Commentary on our big day out July 30th 2016.

YSI doing better.

MAIN MESSAGES when compared with July 2nd data.
Samples collected on a flooding tide, close to high water.
1 Water temperatures slightly lower.
2 Salinity similar.
3 pH values around 8.00. Similar
4 Dissolved oxygen typical
5 Chloro a concentrations slightly less, low biological activity.
6 NNN some slightly increased values. All exceed guideline values
7 DRP similar, a spike at #89 and 810. All exceed guideline values.
8 Turbidity increased.
9 Enterococci numbers low and well below guideline values.

What was the day like?
Cool overcast day. Light winds E/NE with gusts up to 10 knots. 75-100% ccv.

Tide and harbour conditions.
High tide at 1239 at Dunedin, 2.2 m tide, very high. Most sampling took place close to mid-high water, a flooding tide. 21 mm of rainfall over the last 10 days, no rain over the last 4 14.30..

Is there anything unusual ?
Nothing special was noted but I was pleased with observations being made of birds, seaweeds and dead octopi at Site 4. We need to be making this another arrow to our observations.

Seaweeds.
No data
Animals
No data

Conditions of the surface water and does the water have any real or apparent colour?
Surface conditions were quite calm at most sites. This was to be expected with light easterly blowing. There was a slight ripple or chop at some sites... 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.5.1 ^{o}C (#88) – 8.3 ^{o}C.(#81/2) Most around 7^{o}C. The water temperatures are cooler than July 2nd The winter pattern of temperature is establishing itself, a slight temperature gradient decreasing from the mouth to the head of the harbour.
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 (5.6^{o}C at 14230) is cooler than water entering the harbour mouth in winter.

[July 2nd 5.3 ^{o}C (#810) – 8.7 ^{o}C.(#81/2)]

Salinity

Sites that are directly impacted on by the tidal flow showed a range of 32.84 (#810) -34.24 ppt (#81/2) The salinities are similar to July 2nd. The high tide meant that sites are influenced strongly flooding seawater into the harbour. Salinity at discharged sites was determined by the freshwater flowing.(0.1 at #88, this was freshwater being sampled!). A salinity gradient of decreasing values the further you go up the harbour quite pronounced.
[July 2nd 31.6 (#86) -34.2 ppt (#81/2)]

Open sea salinity 34.998 ppt!!!

YSI 85	32.3	1.042415
pro2030	29.7	1.13367

These differences are included in our adjusted calculations for salinity and conductivity.

pH

8.16 (#89)-8.29 (#810). pH reasonably uniform 8.1-8.2.
What about buffers in the water???
[July 2nd 7.8/7.9 (#88/9)-8.25 (#83).]

Turbidity

All sites tested. Range was 1.58 NTU (#82) – 9.67 NTU (#88) 10.7 NTU (#87) 11.8 NTU (#89).
The water was generally clear at all open water sites except 87.
Discharge sites higher than the open water sites
Filtering of the water samples was "easy" as the water generally was very clear.
Some turbidity could be explained by the extra phytoplankton in 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.
[July 2nd 1.07 NTU (#81/3) – 11.1 NTU (#88).]

*** 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, #87and 9. One is a discharge sites.
New data:
From 2013 Coastal and estuarine water quality
Median WQ values 2.63 NTU C/5.3 E NTU
Open water sites similar to median values.

Dissolved oxygen (DO) mg L^{-1} and % saturation.

The DO readings shows a range from sites tested 8.07 mg L^{-1} (#89)-11.94 mg L^{-1} (#88)
DO % saturation range 76.5% (#89) – 96.5 % (#86) .
The data suggests a degree of uniformity between open water sites.
Similar to July 2nd data.
Close to the median DO values for coastal waters. Less photosynthetic activity and calm waters, less agitation of the air-water interface.
The sites with supersaturated concentrations of DO generally had elevated concentrations of chlorophyll a
[July 2nd 8.14 mg L^{-1} (#85)-13.01 mg L^{-1} (#88) and 81.8% (#86) – 100.1 % (#88)]

From 2013 Coastal and estuarine water quality
Dissolved Oxygen; 99.5% C/95.9 E

Chlorophyll a.
The range of values is 0.58 µgL^{-1} (#81)/0.71µgL^{-1}(#82) – 2.06 µgL^{-1}(#88)
Range and values are similar than July 2nd . This suggests less biological activity at most sites.
Values above 5.0 are classified in estuaries as a matter for concern, possible algal blooms???

[July 2nd 0.71 µgL^{-1} (#83)/0.57µgL^{-1}(#84) – 1.22 µgL^{-1}(#86)]

All sites had low values.

Low 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.
1.65 µmol L^{-1} (#810) – 7.45 µmol L^{-1} Open water sites. All sites close to 4 µmol L^{-1} **, similar values overall than values.**

4.09 µmol L^{-1}(#86) – 61.43 µmol L^{-1}(#89)/ 76.41 µmol L^{-1}(#88) Storm water /discharge sites some are **greater than July 2nd values.**.
The tide was starting to flood , so discharge sites like #88 and 9 were draining water off the land
Winter values are higher and this story is being told here, less uptake by phytoplankton??

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

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

[July 2nd 3.93 µmol L^{-1}(#85) -5.65 µmol L^{-1}(#87) Open water sites. All sites around
.
7.91 µmol L^{-1}(#86) – 55.69 µmol L^{-1}(#89)/ 55.69 µmol L^{-1}(#88) Storm water /discharge sites]

ALL sites exceed guidelines.
GUIDELINE value 1.79 µ mol L^{-1} (=0.025 mg N-NO_3^{-1} L^{-1})
Medium ENVIRONMENTAL HEALTH CATEGORY !!!!!!

From 2013 Coastal and estuarine water quality
NNN: median values 0.01mg/L, (0.714 µ mol L^{-1}) C/ 0.02 mg/L (1.43 µ mol L^{-1}) E All values exceed the median value.

DRP (dissolved reactive phosphate)

Range of 0.32µmol L^{-1}(#87) – 3.19 µmol L^{-1} (#89).
The range was greater and the values is similar to Juy 2nd.
Values low except for a "spike" at #89/810.

[July 2nd 0.53µmol L^{-1}(#82) – 1.57 µmol L^{-1} (#86).]

All sites exceed the Guidelines.

GUIDELINE value 0.0322 µ mol L^{-1} (= 0.010 mg P- PO_4^{3-} L^{-1})

Enterococci

We did much better this day. Hamish and the OGHS did an excellent job.
Low bacterial activity in the water. The range of values is 0 MPN/100 ml (#81/2/5) – 19MPN /100mL(#86) and 20 (#88)

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

No sites exceeded the guideline values, well done harbour.

SUMMARY OF DATA.

DATE: **30/07/2016**

What is the weather like? • ***Air temperature*** • ***Wind speed and direction*** • ***Cloud cover***	#81and 2 8oC,SW slight wind,90%ccv #82 #83 9oC,SE sl breeze, 75% ccv #84 9oC, slight S,75% ccv #85 10-15oC,Northerly,0-5k/h,95-98%ccv #86 10-14oC, N 0-5k/h, 100% ccv #87 light breezeE, 80-85% ccv #88 _ #89 7.7oC,No wind,moderate ccv #810 sl wind, 90% ccv
What is the time, and what stage is the tide? ***What is the condition of the Leith ?*** ***Check websites (Met service and Port otago)***	#81and 2 943, flooding, close to HW #82 #83 1007, coming in #84 1030, tide coming in #85 1145, very high, slack water #86 1200,very high tide #87 935, HW, ebbing #88 _ #89 1009, low water #810 1042,High tide

Is there anything unusual to report (dead crabs, nasty smell, coloured sheen on the water)? • **Discharge pipes** • **Any star fish/other animals ??** • **Rubbish or litter.**	#81and 2 shags on green structure #82 #83 seagulls, seaweed, bird poo. #84 dead octopus, some rubbish #85 No discharges/smoke, clear shores #86 lot of leaf litter, various plastic bags line of leaf litter passed by #87 _ #88 _ #89 Litter on rocks #810 _
• ***Special seaweeds*** ***f=few*** ***s=some*** ***m=many***	See data sheets
Animals	See data sheets
What condition is the surface of the water?	#81and 2 fast moving #82 #83 sl ripples #84 sl ripples #85 small ripples #86 low ripples, no white caps #87 ripples #88 _ #89 water calm, foam on surface #810 water flow fast
Does the water have any real, or apparent colour?	#81and 2 clear/green/grey #82 #83 green/teal #84 green/grey

	#85	v green
	#86	green
	#87	Looks green/grey
	#88	_
	#89	no
	#810	No

What is the water temperature ?	#81and 2	8.3
	#82	
	#83	7.3
	#84	6.8
	#85	6.7
	#86	6.8
	#87	6.1
	#88	5.1
	#89	5.6
	#810	6
		^{o}C
What is the salinity of the sample ?	#81and 2	**34.24**
	#82	
	#83	**33.90**
	#84	**33.90**
	#85	**33.46**
	#86	**33.46**
	#87	**33.46**
	#88	**0.10**
	#89	**28.46**
	#810	**32.84**
		ppt

What is the electrical conductivity of the sample ? ***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***	#81and 2 36.28 _ #82 0.00 _ #83 34.97 _ #84 34.51 _ #85 33.68 51.92 #86 33.75 51.84 #87 33.15 52.02 #88 0.17 0.28 #89 25.01 46.19 #810 32.45 51.30 mS/cm
What is the pH of the sample ?	#81and 2 8.21 #82 8.19 #83 8.24 #84 8.19 #85 8.23 #86 8.3 #87 8.2 #88 8.18 #89 8.16 #810 8.29
What is the water turbidity?	#81and 2 3.58 #82 1.58 #83 3.07 #84 2.48 #85 5.65 #86 3.32 #87 10.4 #88 9.67 #89 11.8 #810 2.01 NTU
What is the oxygen concentration of your sample *? Measure both methods mg/L and % saturation*	#81and 2 8.99 #82 #83 9.29 #84 9.03 #85 8.94 #86 9.63 #87 8.83

	#88 11.94 #89 8.07 #810 9.32 mg/L #81and 2 93.2 #82 #83 93.6 #84 90.2 #85 92.2 #86 96.5 #87 88 #88 94.6 #89 76.5 #810 91.8 % saturation
What is the chlorophyll a concentration of the sample ? • ***Record the volume of water filtered***	#81and 2 0.58 #82 0.71 #83 0.89 #84 1.05 #85 1.14 #86 1.00 #87 1.80 #88 2.06 #89 1.41 #810 0.85 µg/L 0-2 low >2-5 medium >5-10 high >10 very high
******NNN**	#81and 2 5.56 #82 7.45 #83 4.11 #84 3.69 #85 4.09 #86 4.09 #87 2.93 #88 76.41

	#89 61.43 #810 1.65 µmol/L
******DRP**	#81and 2 0.53 #82 0.48 #83 0.43 #84 0.42 #85 1.00 #86 1.08 #87 0.32 #88 0.64 #89 3.19 #810 2.43 µmol/L
What is the enterococci count in the sample ?	#81and 2 0 #82 0 #83 3 #84 3 #85 0 #86 19 #87 2 #88 20 #89 10 #810 10 colonies indicated /100mL