

Commentary on our big day out November 28th 2015

Good news, both our YSIs are back in business!!

Turbidity higher, NNN higher, Enterococci counts higher, DO slightly lower as were the chloro a values compared with Oct 31st values.

What was the day like?

A mild day with variable cloud cover, 20-80%. Wind direction changed from light NW to W then SW later in the morning. Around 10 knots gusting to 20knots.

Tide and harbour conditions.

All observations and sample collection occurred between 0935 and 1230. All observations carried out on an ebbing tide. The tide was high at 0800 at a height of 2.2 m.

Water of Leith, 0.356 cumecs and 11.3°C at 11.00.

Rainfall 20.5 and 17.0 mm on two previous days.

Is there anything unusual ?

Nothing significant

Seaweeds.

See the data sheets

Animals

See the data sheets.

Conditions of the surface water and does the water have any real or apparent colour?

Surface conditions were calm at most sites. Later in the morning when the wind speed increased the surface was less calm.. There was nothing unusual about the colour at the surface of the water.

WE make this observation to check for any unusual discharges, like oil on the surface. The good news is that seldom do we notice any sheens or unusual colours on the surface of the water.

Water temperature

The water temperature ranged from 13.1 °C (#88) – 15.9 °C.(#86) Many readings around 13. The water temperatures are slightly warmer than Oct 31st readings.

The water temperature will have an effect on the solubility of different substances in water, solubility of ions will decrease however the solubility of oxygen and gases will increase.

Freshwater flowing in from the Leith is colder than water entering the harbour mouth in winter.

[October 31st 7.8 °C (#88) – 11.9 °C.(#86)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 28.0 (#810) -34.71 ppt (#81) . The pattern is similar to Oct 31st , suggestion of a gradient of higher salinity close to the mouth of the harbour. All measurements taken close to mid tide.

Some samples were tested in the lab.

[October 31st 30.6 (#86) -33.8 ppt (#83)]

Open sea salinity 34.998 ppt!!!

Salinity readings more accurate, both YSI instruments are check each time against standard sea water. YSI 2030 measured 33.6 (standard 33.7ppt). YSI 85 measured 32.5 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 7.79 (#82) – 9.64(#88).

pH range was greater with most readings around 8. #88 Macandrew Bay) again has had the most alkaline reading. The marina site at Macbay (#87) had the second highest reading.

What about buffers in the water???

[October 31st 7.46 (#89) – 9.19(#88).]

Turbidity

All sites tested. Range was 1.49 NTU (#83) – 13.1 (#86) /15.6 NTU (#88)/ 16.9 NTU (#810)

The water was quite turbid at discharge sites. A reflection of the recent rainfall carrying sediment into the harbour.

The range was similar to Oct 31st readings except for #89. Discharge sites higher than the open water sites

Some turbidity could be explained by the extra phytoplankton in the water, but in this case the sediment is mixing well with the water.

The samplers have to be careful collecting their samples at low tide and avoid including sediment in their samples. It was difficult to collect a sample from #89 as the water was very shallow.

[October 31st 1.47 NTU (#87) – 15.5 (#85) /34.6 NTU (#89).]

**** Why is turbidity important?? .**

Light is essential for photosynthesis, increased turbidity will inhibit PS deeper in the water column.

Increased surface area will increase the solubility of nutrients?especially phosphates/heavy metals.

Presence of significant amounts of fine particles in the water column will act against filter feeders!!, may block up their siphons/filters.

Guideline values 0.5-10 NTU ANZECC&ARMCANZ (2000)

All samples within these guidelines except for #86, #88, #89 and #810. All relating to discharge sites.

Dissolved oxygen (DO) mg L⁻¹ and % saturation.

The range of DO readings shows a range from sites tested 4.90 (#89)-10.7 mg L⁻¹ (#88), many readings about 7-8, slightly lower overall than Oct 31st.
Similar range to Oct 31st, with a very low reading at #89, some anoxic conditions again at this site.

% saturation range 69.5% (#89) – 101.9 % (#81/2). One site has DO super saturated water.
The DO values lower than Oct 12th, but fewer sites were supersaturated. Generally the water was adequately oxygenated and saturated with oxygen. All sites have DO concentrations that will support as healthy biological community.

[October 31st 7.95(#810)-11.5 mg L⁻¹ (#88) and % saturation range 79% (#89) – 109.9 % (#86)]

Chlorophyll a.

The range of values is 1.21 µg L⁻¹ (#84)/1.41 µg L⁻¹(#87) – 3.67 µg L⁻¹(#88)/ 3.57µg L⁻¹(#89).
Range is less than Oct 31st, overall smaller values. **Five sites had medium values**, suggesting a reasonable level of biological activity.

There was no neat story correlating a high concentration of chlorophyll a with a very low concentration of NNN. If there has been a steady point and non point input of NNN from the land then this relationship may not show.

Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

[October 31st 1.41 µg L⁻¹ (#87)/1.43 µg L⁻¹(#81/83) - 9.11 µg L⁻¹(#85)/ 6.30 µg L⁻¹(#89).]

Medium ENVIRONMENTAL HEALTH CATEGORY for open water

0-2 (µg L⁻¹) low

>2-5 medium

>5-10 high

>10 very high

NNN (total dissolved nitrates and nitrites)

Variable readings from different sites.

0.07 µmol L⁻¹(#85) -9.38 µmol L⁻¹(#810) Open water sites. Most sites around 2-9µmol L⁻¹ **higher than Oct 31st**.

3.42 µmol L⁻¹(#86) –20.01 µmol L⁻¹(#88)/ 33.82 µmol L⁻¹(#89) Storm water /discharge sites **similar to values** at Oct 31st.

Greater range of values in Open water sites.

Assume that more NNN being utilised by the phytoplankton. Chloro a levels are **higher** reflecting the **lower** concentration of nutrients. ??

Hypothesis.

A Brief algal bloom!!!!

The phytoplankton will draw down the NNN in the water, is there biological activity developing in the harbour??

[October 31st) 0.37 µmol L⁻¹(#85) -3.64 µmol L⁻¹(#83) Open water sites
3.32 µmol L⁻¹(#86) –20.62 µmol L⁻¹(#89)/ 29.06 µmol L⁻¹(#88) Discharge sites]

Nine sites exceed guidelines.

GUIDELINE value 1.79 $\mu\text{mol L}^{-1}$ (=0.025 mg N-NO₃⁻¹ L⁻¹)

HIGH ENVIRONMENTAL HEALTH CATEGORY !!!!!

DRP (dissolved reactive phosphate)

Range of 0.43 $\mu\text{mol L}^{-1}$ (#82) – 1.32 $\mu\text{mol L}^{-1}$ (#88).

The range of values is similar to Oct 31st values.

[October 31st 0.30 $\mu\text{mol L}^{-1}$ (#87) – 1.06 $\mu\text{mol L}^{-1}$ (#85).]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 $\mu\text{mol L}^{-1}$ (= 0.010 mg P- PO₄³⁻ L⁻¹)

HIGH ENVIRONMENTAL HEALTH CATEGORY

Enterococci

Range of values was 1(#81)/2(#82)-450 cells 100 mL⁻¹(#88)/670 cells 100 mL⁻¹ (#89)

Other sites showed a stronger than usual indication of bacteria, is this an effect of the two days of rain previous to the monitoring day ?? Very strong at #88/89.

#88 Macandrew bay stormwater and #89 Somervilles Creek exceeded the guideline value.

Guideline value 140 cells per 100mL of sample indicated *Enterococci* bacteria

SUMMARY OF DATA.

DATE: 28/11/2015

What is the weather like?	#81 and 2	15oC,E breeze, 75% ccv
• <i>Air temperature</i>	#82	
• <i>Wind speed and direction</i>	#83	15oC,light east, 80% , med ccv
• <i>Cloud cover</i>	#84	15oC,partial cloud
	#85	15-16oC,Southerly down harb,10-15k,20% ccv
	#86	15-16oC,Southerly down harb,10-15k,80% ccv
	#87	S, 5kph,80% ccv, 12.7oC
	#88	11.7oC,10kph,S, 80% ccv

	#89 SSW,15kph,70%ccv #810 SW,15kph,20% ccv,cleared rapldly after a shower
What is the time, and what stage is the tide? What is the condition of the Leith ? Check websites (Met service and Port otago)	#81 and 2 1010 ebbing #82 #83 0955, going out, med high #84 0935, ebb tide #85 outgoing tide #86 lowish, going out, outflow from Leith quite high #87 Fullish, going out #88 going out #89 fullish-going out #810 going out
Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)? <ul style="list-style-type: none"> • Discharge pipes • Any star fish/other animals ?? • Rubbish or litter. 	#81 and 2 – #82 #83 – #84 #85 persistent surface bubbles, lots of litter, clumps of filamentous red #86 Fine organic silt coming down the Leith. #87 – #88 ducks #89 – #810 –
<ul style="list-style-type: none"> • Special seaweeds 	See data sheets
f=few	
s=some	
m=many	
Animals	See data sheets
What condition is the surface of the water?	#81 and 2 sl ripple #82 #83 calm

	#84 v calm #85 short steep ripples #86 very smooth #87 slight chop #88 froth on water #89 choppy #810 choppy
Does the water have any real, or apparent colour?	#81 and 2 clear #82 #83 green/blue #84 clear #85 transition from silty brown at the edge to real green #86 stirring up silt, high turbidity #87 pretty normal #88 normal #89 Usual grey-brown #810 -

Understanding Estuarine Processes

SITE: _____ DATE: _____

What is the water temperature ?	#81 and 2 13.5 #82 #83 13.4 #84 13.5 #85 15.3 #86 15.9 #87 14.5 #88 - #89 13.1 #810 13.7
	°C

<p>What is the salinity of the sample ?</p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>34.71</td></tr> <tr><td>#82</td><td>0.00</td></tr> <tr><td>#83</td><td>34.61</td></tr> <tr><td>#84</td><td>34.20</td></tr> <tr><td>#85</td><td>34.31</td></tr> <tr><td>#86</td><td>32.29</td></tr> <tr><td>#87</td><td>34.32</td></tr> <tr><td>#88</td><td>0.21</td></tr> <tr><td>#89</td><td>22.19</td></tr> <tr><td>#810</td><td>28.00</td></tr> </table> <p style="text-align: right;">ppt</p>	#81 and		2	34.71	#82	0.00	#83	34.61	#84	34.20	#85	34.31	#86	32.29	#87	34.32	#88	0.21	#89	22.19	#810	28.00
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#810	28.00																						
<p>What is the electrical conductivity of the sample ?</p> <p><i>NOTE: record the first conductivity, this is the actual conductivity at this temperature, the next reading is the specific conductance, the conductivity adjusted by the instrument to 25 ° C</i></p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>40.705/_</td></tr> <tr><td>#82</td><td></td></tr> <tr><td>#83</td><td>40.633/_</td></tr> <tr><td>#84</td><td>40.327/_</td></tr> <tr><td>#85</td><td>42.113/_</td></tr> <tr><td>#86</td><td>41.000/_</td></tr> <tr><td>#87</td><td>40.5/50.5</td></tr> <tr><td>#88</td><td>.31/.51</td></tr> <tr><td>#89</td><td>26.8/35.0</td></tr> <tr><td>#810</td><td>33.4/42.5</td></tr> </table> <p style="text-align: right;">mS/cm</p>	#81 and		2	40.705/_	#82		#83	40.633/_	#84	40.327/_	#85	42.113/_	#86	41.000/_	#87	40.5/50.5	#88	.31/.51	#89	26.8/35.0	#810	33.4/42.5
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<p>What is the pH of the sample ?</p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>7.79</td></tr> <tr><td>#82</td><td>7.82</td></tr> <tr><td>#83</td><td>8.02</td></tr> <tr><td>#84</td><td>7.99</td></tr> <tr><td>#85</td><td>8.29</td></tr> <tr><td>#86</td><td>8.2</td></tr> <tr><td>#87</td><td>8.39</td></tr> <tr><td>#88</td><td>9.64</td></tr> <tr><td>#89</td><td>8.31</td></tr> <tr><td>#810</td><td>7.84</td></tr> </table>	#81 and		2	7.79	#82	7.82	#83	8.02	#84	7.99	#85	8.29	#86	8.2	#87	8.39	#88	9.64	#89	8.31	#810	7.84
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<p>What is the water turbidity?</p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>6.33</td></tr> <tr><td>#82</td><td>6.6</td></tr> <tr><td>#83</td><td>1.49</td></tr> </table>	#81 and		2	6.33	#82	6.6	#83	1.49														
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	#810	1.61	
			μg/L
	0-2 low		
	>2-5 medium		
	>5-10 high		
	>10 very high		
****NNN	#81 and		
	2	2.30	
	#82	2.88	
	#83	3.18	
	#84	6.30	
	#85	0.07	
	#86	3.42	
	#87	3.05	
	#88	20.01	
	#89	33.82	
	#810	9.82	
			μmol/L
****DRP	#81 and		
	2	0.50	
	#82	0.43	
	#83	0.51	
	#84	0.90	
	#85	0.55	
	#86	0.85	
	#87	0.51	
	#88	1.32	
	#89	1.11	
	#810	0.69	
			μmol/L
What is the enterococci count in the sample ?	#81 and		
	2	2	
	#82	1	
	#83	17	
	#84	15	
	#85	3	
	#86	65	
	#87	13	
	#88	450	
	#89	670	
	#810	35	

	colonies indicated /100mL
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