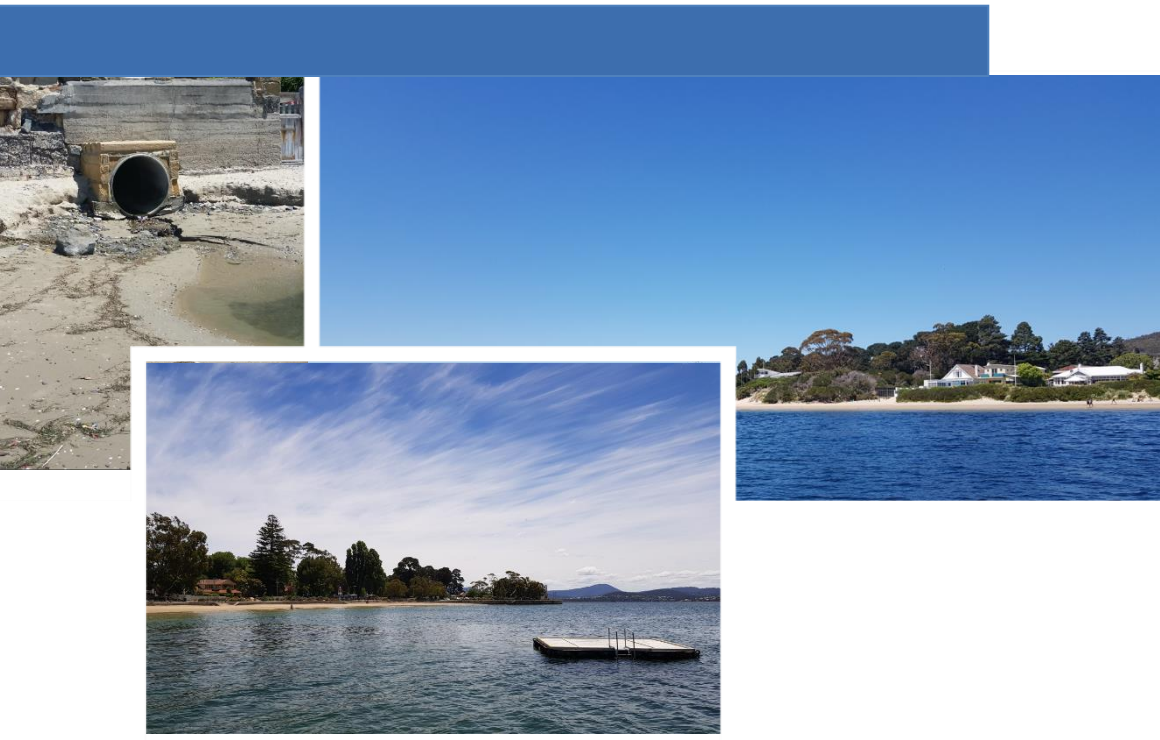


# Derwent Estuary Recreational Water Quality Program

Annual Report 2023-24



Derwent Estuary  
Program

The Derwent Estuary Program (DEP) is a regional partnership between local governments, the Tasmanian State Government, businesses, scientists, and community-based groups to share science for the benefit of our estuary. The DEP was established in 1999 and has been nationally recognised for excellence in coordinating initiatives to reduce water pollution, conserve habitats and species, monitor river health and promote greater use and enjoyment of the foreshore.

Our major sponsors include Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough councils, the Tasmanian State Government, TasWater, Tasmanian Ports Corporation, Norske Skog Boyer, Nyrstar Hobart Smelter, Hydro Tasmania, EPA Tasmania, NRM South and the Institute for Marine and Antarctic Studies.



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# 1 EXECUTIVE SUMMARY

This report presents results of the Derwent Estuary Recreational Water Quality Program (RWQ) 2023-24 season. The RWQ program is a collaborative initiative between six local councils, the State Government of Tasmania, Environmental Protection Authority Tasmania (EPA) and the Derwent Estuary Program (DEP). Water samples were collected weekly at 38 sites throughout the estuary between 1 December 2023 and 31 March 2024 and analysed for the faecal indicator bacteria, enterococci.

This summer, the number of enterococci results that exceed the prescribed trigger level of 140 MPN 100 mL<sup>-1</sup> set by the Tasmanian Recreational Water Quality Guidelines 2007 (DoH, 2007) was significantly lower than last season. The water quality at most swimming sites was overall better than the last two seasons. This season saw only 16 exceedances (enterococci >140 MPN 100 mL<sup>-1</sup>), compared with 22 last summer and 49 the previous season.

At the end of this season, eleven swimming sites were graded as Good, six sites graded as Fair, and two as Poor. Four sites improved their rating: Howrah Beach (east), Nutgrove Beach (east + west) and Taroona Beach from Fair to Good (Figure 4-1). Four sites received a long-term rating for the first time (now having five years of data). Two of these newly rated sites are Good, Bellerive Beach (east) and Blackmans Bay Beach (north), while Kingston Beach (south) is Fair and Blackmans Bay Beach (south) is Poor.

The water quality at the 19 environmental sites also significantly improved from the previous season. On 24 occasions, enterococci result over 140 MPN 100 mL<sup>-1</sup> were recorded, compared to 56 times last year. There are now six environmental sites with Good long-term ratings, eight Fair, and five Poor. One site dropped its rating, Kangaroo Bay (from Good to Fair). Four sites improved their rating following this summer's sampling including Victoria Dock, New Town Bay, Marieville Esplanade and Regatta Pavilion, all from Poor to Fair. The Mid-river Derwent sampling location continues to be the environmental site with the consistently best water quality, followed by Montagu Bay, Elwick Bay and now Old Beach and Sullivans Cove.

The big change to this year's RWQ season, was the addition of a forecasting trial. In many cities around the world, including Melbourne and Sydney, in addition to the weekly sampling results and general advice, the swimming public is provided with daily forecasts, a prediction of what kind of pollution level is to be expected at popular swimming sites. This is new to Tasmania, and it was an exciting project that was well received by our stakeholders and the swimming public. The forecasts provided were assessed as Appropriate advice 92.8% of the time, with 2.8% Missed alarms (14 sites had none) and 4.7% False alarms, which in all was comparable with our interstate counterparts. An update regarding the future of the forecasting program will be made public prior to the next RWQ season.

Overall, it was a dry summer for Tasmania, with summer rainfall down about 16% below the long-term average (BoM, 2024b). For Hobart (Ellerslie Road BoM station) rainfall was 49% of the long-term average, suggesting a significantly dry summer in Hobart. As is often the case, rainfall varied greatly between the summer months in the estuary. December had one significant rainfall event and January had two. The remainder of the summer period saw low to no rain falling, with all sites experiencing <10 mm in the month of February. While rainfall is a common driver of pollution at our swimming sites, it is difficult to draw conclusions between rainfall and enterococci results. Many of this summer's swimming site failures appeared unrelated to rainfall events.

The forecasts provided a great addition to our suite of usual information to the public this summer. It was clear from the feedback that by improving the available information

communities and partners were able to make informed decisions about swimming in the estuary. Many thanks to all our local council and TasWater for their ongoing commitment in build-up of local expertise and knowledge-sharing, which continued to enhance the RWQ program.

## **1.1 Season follow-ups**

The following are issues which individual EHOs have raised with DEP during the season, which are worthwhile clarifying.

### **1.1.1 Measurement Uncertainty (MU) and retesting**

The issue of re-testing if a sampling result is less than 140 MPN 100 mL<sup>-1</sup>. but falls within the Measurement Uncertainty (MU) of the Enterococci specification, came up during the season. The Public Health Lab (PHL) is obligated to recommend retesting if this is the scenario, but we have agreement with DoH that samples in the RWQ program only require re-testing if they exceed our program trigger level, i.e. 140 MPN 100 mL<sup>-1</sup>.

### **1.1.2 To sample or not to sample – during Christmas**

Sampling weekly during the summer months is a requirement in the Tasmanian Recreational Water Quality Guidelines 2007 (DoH, 2007). Having said that, it is up to the individual councils to determine whether they have the resource capacity to sample between Christmas and New Year; not all councils are able to.

Looking forward, if forecasting becomes a permanent feature of the RWQ program, it can help fill in at those times where sampling is difficult, for whatever reason.

### **1.1.3 Beach Watch website changes**

Please note that the DEP Beach Watch website now looks a little different in the off-season <https://www.derwentestuary.org.au/beach-watch/>.

The columns with Tuesday sampling results and forecasting data will now be hidden during winter, and only the long-term ratings shown (long-term ratings will be updated when this report is published). Also note that the date above the map is now always today's date, a bit less confusing than only having Tuesday dates.

**Please do let the DEP team know if you have suggestions for website improvements.**

## **2 INTRODUCTION**

Water quality monitoring of beaches and bays in the Derwent Estuary is coordinated by the DEP in collaboration with Department of Health (DoH), Tasmanian EPA and the six councils that border the estuary (Brighton, Clarence, Derwent Valley, Glenorchy, Hobart and Kingborough). The primary objectives of the program are to coordinate monitoring, support investigations and assist councils and the DoH in managing human health risks associated with poor water quality. The DEP's role in the program is to:

- Coordinate recreational water quality monitoring in the Derwent Estuary.

- Compile and analyse data, including classification of beaches and bays, annual reporting and analysis of long-term trends (using methods outlined Tasmanian Recreational Water Quality Guidelines 2007 (DoH, 2007).
- Support and encourage site specific investigations into poor or deteriorating water quality at targeted sites.

The water quality data is made publicly available via the DEP website and Facebook page on a weekly basis throughout the summer (December-March), to allow the community to make informed decisions as to where and when to swim. This data is also used to inform decision-making processes, by identifying stormwater and wastewater assets that require investigating.

## 2.1 Pathogens and health risks

Water contaminated by sewage and animal faeces may contain pathogenic micro-organisms (bacteria, viruses, protozoa), which pose a health hazard when the water is used for primary contact recreation, such as swimming. Infection may occur by swallowing, inhaling or by direct contact of contaminated water with ears, nasal passages, mucous membranes, and cuts in the skin, which allow the pathogens to enter the body (N.Z. Ministry for the Environment, 2002). The most common health conditions associated with primary contact recreation in contaminated water are gastrointestinal disorders, respiratory illnesses, eye, nose and throat infections and skin disorders.

Direct detection of pathogens is not a feasible option for routine assessments since they occur intermittently and are difficult to recover from water. Thus, water samples are analysed for the concentration of more easily detected microorganisms, which may indicate the presence of pathogens, referred to as faecal indicator bacteria (refer to (DEP, 2015 for more information). In the Derwent Estuary, enterococci are sampled as the key faecal indicator bacteria, as required by the Tasmanian Recreational Water Quality Guidelines 2007 (DoH, 2007).

## 2.2 Sources of contamination

Key sources of faecal contamination in coastal waters can include untreated sewage, or faecal contamination from a catchment transported via the stormwater system, animal faeces, or resuspension of contaminated sediments:

- Stormwater systems in urban areas can be contaminated with sewage. The source for this contamination can be caused by a failure in the wastewater (sewage) system, including infrastructure damage or blockages (tree roots, wet wipes etc) causing overflows, overflows during high rainfall events, or direct cross-connections, leakages, or animal faeces in low rainfall (or non-rainfall) events.
- Direct contamination can occur from animal faeces. High density animal aggregations, such as birds or dogs, on beaches can contribute to contamination.
- Resuspension of contaminated sediments by wind or wave action is also a possible source of contamination.

Differentiating between contaminant sources can be very difficult, however regular (and case-based) sanitary surveys, possibly combined with specialist laboratory techniques, such as sterols can help advance our understanding. Systematic investigation is critical to locate a pollution source. See the DEP Source Tracking Framework and Toolkit [https://www.derwentestuary.org.au/assets/Source\\_Tracking\\_Framework\\_and\\_Toolkit\\_Mar2020.pdf](https://www.derwentestuary.org.au/assets/Source_Tracking_Framework_and_Toolkit_Mar2020.pdf).

## 2.3 Recreational water quality guidelines

Swimming and environmental sites in the Derwent Estuary are graded as Good, Fair or Poor. This is in accordance with the Recreational Water Quality Guidelines for Tasmania (DoH, 2007), which are largely based on the national Guidelines for Managing Risks in Recreational Water (NHMRC, 2008). Both guidelines are currently under review. The guidelines are based on aseptic grab sample analysis for the faecal indicator microbial group enterococci, and the Tasmanian guidelines adopt a three-tiered approach to classifying the long-term quality of a site based on five years of data. The tiers are:

- *Good*: rolling 5-year 95<sup>th</sup> Hazen percentile value of < 200 enterococci MPN 100 mL<sup>-1</sup>.
- *Fair*: rolling 5-year 95<sup>th</sup> Hazen percentile value of 200 - 500 enterococci MPN 100 mL<sup>-1</sup>.
- *Poor*: rolling 5-year 95<sup>th</sup> Hazen percentile value of > 500 enterococci MPN 100 mL<sup>-1</sup>. In this case, water at these sites is considered a threat to public health in the event of primary contact recreation and local councils are required to advise the general public and to erect warning signs.

In addition to long-term site classification, trigger levels have been set to manage public exposure to episodic or emerging water quality issues. If a sample exceeds 140 enterococci MPN 100 mL<sup>-1</sup>, the council is required to resample as soon as possible, and if two consecutive samples return enterococci results above 280 MPN 100 mL<sup>-1</sup>, the public must be advised directly via signage on the beach in question. This signage can only be removed by Council's Authorised Officer in consultation with DoH.

## 3 RECREATIONAL WATER QUALITY PROGRAM

### 3.1 Swimming and Environmental sites

Aseptic grab samples are collected each Tuesday by Council and the EPA/DEP throughout the Derwent Estuary, during summer and early autumn each year (from 1 December to 31 March). Sites are categorised as either swimming sites or environmental sites, as described below, and locations are shown in Figure 3-1.

- The 19 swimming sites monitored this season are in locations where a significant number of people swim or conduct other primary contact recreation. Primary contact refers to where recreational water is used for whole-body contact, i.e., where there is a risk of swallowing water (NHMRC, 2008). These sites are sampled by councils.
- The 19 environmental sites monitored this season, sampled by either councils or EPA/DEP were selected using the following rationale:
  - Bays and coves that are frequently used for secondary contact recreation and/or have foreshore parks. Secondary contact refers to incidental contact, i.e., activities where only the limbs are regularly wet and in which greater contact (including swallowing water) is unusual, such as boating and fishing (NHMRC, 2008).
  - Areas with potential sources of faecal contamination.
  - Sites with relatively low risk of contamination, sampled to contextualise swimming site results.
  - Sites associated with major swimming events, such as the Trans-Derwent Swim.

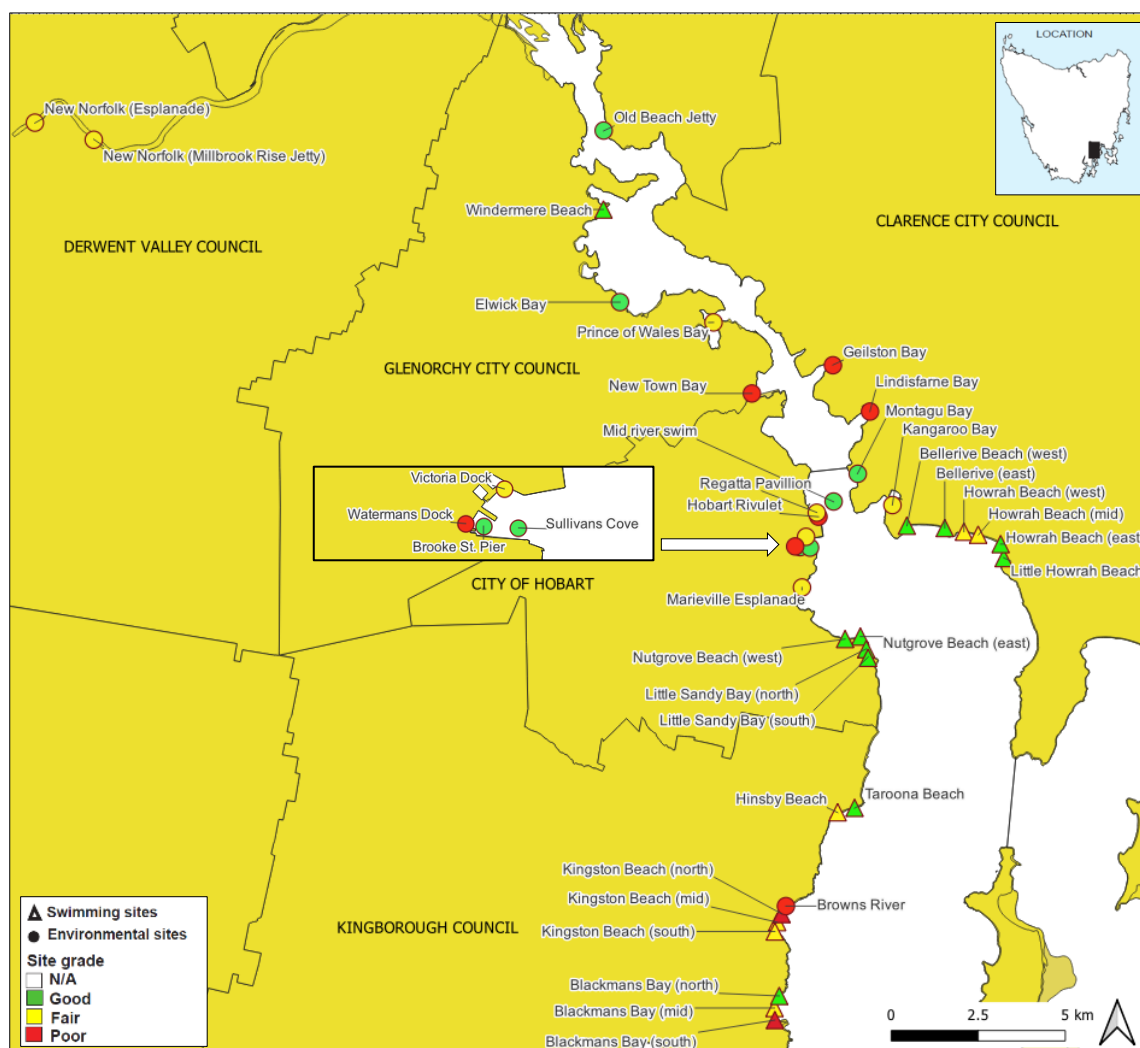


Figure 3-1. Recreational Water Quality sampling sites (swimming and environmental sites) with their current water quality classification based on data collected in the summer months between December 2019 and March 2024.

### 3.2 Inter-calibration exercise

An inter-calibration exercise is organised by the DEP at the start of each season to ensure that all sampling officers are using the same protocols, thus minimising sampler bias. The sampling method is demonstrated, associated protocols are reviewed, and participants simultaneously sample from a designated location. Results are compared to identify any sampler bias and are also useful to better understand the degree of variability between water samples collected from a given site and/or between sites.

The exercise is also a good opportunity to talk about any concerns and finer details of sampling both by new and more experienced samplers, and good questions are always brought up for discussion. For a full report on this season's inter-calibration exercise, which was a particularly windy and challenging day (Figure 3-2), see Appendix 9.1.

The next inter-calibration exercise will be conducted in November 2024.





Figure 3-2. EHOs sampling together in very challenging conditions, as part of the annual inter-calibration exercise, at Kingston Beach on 27<sup>th</sup> November 2023.

## 4 2023-24 RWQ SEASON RESULTS

### 4.1 Long-term site classification

After each RWQ season, a new long-term rating is calculated for all swimming and environmental sites. This calculation is based on the immediate previous five seasons of sampling data for each site. Table 1 below shows the updated rating after the 2023-24 season. The colours refer to Tasmanian *Recreational Water Quality Guidelines* (DoH, 2007), calculating a rolling 5-year 95<sup>th</sup> Hazen percentile for enterococci, where green denotes Good ( $< 200$  MPN  $100\text{ mL}^{-1}$ ), yellow denotes Fair ( $200 - 500$  MPN  $100\text{ mL}^{-1}$ ), and red denotes Poor ( $> 500$  MPN  $100\text{ mL}^{-1}$ ). The number of samples with enterococci results between  $140$  and  $280$  MPN  $100\text{ mL}^{-1}$ ,  $> 280$  MPN  $100\text{ mL}^{-1}$ ,  $> 140$  and total number of samples, for the same 5-year period are also shown.

**Following this latest season, all sampling sites now have 5 years of data, so all sites now have a confirmed long-term rating.**

Table 1. Updated long-term ratings for all swimming and environmental sites as calculated after the 2023-24 RWQ season.

		Updated long-term rating	5-year 95 <sup>th</sup> Hazen percentile	Total number of samples
Swimming sites	Bellerive Beach (east)	Good	88	86
	Bellerive Beach (west)	Good	113	86
	Blackmans Bay Beach (mid)	Fair	397	86
	Blackmans Bay Beach (north)	Good	113	87
	Blackmans Bay Beach (south)	Poor	916	87
	Hinsby Beach	Fair	220	87
	Howrah Beach (east)	Good	193	86
	Howrah Beach (mid)	Fair	345	86
	Howrah Beach (west)	Fair	226	86
	Kingston Beach (mid)	Fair	228	87
	Kingston Beach (north)	Poor	622	87
	Kingston Beach (south)	Fair	248	87
	Little Howrah Beach	Good	112	86
	Little Sandy Bay Beach (north)	Good	87	85
	Little Sandy Bay Beach (south)	Good	98	86
	Nutgrove Beach (east)	Good	44	84
	Nutgrove Beach (west)	Good	177	86
	Taroona Beach	Good	151	87
	Windermere Beach	Good	121	82
Environmental sites	Brooke Street Pier	Good	136	67
	Browns River	Poor	2427	87
	Elwick Bay	Good	109	81
	Geilston Bay	Poor	1103	67
	Hobart Rivulet	Poor	1099	67
	Kangaroo Bay	Fair	243	67
	Lindisfarne Bay	Poor	2129	67
	Marieville Esplanade	Fair	334	86
	Mid-river swim	Good	20	66
	Montagu Bay	Good	65	66
	New Norfolk (Esplanade)	Fair	275	75
	New Norfolk (Millbrook Rise Jetty)	Fair	246	75
	New Town Bay	Fair	484	67
	Old Beach Jetty	Good	123	69
	Prince of Wales Bay	Fair	206	67
	Regatta Pavilion	Fair	335	68
	Sullivans Cove	Good	134	67
	Victoria Dock	Fair	297	67
	Watermans Dock	Poor	926	67

## 4.2 Site results

### 4.2.1 Swimming Sites

This season again saw no new swimming sites added to the sampling regime. All sites now have at least 5 years of data and have all been assigned a long-term rating. New long-term ratings were provided for Bellerive Beach (east), Blackmans Bay Beach (north + south), and Kingston Beach (south).

The water quality at the swimming sites was overall better than the last two seasons. This season saw only 16 exceedances (enterococci  $>140$  MPN  $100\text{ mL}^{-1}$ ), compared with 22 last summer and 49 the previous season (Table 2). See the full list of enterococci results and exceedances for all swimming sites in the 2023-24 season in Appendix 9.3.1.

Table 2. List of the number of swimming sites from the last eight RWQ seasons triggering a retest under the Tasmanian Recreational Water Quality Guidelines by exceeding enterococci  $>140$  MPN  $100\text{ mL}^{-1}$  (DoH, 2007).

RWQ season	Number of exceedances
2023-24	16
2022-23	22
2021-22	49
2020-21	28
2019-20	5
2018-19	52
2017-18	23
2016-17	24

At the end of this season, eleven sites were graded as Good, six sites graded as Fair, and two as Poor. Four sites improved their rating: Howrah Beach (east), Nutgrove Beach (east + west), Taroona Beach from Fair to Good Figure 4-1. Two of the newly rated sites went to Good, Bellerive Beach (east) and Blackmans Bay Beach (north), while Kingston Beach (south) went to Fair and Blackmans Bay Beach (south) went to Poor.

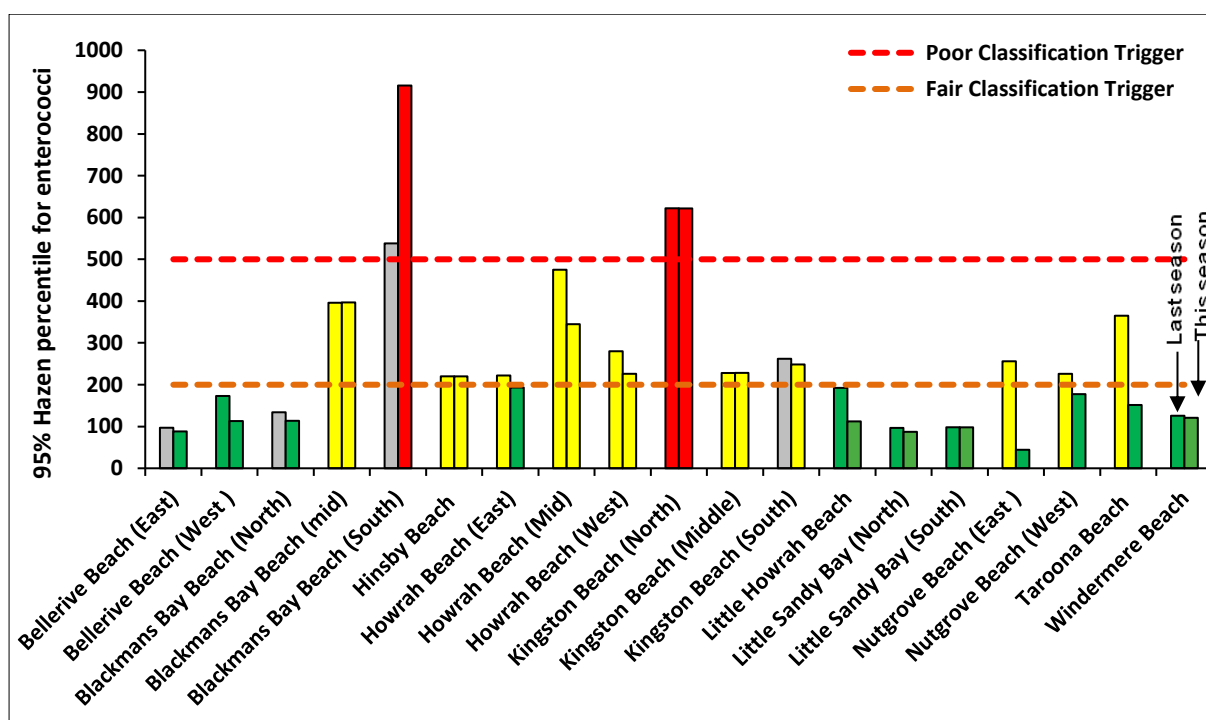


Figure 4-1: Comparison of rolling 5-year Hazen percentile enterococci result for swimming sites. Each site is presented as a pair of results, where the left bar represents 2022-23 RWQ season results, while the right bar represents 2023-24 season results. Green denotes Good ( $< 200$  MPN  $100 \text{ mL}^{-1}$ ), yellow denotes Fair ( $200 - 500$  MPN  $100 \text{ mL}^{-1}$ ), red denotes Poor ( $> 500$  MPN  $100 \text{ mL}^{-1}$ ), and the classification trigger lines are indicated with dotted lines. Grey columns indicate that less than five years of data was available at that time, thus the data is less robust.

The two swimming sampling sites with the consistently best water quality in the RWQ program is yet again the two Little Sandy Bay Beach sites (south + north). The two swimming sites currently in Poor is Kingston Beach (north), located near the Poor environmental sampling location at the Browns River mouth and Blackmans Bay Beach (south). Blackmans Bay Beach (mid + south) had some persistent problems at the end of last season, which Kingborough Council are doing their best to resolve. Read about specific site investigations in Section 5. Windermere Beach continues to stay firmly in the Good category. Improvements in Hobart too, with all sites now rated as Good.

Figure 4-2 highlights the proportion of Good, Fair and Poor swimming sites over the last eight RWQ seasons, showing an increase in Good sites over last season, and that there are now more, Good than Fair sites in the program.

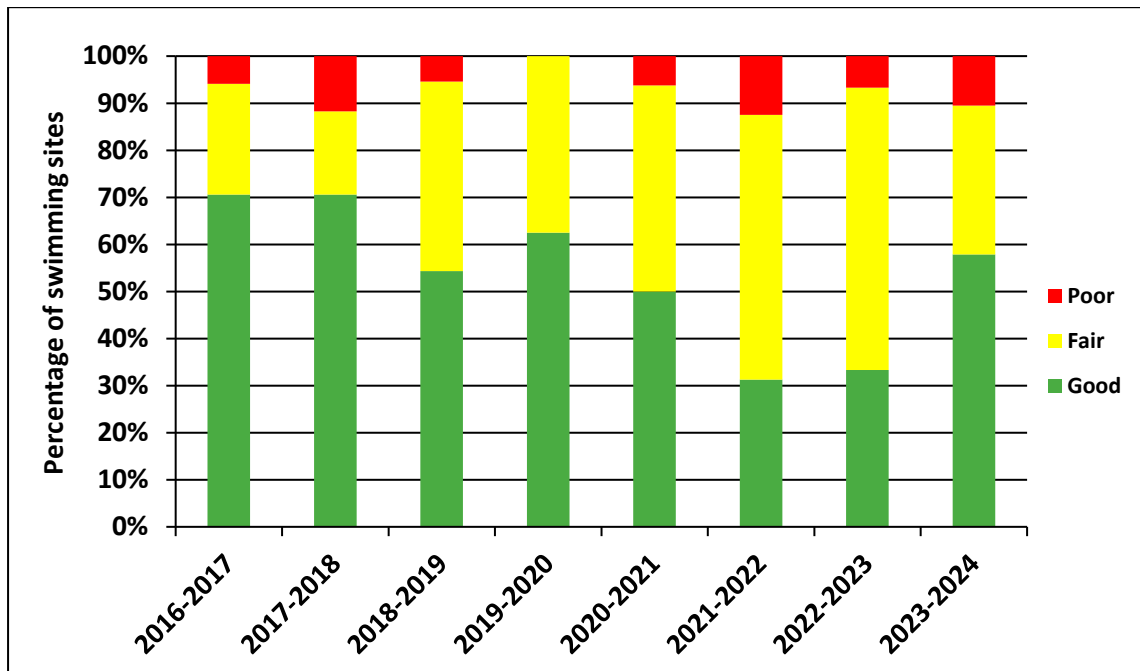


Figure 4-2 Proportion of swimming sites graded as Good, Fair, and Poor in the last eight RWQ seasons.

#### 4.2.2 Environmental Sites

There were no new sites added to the sampling program this summer; and all sites now have a long-term rating assigned to them.

The enterococci result from the 19 environmental sites showed 24 exceedances (enterococci  $>140$  MPN  $100\text{ mL}^{-1}$ ), compared to 56 during the last summer and 51 the previous season (Appendix 9.3.2).

After updating the long-term ratings at the end of the 2023-24 season, there are now seven sites graded as Good, seven as Fair, and five as Poor. One site dropped from Good to Fair (Kangaroo Bay). There were four site improvements in ratings following this recent season with Marieville Esplanade, New Town Bay, Regatta Pavilion and Victoria Dock all going from Poor to Fair (Figure 4-3). Figure 4-4 shows the proportion of Good, Fair and Poor swimming sites over the last eight RWQ seasons, highlighting the change over the years to the current situation of less Good and Poor, and more Fair environmental sites across the estuary.

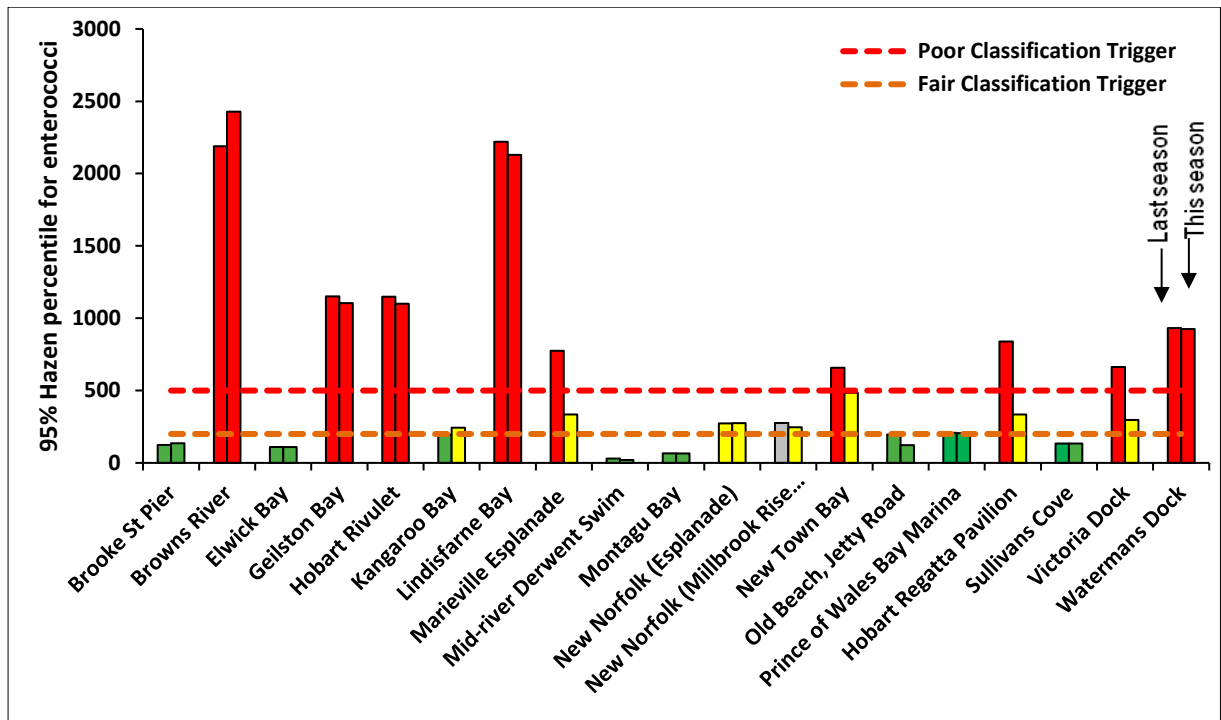


Figure 4-3 Comparison of rolling 5-year Hazen percentile enterococci result for the environmental sites. Each site is presented as a pair of results, where the left bar represents 2022-23 RWQ season results, while the right bar represents 2023-24 season result. Green denotes Good (< 200 MPN 100 mL<sup>-1</sup>), yellow denotes Fair (200 - 500 MPN 100 mL<sup>-1</sup>), red denotes Poor (> 500 MPN 100 mL<sup>-1</sup>), and the classification trigger lines are indicated with dotted lines. Grey columns indicate that less than five years of data was available at that time, thus the data is less robust.

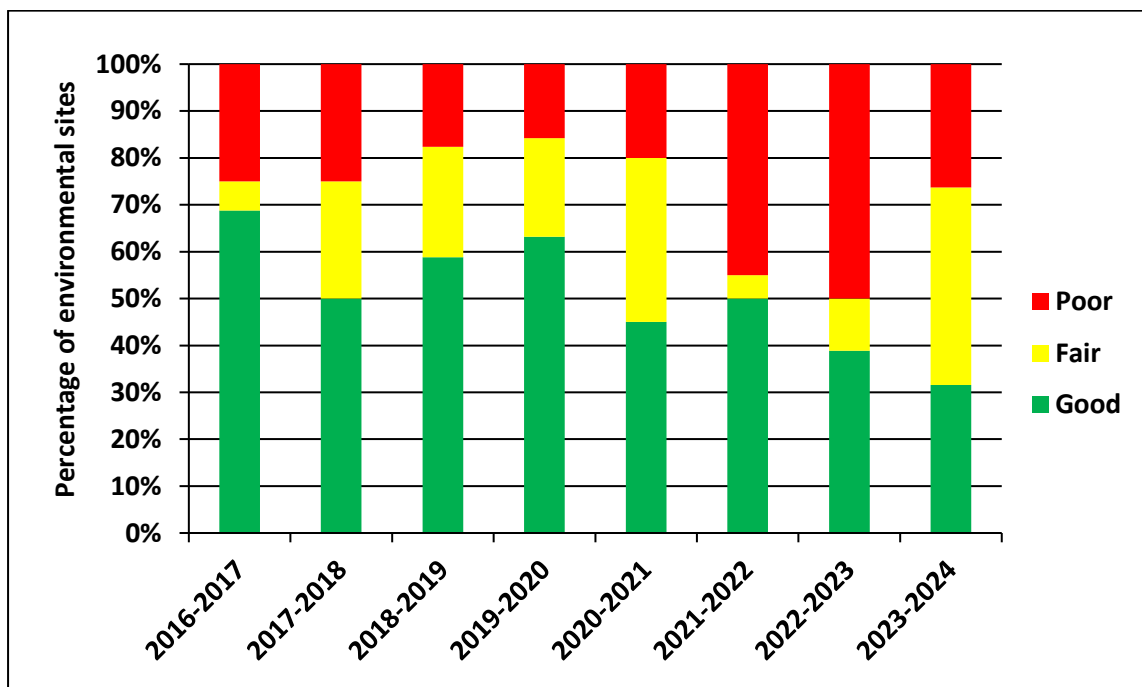


Figure 4-4 Proportion of Environmental Sites graded as Good, Fair, and Poor in the last eight RWQ seasons.

After this season, the Mid- River Derwent location continues to be the environmental site with the best water quality, followed by Montagu Bay and Elwick Bay. Hobart Rivulet had a poor season this summer with seven fails out of 17 sample events, followed by Browns River with six fails from 18 samples. There was a big improvement from last season's results with all other sites seeing a reduction in the number of failed samples. Four sites saw improvements this season (New Town Bay, Marieville Esplanade, Regatta Pavilion and Victoria Dock, which all saw ratings improvements from Poor to Fair.

See this season's complete list of enterococci results for all environmental sites in Appendix 9.3.2.

#### **4.3 Rainfall**

Rainfall is a driver of pollution at beaches and other recreational swimming areas, as it generates potentially contaminated stormwater runoff and can trigger discharges and overflows from the wastewater (sewerage) system. The water quality of urban beaches and bays can therefore be strongly influenced by rainfall (NHMRC, 2008). We also know that our beaches can respond very differently to rainfall depending on the proximity of sampling sites to stormwater outlets, activities in, and topography of, the catchment.

Rainfall varies considerably across the Derwent Estuary, with rainfall data collected and reported by the Bureau of Meteorology (BoM). Observations of daily rainfall are nominally made at 9 am and record the total rainfall for the previous 24 hours. RWQ Tuesday sampling mostly occur between 9 and 10.30 am, but can be later in the day, especially DEP/EPA boat sampling, which means that at times the rainfall records for the following day are relevant when investigating why particular enterococci results are high.

Five weather stations in the Derwent Estuary catchments, Ellerslie Road (Hobart), Greenhill Drive (Kingston), Mount Rumney, Dennes Point and New Norfolk west, have been selected as relevant when considering rain impact on the RWQ sampling sites. Mount Rumney is only useful post-season, and not on a daily basis, as its records are only updated monthly (BoM, 2023). The gauge at Dennes Point was included this season, as it is used in the forecasting program for Kingborough Council sites.

Long-term rainfall averages for the program months are currently ranging between 140.70 mm at New Norfolk and 201.30 mm at Kingston, the latter generally experiencing more rain than the other sites. During the 2023-24 RWQ season, total rainfall was the driest observed season from the last 10 years of results Figure 4-5.

The complete 2023-24 summer rainfall data for the five BoM weather stations that cover the Derwent Estuary are listed in Appendix 9.2.

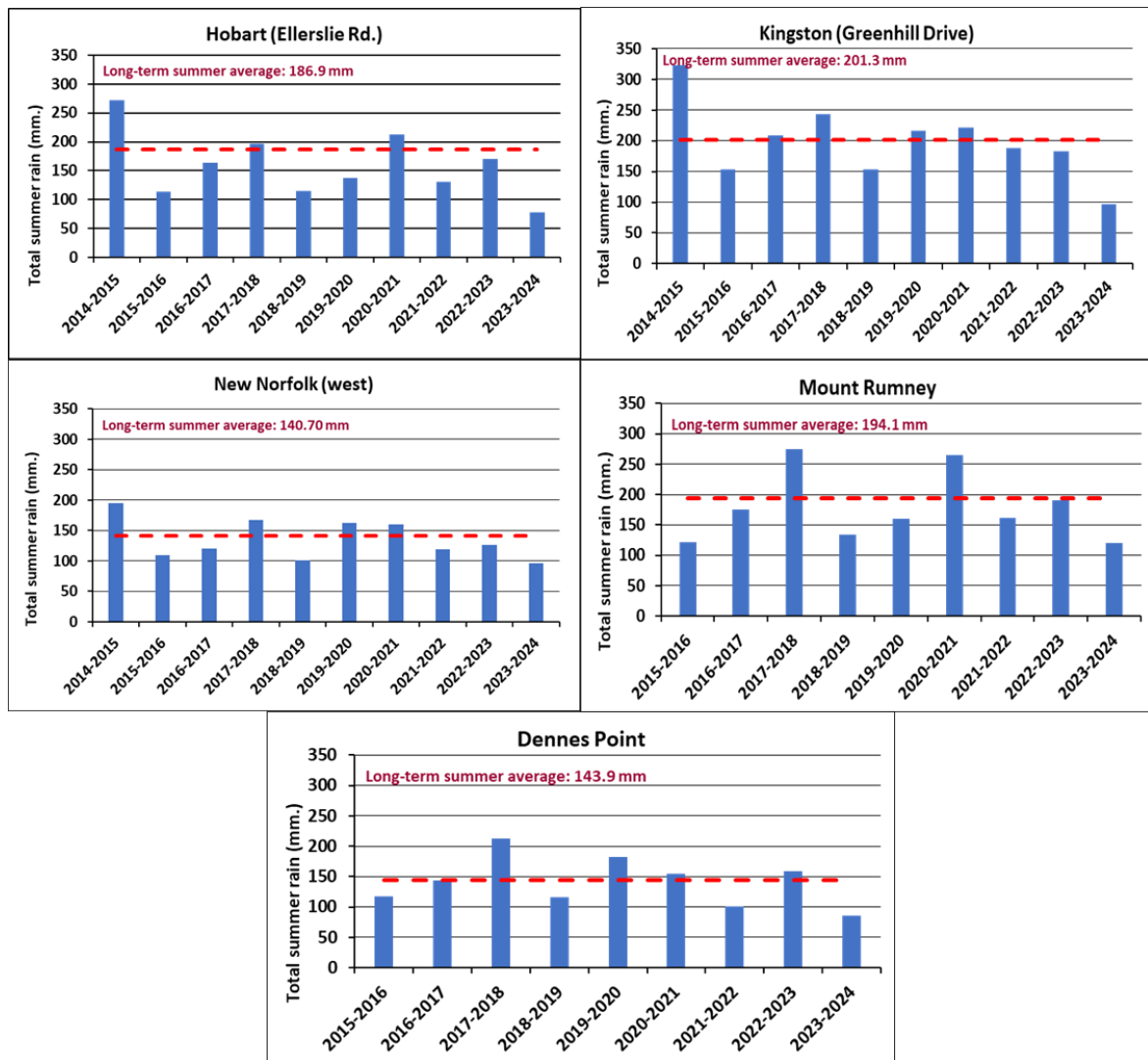


Figure 4-5 Total rainfall (in mm) at five weather stations in the Derwent Estuary catchments during the last ten RWQ program seasons (between December and March), as recorded by the Bureau of Meteorology (2024). The long-term average rainfall is indicated in red text and by a dotted line.

Overall, it was a dry summer for Tasmania, with summer rainfall was down about 16% below the average (BoM, 2024b). For Hobart (Ellerslie Road) rainfall was 49% of the long-term average, suggesting a significantly dry summer in Hobart. As is often the case, rainfall varied greatly between the summer months in the estuary. December had one significant rainfall event with January having two. The remainder of the summer period saw low to no rain falling with all sites experiencing <10mm in the month of February (Appendix B 9.2).

#### 4.3.1 Rainfall vs enterococci

A limited assessment of the relationship between enterococci results and recorded rainfall data has been conducted. The assessment includes all enterococci samples collected across the swimming sites this season, a total of 315 samples. Results are separated into two groups:

- **Group 1.** Enterococci results < 140 MPN 100 ml<sup>-1</sup>: 299 samples.
- **Group 2.** Enterococci results > 140 MPN 100 ml<sup>-1</sup>: 16 samples.



These two groups were separately assessed for a possible response to rainfall (Figure 4-6). Rainfall data was used from the two local BoM stations covering the swimming sites, with records for the 24 hours prior to 9 am on the day of sampling. Rainfall after 9 am on the day of sampling was not included in this assessment, and neither was rainfall from the previous days, which both could potentially have a significant impact on beach water quality.

**Group 1 (enterococci < 140 MPN):**

- 299 samples.
- 59 % of the enterococci results (< 140 MPN 100 ml<sup>-1</sup>) occurred when no rain fell in the preceding 24 hours.
- 30 % of results occurred on days when the total rainfall in the preceding 24 hours was > 0 and < 5 mm.
- 6 % of results occurred on days when the total rainfall in the preceding 24 hours was between 5.1 and 10 mm.
- 5 % of results occurred on days when the total rainfall in the preceding 24 hours was between 10.1 – 20mm.

**Group 2 (enterococci > 140 MPN):**

- 16 samples.
- 50 % of high enterococci values (> 140 MPN 100 ml<sup>-1</sup>) occurred when no rain fell in the preceding 24 hours.
- 25 % of high enterococci values occurred on days when the total rainfall in the preceding 24 hours was > 0 and < 5 mm.
- 13 % of high enterococci values occurred on days when the total rainfall in the preceding 24 hours was between 5.1 and 10 mm.
- 13 % of results occurred on days when the total rainfall in the preceding 24 hours was between 10.1 – 20mm.

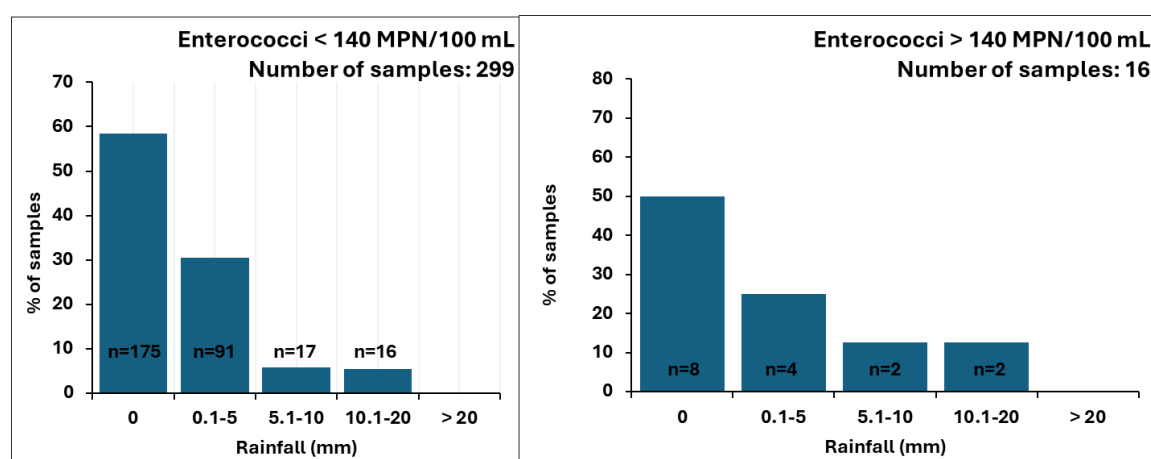


Figure 4-6 Proportion of enterococci sample results < 140 MPN 100 ml<sup>-1</sup> (a) and > 140 MPN 100 ml<sup>-1</sup> (b), matched with rainfall data recorded in sampling day, from two BoM stations across the estuary. Graphs include all samples collected at swimming sites during the 2023-24 RWQ season. n = number of samples.

As Figure 4-6 shows, of the 315 swimming site samples collected this summer, 97 % of enterococci results were < 140 MPN 100 ml<sup>-1</sup> (299 samples). Rainfall did not appear to negatively influence most enterococci results, with 124 of *all* 132 rainfall events (< 1 mm) resulting in enterococci result below 140 MPN 100 ml<sup>-1</sup>; including 17 samples taken when rainfall of between 5 and 10 mm was recorded.

For the 2023-2024 RWQ season there was no significant rain recorded in the estuary on the sampling Tuesdays (Appendix 9.2). This summer's overall good enterococci results suggests that lower rainfall can lead to better results. However, it should be noted that the dry weather exceedances are likely to come from another external source. There can be numerous reasons for dry weather fails, including sewage cross-connection, sewage spill, sewer leak, residential or business discharge, as well as swell and high winds resuspending sediments.

## **5 SPECIFIC INVESTIGATIONS**

Water quality investigations are occurring at various estuary sites as discussed below. The DEP recommends that councils view a new Fair site classification as a forewarning that problems with poor water quality may be escalating, and therefore warrants investigation. Ideally, councils employ dedicated stormwater investigation officers for such work.

Link to the DEP 2020 Source Tracking Framework and Toolkit, which outlines a standard process for identifying sources of faecal pollution in the Derwent Estuary: [https://www.derwentestuary.org.au/assets/Source\\_Tracking\\_Framework\\_and\\_Toolkit\\_Mar2020.pdf](https://www.derwentestuary.org.au/assets/Source_Tracking_Framework_and_Toolkit_Mar2020.pdf)

**The following site-specific information has been provided by individual councils.**

### **5.1 Derwent Valley Council**

The RWQ sampling site located at the Esplanade was downgraded to an environmental sampling site in 2022 however continues to be sampled as if it was a swimming site. This is due to its central location and public use namely, swimming, rowing, and boating.

The location of the sampling site is within 50 metres of a stormwater outfall which also led to the downgrade. The relocation of this outfall has been investigated by Council and at the present would need outside grant funding to relocate due to the costs involved. The overall water quality is rated as “fair” at the conclusion of the 2023-2024 Recreational Quality Program based on the last 5 years.

This season's water quality results were an improvement on 2022-2023 and consistent thorough out the season. The slightly drier and warmer weather may have aided this. Council wishes to continue to sample the Esplanade as if it were a recreational site due to it being a focal point for the town for swimming and recreational activities.

### **5.2 Kingborough Council**

#### **Blackmans Bay Beach**

Recent water sampling results and the identified decline in water quality at the Blackmans Bay Beach South site continue to be a priority for Council. Kingborough Council acknowledges the important role of our recreational sites within our community providing a space to connect, unwind and enjoy our beautiful marine environment.

Council continues to actively investigate impacts to water quality at the Blackmans Bay Beach recreational sites with a focus of the southern end of this beach. Over the last 12 months extensive out-of-season sampling and investigations into the potential sources of pollution in the Blackmans Bay catchment have been undertaken. To date these investigations have not identified any clear trends in the water quality at these sites.

Council continues to actively work with stakeholders such as TasWater to address pollution sources when identified. This partnership has to date seen extensive resources committed to infrastructure upgrades within the catchment.

Visual inspection, bacterial sampling and ammonia testing of the stormwater network is continuing both outside the recreation water sampling season and through the 24/25 recreational sampling season. This sampling will be utilised to identify potential sources of contamination in the stormwater network that may impact the marine environment and water quality trends in the area.

Kingborough Council are continuing to investigate other options available to them for these Recreational Water sites.

## **Taroona**

Taroona Beach is a valued recreational site within the municipality and has recently been the focus of Council infrastructure upgrades with the amenities onsite being refurbished. Water quality at this site has improved resulting in the upgrade from 'fair' to 'good' at the end of this season.

As with all recreational water site within the municipality Kingborough Council will continue to monitor pollution trends and inputs to this site to ensure the continued improvement of recreational water quality for our community.

## **5.3Clarence beaches**

Clarence City Council's (CCC) stormwater investigations concluded in 2023 due to the completion of Howrah and Bellerive catchment investigations and repairs made to stormwater infrastructure where required. The investigations and resulting works appear to have been successful in improving water quality at some degraded RWQ sampling sites specifically those surrounding the Howrah catchment. Following this season the long-term grading of Howrah Beach (East) has improved from fair to good as a result of Council's continued efforts to improve water quality at identified swimming beaches, however drier conditions may have also helped in the reduction of stormwater inputs during the season. Council, has also intermittently sampled some of its other popular non RWQ sites including, Lauderdale Beach, Opossum Bay, Spring Beach (Blessington St) and Seven-mile Beach. The results of these sites over the last season have been good with no observed exceedances being recorded. A sample was also taken from Lauderdale Canal which was also under RWQ primary contact limits.

Public education on stormwater pollution, appropriate remediation, and intervention measures upstream of the beach, will continue into the 2024-25 financial year. These intervention measures may include a number of targeted projects which aim to reduce the volume of larger polluting materials from reaching the beach.

Council will continue to develop appropriate initiatives and commit to long-term improvements to the stormwater network, to minimise the environmental and public health impact stormwaters have on the River Derwent and the identified swimming beaches within the river. With the positive results seen at Howrah and Bellerive resulting from the success of council's investigative works, Council is now better prepared to respond to future pollution events and mitigate any future risks to public health.

## 5.4 Marieville Esplanade

The environmental site Marieville Esplanade in Sandy Bay has been in the Poor section for many years. The sample site is by the rowing club house within the Short Beach Reserve, about 150m from the mouth of Sandy Bay Rivulet. The reserve is a very popular place for locals to meet up and walk their dogs (off lead area).

City of Hobart (CoH) has designed a sampling plan to investigate point sources of pollution that may be impacting upon the water quality at Marieville Esplanade. This sampling operation has been developed to understand and address the impact of sewage into stormwater contamination in the Sandy Bay Rivulet catchment on the Marieville Esplanade area. Building on work in 2021-2023, investigations in the New Town Rivulet and Hobart Rivulet catchments has led to several sewerage issues being found and fixed in the past 12 months. The stormwater team will continue to work through stormwater systems to find sewerage intrusions to increase our rivulet health and to protect the Derwent Estuary.

## 6 SPECIAL STUDIES

As part of each RWQ season, the DEP, supported by DoH, usually conducts an additional special-interest project that supplements a particular current focus.

This summer all efforts again went to conducting a second season-long trial of whether forecasting recreational water quality is possible here in the Derwent Estuary – see Section 6.1.

### 6.1 Forecasting Trial

In many countries, and in some Australian mainland cities, in addition to the weekly results and general advice, the swimming public is provided with a daily forecast, a prediction of what kind of pollution level can be expected at popular swimming sites. These forecasts are usually provided to the public via websites, QR codes, alerts via text messages, signs, or apps.

A decision was made to trial the NSW rainfall forecasting method in the Derwent Estuary alongside the 2023-24 RWQ season, allowing for comparison of the forecasts with the regular weekly enterococci results. A massive thanks to our interstate counterparts who have provided support through this process.

So why would we embark on daily water quality forecasting here in the Derwent Estuary? Some of the main drivers include:

- *To overcome the issue of the time lag between water sampling (on Tuesdays) and when most people swim (i.e. weekends) by providing timely communication. Much can happen to influence water quality during this period.*
- *To assist with management of beaches with Poor long-term ratings. Rather than only having a blanket no swim advisory attached to them, with daily up-to-date information, people will be able to confidently swim at these sites - sometimes. This would be of great benefit to local councils, with more positive communication options available to them.*
- *To implement a communication system where swimmers can quickly be notified about sewage spills and other sudden changes to the water quality at their local beach.*

- *To empower the public to make informed decisions around swimming site suitability prior to undertaking recreational activities.*
- *To enable large scale events (e.g. Ironman) to have access to current water quality information regardless of the event day and weather conditions.*

A successful public trial of the forecasting program was conducted alongside the 2023-24 RWQ season, with all estuary swimming sites included. Forecasts were updated daily prior to 9 am, allowing swimmers to access up to date information for their favourite swimming beach (even on the weekends). The Derwent Estuary Program's Beach Watch webpage became the homepage for this new information.

2318 daily forecasts were produced during the trial. To assess their accuracy, we compared the Tuesday forecast results with the enterococci results sampled on the same days. Table 3 details how the forecasts were assessed.

Table 3. Metrics of how the forecasts are assessed, based on the same methods as used in NSW and VIC.

Metric	Result
<b>Appropriate advice</b>	If microbial water quality is good (< 140 MPN), and our report forecasted Unlikely or Possible, <b>OR</b>  If microbial water quality was elevated (>140 MPN) and our report forecasted Possible or Likely.
<b>False alarm (type 1 error)</b>	When we forecast Likely, and water quality is good (<140 MPN).
<b>Missed alarm (type 2 error)</b>	When we forecast Unlikely, and the pollution level is elevated (>140 MPN).

The comparison gave us 320 events to analyse, with Appropriate advice provided 92.8% of the time. Overall, we had 2.8% Missed alarms (14 sites had none) and 4.7% False alarms. Seven sites had 100% accuracy and all other sites except one had greater than 85% accuracy of forecasts matching enterococci results (Table 4).

Table 4. Total breakdown of accuracy of advice for all 320 confirmed forecast values.

Accuracy of advice	Count	Percent %
Appropriate advice	297	92.8
False Alarm	15	4.7
Missed Alarm	9	2.8
<b>Total</b>	320	

These results are comparable with our interstate counterparts, with NSW Beachwatch reporting 93% appropriate advice following the 2022-2023 season. In VIC, the Beach Report for 2021-22 stated that Appropriate advice was provided for 96% of all forecasts, whereas their Yarra Watch 2021-22 program provided Appropriate advice in 57% of all forecasts.

Feedback both internally and through our public survey was well received with all stakeholders finding the information clear and accessible. All stakeholders outlined that the daily information was suitable and enabled them to be informed prior to swimming at their favourite site.

An update regarding the future of the forecasting program will be made public prior to the 2024-2025 RWQ season.

## 7 COMMUNICATIONS

There was occasional TV, radio, and newspaper media about the RWQ program throughout the summer. But more and more people obtain general information and news via social media rather than such traditional sources, including websites, which is also apparent for the RWQ program. As can be seen below, the DEP Facebook posts have significantly more reach than the Beach Watch website. Both website and Facebook reach is possibly higher than reported, as some people hide or clear their browsing history. Both outreach methods have increased from last year.

### 7.1 Website

Weekly RWQ results were reported via the DEP website on the *Beach Watch* page (for swimming sites) <https://www.derwentestuary.org.au/beach-watch/> and the associated *Bay Watch* page (for environmental sites). These pages allow the public to locate a weekly sampling result and long-term rating for a particular beach or bay by clicking on an interactive map or looking at a table.

The Beach Watch page had over 7,617 page views over the course of the 2023–24 RWQ season, which is up 1,694 views from last season. 6 December and 10 December saw the most page views, 221 and 395 respectively.

### 7.2 Facebook

Weekly RWQ results are shared on the DEP Facebook page [www.facebook.com/derwentestuary](https://www.facebook.com/derwentestuary) and Instagram <https://www.instagram.com/derwentestuaryprogram/>. This season again saw an increase in Facebook reach from previous summers, with an average post reach of around 1200 (up from around 580). The greatest reach was from a post in early-January with 75000 views (down slightly from last season, where the greatest reach was 8200 views). Again, it really helps when our partners and friends share our posts (Figure 7).



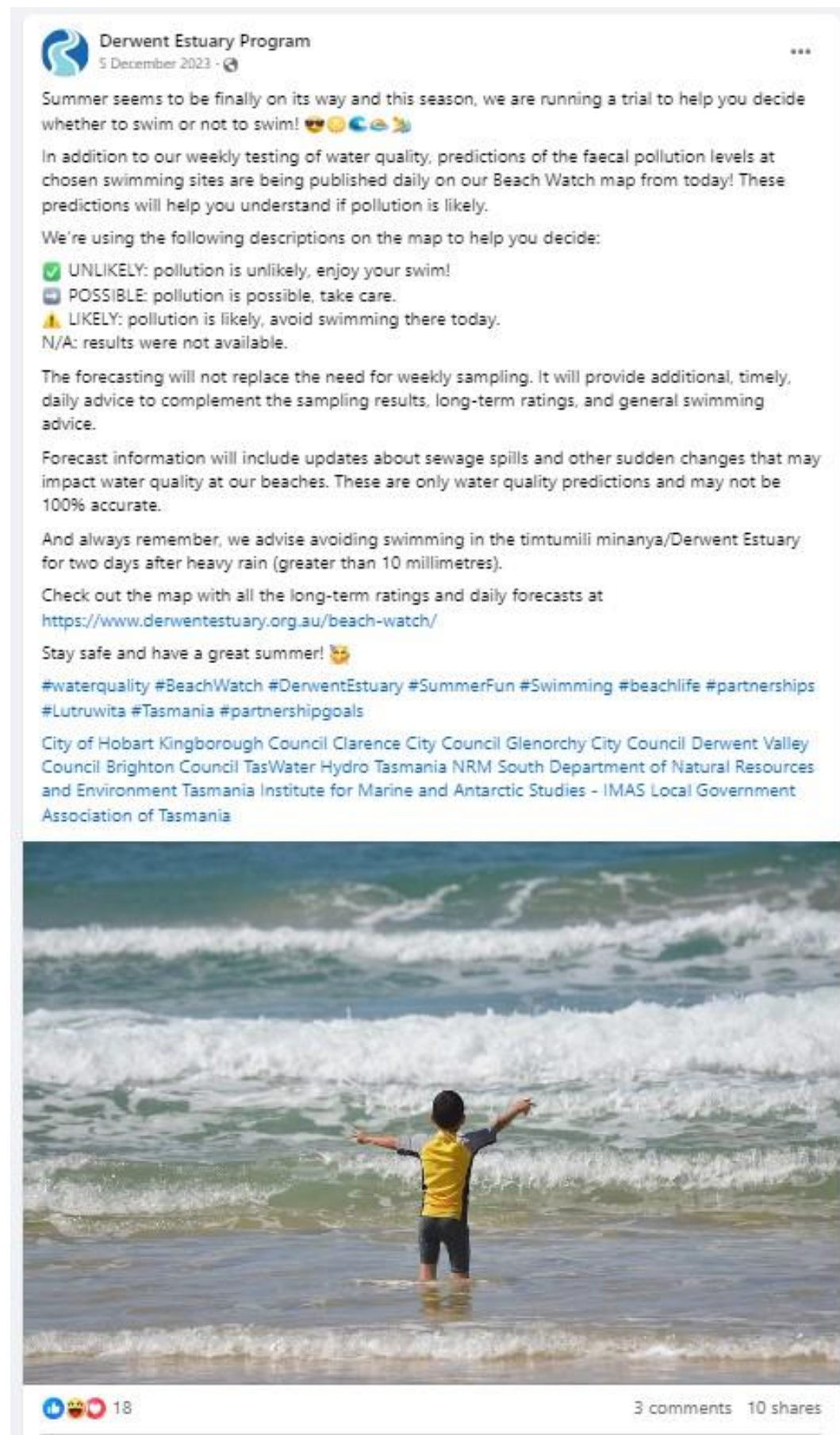


Figure 7. DEP Facebook post on 5 December 2023, which was reached by 7000 people.

### 7.3 Signage

The signs installed at Derwent Estuary swimming sites are a useful source of information for beach users. The DEP recommends that local councils conduct an annual review of signage in their municipality to ensure that all signs are located in the most appropriate locations (i.e. visible to most visitors), are in good condition (e.g. free of graffiti and not obstructed by vegetation), and that they are replaced with new signs as required (i.e. when the water quality category changes).

After updating the long-term ratings following the 2023-24 season, the following beach sign changes are recommended:

- Howrah Beach (east) – from Fair to Good
- Nutgrove Beach (east) – from Fair to Good
- Nutgrove Beach (west) – from Fair to Good
- Taroona Beach – from Fair to Good

For new swimming sites, it is recommended that signs are only erected once a long-term rating has been established, which is after five seasons. This is now the case for the following swimming sites:

- Bellerive Beach (east) – from no classification to Good
- Blackmans Bay Beach (north) – from no classification to Good
- Blackmans Bay Beach (south) – from no classification to Poor
- Kingston Beach (south) – from no classification to Fair

Councils are not required to put up signs to indicate the water quality for environmental sites but may choose to do so in well-visited locations.

## 8 ACKNOWLEDGEMENTS

As always, the DEP would like to sincerely thank all council environmental health officers and other council staff and management who have supported the annual RWQ season, as well as EPA staff who have assisted with boating requirements. Many thanks also to the staff at the Public Health Laboratory and the Department of Health for their ongoing participation and support, and our industry partners, including TasWater staff, who were invaluable in the forecasting trial.

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## 9.1 Appendix A - Intercalibration report, RWQ season 2023-24

### Summary and conclusions

Recreational Water Quality (RWQ) monitoring in the Derwent Estuary is conducted and reported on in accordance with the Recreational Water Quality Guidelines 2007 (DoH, 2007). The latest annual program report (from season 2022-23) can be viewed [here](#). To guarantee correct and consistent water sampling technique, to assess the degree of variability between samples, samplers, and various nearby locations, and importantly, to ensure trust in the data gathered, the Derwent Estuary Program (DEP) coordinates an annual inter-calibration exercise with local councils prior to the start of each RWQ season.

On a cool and overcast afternoon on 27 November 2023, environmental health officers from three estuary councils collected water samples at two sites at the northern end of Kingston Beach, the first being the regular RWQ program sampling site (*Kingston Beach (north)*). Results varied considerably, but all samples failed, as per the Tasmanian RWQ guidelines (enterococci >140), including the sample taken in a recently cut channel where Browns River breaks through to the estuary.

The poor results in the rivulet channel and at both sampling sites were expected, as there had been significant rain over the previous two days to sampling, and that this end of Kingston Beach is known to be impacted by Browns River after rain. Muddy water was clearly observed on the day flowing out from the river and hugging the beach (Figure 8). The sample results were mostly higher at Site 1, but both sites were unmistakably impacted by the murky rivulet outflow.

The results demonstrated inhomogeneous water quality conditions, with considerable variability between samplers. Given that urban rivulets are a known source of faecal contamination, especially after heavy rain, the higher enterococci result from the rivulet and Site 1 were expected. Normally we would have anticipated lower results at Site 2 (further away from the source) but given the conditions on the day and the previous days, there was not enough time and distance for adequate dilution to occur. The difference between samplers were likely caused by the swell that was rolling in intermittently at the time of sampling, causing irregular mixing of sediment from the rivulet and the marine water, and with some samplers going out further than others (Figure 9). All samplers adopted good aseptic grab sampling technique, removing bottle lids at the last moment before collecting a sample, protecting the bottle and lid from contamination, labelling bottles correctly and storing samples in a chilled esky for subsequent transport to the laboratory.



Figure 8. Brown-coloured water observed flowing south hugging the beach at time of sampling.



Figure 9. Intermittent swell causing mixing of the water column at time of sampling.

## Introduction

The RWQ monitoring is conducted and reported in accordance with the Recreational Water Quality Guidelines 2007 (*Public Health Act 1997*). The guidelines recommend classifying primary contact recreation beaches using 5-year 95<sup>th</sup> Hazen percentile values for the faecal indicator bacteria enterococci:

- Good (surveillance mode) = < 200 MPN/100 mL.
- Fair (alert mode) = 200 - 500 MPN/100 mL.
- Poor (action mode) = > 500 MPN/100 mL.

The long-term beach classification guidelines do not take into account the possible influence of variability in the data due to differences in sampling techniques between samplers, or possible heterogeneity of the sampled water body. The RWQ program uses data provided by a number of different council environmental health officers, which increases the risk of variability due to sampling technique. Thus, the primary objective of the annual inter-calibration exercise is to review and practice sampling methods at the start of each season, in order to improve consistency of results. A secondary objective is to gain a better understanding of water quality at a particular site.

## Participants

The DEP (Inger Visby) coordinated the participation of the following:

- Kingborough Council (Michael Steele)
- Clarence City Council (Phillip Pennisi)
- Glenorchy City Council (Simone Clifford, Amanda Wieland)
- Derwent Valley Council (Ken Lyall)

Scott Burton from DOH were in attendance, and there were apologies from Brighton Council, Clarence Council and City of Hobart.

## Location

Sample 1 was taken at the regular Kingston Beach (north) RWQ sampling site. Sample 2 was obtained approx. 100 m. west of the first sample. An additional sample was taken directly in the fast-flowing channel from Browns River to assess this as a potential source of contamination. The rivulet has very recently cut a new channel through to the beach, shown in blue below (Figure 10).

Kingston Beach is one of the RWQ program's most popular swimming sites, but the northern site unfortunately has a Poor long-term rating, due to its proximity to Browns River, which is an Environmental Site with a permanent Poor rating. Considerable effort has, and is, taking place in the Browns River catchment to identify and rectify any issues.



Figure 10. Location of the three sites sampled for the RWQ inter-calibration exercise on 27 November 2023 at Kingston Beach, with recent river channel between Browns River and Derwent Estuary indicated in blue.



## Safety

Wader safety was discussed, including how valuable wader safety courses are. Wearing waders can be highly hazardous if water gets inside them, e.g., from boat wake or when bending to take a water sample. The DEP recommends that everybody complete a Wader Safety course. In the meantime, watch this very useful short video on wader safety <https://www.mast.tas.gov.au/guides/wader-safety/>. Furthermore, as part of wader safety, it is important to wear a tight belt, and ideally also wear a personal flotation device (PFD) (Figure 11).

For added security, it is also recommended that no one samples on beaches on their own. Always be aware of the surroundings and only conduct sampling if it is safe to do so. Always use common sense and don't take risks - personal safety is more important than sampling.

DEP also recommends consulting the **Water Sampling Guide** produced by Surf Life Saving Tasmania, which goes into detail explaining rips, waves, sun safety, life jackets, cold water emersion and marine creatures we might come across.



Figure 11. Simone and Amanda from Glenorchy City Council are well prepared for recreational water sampling. Note sea safety with waders, belt and life jackets.

## Method

Filling in the laboratory submission form was discussed, including entering wind speed, rain, wind direction, date and time of sampling. It can be useful to look up climate data just prior to sampling. This becomes important if results are high and we need to look back at conditions at sampling time. Participants were also encouraged to note other observations, such as discolouration, odour, construction activity, boat presence, density of wildlife, evidence of faeces, proximity to stormwater outfalls, or any other matters which might influence results. Participants can take a photo or make a copy of the lab submission form to file for their own records.

All bottles should be pre-sterilised and provided by PHL. They are dated by the lab, so ensure that you are not using old bottles. Just before sampling, bottles were labelled with the site, time, and the samplers' names. Always worth having a spare bottle,

should one become compromised (e.g., by touching the inside of the lid by mistake when sampling).

Samplers waded out to about 1 m depth, and concurrently collected a single sample at each site from an approximate water depth of 0.3 m. Bottles were only opened immediately prior to collecting the sample. Once the bottle cap had been removed, care was taken to ensure that this was not contaminated by fingers or by contact with surfaces. The bottle was quickly plunged to the required sampling depth, then it was tilted upward with the mouth pointed upward. The sample was brought to the surface and a portion of the sample tipped out so that the level in the sample container was at the bottle collar. The sample lid was screwed tightly shut before removing it from the sample pole, and the sample was placed upright in a chilled esky ready for transport to the laboratory. Samples should be delivered to the laboratory ASAP after sampling (24 hr max.), and on this day they were delivered approx. 1 hour after sampling.

## Results

The enterococci result from Site 1 and 2 all failed (as per Tasmanian RWQ guidelines), varying between 249 and 1046. In the Browns River channel by the beach the enterococci result was 1296 MPN/100 mL.

Table 5. Summary of enterococci concentration results (MPN/100 mL) sampled on 27 November 2023.

Sampler	Browns River channel	Sample 1 (Kingston Beach (north) sample site)	Sample 2 (~ 100 m south of Sample 1)
Phillip (CCC)	1296	420	249
Ken (DVC)		857	428
Amanda (GCC)		855	723
Simone (GCC)		1046	384
Michael (KC)		272	496

## Rain, wind, tide conditions

According to the Kingston weather station at Greenhill Drive, there was 4.6 mm of rain in the 24 hours prior to 9am on sampling day, and 14.6 mm of rain the previous day (BoM, 2023).

At Dennes Point, at 3pm on the day of sampling, it was cool (13 degrees), overcast, the wind was east, south easterly with wind speeds ~ 17 km/hr (BoM, 2024a) and the tide outgoing around 0.4 m (WillyWeather, 2023).

## Acknowledgements

Thank you very much to the new EHOs and cadets who participated in this session with great enthusiasm and willingness to learn, share and contribute to group discussion, and to all our councils for valuing and prioritising the RWQ program.

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## 9.2 Appendix B – Rainfall data across the Derwent Estuary

Table 6. Daily Rainfall (up to 9am on sample dates) between December and March at five BOM weather stations across the Derwent Estuary: Hobart's Ellerslie Rd (HE); Mount Rumney (MR); Kingston's Greenhill Drive (KG); New Norfolk West (NN); Dennes Point (DP). RWQ sampling days are highlighted in yellow.

December 2023						January 2024						February 2024						March 2024					
Date	HE	MR	KG	NN	DP	Date	HE	MR	KG	NN	DP	Date	HE	MR	KG	NN	DP	Date	HE	MR	KG	NN	DP
1st	0.4	1	3.2	0	0.4	1st	0	0	0	0	0.2	1st	0	0	0	0	0	1st	0	0	0	0	0.2
2nd	0	0	0	0	0	2nd	0	0	0	0	0	2nd	0	0	0	0	0	2nd	0	0	0.8	0.6	0.2
3rd	0.8	0.8	3.6	0	1.6	3rd	0	0	0	0	0	3rd	0	0	0	0	0	3rd	0	0	0	0	0
4th	0.2	0	0	0	0	4th	1.8	2.6	2.4	3	0	4th	0.4	0.4	1.2	0.4	1.4	4th	0.6	0.8	1	0.4	1.4
5th	0	0	0	0	0	5th	0	0.2	0	0	0	5th	1.6	1.6	2.4	1	1.6	5th	0	0	0	0	0
6th	0	0	0	0	0	6th	0	0	0	0	0	6th	0.2	0	0	0	0.2	6th	0	0	0	0	0
7th	0	0	0	0	0	7th	0	0	0	0	0	7th	0	0	0	0	0	7th	0	0	0	0	0
8th	0	0	0	0	0	8th	14.2	22.4	16.2	18.2	10.6	8th	0	0	0	0	0	8th	0	0	0	0	0
9th	6	7	6.4	6.8	6	9th	0.4	0.2	0.4	0	0	9th	0	0	0	0	0	9th	0	0	0	0	0
10th	0.2	0	0.6	0	0	10th	0	0	0	0	0	10th	0	0	0	0	0	10th	0	6	0	0	0
11th	0	0	0	0	0	11th	0	0	0	0	0	11th	0	0	0	0	0	11th	6.2	1.2	5.8	3.4	4
12th	0	0	0	0	0	12th	0	0	0.4	0	0.2	12th	0	0	0	0	0	12th	0.2	0	0.2	0.2	0.2
13th	0	0	0	0	0	13th	1.4	1.6	1.6	2.6	1.8	13th	0	0	0	0	0	13th	0	0	0	0	0.2
14th	17.8	26.6	15	22.8	22.6	14th	0	0	0	0	0	14th	0.2	1	3.4	1	2	14th	0	0	0	0	0
15th	0	0.4	0	0.4	0.2	15th	0	0	0	0	0	15th	0	0	0	0	0.2	15th	0	0	0	0	0
16th	0	0	0	1.2	0	16th	0	0	0	0	0	16th	0	0	0	0	0	16th	0	0	0	0	0
17th	0.4	0.8	2.2	0.6	0.6	17th	0	0	0	1.8	0	17th	0	0	0	0	0	17th	0	0	0	0	0
18th	0	0	0	0	0	18th	16.4	19	14.6	18.4	12.6	18th	0	0	0	0	0	18th	0	0	0	0	0
19th	1	1.6	2	2.2	1.2	19th	0.2	1.6	3.4	0.6	6.4	19th	0	0	0	0	0	19th	0	0	0	0	0
20th	0.2	5.4	0.6	0	0.2	20th	0	0	0	0	0.2	20th	0	0	0	0	0	20th	1.4	8.8	1.8	1.6	1.8
21st	0	0	0	0	0	21st	0	0	0	0	0	21st	0	0	0	0	0	21st	0	0	0.6	0	0.2
22nd	0	0	0	0	0	22nd	0.2	0.8	1.2	0	0.2	22nd	0	0	0	0	0	22nd	0	0	0	0	0
23rd	0	0	0	0	0	23rd	0	0	0	0	0	23rd	0	0	0	0	0	23rd	0	0	0	0	0
24th	0	0	0	0	0	24th	0.2	0	0.2	0	0	24th	0	0	0	0	0	24th	0	0	0	0.4	0
25th	0	0	0	0	0	25th	0	0	0	0	0	25th	0	0	0	0	0	25th	0	5.2	0.6	0.8	0
26th	0	0	0	0	0	26th	0	0	0	1.6	0	26th	0	0	0	0	0.2	26th	0	0.4	0.2	0	0.2
27th	0	0	0	0	0	27th	0	0	0	0	0	27th	0	0	0	0	0.2	27th	0	0	0	0.6	0
28th	0	0	0	0	0	28th	1	0.2	1.8	1.2	1.2	28th	0	0	0	0	0	28th	0	0	0	0	0
29th	2	0	0.2	0	1.2	29th	0.2	0	0	0	0	29th	1.8	1.5	2	3.6	4.2	29th	0	0	0	0	0
30th	0.2	0	0.4	0.4	0	30th	0	0	0	0	0							30th	0	0.2	0	0	0
31st	0	0.8	0.2	0	0.2	31st	0	0	0	0	0							31st	0.2	0.4	0	0	0

	RWQ sampling days
Rainfall (mm)	
5 - 10	
>10 - 20	
> 20	

### 9.3 Appendix C – 2023-24 enterococci results

#### 9.3.1 Swimming sites

Date	CoH				CCC						KC						GCC			
	Little Sandy Bay Beach (south)	Little Sandy Bay Beach (north)	Nutgrove Beach (east)	Nutgrove Beach (west)	Bellerive Beach (east)	Bellerive Beach (west)	Howrah Beach (east)	Howrah Beach (mid)	Howrah Beach (west)	Little Howrah Beach	Blackmans Bay Beach (north)	Blackmans Bay Beach (mid)	Blackmans Bay Beach (south)	Hinsby Beach	Taroona Beach	Kingston Beach (north)	Kingston Beach (mid)	Kingston Beach (south)	Windermere Bay Beach	No.exceedences over 140 MPN
05-Dec-23	10	10	10	10	10	10	10	10	10	10	10	10	10	10	<10	52	41	20	<10	0
12-Dec-23	10	31	20	121	31	1723	73	243	52	31	10	10	20	10	148	85	41	110	<10	3
19-Dec-23	63	10	10	10	34	10	10	10	10	10	41	97	228	10	<10	63	31	20	52	1
27-Dec-23	10	63	31	10	NA	NA	NA	NA	NA	NA	31	20	233	10	41	10	31	63	NA	1
02-Jan-24	10	10	10	10	10	10	10	10	10	10	10	10	10	10	<10	10	10	10	<10	0
09-Jan-24	10	10	10	10	10	10	10	10	41	10	97	NA	31	10	75	345	110	246	<10	2
16-Jan-24	10	10	10	52	10	10	10	20	10	10	10	20	292	10	<10	10	20	30	<10	1
23-Jan-24	10	10	10	10	20	10	10	20	10	10	10	10	908	10	<10	98	10	31	<10	1
30-Jan-24	10	10	10	30	10	10	10	10	10	10	10	63	86	10	<10	10	10	10	<10	0
06-Feb-24	10	10	10	10	10	10	10	10	10	10	41	110	10	10	<10	97	52	52	75	0
13-Feb-24	10	10	10	10	10	10	41	10	20	10	10	20	991	10	<10	10	20	20	<10	1
20-Feb-24	10	10	10	10	10	10	10	10	10	10	10	31	331	10	20	52	10	10	<10	1
27-Feb-24	10	10	10	31	10	10	10	10	10	10	10	52	52	10	<10	10	10	63	<10	0
05-Mar-24	10	10	10	20	10	10	10	10	10	10	31	160	241	10	<10	75	31	96	<10	2
12-Mar-24	108	98	10	41	20	85	20	187	20	10	110	253	10	10	<10	31	134	109	41	2
19-Mar-24	10	10	10	10	10	10	10	10	10	10	10	10	122	10	<10	20	10	10	110	0
26-Mar-24	20	10	10	10	10	10	75	20	10	41	10	556	52	10	<10	10	31	63	41	1
																				16

Figure 9-12 2023-24 RWQ season swimming site results listed under each local council. Results are enterococci MPN per 100 mL. The last column lists the number of enterococci result exceedances above 140 MPN per 100 mL., which are also highlighted in red.



### 9.3.2 Environmental sites

Date	CoH							GCC			KC	CCC				BC	DVC			
	Brooke St Pier	Hobart Rivulet	Marievale Esplanade	Regatta Pavilion	Sullivans Cove	Victoria Dock	Watermans Dock	* New Town Bay	Elwick Bay	Prince of Wales Bay Marina	Browns River	Geilston Bay	Kangaroo Bay	Lindisfarne Bay	Montagu Bay	Old Beach, Jetty Road	New Norfolk (Esplanade)	New Norfolk (Millbrook Rise Jetty)	Mid-river Derwent Swim	No. exceedances over 140 MPN
05-Dec-23	10	75	10	20	10	10	10	10	10	10	272	10	10	10	10	122	10	30	10	1
12-Dec-23	10	146	246	10	10	10	10	20	10	10	86	10	10	20	10	10	10	10	10	2
19-Dec-23	20	52	145	10	10	20	10	20	145	10	1850	10	10	31	10		109	63	10	3
27-Dec-23	NA	NA	132	NA	NA	NA	NA	NA	NA	NA	98	NA	NA	NA	NA	NA	NA	NA	NA	0
02-Jan-24	10	75	20	110	10	10	31	10	30	20	86	10	10	10	10	20	96	85	10	0
09-Jan-24	259	41	31	216	10	10	173	10	10	10	5748	272	388	41	10	20	NA	NA	10	6
16-Jan-24	10	20	10	10	10	10	10	10	10	20	62	10	10	31	10	75	41	10	10	0
23-Jan-24	10	932	10	10	20	10	20	10	20	10	985	10	10	10	10	41	NA	NA	10	2
30-Jan-24	10	73	31	10	10	10	10	20	10	20	63	10	10	30	10	10	10	10	10	0
06-Feb-24	10	318	109	10	10	10	20	10	10	20	85	10	10	10	10	31	74	52	10	1
13-Feb-24	20	41	10	10	10	10	20	20	10	10	63	10	10	10	10	10	75	10	10	0
20-Feb-24	10	1178	10	10	10	10	31	20	10	10	63	10	10	10	10	31	72	97	10	1
27-Feb-24	85	52	10	31	10	10	10	10	10	20	10	10	10	10	10	10	63	20	10	0
05-Mar-24	10	1086	98	10	10	10	10	63	31	10	313	31	10	41	10	10	62	86	10	2
12-Mar-24	10	146	20	20	63	10	512	10	10	30	6131	10	75	160	10	10	122	185	10	5
19-Mar-24	10	10	86	10	10	10	20	10	10	10	85	10	20	10	10	10	31	108	10	0
26-Mar-24	10	373	63	20	10	10	10	10	10	31	52	41	10	10	10	10	61	85	10	1
																				24

Figure 9-13 2023-24 RWQ season environmental site results listed under each relevant local council. Results are enterococci MPN per 100 mL. The last column lists the number of enterococci result exceedances above 140 MPN per 100 mL, which are also highlighted in red.

\* New Town Bay is located between Hobart and Glenorchy municipalities.