



# BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 11 (NOVEMBER 2008)

DECEMBER 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 November 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.

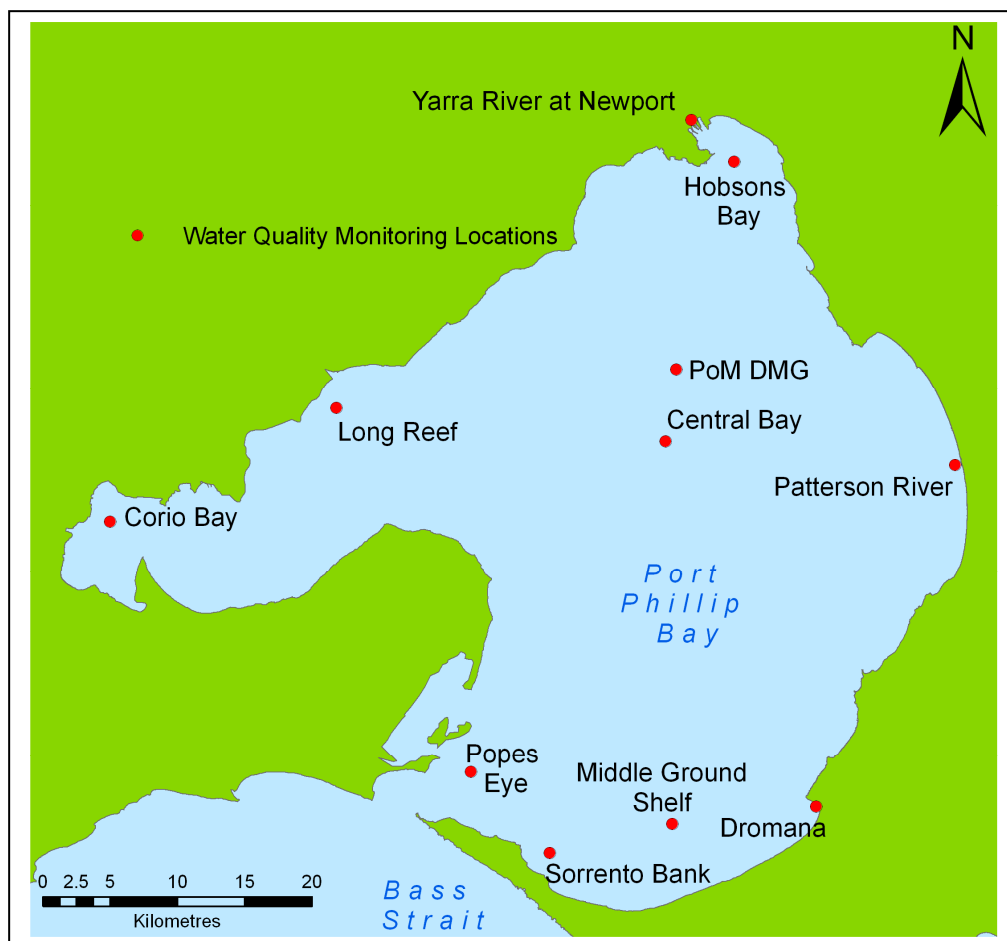


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY

## 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 exceeded once and the EWMA control limits were exceeded six 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 CDP\_ENV\_MD\_023 Rev 1.1, 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 new exceptions to the Water Quality Detailed Design CDP\_ENV\_MD\_023 Rev 1.1 during this reporting period.

The following previously issued exception report still applies to this progress report:

- ER080901: A variation to the Limit of Reporting (LOR) for various parameters.

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 <sup>2</sup> mg/L	PAR  micro Einsteins/m <sup>2</sup> /sec
			mg/L	% saturation						
12/11/08	Yarra River at Newport	0.5	7.1	95	35.4	1.9	19.2	2.4	3.5	226.4
12/11/08	Yarra River at Newport	7.5	NST	NST	NST		NST	3.2	NST	20.3
11/11/08	Hobsons Bay	0.5	7.3	97	35.3	3.6	18.8	1.7	2.6	1250.6
12/11/08	Central Bay	0.5	7.6	99	36.9	12.1	17.2	<0.5	<1.5	187.7
12/11/08	PoM DMG	0.5	7.5	97	36.9	11.6	17.0	<0.5	<1.5	499.6
12/11/08	Corio Bay	0.5	7.9	105	37.8	>3.0 <sup>1</sup>	18.2	0.6	<1.5	196.4
11/11/08	Long Reef	0.5	8.1	109	37.3	4.2	19.0	0.8	<1.5	103.2
11/11/08	Patterson River	0.5	7.5	99	36.7	>3.6 <sup>1</sup>	18.4	0.5	<1.5	1746.7
11/11/08	Dromana	0.5	7.8	101	36.5	>5.9 <sup>1</sup>	17.1	0.5	<1.5	190.5
11/11/08	Middle Ground Shelf	0.5	7.6	97	36.5	9.2	16.5	<0.5	<1.5	98.9
11/11/08	Sorrento Bank	0.5	7.7	97	36.1	>3.0 <sup>1</sup>	16.1	<0.5	<1.5	84.8
12/11/08	Popes Eye	0.5	7.6	96	36.0	7.8	16.2	<0.5	<1.5	601.7

**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 physico-chemical 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. Secchi disc visible on bottom.
2. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (LOD) (see Exception Report ER080901).

TABLE 2A NUTRIENTS

Date	Sampling Site	Depth m	Ammonium µg/L		Nitrate µg/L	Nitrite <sup>1</sup> 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
12/11/08	Yarra River at Newport	0.5	20.6	23.4	26.5	<1.2	26.5	42.0	156	243	246
12/11/08	Hobsons Bay	0.5	11.9	9.2	19.9	<1.2	19.9	11.2	134	213	183
11/11/08	Central Bay	0.5	6.0	5.4	2.1	<1.2	<2.4	1.9	105	126	136
12/11/08	PoM DMG	0.5	6.8	5.3	2.3	<1.2	<2.4	2.7	110	132	142
12/11/08	Corio Bay	0.5	6.5	5.6	2.8	<1.2	2.8	2.2	135	166	185
12/11/08	Long Reef	0.5	7.3	17.1	7.8	<1.2	7.7	35.6	167	231	237
11/11/08	Patterson River	0.5	6.5	6.3	3.4	<1.2	3.4	6.5	120	149	161
11/11/08	Dromana	0.5	6.5	6.2	2.0	<1.2	<2.4	4.6	99	121	134
11/11/08	Middle Ground Shelf	0.5	5.5	4.8	2.0	<1.2	<2.4	2.1	101	120	127
11/11/08	Sorrento Bank	0.5	4.8	5.1	2.3	<1.2	<2.4	4.5	76	98	116
11/11/08	Popes Eye	0.5	6.0	6.0	3.8	<1.2	3.8	7.2	80	103	108

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 only (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. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (LOD) (See Exception Report ER080901).

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

Date	Sampling Site	Depth m	Phosphate µg/L		Organic Phosphorus <sup>1</sup> µg/L	Total Phosphorus µg/L		Silicate µg/L
			Measured Value	EWMA		Measured Value	EWMA	
12/11/08	Yarra River at Newport	0.5	73	69	23	96	90	249
12/11/08	Hobsons Bay	0.5	71	73	30	101	94	238
11/11/08	Central Bay	0.5	46	53	<18	61	67	107
12/11/08	PoM DMG	0.5	47	52	<18	59	67	115
12/11/08	Corio Bay	0.5	56	69	<18	74	87	141
12/11/08	Long Reef	0.5	160	121	40	200	144	113
11/11/08	Patterson River	0.5	63	60	19	82	76	71
11/11/08	Dromana	0.5	34	41	<18	47	54	82
11/11/08	Middle Ground Shelf	0.5	34	42	<18	45	54	91
11/11/08	Sorrento Bank	0.5	20	29	<18	29	38	58
11/11/08	Popes Eye	0.5	16	22	<18	27	32	47

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).

1. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (LOD) (See Exception Report ER080901).

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

Date	Sampling Site	Depth m	Arsenic µg/L		Tri-butyl Tin <sup>1</sup> (TBT) µg/Lx10 <sup>-3</sup>	Cadmium µg/L	Chromium µg/L	Copper µg/L	Mercury µg/L	Nickel µg/L	Lead µg/L	Zinc µg/L
			Measured Value	EWMA								
12/11/08	Yarra River at Newport - total	0.5	2.4	2.4	<2	<0.2	<0.5	<1	<0.1	0.9	<0.2	<5
12/11/08	Hobsons Bay - total	0.5	2.8	2.8	<2	<0.2	<0.5	<b>2</b>	<0.1	1.1	<0.2	<5
12/11/08	Hobsons Bay - dissolved	0.5	NAR	-	NST <sup>1</sup>	NAR	NAR	<1	NAR	NAR	NAR	NAR
11/11/08	Central Bay - total	0.5	2.8	<b>2.9</b>	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	0.8	<0.2	<5
12/11/08	PoM DMG - total	0.5	2.3	2.8	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	0.6	<0.2	<5
12/11/08	Corio Bay - total	0.5	2.8	2.9	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	0.9	<0.2	<5
12/11/08	Long Reef - total	0.5	3.0	3.0	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	1.4	<0.2	<5
12/11/08	Long Reef - dissolved	0.5	2.4	-	NST <sup>1</sup>	NAR	NAR	NAR	NAR	NAR	NAR	NAR
11/11/08	Patterson River - total	0.5	2.8	<b>2.8</b>	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	0.7	<0.2	<b>6</b>
11/11/08	Patterson River - dissolved	0.5	NAR	-	NST <sup>1</sup>	NAR	NAR	NAR	NAR	NAR	NAR	<b>9<sup>2</sup></b>
11/11/08	Dromana - total	0.5	2.6	<b>2.7</b>	NST <sup>1</sup>	<0.2	0.6	<1	<0.1	0.9	<0.2	<5
11/11/08	Middle Ground Shelf - total	0.5	2.3	2.6	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	0.9	<0.2	<5
11/11/08	Sorrento Bank - total	0.5	2.0	2.4	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
11/11/08	Popes Eye - total	0.5	1.9	2.2	NST <sup>1</sup>	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5

NOTES:

**Yellow** coloured cells indicate measured results above the Shewhart control limit (for 'total' fraction) (see Appendix 1, Table 5 for details).

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

**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.

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.



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 <sup>3</sup>	Total Phytoplankton cells/L	Diatoms cells/L	Dinoflagellates cells/L	Other Flagellates cells/L
			Measured Value	EWMA						
12/11/08	Yarra River at Newport	0.5	1.87	1.64	<0.18	0.64	3.0E+05	6.7E+04	2.4E+04	2.1E+05
12/11/08	Yarra River at Newport	7.5	NST <sup>1</sup>	-	NST <sup>1</sup>	0.66				
12/11/08	Hobsons Bay	0.5	1.58	1.46	<0.18	0.48	4.5E+05	1.8E+05	2.6E+04	2.4E+05
11/11/08	Central Bay	0.5	0.25	0.72	<0.18	0.12	1.4E+05	7.3E+04	3.1E+03	6.1E+04
12/11/08	PoM DMG	0.5	0.24	0.62	<0.18	0.12	1.4E+05	3.1E+04	1.0E+04	9.7E+04
12/11/08	Corio Bay	0.5	0.36	0.70	<0.18	0.27	2.9E+05	1.0E+05	1.4E+04	1.7E+05
12/11/08	Long Reef	0.5	1.53	1.25	<0.18	0.66	1.0E+06	6.1E+05	2.0E+04	4.2E+05
11/11/08	Patterson River	0.5	0.48	0.92	<0.18	0.80	4.3E+05	2.9E+05	2.6E+04	1.1E+05
11/11/08	Dromana	0.5	0.37	0.71	<0.18	0.13	6.0E+05	4.3E+05	1.4E+04	1.5E+05
11/11/08	Middle Ground Shelf	0.5	0.27	0.62	<0.18	0.08	2.3E+05	1.1E+05	1.1E+04	1.1E+05
11/11/08	Sorrento Bank	0.5	0.41	0.67	<0.18	0.14	4.4E+05	2.8E+05	1.0E+04	1.5E+05
11/11/08	Popes Eye	0.5	0.46	0.59	<0.18	0.24	2.0E+05	1.1E+05	8.0E+03	7.9E+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.

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 1.1 (available on the Channel Deepening Project website [www.channelproject.com](http://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 a calculated exponentially weighted average of all prior data, including the most recent measurement, 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.

In the case of metals, EWMA and Shewhart control limits apply to the 'total' fraction, since the historical data they are derived from are 'total' metals. Conversely SEPP objectives and ANZECC guidelines apply to the 'dissolved' metal fraction. For transparency, this report highlights all metals exceedences whether total or dissolved.



APPENDIX 1 (CONT'D)

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 1.1 (available on the Channel Deepening Project website [www.channelproject.com](http://www.channelproject.com)).

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- <i>a</i> 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 4 CDP\_ENV\_MD\_023 Rev 1.1 (available on the Channel Deepening Project website [www.channelproject.com](http://www.channelproject.com)).

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

		Channel Deepening PARAMETER																													
Sampling Site	SEPP (WoV) schedule & segment	ANZECC Level of Protection	Dissolved Oxygen (% saturation)				Salinity variation	Temperature (°C)	Secchi disc depth (m)	Attenuation of PAR	Turbidity	Suspended Solids (mg/L)				Chlorophyll-a (ug/L)		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)
			Min for 1m below surface	Min 1m above bottom	Lower limit for 90th percentile	Min percentage concentration						Annual 90th percentile	Annual 50th percentile	Annual 90th percentile	Annual 50th percentile	Annual 90th percentile	Annual 50th percentile														
Yarra River at Newport	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
	F7 Yarra Port				>60%		N ± 2				<20	<50	<25	<60				15	5	120	10	25	50	0.2	10	3	1	0.05	15	5	0.006
Hobsons Bay	F6 Hobsons	99%	>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		>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 SEPP Schedule F7 - Waters of the Yarra Catchment objectives

Limit of reporting above objective

NOTES

Schedule F7 (Waters of the Yarra Catchment) is included 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
Collection Date	12/11/2008	12/11/2008	11/11/2008	12/11/2008	12/11/2008	12/11/2008	11/11/2008	11/11/2008	11/11/2008	11/11/2008
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Species									
Total Phytoplankton	3.0E+05	4.5E+05	1.4E+05	1.4E+05	2.9E+05	1.0E+06	4.3E+05	6.0E+05	2.3E+05	4.4E+05
Diatoms	6.7E+04	1.8E+05	7.3E+04	3.1E+04	1.0E+05	6.1E+05	2.9E+05	4.3E+05	1.1E+05	2.8E+05
Dinoflagellates	2.4E+04	2.6E+04	3.1E+03	1.0E+04	1.4E+04	2.0E+04	2.6E+04	1.4E+04	1.1E+04	1.0E+04
Other flagellates	2.1E+05	2.4E+05	6.1E+04	9.7E+04	1.7E+05	4.2E+05	1.1E+05	1.5E+05	1.1E+05	1.5E+05

Genus	Species	Estimate Cells/L									
<i>Amphora</i>	sp.		2.E+03				X	4.E+03	4.E+03	1.E+03	
<i>Ardissonea</i>	<i>crystallina</i>						X		X		
<i>Asterionellopsis</i>	<i>glacialis</i>										8.E+03
<i>Bacillaria</i>	<i>paxillifera</i>		2.E+04							X	
<i>Bacteriastrium</i>	sp.			5.E+03		X			2.E+04	5.E+03	
<i>Chaetoceros</i>	spp.	1.E+04	3.E+04	3.E+04	7.E+03	4.E+03	3.E+05	2.E+05	1.E+05	2.E+04	4.E+04
<i>Cocconeis</i>	spp.	4.E+03	1.E+04	6.E+03	8.E+03	2.E+04	6.E+04	2.E+04	4.E+04	1.E+04	1.E+04
<i>Coscinodiscus</i>	spp.			X			5.E+03				
<i>Cylindrotheca</i>	<i>closterium</i>	8.E+03	1.E+04	4.E+03	2.E+03	1.E+04	1.E+05	6.E+03	3.E+04	9.E+03	2.E+04
<i>Dactyliosolen</i>	<i>fragilissimus</i>			X				X	4.E+03	4.E+03	1.E+04
<i>Entomoneis</i>	sp.					X		X	X		
<i>Eucampia</i>	<i>zodiacus</i>		X								
<i>Fragilaria</i>	spp.	4.E+03	6.E+03			6.E+03	2.E+04		4.E+03	1.E+03	
<i>Fragilariopsis</i>	spp.						X	X			
<i>Grammotophora</i>	<i>marina</i>						X	2.E+03	6.E+03		X
<i>Guinardia</i>	<i>fiacida</i>			1.E+03	1.E+03				X	X	X
<i>Hemiaulus</i>	<i>hauckii</i>							2.E+03			2.E+03
<i>Leptocylindrus</i>	<i>danicus</i>			9.E+03	2.E+03			1.E+04	4.E+03	X	2.E+03
<i>Leptocylindrus</i>	<i>minimus</i>			X							X
<i>Licmophora</i>	sp.	2.E+03	X						2.E+03		
<i>Naviculoid</i>	spp.	X	8.E+03		1.E+03	6.E+03		2.E+04	1.E+04	8.E+03	6.E+03
<i>Nitzschia</i>	spp.	8.E+03	4.E+03		2.E+03	8.E+03		6.E+03	4.E+03	2.E+03	4.E+03
<i>Pleurosigma</i>	sp.	X	X	X		X		X	2.E+03	X	
<i>Pseudo-nitzschia</i>	<i>delicatissima</i> group										X
<i>Pseudo-nitzschia</i>	<i>fraudulenta/australis</i>								X		X
<i>Pseudo-nitzschia</i>	<i>pungens/multiseriis</i>	6.E+02	X					7.E+02		X	X
<i>Rhizolenia</i>	spp.			X	X			X	X	X	X
<i>Skeletonema</i>	<i>japonica/pseudocostatum</i>			1.E+04	3.E+03		5.E+04	X	2.E+05	3.E+04	2.E+05
<i>Striatella</i>	<i>unipunctata</i>		X			X			2.E+03		X
<i>Thalassiosira</i>	sp.		4.E+03				1.E+04		2.E+03		X
<i>Thalassiosira</i>	<i>cf. mala</i>	3.E+04	9.E+04		5.E+03	4.E+04	7.E+04	1.E+04	3.E+04	1.E+04	1.E+04

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 1.1.

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	
Collection Date	39764	39764	39763	39764	39764	39764	39763	39763	39763	39763	
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	
<b>Genus</b>	<b>Estimate Cells/L</b>										
<b>Total Phytoplankton</b>	302704	446114	137113	138403	286008	1040008	432710	596059	231211	438161	
<b>Diatoms</b>	66552	182005	73005	31001	102004	605004	292705	430005	108006	280009	
<b>Dinoflagellates</b>	24002	26108	3106	10402	14003	20004	26003	14054	11205	10152	
<b>Other flagellates</b>	212150	238001	61002	97000	170001	415000	114002	152000	112000	148000	
<b>Dinoflagellates</b>											
<i>Alexandrium</i>	<i>pseudogonyaulax</i>		1.E+02	9.E+02	4.E+02	X	X	5.E+01	2.E+02	2.E+02	
<i>Amphidinium</i>	<i>spp.</i>		X			X	X			2.E+03	
<i>Ceratium</i>	<i>furca</i>		X								
<i>Ceratium</i>	<i>tenue</i>	X		1.E+03	3.E+03			X	1.E+03	X	
<i>Ceratium</i>	<i>tripos</i>		X	X	X					X	
<i>Dinophysis</i>	<i>acuminata</i>		X		X				X		
<i>Gonyaulax</i>	<i>spp.</i>	X					X				
<i>Gymnodinioid</i>	<i>spp.</i>	2.E+04	1.E+04		6.E+03	1.E+04	2.E+04	1.E+04	6.E+03	3.E+03	
<i>Gyrodinium</i>	<i>spp.</i>	2.E+03				2.E+03		2.E+03	2.E+03	X	
<i>Heterocapsa</i>	<i>rotundata</i>	4.E+03	1.E+04	1.E+03	1.E+03	2.E+03	X	6.E+03	6.E+03	6.E+03	
<i>Noctiluca</i>	<i>scintillans</i>			X	5.E+01						
<i>Peridinium</i>	<i>spp.</i>			X			X	X	1.E+03	2.E+03	
<i>Polykrykos</i>	<i>schwartzii</i>		X								
<i>Prorocentrum</i>	<i>gracile</i>		X			X			X		
<i>Protoceratium</i>	<i>reticulatum</i>			X							
<i>Protoperdinium</i>	<i>spp.</i>		X	X				2.E+03	X	2.E+03	
<i>Pyrocystis</i>	<i>lunula</i>			X				2.E+03			
<i>Scripsiella</i>	<i>spp.</i>	2.E+03	X				X			X	
<i>Takayama</i>	<i>pulchella</i>		3.E+02	2.E+02						2.E+02	
<i>Thecadinium</i>	<i>spp.</i>						X				
<b>Chrysophytes</b>											
<i>Calycomonas</i>	<i>spp.</i>		4.00E+03	1.00E+03		1.40E+04	1.50E+04		4.00E+03		
<i>Dinobryon</i>	<i>spp.</i>				4.00E+03						
<b>Prymnesiophytes</b>											
<i>Chrysochromulina</i>	<i>spp.</i>	2.60E+04	4.60E+04	1.40E+04	1.30E+04	2.40E+04	3.00E+04	2.20E+04	1.60E+04	2.50E+04	
<i>Emiliania</i>	<i>huxleyi</i>	6.00E+03	1.00E+04	1.20E+04	1.20E+04	2.20E+04	1.00E+04	8.00E+03	1.80E+04	1.70E+04	
<b>Cryptophytes</b>											
<i>Hemiselmis</i>	<i>sp.</i>	5.00E+04	5.40E+04	1.10E+04	2.40E+04	5.00E+04	5.00E+04	2.80E+04	3.00E+04	2.60E+04	
<i>Leucocryptos</i>	<i>marina</i>							X			
<i>Plagioselmis</i>	<i>prolonga</i>	5.20E+04	4.00E+04	1.00E+04	1.60E+04	2.80E+04	9.00E+04	2.00E+04	3.00E+04	2.00E+04	
<i>Teleaulax</i>	<i>acuta</i>	2.00E+04	2.80E+04	2.00E+03	1.00E+03	4.00E+03	7.50E+04	1.20E+04	6.00E+03	5.00E+03	
<b>Prasinophytes</b>											
<i>Pterosperma</i>	<i>spp.</i>										
<i>Pyramimonas</i>	<i>spp.</i>	4.20E+04	2.80E+04	9.00E+03	1.80E+04	1.80E+04	3.00E+04	1.60E+04	1.80E+04	1.40E+04	
<i>Tetraselmis</i>	<i>spp.</i>	1.40E+04	2.40E+04	2.00E+03	9.00E+03	8.00E+03	6.50E+04	6.00E+03	1.20E+04	3.00E+03	
<b>Euglenophyta</b>											
<i>Eutreptiella</i>	<i>spp.</i>	2.00E+03	X	X		2.00E+03	5.00E+04	2.00E+03	1.80E+04	2.00E+03	
<b>Other</b>											
<i>Apedinella</i>	<i>spinifera</i>		4.00E+03								
<i>Ebria</i>	<i>tripartita</i>					X		X			
<i>Dictyocha</i>	<i>octonaria</i>	1.50E+02									
<i>Unidentified</i>	<i>amoeba</i>			X							
<b>Comparative data in the report</b>											
<b>VSQAP Phytoplankton action levels in per litre (DPI, 2008)</b>	<b>cells</b>	<b>Yarra River at Newport</b>	<b>Hobsons Bay</b>	<b>Central Bay</b>	<b>PoM DMG</b>	<b>Corio Bay</b>	<b>Long Reef</b>	<b>Patterson River</b>	<b>Dromana</b>	<b>Middle Ground Shelf</b>	<b>Sorrento Bank</b>
<b>Taxa</b>	<b>Warning to growers</b>										
<i>Pseudo-nitzschia</i> spp.	50 000	550	X					700	X	X	
<i>Rhizosolenia cf chunii</i>	10 000			X	X				X	X	X
<i>Alexandrium catenella</i>	100										
<i>Alexandrium minutum</i>	100										
<i>Alexandrium tamarense</i>	100										

NOTES

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