Harbour

Rolling mean of 3yrs for sedimentation data

Indicator	Onepoto Arm		Pauatahanui Arm		Total Harbour
	<i>Intertidal</i>	<i>Subtidal</i>	<i>Intertidal</i>	<i>Subtidal</i>	
Sedimentation Index rate (mm) (2011/13)	10.3	-14.0	2.2	-	-
Sedimentation Index rate (mm) (2012/14)	-0.9	-3.5	-3.2	12.2	1.2
Sedimentation Index rate (mm) (2013/15)	2.0	-4.4	-1.3	-1.2	-11.3
Sedimentation Index rate (mm) (2014/16)	4.4	-0.25	-2.0	2.2	1.1
Sedimentation Index rate (mm) (2015/17)	2.74	-9.75	-0.98	15.8	2.4

Our Comment:

The sedimentation rates vary considerably on a year to year basis and with a significant storm event occurring during the year sediment within the harbour and in particular the subtidal part of the Pauatahanui Inlet has seen a significant increase in sedimentation impacting on the overall harbour result for the period.

The sedimentation rate for the Onepoto Arm (subtidal), and Pauatahanui Inlet (intertidal) are rated as **Excellent**, and are below the desired sedimentation rate of 1mm per year.

Last year we raised concern with the predicted land disturbance, particularly from Transmission Gully construction, forest harvesting and urban development and potential impacts on the harbour in the years ahead. The November flood had a significant impact on the Pauatahanui Inlet sedimentation rates and as a result there is a large increase in mud in the Pauatahanui Arm with the mean mud content of subtidal sediments increasing from 40%, to over 70% in the last five years.

Mud causes problems for harbour life as it creates conditions where oxygen and nutrients are reduced. The result is a smelly, unhealthy sediment layer that reduces diversity of plants and sea life. Soft mud also gets moved around the harbour and causes noticeable reductions in water clarity and quality.

One off Measurement for 2017 after the November floods.

On 15 November 2016, a relatively large (1 in 20 year return period) flood event resulted in widespread sediment deposition in Porirua Harbour, particularly in the Pauatahanui Arm where the intertidal flats were reportedly smothered in fine sediment (Megan Oliver, GWRC, pers. comm.). Because of the significance of this deposition, and because this rainfall event was one of several relatively large storms that had impacted on the estuary in the previous year, GWRC commissioned a one-off interim set of intertidal sediment plate measures (undertaken on 1 December 2016) to assess the magnitude of this event, and the cumulative impact of previous events between Jan. and Dec. 2016.

The results of this survey, undertaken 2 weeks after the 15 November 2016 flood, are summarised in Table 3.

Sampling showed that while significant intertidal deposition was present, it appeared that some of the initially reported deposition had already been remobilised and deposited elsewhere. This is reflected in the intertidal plate measurements which showed significant recent deposition in the Pauatahanui arm at the Kakaho, Boatsheds, and Duck Creek sites (+2.5 to +13.5mm).

These sites all had observable surface deposits of fine muds, the most extensive at Kakaho where they extended across the entire intertidal flats from high to low tide. This fine mud may have been as a result of slips in the Kakaho valley caused by the November earthquake as this fault line traverses the valley. The mud plume from the Kakaho stream mouth extended 300 metres into the harbour.

In contrast, there was no significant deposition recorded over the sediment plates at the Horokiri and Pauatahanui Stream sites, but there were strong indications that the sites had been recently blanketed in muds, but that much of this had been remobilised and deposited elsewhere including among saltmarsh, or in subtidal zones.

Table 3: Mean change in intertidal sediment plate depths (mm) between January 2016 and December 2016, Porirua Harbour.

Onepoto Arm	Mean Change	Mud Extension
Por A Railway (FS)	-1.3mm	
Aotea	+0.5mm	
Por B Polytech (FS)	-0.7mm	
Pauatahanui Arm		
Boatsheds	+2.5mm	
Kakaho	+13.5mm	+300m
Horokiri	-1.3mm	+65m
Paua B (FS)	-2.0mm	
Duck Creek	+2.5mm	+10m
Browns Bay	-5.0mm	+40m

Over the past year there has been deposition of 12-90mm (Figure 6) with a corresponding increase in the spatial extent of soft muds. When established in 2013, each subtidal site was located approximately 5m subtidally off where soft muds were first encountered when wading from the shoreline. In 2017 subtidal soft muds had extended shorewards by the following distances:

The large expansion of subtidal soft mud towards the intertidal boundary, the very high measured deposition in Jan. 2017, and the trend of increasing deposition across all Pauatahanui subtidal sites highlight that the Pauatahanui subtidal basins (the primary deposition zones in the estuary) are currently undergoing a very rapid rate of infilling.

3. EDUCATION AND RECREATIONAL USAGE

What is being measured:

3.1 Recreational usage of the Harbour.

Feedback from recreational groups on the quality of the harbour in satisfying their recreational expectations.

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Comment
4	4	NA	3	4	

Comment:

A survey was carried out across recreational users of the Porirua Harbour. This survey was sent to yachting, boating, rowing, outrigger canoeing and kayak users of the harbour. The majority of the clubs indicate that their group continues to grow in numbers and regular users of the harbour. The recreational users tend to utilize the Onepoto Arm more than the Pauatahanui Inlet.

The survey provides a rating for their overall experience in the past year and their experience on the water quality. Recreational groups rated their experience on the water as good, however water quality received a lower rating of fair. Overall we have rated the recreational usage as **Good**.

The main concerns from recreational users is the increase in sedimentation and the shifting and growth of sand banks which means they have to be alert in respect of the areas they use in the harbour and tide times and the water quality especially after storm events.

What is being measured:

3.2 Recreational Water Quality

Recreational water quality results from weekly summer monitoring of six sites in Porirua Harbour

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Sites	Comment
4	4	3	4	4	Pauatahanui Inlet at Paremata Bridge	suitable for swimming most of the time
3	3	4	4	4	Karehana Bay at Cluny Rd	suitable for swimming most of the time
3	3	3	3	3	Pauatahanui Inlet at Water ski club;	generally suitable for swimming with care
3	3	3	2	3	Plimmerton Beach at Bath Street	generally suitable for swimming with care
2	2	2	2	3	South Beach at Plimmerton	generally suitable for swimming with care
2	2	2	2	3	Porirua Harbour at Rowing Club	generally suitable for swimming with care

Data Used:

GWRC and PCC jointly monitor microbiological water quality at 11 coastal sites in Porirua, six of which are located either within the harbour or on its outer margins. The monitoring programme comprises weekly water sampling for the 17 weeks between December and the end of March (monthly sampling also occurs outside of this period).

Table 4 below lists a summary of compliance with the surveillance, alert and action levels of the national microbiological water quality guidelines for recreational waters (MfE/MoH 2003) for data collected over summer 2016/17, as reported by Brasell and Morar (2017). It also lists the current Suitability for Recreation Grade (SFRG) assigned to each site. This grade describes the general condition of the water at any given time from a public health perspective.

Table 4: Summary of microbiological water quality data for the 2016/17 summer at selected coastal monitoring sites in Porirua

(Source: Brasell KA and Morar SR. 2017. Is it safe to swim? Recreational water quality monitoring results for 2016/17.)

Bathing site	n	No. sample results (Enterococci cfu/100mL)			Beach grading (2014/15 – 2016/17 data)		
		Surveillance (≤ 140)	Alert (141–280)	Action (>280)	SIC Grade	MAC Grade (95 th -ile value)	SFRG
Karehana Bay at Cluny Rd	17	17	0	0	Moderate	B (66)	Good
Plimmerton Beach at Bath St	17	14	2	1	Moderate	C (433)	Fair
South Beach at Plimmerton	17	14	3	0	Moderate	C (279)	Fair
Pauatahanui Inlet at Water Ski Club	17	15	2	0	Moderate	C (205)	Fair
Pauatahanui Inlet at Paremata Bridge	17	17	0	0	Moderate	A (40)	Good
Porirua Harbour at Rowing Club	17	11	1	5	Moderate	C (353)	Fair

Comment:

The results from the sampling are an improvement on previous years with our most popular beach South Beach moving from Poor to **Fair** and both the Rowing Club site and Plimmerton Beach at Bath Street also moving from a Poor to a **Fair** rating.

This indicates that work carried out by PCC on improvements to the sewerage and storm water systems is improving the water quality flowing into the harbour at our beach sites.

What is being measured:

3.3 Education Resource Usage

Engagement with schools in the catchment through the PHT Education programme

Rating 2015	Rating 2016	Rating 2017	Number of Schools in the catchment engaged in the PHT programme
3	4	4	43 of 51 schools in the catchment engaged in the programme after three years.

Comment:

The PHT has produced a curriculum based resource for teachers based on the *Living Waters* series of short documentaries.

The resource is presented in three themes, each with a specific curriculum focus including ecology of the harbour with a science focus; the harbour as a taonga with a social studies focus, and the human impact on the harbour with a focus on both science and social studies.

The Porirua Harbour Trust’s education programme has now been running for three years and continues to provide essential support for schools in the catchment area for Te Awarua-o-Porirua Harbour. Thanks to the generous support of the Philipp Family Foundation, we have continued to support a core group of engaged schools, through teacher professional learning, planning advice, and the provision of useful resources. This year, we also engaged with four new schools, bringing the total number of schools engaging with harbour education up to 43

(out of 51 in total). The eight remaining schools are mostly in the catchment for Porirua Stream (Newlands, Johnsonville, Tawa).

Teacher professional development (PLD) continues to be a large part of the education programme, and 40 schools have now taken part in some form of PLD over the last three years. In 2017 we facilitated two full-day teacher workshops, as well as regular after school hui. A total of 63 teachers, from 22 schools, took part in our professional learning this year. These workshops were successful collaborations with EnviroSchools, Pātaka, Ngāti Toa, Forest and Bird (Pāuatahanui Wildlife Reserve) and Mountains to Sea Wellington.

The other main project in 2017 was the student journal about Te Awarua-o-Porirua. Students from six primary schools worked with Esme (Pātaka) and local artists, writers, designers and historians, to create a wonderful journal, which they named 'The Current'. Porirua City Council generously supported this project, with additional funding from the Hutt Mana Charitable Trust, and a sponsored printing rate from The Big Picture.

Each school chose 2 – 3 students to be part of a student leadership group. This group took part in eight after school workshops. The purpose of the workshops was to create leaders in the classroom to be advocates and kaitiaki (guardians) for the harbour and local environment. It also provided an opportunity for these students to learn new creative skills, across a range of artistic mediums. The workshops included field trips and sessions with local artists, designers, authors, historians and mana whenua. The student leaders then shared their new knowledge and skills with their classmates, helping to guide the creation of the work for the journal.

The aim of this project was to produce a journal about Te Awarua-o-Porirua Harbour, created by students, with inspiring stories, poetry and artwork, that could be used as a learning resource in classrooms. Six primary schools took part in the project, with eight lead teachers and a total of about 350 students involved.

All of the students, teachers and mentors involved with this project found it hugely rewarding. It provided a unique opportunity for students to learn about their local environment through many different lenses, and to learn a range of creative skills.

Class sets of the journals have been distributed to 17 local primary schools thus far along with stakeholders, and more copies are being printed to be given to the remaining 23 primary schools in the catchment area for Te Awarua-o-Porirua Harbour

4. ECOLOGICAL HEALTH

What is being measured:

4.1 Ecological health of streams

Uses the Macroinvertebrate Community Index (MCI) for the three main streams with the mean score for the last three years.

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Sites
4	4	4	4	4	Horikiri Stream at Snodgrass
4	4	4	3	-	Porirua Stream at Glenside – not monitored this year
3	3	3	3	3	Porirua Stream at Wall Place
4	3	3	3	3	Pauatahanui Stream at Elmwood Bridge

Data Used:

The indicator we have used for stream health is the Macroinvertebrate Community Index (MCI) which measures the abundance of organisms like worms, insects, flies, beetles and snails. It is a nationally accepted index of macroinvertebrate health which accounts for the sensitivity of invertebrates to environmental stressors .

Macroinvertebrate sampling was undertaken at three sites in the Porirua Harbour catchment in 2016/17 as part of GWRC's Rivers Water Quality and ecology monitoring programme (RWQ&E). The MCI scores derived from this sampling are listed in Table 5. Under the RWQ&E programme a single macroinvertebrate sample is collected at or adjacent to each sampling site during late summer/early autumn. The timing of sampling is determined at random, although macroinvertebrate sampling is, where practicable, avoided within two weeks of any flood event (ie, flows greater than three times the median river flow).

We have included the MCI mean score for the last three years and have used this rolling three year mean in determining the MCI Mean Quality Class.

Table 5: MCI scores for RWQ&E sites in the Porirua Harbour catchment sampled between 2013 and 2017

(Source : Martin E, Morar S and Heath MW. 2017. *Rivers Water Quality and Ecology Monitoring Programme: Annual Data Report 2016/17.*.)

Site no.	Site name	MCI 2013	MCI 2014	MCI 2015	MCI 2016	MCI 2017	MCI Mean 2013 -17	MCI Mean quality class
RS13	Horokiri Stream at Snodgrass	116.5	115	98.3	109.6	118.5	111.6	Good
RS14	Pauatahanui S at Elmwood Bridge	100.0	105.6	92.5	90.9	100.4	97.9	Fair
RS15	Porirua Stream at Glenside	118.6	104.4	94.4	100.0	N/A	104.35	Good
RS16	Porirua Stream at Wall Place	93.7	87.0	80.9	80.7	98.1	88.0	Fair

Key to quality classes (Stark & Maxted 2007): Excellent ≥ 120, Good 100–119, Fair 80–99, Poor <80

Comment:

The three sites monitored this period all have an improved MCI compared with previous years.

Both Horokiri Stream and Pauatahanui Stream have a good rating and Porirua Stream while achieving a slight improvement is still rated as **Fair**. Of concern is that the Glenside site which was showing an improved quality reading from 2015 to 2016 was not monitored in 2017.

The three Porirua Catchment streams are recorded as being in the **Fair** category of the Water Quality Index for streams in the Greater Wellington region and in the lower third of all streams in the region.

What is being measured:

4.2 Ecological health of the Harbour

Harbour condition based on the GWRC nutrient enrichment (eutrophication) measures for each inlet until 2016. These include RPD and low and high density macroalgal cover.

What is being Measured	Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Sites
Ecological Health of the harbour RPD	3	3	3	4	3	Onepoto Arm – intertidal
Ecological Health of the harbour RPD	3	3	3	3	3	Pauatahanui - intertidal
Ecological Quality Rating of the harbour for macroalgae	-	4	4	4	4	Porirua Harbour - EQR

Data Used:

GWRC assesses the ecological condition of the intertidal habitat within each arm of Porirua Harbour using a combination of broad and fine scale measures that target the common estuarine issues of sedimentation, eutrophication (nutrient enrichment) and toxic contamination. As sedimentation is already included separately in our scorecard, the review team has based the harbour estuarine health assessment on measures relating to eutrophication.

Increased nutrient enrichment (eutrophication) in estuaries can stimulate the abundance of fast growing green and red macroalgae. The resulting blooms can have significant effects on water and sediment quality. Annual indicators of eutrophication include a broad scale assessment of the change in the area of nuisance macroalgal growth and measurements of sediment oxygenation (as determined by the depth of the redox potential discontinuity (RPD) layer)*. This is the layer below which oxygen is severely reduced, as a result of which the diversity of life reduces.

It is important to note that the method for assessing the macroalgae condition has changed from simple percentage cover (density) estimates used in previous years, to an Ecological Quality Rating (EQR) for macroalgae. This rating incorporates a more comprehensive assessment of parameters such as macroalgae biomass, the degree to which the algae are found growing deep in the sediment (entrainment) and the area of available habitat (see Stevens & Robertson 2016 for more detail).

Table 6: Eutrophication indicator results for selected locations in Porirua Harbour assessed in early 2017 (subtidal RPD data also included for completeness). RPD cells shaded in light green and yellow equate to rankings of moderate and low risk, respectively

(Source: Oliver MD, Conwell C. 2017. *Coastal Water Quality and Ecological Monitoring Programme: Annual Data report 2016/17*)

Indicator	Onepoto Arm (RPD)							Pauatahanui Arm (RPD)										
	Intertidal			Subtidal				Intertidal					Subtidal					
Site No.	1	2	3	S6	S7	S8	S9	6	7	8	9	10	11	S1	S2	S3	S4	S5
RPD (cm) 2014	1.5	3	1	1	3	5	5	3	2	1	1.5	3	3	1	1	1	3	3
RPD (cm) 2015	1	2	1	2	2	2	3	1	1	1	1	3	3	1	1	1	1	1
RPD (cm) 2016	3	5	1	2	2	2	3	3	1	1	1	3	5	1	1	1	1	1
RPD (cm) 2017	3	3	2	1	2	>5	>5	2	2	1	2	>5	3	2	1	2	2	1

Ecological Quality Rating for macroalgae	Porirua Harbour
EQR 2014	<0.5
EQR 2015	0.58
EQR 2016	0.61
EQR 2017	0.54

Metal Contaminants in Storm water discharges:

Contaminants in urban storm water discharges have been identified as a potential medium to long-term risk to the health of the marine organisms living in our harbour, largely through the accumulation of these contaminants in the sediments. Metals which tend to bind to the mud fraction of sediments have been measured since 2004 at five subtidal sites within the harbour and the results will be included in future reports.

Comment:

The RPD results for 2017 show that the sediments were generally well oxygenated despite their often muddy nature. Throughout the estuary, sediment was relatively well oxygenated, had a low total organic carbon and sulphur content, and did not support nuisance macroalgal growths. These results provide a preliminary indication that Porirua Harbour sediments were in the “low” to “moderate”, rather than “high” (or poorly oxygenated) category, and likely reflect the combined influence of relatively low organic content, and the process of currents or wave action pumping oxygenated water into the sediments. Overall, the sand-dominated habitats appeared to be in good (healthy) ecological condition.

The concentration of opportunistic macroalgae near the mouth of major streams entering the estuary (e.g. Porirua, Pauatahanui, Horokiri, Kakaho) suggest catchment nutrient inputs are the most likely driver of the observed growths. Combined with ongoing mud deposition both macroalgal growth and increasing muddiness remain continuing concerns within Porirua Harbour.

The concentrations of stormwater-derived metals are of concern especially copper, lead and zinc. Copper enters the harbour from vehicle brake pads, lead from paint products and zinc from galvanized iron roofs and car tyres.

5. WASTE

What is being measured:

5.1 Record of large items of waste collected in the intertidal and tidal area

Number of large items of rubbish collected each year in the Porirua Stream area of Onepoto Arm and an assessment in January of large items still to be collected.

Rating 2013	Rating 2014	Rating 2015	Rating 2016	Rating 2017	Comment
2	3	3	3	NA	

Data Used:

Information is collected by the Porirua City Council and an annual inspection is carried out in early 2018 at low tide of the area from the mouth of the Porirua Stream across the harbour from Wineera Point to the railway line on the east.

Comment:

The Porirua Stream mouth at the south end of the Onepoto Arm is a collection point for refuse coming down the Porirua and Kenepuru Streams. Over the years there has been a concentrated effort to remove large items from the tidal area of the stream bed. Some 400 plus tyres, road cones, shopping trolleys and other material was taken out of this part of Onepoto Arm by the Porirua City Council in 2009.

In recent years, various groups normally coordinated by Ngati Toa and Porirua City Council, have carried out tidal and intertidal clean ups of the Onepoto Arm with the emphasis on removal of large rubbish material in the intertidal zone of the Porirua Stream.

Over the years there has been an improvement in the reduction of large items removed from the Onepoto Arm with over 400 items in 2009 and between 85 -90 items in 2016, predominantly car tyres and road cones.

The number of large items collected in the 2016 year was similar to the last few years at around 90 large items. This is of concern as it shows a continuing pattern of disposal of these items into the waterways.

The data for 2017 was not available at the time of preparing this report and hence no assessment is made for the 2017 year.

While the reduction from the peak of 400 in 2009 is commendable it is still of major concern that tyres continue to find their way into the stream and harbour rather than being disposed of in an appropriate manner. PCC needs to find a solution to large items, particularly tyres from being dumped in the harbour rather than taken to the land fill.

6. Acknowledgements:

The Porirua Harbour Trust acknowledges the strong support from the staff of Greater Wellington Regional Council, Porirua City Council and Wellington City Council in the provision of data and reports to assist the review team in preparing this scorecard.

The review team recognize that in supplying the environmental information Greater Wellington Regional Council has exercised all reasonable skill and care in compiling the contents of the information provided.

7. References

Oliver MD, Conwell C. 2017. *Coastal Water Quality and Ecological Monitoring Programme: Annual Data report 2016/17*. Greater Wellington Regional Council, Publication No.GW/ESCI-T-17/97, Wellington.

Brasell KA and Morar SR. 2017. *Is it safe to swim? Recreational water quality monitoring results for 2016/17*. Greater Wellington Regional Council, Publication No. GW/ESCI-T-17/98, Wellington.

Martin E, Morar S and Heath MW. 2017. *Rivers Water Quality and Ecology Monitoring Programme: Annual Data Report 2016/17*. Greater Wellington Regional Council, Publication No.GW/ESCI-T-17/95, Wellington.

Stevens LM. 2017. *Porirua Harbour: Sediment Plate Monitoring 2016/17*. Report prepared by Wriggle Coastal Management for Greater Wellington regional Council.

Appendix One – What is being measured and our rating system.

	Agency Action	Sedimentation	Community and Recreational Usage	Ecological Health	Waste
	<p>An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan</p> <p>This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.</p>	<p>Harbour Sedimentation. Utilising the Mean Annual sedimentation rate measurements from the 18 sedimentation plates, in the Onepoto Arm and Pauatahanui Inlet.</p> <p>Separate rating for subtidal and intertidal areas in each estuary inlet.</p> <p>Ratings based on those developed by Stevens and Robertson 2016</p>	<p>Recreational usage of the Harbour.</p> <p>Feedback from recreational groups on the quality of the harbour in providing their expectations.</p> <p>Recreational water quality monitoring results from weekly sampling carried out between December and March each year</p> <p>Education success, number of schools in the PHT education programme</p>	<p>Regular Testing of ecological health within streams and the Harbour</p> <p>Uses the annual measurement of Macroinvertebrate Community Index (MCI) for the three main streams.</p> <p>Harbour health based on the GWRC nutrient enrichment (eutrophication) measures and risk ratings developed by Stevens and Robertson 2016.</p>	<p>Annual Record of waste collected in the intertidal and tidal area</p> <p>Number of large items of rubbish collected each November in the Porirua Stream area of Onepoto Arm.</p>
5	All planned actions in the Action Plan funded and all agreed outputs and outcomes achieved and delivered on.	<p>Very Low</p> <p>Increase of 0 to 1mm for the year.</p> <p>Measure for each estuary.</p>	<p>Very Good - For all current and anticipated future activities</p> <p>Water Quality Very Good - Suitable for swimming</p> <p>45+ schools in the programme</p>	<p>MCI - Excellent</p> <p>Harbour Health – Very Good</p> <p>RPD - Excellent</p>	<p>Very Good</p> <p>Large items removed <25</p>
4	All planned actions in the Action Plan funded and most agreed outputs and outcomes delivered on.	<p>Low</p> <p>Increase of 1 to 2mm for the year.</p> <p>Measure for each estuary</p>	<p>Good - For current activities</p> <p>Water Quality Good - Suitable for swimming most of the time</p> <p>35+ schools in the programme</p>	<p>MCI – Good</p> <p>Harbour Health – Good</p> <p>RPD - Good</p>	<p>Good</p> <p>Large items removed <50</p>
3	Most planned actions in the Action Plan funded and most agreed outputs and outcomes delivered on.	<p>Moderate</p> <p>Increase of 2 to 5mm for the year.</p> <p>Measure for each estuary</p>	<p>Fair - For current activities</p> <p>Water Quality Fair - Generally suitable for swimming</p> <p>25+ schools in the programme</p>	<p>MCI – Fair</p> <p>Harbour Health – Moderate</p> <p>RPD - Fair</p>	<p>Fair</p> <p>Large items removed <100</p>
2	Most planned actions in the Action Plan funded and some agreed outputs and outcomes delivered on.	<p>High</p> <p>Increase of 5 to 10mm for the year.</p> <p>Measure for each estuary</p>	<p>Poor - For current activities</p> <p>Water Quality Poor - Not always suitable for swimming</p> <p>15+ schools in the programme</p>	<p>MCI – Poor</p> <p>Harbour Health – poor</p> <p>RPD - Poor</p>	<p>Poor</p> <p>Large items removed <150</p>
1	Some planned actions in the Action Plan funded and some agreed outputs and outcomes delivered on.	<p>Very High</p> <p>Greater than 10mm increase for the year. Measured for each estuary.</p>	<p>Very Poor - For current activities</p> <p>Water Quality Very Poor - Unsuitable for swimming</p> <p><15 schools in the programme</p>	<p>RPD – Very Poor</p>	<p>Very Poor</p> <p>Large items removed >150</p>

Appendix Two - Measurement Methodology

	Agency Action	Sedimentation	Community and Recreational Use	Ecological health	Waste
	<p>An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.</p>	<p>Harbour Sedimentation. Utilising the Mean Annual sedimentation data from the 18 sedimentation plates, (9 in the intertidal and 9 in the sub tidal) in the Onepoto Arm and Pauatahanui Inlet.</p> <p>Separate rating for subtidal and intertidal in each inlet.</p>	<p>Recreational Usage of the Harbour. Obtain feedback from the recreational users of the harbour, Water Quality monitoring of beaches using the national recreational water quality guideline.</p> <p>Schools utilizing the PHT education resource for the catchment</p>	<p>Regular Testing of ecological health within streams and the Harbour Uses the Macroinvertebrate Community Index (MCI) for the three main streams.</p> <p>Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet.</p>	<p>Annual Record of waste collected in the intertidal and tidal area Number of large items collected each November in the Porirua Stream area of Onepoto Arm.</p> <p>This would include a count of large items tyres, road cones and shopping trolleys to indicate the trend toward less rubbish entering the harbour.</p>
	<p>Assessment of the work carried out against the Detailed Action Plan taking into account the annual report provided to the three councils on the Porirua Harbour Action Plan, the annual plans and budgets for the next year and the long-term plan commitments of the councils and agencies compared to the Strategy.</p> <p>Will require a pre and post discussion with the Harbour Co-ordinator to ensure full understanding of what is included and excluded from the Detailed Action plan each year.</p>	<p>Utilising the Annual GWRC Porirua Harbour Intertidal Sediment Monitoring report.</p> <p>Using the 2008 data as the base where available and a minimum of two years data for each site.</p> <p>Information to be averaged separately for the Onepoto Arms and Pauatahanui Inlet for both sub tidal and inter tidal zones and each inlet to be reported separately.</p> <p>The result to include commentary on each estuary and granular size as well as mud impacts.</p>	<p>Survey once a year in December of the Harbour recreation user group.</p> <p>Use weekly summer monitoring as provided by GWRC of indicator bacteria levels at harbour beaches and measure against the national recreation grade.</p> <p>Evaluate the PHT education programme at the end of each year and identify the number of schools (primary, intermediate and secondary) - out of the 51 schools in the catchment who are utilising the PHT education programme.</p>	<p>Fresh water in the Wellington region is highly valued for a variety of uses, including water supply, irrigation, recreation and aquatic ecosystem health. The Macroinvertebrate Community index measures the health of the streams through an assessment of the health of the macro invertebrate community in each stream.</p> <p>The Harbour condition rating takes into account nutrient enrichment, (organic and nutrient content, sediment oxygenation, nuisance algae cover).</p> <p>There will be separate scores for each estuary.</p>	<p>Each year in November as part of the Love your Coast campaign the PHT will carry out intertidal and sub tidal clean ups around the Porirua Harbour.</p> <p>The Porirua Stream mouth is the main collection point for rubbish in the Onepoto Arm and will be used as the key indicator of rubbish in the harbour.</p> <p>The number of large items removed in the month (tyres, road cones, trolleys bikes etc) will give the annual measure of rubbish.</p>

Appendix Three: Results for 2017

RESULTS FOR 2016																						
Agency Action	Sedimentation	Community and Recreational Usage							Ecological Health				Waste									
An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.	Harbour Sedimentation. Utilising the Mean Annual sedimentation data from the 18 sedimentation plates, (9 in the intertidal and 9 in the subtidal) in the Onepoto Arm and Pauatahanui Inlet. Separate rating for subtidal and intertidal in each inlet.	Recreational usage of the Harbour. Feedback from recreational groups on the quality of the harbour in providing their recreational requirements. Water Quality at our beaches using the National Recreational water quality monitoring. Number of schools in the PHT Education programme							Regular Testing of ecological health within streams and the Harbour Uses the Macroinvertebrate Community Index (MCI) for the three main streams. Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet.				Annual Record of waste collected in the intertidal and tidal area Number of large items collected each November in the Porirua Stream area of Onepoto Arm.									
															Onepoto	Pauatahanui		Usage	Water Quality			
	Inter tidal	Sub tidal	Inter tidal	Sub tidal	Onepoto	Pauatahanui	South Beach Plimmerton	Plimmerton Beach at Bath St	Water Ski Clun Pauatahanui Inlet	Paremata Bridge Pauatahanui Inlet	Porirua Harbour Rowing Club	Karehana - Cluny Road	Number of Schools in the education	Horikiri	Pauatahanui	Porirua at Glenside	Porirua at Wall Place	Onepoto Intertidal	Pauatahanui Intertidal	Porirua Harbour density macroalgal		
5																						
4	Most planned actions continue to be delivered.												43									
3																						Not recorded this year
2																						
1																						

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