



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 4 (APRIL 2008)

MAY 2008

INTRODUCTION TO THE PROGRAM

This report summarises water quality data obtained for the Channel Deepening Project (CDP) Baywide Water Quality Monitoring Program at 11 sampling sites in Port Phillip Bay. Data is for April 2008. Monthly Progress Reports will be prepared throughout the dredging program and for two years thereafter.

Where extensive local water quality data is available, control charts (Shewhart and EWMA) have been developed (see Appendix 1). These charts provide a guide against which data can be compared. Where data is recorded beyond natural or expected variation, further investigation will be undertaken.

The information contained in this report is correct as available to EPA Victoria at the time of publication.

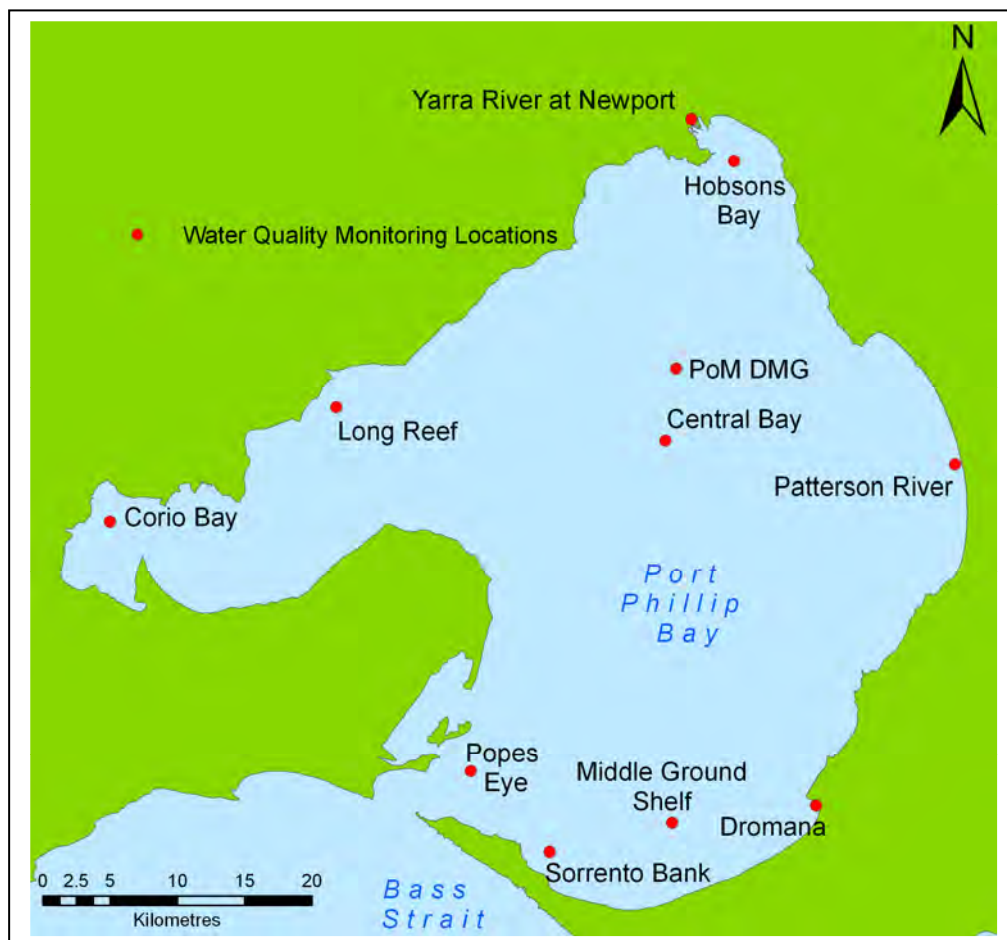


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY



RESULTS AND DISCUSSION

All results presented in Tables 1 - 4 were assessed against the control limits listed in Tables 5 and 6 and where appropriate, compared to the SEPP objectives and ANZECC trigger levels of Table 7 (Appendix 1). Phytoplankton data is presented in Table 8 (Appendix 2).

Within this reporting period the Shewhart control limits were not exceeded and the EWMA control limits were exceeded four times (see Tables 1 - 4).

No significant events were observed during the field sampling that would affect these results

As detailed in section 4.1.3 in the Water Quality detailed design document CDP_ENV_MD_023 Rev 0, samples were not taken at depth at the Yarra River site as the salinity difference between the near surface and depth was less than 10 ppt.

Where dissolved metal results exceeded total metal results, the results were within acceptable levels of inter-sample variation.

All data recorded in this report has been subject to internal quality assurance according to EPA standard operating procedures for field sampling and data assessment.

There were no exceptions to the Water Quality detailed design document CDP_ENV_MD_023 Rev 0 during this reporting period. However, the following previously issued Exception Reports still apply to this progress report:

- ER080306. A change in method for the calculation of Dissolved Organic Nitrogen has resulted in not all sites having these results (see Table 2a).



TABLE 1 PHYSICO-CHEMICAL PARAMETERS (NST – No Sample Taken)

Date	Sampling Site	Depth m	Dissolved Oxygen		Salinity g/L	Secchi disc depth m	Temperature °C	Turbidity NTU	Total Suspended Solids mg/L	PAR micro Einsteins/m ² /sec
			mg/L	% saturation						
18/04/08	Yarra River at Newport	0.5	8.6	108	34.6	2.7	16.4	1.53	2.8	194.2
18/04/08	Yarra River at Newport	4.5	NST	NST	NST		NST	2.30 ¹	NST	29.4 ¹
16/04/08	Hobsons Bay	0.5	7.6	99	37.5	3.6	17.3	1.46	2.1	63.3
16/04/08	Central Bay	0.5	7.5	97	37.6	4.1	16.7	1.18	1.6	447.3
16/04/08	PoM DMG	0.5	7.5	98	37.6	4.0	17.2	0.95	1.3	231.1
16/04/08	Corio Bay	0.5	7.5	97	38.6	2.4	16.2	1.71	2.5	239.0
16/04/08	Long Reef	0.5	7.6	98	38.0	>5.3 ²	16.5	0.55	0.9	346.8
18/04/08	Patterson River	0.5	8.8	114	37.4	>2.9 ²	16.9	0.39	0.9	930.8
15/04/08	Dromana	0.5	7.0	91	37.1	>5.6 ²	17.1	0.44	1.4	206.9
15/04/08	Middle Ground Shelf	0.5	7.9	102	37.1	7.9	17.0	0.57	1.2	372.3
15/04/08	Sorrento Bank	0.5	8.1	105	36.7	>3.1 ²	17.4	0.61	0.6	86.2
15/04/08	Popes Eye	0.5	7.9	101	36.6	6.0	16.4	0.41	1.2	974.2

NOTES:

In situ data for temperature, turbidity and PAR are recorded across the depth profile. The result presented is for the specific depth noted. All other *in situ* samples are taken at 0.5 m from surface, except Yarra River at Newport and Hobsons Bay where if required, bottom samples are also collected.

Blue coloured cells indicate a result outside SEPP objectives (see Appendix 1, Table 7 for details).

1. Measurements taken at 4.5m (to avoid damage to profiler).
2. Secchi disc visible on bottom.



TABLE 2A NUTRIENTS (NDA – No Data Available)

Date	Sampling Site	Depth m	Ammonium µg/L		Nitrate µg/L	Nitrite µg/L	Nitrate plus Nitrite µg/L		Dissolved Organic Nitrogen µg/L	Total Nitrogen µg/L	
			Measured Value	EWMA			Measured Value	EWMA		Measured Value	EWMA
18/04/08	Yarra River at Newport	0.5	40.6	13.2	40.7	<0.4	40.7	10.0	180	290	232
16/04/08	Hobsons Bay	0.5	5.7	5.8	1.7	<0.4	1.7	6.0	130	161	185
16/04/08	Central Bay	0.5	5.9	5.4	0.6	<0.4	0.6	1.2	128	162	152
16/04/08	PoM DMG	0.5	5.6	5.3	0.6	<0.4	0.6	1.3	128	159	151
16/04/08	Corio Bay	0.5	5.4	4.7	1.0	<0.4	1.0	1.2	NDA ¹	191	198
16/04/08	Long Reef	0.5	5.3	26.9	0.8	<0.4	0.8	22.7	145	168	255
18/04/08	Patterson River	0.5	6.7	6.6	1.5	<0.4	1.5	6.5	NDA ¹	153	180
15/04/08	Dromana	0.5	6.0	6.3	0.7	<0.4	0.7	1.5	NDA ¹	139	145
15/04/08	Middle Ground Shelf	0.5	5.5	5.1	1.5	<0.4	1.5	1.2	109	136	138
15/04/08	Sorrento Bank	0.5	7.2	6.3	1.2	<0.4	1.2	1.3	103	132	126
15/04/08	Popes Eye	0.5	7.2	6.2	2.1	<0.4	2.1	2.6	92	120	110

NOTES:

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

Green coloured cells indicate results above ANZECC trigger value (see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6).

1. See Exception Report ER080306.



TABLE 2B NUTRIENTS (CONT'D) – PHOSPHORUS AND SILICATE

Date	Sampling Site	Depth m	Phosphate µg/L		Organic Phosphorus µg/L	Total Phosphorus µg/L		Silicate µg/L
			Measured Value	EWMA		Measured Value	EWMA	
18/04/08	Yarra River at Newport	0.5	84	66	15	100	95	472
16/04/08	Hobsons Bay	0.5	75	68	13	89	90	106
16/04/08	Central Bay	0.5	70	60	11	80	74	84
16/04/08	PoM DMG	0.5	71	54	12	84	73	111
16/04/08	Corio Bay	0.5	82	78	11	93	99	125
16/04/08	Long Reef	0.5	79	127	10	89	146	125
18/04/08	Patterson River	0.5	67	63	11	78	80	67
15/04/08	Dromana	0.5	49	48	9.1	59	62	50
15/04/08	Middle Ground Shelf	0.5	44	45	7.1	51	62	35
15/04/08	Sorrento Bank	0.5	36	30	7.4	43	42	46
15/04/08	Popes Eye	0.5	31	23	5.9	37	34	28

NOTES:

Green coloured cells indicate results above ANZECC trigger value (see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6).



TABLE 3 METALS, METALLOIDS AND ORGANOMETALLICS (NST – No Sample Taken; NAR - No Analysis Required)

Date	Sampling Site	Depth m	Arsenic		Tri-butyl Tin ¹ (TBT) µg/Lx10 ⁻³	Cadmium µg/L	Chromium µg/L	Copper µg/L	Mercury µg/L	Nickel µg/L	Lead µg/L	Zinc µg/L
			Measured Value	EWMA								
18/04/08	Yarra River at Newport - total	0.5	2.8	2.9	<2	<0.2	<0.5	2	<0.1	<0.5	<0.2	8 ³
18/04/08	Yarra River at Newport - dissolved	0.5	NAR	-	NST	NAR	NAR	2	NAR	NAR	NAR	6
16/04/08	Hobsons Bay - total	0.5	2.7	2.9	<2	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
16/04/08	Central Bay - total	0.5	2.8	2.8	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
16/04/08	PoM DMG - total	0.5	2.9	3.1	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
16/04/08	Corio Bay - total	0.5	3.3	3.4	NST	<0.2	<0.5	<1	<0.1	0.7	<0.2	<5
16/04/08	Corio Bay - dissolved	0.5	3.5 ²	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	NAR
16/04/08	Long Reef - total	0.5	3.2	3.1	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
16/04/08	Long Reef - dissolved	0.5	2.8	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	NAR
18/04/08	Patterson River - total	0.5	2.8	2.8	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
15/04/08	Dromana - total	0.5	2.6	2.7	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
15/04/08	Middle Ground Shelf - total	0.5	2.4	2.8	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
15/04/08	Sorrento Bank - total	0.5	<0.5	2.2	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
15/04/08	Popes Eye - total	0.5	2.2	2.5	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	6
15/04/08	Popes Eye - dissolved	0.5	NAR	-	NST	NAR	NAR	NAR	NAR	NAR	NAR	<5

NOTES:

Blue coloured cells indicate results above SEPP objectives (for metals, ANZECC triggers are the default objective when no SEPP value is specified; see Appendix 1, Table 7 for details). These results are within natural variation for Port Phillip Bay (see control limits, Appendix 1, Tables 5 and 6), unless **bolded** to indicate that no Shewhart control limit exists for metals at these sites.

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

1. TBT is only sampled from sub-surface levels at Yarra River at Newport and Hobsons Bay.
2. Dissolved result greater than total results but within acceptable levels of inter-sample variation.
3. Meets water quality objective for SEPP Schedule F6 segment, although does not meet objectives for Schedule F7 segment (see Appendix 1, Table 7).



TABLE 4 PHYTOPLANKTON AND ALGAL PIGMENTS (NST – No Sample Taken)

Date	Sampling Site	Depth m	Chlorophyll-a µg/L		Phaeophytin-a µg/L	Fluorescence (as <i>in situ</i> chlorophyll-a) mg/m ³	Total Phytoplankton cells/L	Diatoms cells/L	Dinoflagellates cells/L	Other Flagellates cells/L
			Measured Value	EWMA						
18/04/2008	Yarra River at Newport	0.5	1.03	3.20	0.16	0.58	1.1E+06	6.4E+05	6.5E+04	4.0E+05
18/04/2008	Yarra River at Newport	4.5	NST ¹	NST ¹	NST ¹	0.60				
18/04/2008	Hobsons Bay	0.5	0.89	1.75	0.07	0.49	6.7E+05	3.9E+05	3.7E+04	2.5E+05
16/04/2008	Central Bay	0.5	1.09	0.85	0.00	0.45	5.6E+05	4.0E+05	5.1E+04	1.2E+05
16/04/2008	PoM DMG	0.5	1.01	0.65	0.03	0.49	7.8E+05	5.7E+05	6.4E+04	1.4E+05
16/04/2008	Corio Bay	0.5	1.36	1.15	0.21	0.75	1.0E+06	6.9E+05	9.0E+04	2.6E+05
16/04/2008	Long Reef	0.5	0.79	1.86	0.09	0.49	3.8E+05	2.9E+05	2.4E+04	6.4E+04
18/04/2008	Patterson River	0.5	0.52	0.86	0.00	0.23	5.5E+05	2.7E+05	3.8E+04	2.4E+05
15/04/2008	Dromana	0.5	0.54	0.66	0.04	0.43	9.4E+05	7.3E+05	8.7E+04	1.3E+05
15/04/2008	Middle Ground Shelf	0.5	0.38	0.68	0.05	0.23	5.3E+05	4.2E+05	2.0E+04	9.0E+04
15/04/2008	Sorrento Bank	0.5	0.64	0.58	0.21	0.33	4.3E+05	2.9E+05	1.4E+04	1.2E+05
15/04/2008	Popes Eye	0.5	0.63	0.63	0.10	0.21	2.0E+05	1.2E+05	1.3E+04	7.2E+04

NOTES

Sedgewick count method for phytoplankton, diatoms, dinoflagellates, and other flagellates undertaken by using a vertical profile grab sample. For detailed cell counts based on individual species see Appendix 2.

Orange coloured cells indicate EWMA calculated results above EWMA control limits (see Appendix 1, Table 6 for details).

1. No algal pigment sample taken at Yarra River at Newport bottom waters.



APPENDIX 1

DERIVATION OF CONTROL LIMITS AND GUIDANCE VALUES

To define changes outside expected natural variability ('control limit'), control charts have been generated for all parameters where an extensive body of locally relevant water quality data exists (see Tables 5 and 6). The data used in developing control charts is validated data from 1990 onwards.

For other parameters where sufficient background data is not available, comparison is made to water quality objectives in State Environment Protection Policy (SEPP) Schedules F6 (Waters of Port Phillip Bay) and Schedule F7 (Waters of the Yarra Catchment).

Where no specific objective is listed in SEPP, the Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters (2001) are identified (see Table 7).

The derivation and application of the control limits and comparison values is set out in more detail in the Water Quality detailed design document CDP_ENV_MD_023 Rev 0 (available on the Channel Deepening Project website www.channelproject.com).

Specifically, two control charting techniques have been developed and employed in the analysis of water quality results:

- An Exponentially Weighted Moving Average (EWMA) control chart is used for assessment of longer-term changes in baseline results, by comparing an EWMA calculated result to the respective limit.
- A Shewhart control chart is used to compare short-term events, by comparing the measured result directly against the respective limit.

The control limits are as issued by the Port of Melbourne Corporation on January 28, 2008.



TABLE 5. SHEWHART CONTROL LIMITS FOR LISTED WATER QUALITY PARAMETERS

Sampling site	Total Nitrogen µg/L	Ammonium µg/L	Nitrate plus Nitrite µg/L	Total Phosphorus µg/L	Phosphate µg/L	Arsenic µg/L	Cadmium µg/L	Chromium µg/L	Copper µg/L	Lead µg/L	Mercury µg/L	Nickel µg/L	Zinc µg/L	TBT µg/L
Yarra River at Newport	383.31	88.78	182.90	138.91	107.54	4.75	0.20	0.58	3.08	2.79	0.10	4.29	12.77	0.02
Hobsons Bay	382.82	50.61	257.50	135.51	129.08	4.43	0.25	1.17	1.70	0.95	0.13	2.28	9.13	0.01
Central Bay	206.91	21.50	7.43	106.48	112.50	4.66	*	*	*	*	*	1.95	*	*
PoM DMG	217.07	7.81	28.33	107.98	76.61	4.73	*	*	*	*	*	2.82	*	0.02
Corio Bay	275.74	25.37	5.00	140.27	127.68	5.57	*	NA	*	*	*	1.90	*	NA
Long Reef	1035.88	999.28	512.03	536.16	445.31	4.56	*	NA	*	*	*	2.17	*	NA
Patterson River	367.57	30.57	366.52	111.81	87.58	3.56	*	NA	*	*	*	1.14	*	NA
Dromana	222.84	11.03	5.71	89.64	75.42	3.58	*	NA	*	*	*	1.06	*	NA
Middle Ground Shelf	185.93	10.66	2.71	96.82	65.33	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sorrento Bank	168.74	11.54	9.50	63.20	48.44	NA	NA	NA	NA	NA	NA	NA	NA	NA
Popes Eye	209.84	14.74	42.71	471.38	148.04	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES

NA - No limit, as no historical data is available.

* - No limit, as greater than half historical data is below limits of reporting.

Source: Table 5 CDP_ENV_MD_023 Rev 0, (available on the Channel Deepening Project website www.channelproject.com). Limits amended by Port of Melbourne Corporation on January 28, 2008. The version of the Shewhart control limits table in this Progress Report #4 (above) includes a correction to reverse the values for Nickel at Patterson River and Dromana from that specified erroneously in the Detailed Design. The error within the Detailed Design will be corrected in subsequent reviews.



TABLE 6. EWMA CONTROL LIMITS FOR LISTED WATER QUALITY PARAMETERS (Exponentially Weighted Moving Average)

Sampling site	Ammonium µg/L	Nitrate plus Nitrite µg/L	Total Nitrogen µg/L	Phosphate µg/L	Total Phosphorus µg/L	Chlorophyll-a µg/L	Arsenic µg/L
Yarra River at Newport	32.42	39.52	278.39	86.19	108.01	2.0	3.23
Hobsons Bay	19.45	39.53	266.22	85.72	105.32	3.9	2.98
Central Bay	9.90	3.61	168.10	72.32	84.08	1.1	2.86
PoM DMG	6.16	9.92	176.47	66.31	83.99	1.0	3.10
Corio Bay	10.70	2.31	224.48	100.12	115.66	1.4	3.66
Long Reef	219.05	83.74	629.12	238.83	305.50	6.8	3.20
Patterson River	13.65	42.75	243.10	69.75	89.34	2.2	2.59
Dromana	5.00	4.29	170.20	56.93	70.12	1.6	2.52
Middle Ground Shelf	7.02	2.29	156.09	50.94	63.85	0.8	N/A
Sorrento Bank	8.16	4.93	143.10	36.40	45.74	0.8	N/A
Popes Eye	8.20	12.73	145.12	36.75	120.94	0.8	N/A

NOTES

NA - No limit, as no historical data is available.

Source: Table 5 CDP_ENV_MD_023 Rev 0, available on the Channel Deepening Project website www.channelproject.com). Limits amended by Port of Melbourne Corporation on January 28, 2008.



TABLE 7. SEPP OBJECTIVES AND ANZECC TRIGGER VALUES (N = NATURAL)

Sampling Site	Policy Categories		Channel Deepening PARAMETER																											
			Dissolved Oxygen (% saturation)				Attenuation of PAR	Turbidity (NTU)		Suspended Solids (mg/L)		Chlorophyll-a (ug/L)																		
			Min for 1m below surface	Min 1m above bottom	Lower limit for 90th percentile	Minimum percentage concentration		Salinity variation	Temperature (°C)	Secchi disc depth (m)	Annual 90th percentile	Annual 50th percentile	Annual 90th percentile	Annual 50th percentile	Annual median	Annual 90th percentile	Ammonium (ug/L)	Nitrate plus nitrite (ug/L)	Total nitrogen (ug/L)	Phosphate (ug/L)	Total Phosphorus (ug/L)	Arsenic (ug/L)	Cadmium (ug/L)	Chromium (ug/L)	Copper (ug/L)	Lead (ug/L)	Mercury (ug/L)	Nickel (ug/L)	Zinc (ug/L)	TBT (ug/L)
Yarra River at Newport	F6 Hobsons	ANZECC Level of Protection	>90%	>90%		N ± 5%	N ± 1	>2	0.5	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<10	0.006
	F7 Yarra Port					>60%		N + 2				<20	<50	<25	<60			15	5	120	10	25	<50	0.2	<10	2	1	0.05	15	5
Hobsons Bay	F6 Hobsons	95%	>90%	>90%		N ± 5%	N ± 1	>2	0.5	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<10	0.006
Corio Bay	F6 Corio		>90%	>90%		N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<5	0.006
Long Reef	F6 Werribee		>90%	>90%		N ± 5%	N ± 1	>3	0.45	0.5 - 10					2.5	4.0	15	5	120	10	25	<3	5.5	<5	1.3	4.4	0.4	70	<5	0.006
Central Bay	F6 General	99%	>90%		>90%	N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
PoM DMG	F6 General		>90%		>90%	N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Patterson River	F6 Inshore		>90%	>90%		N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Dromana	F6 Inshore		>90%	>90%		N ± 5%	N ± 1	>3	0.45	0.5 - 10					1.5	2.5	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Middle Ground Shelf	F6 General		>90%		>90%	N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Sorrento Bank	F6 General		>90%		>90%	N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004
Popes Eye	F6 General		>90%		>90%	N ± 5%	N ± 1	>4	0.35	0.5 - 10					1.0	2.0	15	5	120	10	25	<3	<0.15	<5	0.3	2.2	0.1	7	<5	0.0004

SEPP Waters of Victoria

N = natural background

SEPP Schedule F6 - Waters of Port Phillip Bay, and Schedule F7 Waters of Yarra Catchment objectives

ANZECC trigger values not highlighted

Cadmium limit of reporting is above SEPP F6 'general' segment's objective

Below limit of reporting

NOTES

In this progress report schedule F7 (Waters of the Yarra Catchment) has been introduced for comparison of water quality objectives at the Yarra River at Newport site, as this site has been determined to be in a crossover area between schedules F6 and F7. Both schedule segments can be applicable to the site dependent on tide cycle and flow conditions in the Yarra mouth.



APPENDIX 2

TABLE 8. PHYTOPLANKTON DATA

	Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
Collection Date	18/04/2008	18/04/2008	16/04/2008	16/04/2008	16/04/2008	16/04/2008	18/04/2008	15/04/2008	15/04/2008	15/04/2008	15/04/2008
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Species										
	Estimate Cells/L										
Total Phytoplankton	1.1E+06	6.7E+05	5.6E+05	7.8E+05	1.0E+06	3.8E+05	5.5E+05	9.4E+05	5.3E+05	4.3E+05	2.0E+05
Diatoms	6.4E+05	3.9E+05	4.0E+05	5.7E+05	6.9E+05	2.9E+05	2.7E+05	7.3E+05	4.2E+05	2.9E+05	1.2E+05
Dinoflagellates	6.5E+04	3.7E+04	5.1E+04	6.4E+04	9.0E+04	2.4E+04	3.8E+04	8.7E+04	2.0E+04	1.4E+04	1.3E+04
Other flagellates	4.0E+05	2.5E+05	1.2E+05	1.4E+05	2.6E+05	6.4E+04	2.4E+05	1.3E+05	9.0E+04	1.2E+05	7.2E+04
Diatoms											
<i>Amphora</i>	<i>sp.</i>	5.0E+03	1.0E+04			x		3.3E+03			1.0E+03
<i>Asterionellopsis</i>	<i>glacialis</i>						2.5E+03	9.3E+04	8.0E+03	6.0E+03	9.0E+03
<i>Asteromphalus</i>	<i>sarcophagus</i>	x			x			3.3E+03	x	x	
<i>Bacillaria</i>	<i>paxillifera</i>	x		x	x					x	
<i>Cerataulina</i>	<i>pelagica</i>		x	x	x	x	x	3.3E+03			
<i>Chaetoceros</i>	<i>spp.</i>	3.6E+05	2.2E+05	2.9E+05	4.3E+05	5.6E+05	2.1E+05	1.7E+05	4.8E+05	3.3E+05	1.9E+05
<i>Cocconeis</i>	<i>spp.</i>	3.5E+04	1.7E+04		6.6E+03	2.7E+04	3.4E+04	5.0E+03	1.7E+04	1.6E+04	2.0E+04
<i>Coscinodiscus</i>	<i>spp.</i>	x	3.3E+03	x	3.3E+03			x			
<i>Cylindrotheca</i>	<i>closterium</i>	3.0E+04	1.0E+04	6.7E+03	2.7E+04	1.7E+04	8.0E+03	7.5E+03	2.7E+04	1.2E+04	2.2E+04
<i>Dactyliosolen</i>	<i>antarcticus</i>	1.0E+04	3.3E+03	1.0E+04	2.7E+04	3.3E+03	x	6.6E+03	x	x	
<i>Dactyliosolen</i>	<i>fragilissimus</i>		x				2.5E+03		4.0E+03	x	
<i>Dactyliosolen</i>	<i>phuketensis</i>			x							
<i>Diploneis</i>	<i>sp.</i>				3.3E+03			x	3.3E+03		x
<i>Ditylum</i>	<i>brightwellii</i>	5.0E+03	x	x	x			x	x	x	1.0E+03
<i>Entomoneis</i>	<i>sp.</i>	5.0E+03	1.0E+04	3.3E+03	3.3E+03	x	2.0E+03	2.5E+03	1.0E+04	2.0E+03	x
<i>Eucampia</i>	<i>zodiacus</i>		6.6E+03			x					3.0E+03
<i>Fragilaria</i>	<i>sp.</i>	x									
<i>Guinardia</i>	<i>flaccida</i>	x	x	x	3.3E+03			x	x		
<i>Hemiaulus</i>	<i>hauckii</i>	x	6.6E+03	6.7E+03	1.0E+04	9.9E+03	x	x	x	1.0E+04	x
<i>Hemidiscus</i>	<i>sp.</i>										
<i>Hyalodiscus</i>	<i>sp.</i>										
<i>Lauderia</i>	<i>annulata</i>										
<i>Leptocylindrus</i>	<i>danicus</i>	1.5E+04	6.6E+03	3.3E+03	1.0E+04	x		1.3E+04	x	6.0E+03	x
<i>Leptocylindrus</i>	<i>mediterraneus</i>										
<i>Leptocylindrus</i>	<i>minimus</i>			1.7E+04							2.0E+03
<i>Licmophora</i>	<i>sp.</i>					x					
<i>Lithodessmium</i>	<i>sp.</i>		x								
<i>Minidiscus</i>	<i>trioculatus</i>	4.0E+04	2.7E+04	1.3E+04		1.3E+04		1.8E+04		4.0E+03	1.4E+04
<i>Naviculoid</i>	<i>spp.</i>	1.5E+04	3.3E+03	3.3E+03	1.0E+04	1.3E+04	8.0E+03	2.5E+03	3.3E+04	1.0E+04	6.0E+03
<i>Nitzschia</i>	<i>spp.</i>	1.5E+04	1.0E+04	3.3E+03		6.6E+03	4.0E+03	2.5E+03	2.0E+04	2.0E+03	8.0E+03
<i>Nitzschia</i>	<i>longissima</i>							x			
<i>Nitzschia</i>	<i>sigmoidea</i>			3.3E+03							
<i>Pleurosigma</i>	<i>sp.</i>	x		x	3.3E+03	3.3E+03	x	x	6.6E+03	2.0E+03	4.0E+03
<i>Proboscia</i>	<i>alata</i>	x	x	x	x			x			
<i>Pseudo-nitzschia</i>	<i>delicatissima</i> group	2.0E+02	4.0E+02	3.5E+03		4.0E+02	4.0E+02	2.0E+03			1.0E+03
<i>Pseudo-nitzschia</i>	<i>pungens/multiseris</i>	2.0E+02	1.7E+03	1.0E+03	1.7E+03	5.0E+02		3.5E+02	1.0E+03	3.8E+03	
<i>Pseudo-nitzschia</i>	<i>turgidula</i>					8.0E+02			4.0E+02		1.0E+02
<i>Rhizosolenia</i>	<i>spp.</i>	x		x	x	x		x	1.3E+04	x	x
<i>Rhizosolenia</i>	<i>setigera</i>										x
<i>Skeletonema</i>	<i>pseudocostatum</i>	6.0E+04	2.3E+04	6.7E+03	x		1.2E+04	3.8E+04		4.0E+03	4.0E+03
<i>Thalassionema</i>	<i>sp.</i>	1.0E+04	6.6E+03	2.3E+04	1.3E+04			x	x	4.0E+03	x
<i>Thalassiosira</i>	<i>sp.</i>	x	3.3E+03					7.5E+03		4.0E+03	4.0E+03
<i>Thalassiosira</i>	<i>cf. mala</i>	3.5E+04	2.0E+04	6.7E+03	2.3E+04	3.3E+04	1.0E+04	2.5E+03	1.3E+04	2.0E+03	1.2E+04



TABLE 8. PHYTOPLANKTON DATA (CONT'D)

		Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
Dinoflagellates												
<i>Alexandrium</i>	<i>catenella/fundyense</i>						5.0E+01					
<i>Alexandrium</i>	<i>pseudogonyaulax</i>			x								x
<i>Ceratium</i>	<i>macroceros</i>			3.3E+03				x				1.0E+03
<i>Ceratium</i>	<i>tenue</i>				x					x	x	x
<i>Ceratium</i>	<i>tripos</i>	x		x				x		x		
<i>Dinophysis/Phalachroma</i>	<i>rotundatum</i>			x								
<i>Gonyaulax</i>	<i>spp.</i>		x					x				x
<i>Gymnodinium</i>	<i>spp.</i>	4.5E+04	2.7E+04	6.7E+03	3.7E+04	6.3E+04	1.2E+04	1.0E+04	5.3E+04	1.4E+04	1.2E+04	7.0E+03
<i>Gyrodinium</i>	<i>spp.</i>		3.3E+03	6.7E+03	3.3E+03	3.3E+03	2.0E+03	1.5E+04	3.3E+03			2.0E+03
<i>Heterocapsa</i>	<i>rotundata</i>	2.0E+04	6.6E+03	2.0E+04	2.0E+04	1.7E+04	6.0E+03	7.5E+03	3.0E+04	4.0E+03		3.0E+03
<i>Karlodinium</i>	<i>sp.</i>			6.7E+03								
<i>Katodinium</i>	<i>sp.</i>			3.3E+03								
<i>Noctiluca</i>	<i>scintillans</i>			5.0E+01								
<i>Oxyrrhis</i>	<i>marina</i>			3.3E+03				2.5E+03				
<i>Peridinium</i>	<i>sp.</i>					3.3E+03						
<i>Polykrykos</i>	<i>schwartzii</i>							x				
<i>Prorocentrum</i>	<i>cordatum</i>								5.0E+01			
<i>Prorocentrum</i>	<i>gracile</i>									x		x
<i>Prorocentrum</i>	<i>rhathymum</i>					x		x				
<i>Prorocentrum</i>	<i>triestinum</i>							2.5E+03				
<i>Protoperdinium</i>	<i>spp.</i>	x	x	x		3.3E+03	x	x			x	
<i>Protoperdinium</i>	<i>leonis</i>			x								
<i>Protoperdinium</i>	<i>pallidum/pellucidum</i>							x				
<i>Protoperdinium</i>	<i>pentagonum</i>			x								
<i>Scrippsiella</i>	<i>spp.</i>		x	x	3.3E+03	x	4.0E+03	x		2.0E+03	2.0E+03	
<i>Takayama</i>	<i>pulchella</i>		2.0E+02	5.0E+02	8.0E+02	x		5.0E+02				
Chrysophytes												
<i>Calycomonas</i>	<i>sp.</i>			3.3E+03				5.0E+03				2.0E+03
<i>Ochromonas</i>	<i>spp.</i>			3.3E+03				5.0E+03				
Prymnesiophytes												
<i>Chrysochromulina</i>	<i>spp.</i>	2.0E+04	3.3E+03	1.3E+04		9.9E+03	2.0E+03	2.8E+04		4.0E+03	6.0E+03	8.0E+03
<i>Emiliania</i>	<i>huxleyi</i>		3.3E+03		1.7E+04			5.0E+03	3.3E+03	2.0E+03	6.0E+03	9.0E+03
<i>Gephyrocapsa</i>	<i>oceanica</i>	1.0E+04	1.3E+04		6.6E+03	3.3E+03				1.2E+04	6.0E+03	4.0E+03
Cryptophytes												
<i>Goniomonas</i>	<i>truncata</i>			3.3E+03								
<i>Hemiselmis</i>	<i>sp.</i>	1.1E+05	8.0E+04	2.0E+04	3.3E+04	4.3E+04	1.4E+04	7.0E+04	4.3E+04	2.2E+04	4.0E+04	1.6E+04
<i>Leucocryptos</i>	<i>marina</i>	5.0E+03		1.0E+04				2.5E+04				1.0E+03
<i>Plagioselmis</i>	<i>prolonga</i>	1.4E+05	9.7E+04	5.0E+04	3.3E+04	1.0E+05	2.2E+04	6.0E+04	4.0E+04	2.4E+04	3.2E+04	2.1E+04
<i>Teleaulax</i>	<i>acuta</i>	1.5E+04			6.6E+03	2.0E+04	6.0E+03	5.0E+03	3.3E+03		2.0E+03	2.0E+03
Chlorophytes												
<i>Ankistrodesmus</i>	<i>sp.</i>	5.0E+03										
<i>Staurastrum</i>	<i>sp.</i>			3.3E+03								
Prasinophytes												
<i>Pyramimonas</i>	<i>spp.</i>	9.0E+04	3.7E+04		3.3E+04	6.0E+04	1.2E+04	1.3E+04	3.3E+04	2.2E+04	2.6E+04	5.0E+03
<i>Tetraselmis</i>	<i>spp.</i>	1.0E+04	1.3E+04	6.7E+03	6.6E+03		6.0E+03	7.5E+03		2.0E+03	2.0E+03	1.0E+03
Euglenophyta												
<i>Eutreptiella</i>	<i>spp.</i>					9.9E+03	2.0E+03	2.5E+03	3.3E+03	2.0E+03		
Cyanoprokaryota												
<i>Oscillatoria</i>	<i>sp.</i>							2.5E+03				
Other												
<i>Apedinella</i>	<i>spinifera</i>							5.0E+03				2.0E+03
<i>Ebria</i>	<i>tripartita</i>			x								
<i>Dictyocha</i>	<i>octonaria</i>							5.0E+01				
<i>Fibrocapsa</i>	<i>sp.</i>			5.0E+01				5.0E+01				
<i>Heterosigma</i>	<i>sp.</i>					6.6E+03						
<i>Unidentified</i>	<i>amoeba</i>										x	
<i>Unidentified</i>	<i>bodonids</i>							5.0E+03				1.0E+03
<i>Mesodinium</i>	<i>rubrum</i>			3.3E+03								
		Comparative data in the report										
VSQAP Phytoplankton action levels in cells per litre (DPI, 2008)		Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
Taxa	Warning to growers											
<i>Pseudo-nitzschia spp.</i>	50 000	400	2100	4500	1700	1700	400	2350	1400	3800	100	1000
<i>Rhizosolenia cf chunii</i>	10 000		0				0					
<i>Alexandrium catenella</i>	100	0	0		0	0		0	0	0	0	
<i>Alexandrium minutum</i>	100	0	0		0	0		0	0	0	0	
<i>Alexandrium tamarense</i>	100	0	0		0	0		0	0	0	0	
<i>Dinophysis acuminata</i>	1 000	0	0		0	0	0	0	0	0	0	0
<i>Dinophysis caudata</i>	1 000	0	0		0	0	0	0	0	0	0	0
<i>Dinophysis fortii</i>	1 000	0	0		0	0	0	0	0	0	0	0
<i>Gymnodinium catenatum</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Karenia mikimotoi</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Karenia brevis</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Prorocentrum lima</i>	1 000	0	0	0	0		0				0	



NOTES

“X” denotes genus identified, but species not determined in sample.

Blank cells denotes neither genus nor species were detected.

For table on VSQAP Phytoplankton action levels refer to Algal Blooms – Detailed Design, CDP_ENV_MD_012 Rev 0.

1. While phytoplankton of the same genus were present, the listed species was not identified.