

Commentary on our big day out July 25th 2015

This day was quite challenging, JMC team didn't show up. YSI 85 had its difficulties. As a result we had field data, we focused on the lab tests.

The feature of the data was the high chlorophyll a results across all sites.

What was the day like?

Hints of spring today, clear skies, warmer temperatures and light winds generally. The air temperature was still cool, between 7-12°C, with a light wind, E/NE 10-15 knots.

** Recommend we purchase proper field note books!!! Water proof , keep thinking about this!!!

Tide and harbour conditions.

All observations and sample collection occurred between 0950 and 1150. High water (1.9m) at Dunedin was 10.30 am. The tide was well in and on the verge of starting to ebb later in the morning. All observations and collections happening close to high tide.. This was a not a good day to observe what is going on in the intertidal zone.

Water samples at storm water outfalls influenced by the high water.

1 mm of rain has fallen over the last 10 days, some snow and very cold frosts!!Brrrrrrr

Water flow from the Leith was close to its median flow, at 0.347 cumecs.

Water temperature of the Waters of Leith was 5.1°C, not hot!

Is there anything unusual ?

Nothing special was noted other than amounts of litter at #89 Somervilles creek, some dead animal remains, plastics/polystyrene.

Seaweeds.

No observations made

Animals

No observations made

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

Surface conditions again quite calm and flat with some ripples. The wind did build later in the morning so the surface behave more disturbed. These conditions would not mix the water in the water column with sediment. The storm water sites usually carry sediment into the harbour. There was nothing unusual about the colour at the surface of the water.

Water temperature

The water temperature ranged from 5.8 °C (#86) – 6.9 °C.(#83) Many readings around 6. The water temperatures are similar to June 27th . The water is cold.

Sites closer to the mouth are slightly warmer than those up the harbour, with the limited data for this day.

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.

[June 27th 4.3 °C (#89) – 7.3 °C. (#81/2)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 33.2 (#89) -34.0 ppt (#83) . The pattern is similar to June 27th except all readings were slightly higher. All measurements were taken as the tide peaked and started to ebb. Our usual stormwater or freshwater sites were impacted by the incoming tide.

Some samples were tested in the lab.

[June 27th 27.8 (#89) -33.7 ppt (#81/2) .]

Open sea salinity 34.998 ppt!!!

Salinity readings more accurate, both YSI instruments are check each time against standard sea water. YSI 2030 measured 33.5 (standard 33.7ppt). YSI 85 measured 32.0 (vs 33.7). These differences are included in our adjusted calculations for salinity and conductivity.

pH

All sites tested. Range was 7.98(#84) – 8.09(#88).

pH range was less with most readings around 8.

What about buffers in the water???

[June 27th 7.4(#88) – 8.9(#86)]

Turbidity

All sites tested. Range was 0.49 NTU (#81) – 4.82 NTU (#88).

The range was less and lower June 27th, readings, this is not surprising as the wind was less and the water column not being agitated as much at the surface. Samples exposed directly to the tidal changes had readings around 1-2 NTU. These samples indicate clear water column.

Storm water and streams all have had a lower turbidity than usual, a comment on the state of tide and weather. Incoming tide and light winds.

Some turbidity could be explained by the extra phytoplankton in the water, a comment from #83, “cloudy”

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.

[June 27th 1.64 NTU (#81) – 12.05 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 ≤ 5.6 NTU ANZECC&ARMCANZ (2000)

No sites exceeded the guideline value.

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

The range of DO readings shows a range from sites tested 9.12 mg L⁻¹ (#84)- 12.5 mg L⁻¹(#87)

Some of the open water sites have high concentration of dissolved oxygen.

% saturation range 92.7 (#89) – 104.5 % (#86). Most of the sites had super saturated water.

The DO values exceeded those of June 27th, despite similar temperatures, the increase could be due to the noticeably higher concentrations of chlorophyll a.

Generally the water was well oxygenated and saturated with oxygen. All sites have DO concentrations that will support as healthy biological community.

[June 27th 9.1 mg L⁻¹ (#89)- 11.5 mg L⁻¹(#86) and 85% (#89) – 99.6 % (#86)]

Chlorophyll a.

Range 2.02 µg/L (#82) – 9.1 µg/L (#89)

The readings have both a greater range and values compared with June 27th. 2 sites have **low** readings around 2 µg/L, 5 sites have **medium** values while 3 have high values of #84 (Mussel bay), #85 Ravensbourne Boat club and #87 (MacAndrew bay marina).

Biological activity is much higher than June 27th despite the low temperatures.

What is going on ???

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

[June 27th 0.84 µg/L (#82) – 3.16 µg/L (#89)]

LOW ENVIRONMENTAL HEALTH CATEGORY for open water

0-2 (µg L⁻¹) low

>2-5 medium

>5-10 high

>10 very high

DRP (dissolved reactive phosphate)

Range of 0.090 µmol L⁻¹(#810) – 1.99 µmol L⁻¹ (#85).

There was a similarity about the readings, all quite low.

Most of the values are lower than to June 27th concentrations.

[June 27th 0.45 µmol L⁻¹(#84) – 0.70 µmol L⁻¹ (#85).].

GUIDELINE value 0.0322 µ mol L⁻¹ (= 0.010 mg P- PO₄³⁻ L⁻¹)

HIGH ENVIRONMENTAL HEALTH CATEGORY

**** We need to be careful with the prep of the mixed reagent, at the first attempt, colour looked good, reaction occurred but the readings kept climbing, suggesting the reaction was continuing.**

NNN (total dissolved nitrates and nitrites)

Variable readings from different sites.

0.61 $\mu\text{mol L}^{-1}$ (#810) -5.93 $\mu\text{mol L}^{-1}$ (#84) Open water sites. Most sites around 3/4 $\mu\text{mol L}^{-1}$ **lower** than June 27th readings.

1.66 $\mu\text{mol L}^{-1}$ (#89) – 20.34 $\mu\text{mol L}^{-1}$ (#86)/ 17.32 $\mu\text{mol L}^{-1}$ (#88) Storm water /discharge sites **lower** than June 27th.

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??

[June 27th 5.25 $\mu\text{mol L}^{-1}$ (#82) – 8.15 $\mu\text{mol L}^{-1}$ (#810) Open water sites

12.62 $\mu\text{mol L}^{-1}$ (#89) – 44.67 $\mu\text{mol L}^{-1}$ (#86)/ 48.13 $\mu\text{mol L}^{-1}$ (#88) Discharge sites]

No sites exceed guidelines.

GUIDELINE value 31.7 $\mu\text{mol L}^{-1}$ (=0.444 mg N-NO₃⁻¹ L⁻¹)

LOW/MED ENVIRONMENTAL HEALTH CATEGORY !!!!!

Enterococci

Indications present at all sites were below the guideline values.

Media fine this time, all sites except #81/2/5 showed signs of enterococci up to 70 cells/100mL at #89 Somervilles creek, 30 cells/100mL at #86 Waters of Leith, 28 cells/100mL at #810, Andersons bay outlet, 20 cells/100mL at MacAndrew bay storm water.

We tested a **blank** on the distilled water, it showed 0 cells/100mL.

Guideline value 140 cells per 100mL of sample indicated

***Enterococci* bacteria**

SUMMARY OF DATA.

DATE: **25/07/2015**

What is the weather like?	#81 and 2	7oC,E breeze,0%ccv
• <i>Air temperature</i>	#83	7oC,E breeze,0%ccv
• <i>Wind speed and direction</i>	#84	7oC,E strong breeze, 0%ccv
	#85	NE up the harbour,0%ccv

<ul style="list-style-type: none"> <i>Cloud cover</i> 	<p>up the harbour, 30kph, #86 0%ccv #87 7.9oC,NE, 20kph, 0%ccv #88 7.9oC,NE, 20kph, 0%ccv #89 calm, few clonds,14oC, #810 12oC,NW, few clouds</p>
<p>What is the time, and what stage is the tide? <i>What is the condition of the Leith ?</i> Check websites (Met service and Port otago)</p>	<p>#81 and 2 1005 #83 0950, high tide #84 0930, almost high tide #85 v near high tide #86 1150, tide starting to ebb #87 full tide #88 full tide #89 1020, med-high tide #810 1045, med-high tide</p>
<p>Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)?</p> <ul style="list-style-type: none"> Discharge pipes Any star fish/other animals ?? Rubbish or litter. 	<p>#81 and 2 – #83 – #84 – no discharges from pipes etc, #85 clean #86 _ very high tide,allobscured #87 – #88 – #89 some litter #810 –</p>
<ul style="list-style-type: none"> Special seaweeds <p>f=few</p> <p>s=some</p> <p>m=many</p>	<p>See data sheets</p>

Animals	See data sheets
What condition is the surface of the water?	#81 and 2 ripple #83 sl ripple #84 fairly calm, slight ripple #85 low swells, small white caps #86 short low swells, occ white cap, ripply gusts #87 choppy #88 – #89 slightly oily #810 foamy, choppy
Does the water have any real, or apparent colour?	#81 and 2 slightly green #83 a bit cloudy #84 clear #85 dull green with tinge of brown #86 grey-green #87 grey-green #88 No special colour #89 clear #810 clear

Understanding Estuarine Processes

SITE: _____ DATE: _____

What is the water temperature ?	#81 and 2 – #82 – #83 6.9 #84 6.5 #85 6.4 #86 5.8 #87 6.4 #88 6.1 #89 – #810 –	°C
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<p>What is the salinity of the sample ?</p>	<table border="0"> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>—</td></tr> <tr><td>#82</td><td>—</td></tr> <tr><td>#83</td><td>34.0033</td></tr> <tr><td>#84</td><td>33.7006</td></tr> <tr><td>#85</td><td>33.4988</td></tr> <tr><td>#86</td><td>18.162</td></tr> <tr><td>#87</td><td>34.112</td></tr> <tr><td>#88</td><td>5.824</td></tr> <tr><td>#89</td><td>33.1961</td></tr> <tr><td>#810</td><td>33.297</td></tr> </table> <p style="text-align: right;">ppt</p>	#81 and		2	—	#82	—	#83	34.0033	#84	33.7006	#85	33.4988	#86	18.162	#87	34.112	#88	5.824	#89	33.1961	#810	33.297
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<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>	<p style="text-align: right;">mS/cm</p>																						
<p>What is the pH of the sample ?</p>	<table border="0"> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>8.05</td></tr> <tr><td>#82</td><td>8.03</td></tr> <tr><td>#83</td><td>8.07</td></tr> <tr><td>#84</td><td>7.98</td></tr> <tr><td>#85</td><td>8.01</td></tr> <tr><td>#86</td><td>8.05</td></tr> <tr><td>#87</td><td>8.1</td></tr> <tr><td>#88</td><td>8.09</td></tr> <tr><td>#89</td><td>8.04</td></tr> <tr><td>#810</td><td>8.08</td></tr> </table>	#81 and		2	8.05	#82	8.03	#83	8.07	#84	7.98	#85	8.01	#86	8.05	#87	8.1	#88	8.09	#89	8.04	#810	8.08
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<p>What is the water turbidity?</p>	<table border="0"> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>0.502</td></tr> <tr><td>#82</td><td>0.486</td></tr> <tr><td>#83</td><td>0.655</td></tr> <tr><td>#84</td><td>1.17</td></tr> <tr><td>#85</td><td>3.89</td></tr> <tr><td>#86</td><td>1.87</td></tr> </table>	#81 and		2	0.502	#82	0.486	#83	0.655	#84	1.17	#85	3.89	#86	1.87								
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	#87 0.992 #88 4.82 #89 1.45 #810 1.34	
		NTU
What is the oxygen concentration of your sample ? Measure both methods mg/L and % saturation	#81 and 2 – #82 #83 9.96 #84 9.12 #85 10.35 #86 10.4 #87 12.5 #88 – #89 – #810	
		mg/L
	#81 and 2 – #82 #83 102.1 #84 92.7 #85 104.5 #86 103 #87 103 #88 – #89 – #810	
		% saturation
What is the chlorophyll a concentration of the sample ? <ul style="list-style-type: none"> • <i>Record the volume of water filtered</i> 	#81 and 2 2.31 #82 2.02 #83 5.12 #84 9.1 #85 6.7 #86 5.54 #87 7.95 #88 2.82 #89 4.85 #810 5.52	

	<p style="text-align: right;">µg/L</p> <p>0-2 low >2-5 medium >5-10 high >10 very high</p>																						
<p>****NNN</p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>4.13</td></tr> <tr><td>#82</td><td>3.98</td></tr> <tr><td>#83</td><td>2.58</td></tr> <tr><td>#84</td><td>5.93</td></tr> <tr><td>#85</td><td>1.39</td></tr> <tr><td>#86</td><td>20.34</td></tr> <tr><td>#87</td><td>1.37</td></tr> <tr><td>#88</td><td>17.32</td></tr> <tr><td>#89</td><td>1.66</td></tr> <tr><td>#810</td><td>0.61</td></tr> </table> <p style="text-align: right;">µmol/L</p>	#81 and		2	4.13	#82	3.98	#83	2.58	#84	5.93	#85	1.39	#86	20.34	#87	1.37	#88	17.32	#89	1.66	#810	0.61
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<p>What is the enterococci count in the sample ?</p>	<table> <tr><td>#81 and</td><td></td></tr> <tr><td>2</td><td>2</td></tr> <tr><td>#82</td><td>1</td></tr> <tr><td>#83</td><td>20</td></tr> <tr><td>#84</td><td>12</td></tr> <tr><td>#85</td><td>1</td></tr> <tr><td>#86</td><td>30</td></tr> <tr><td>#87</td><td>2</td></tr> <tr><td>#88</td><td>20</td></tr> <tr><td>#89</td><td>70</td></tr> <tr><td>#810</td><td>28</td></tr> </table> <p style="text-align: right;">colonies indicated /100mL</p>	#81 and		2	2	#82	1	#83	20	#84	12	#85	1	#86	30	#87	2	#88	20	#89	70	#810	28
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