



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 10 (OCTOBER 2008) EDITION 2

NOVEMBER 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 October 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.

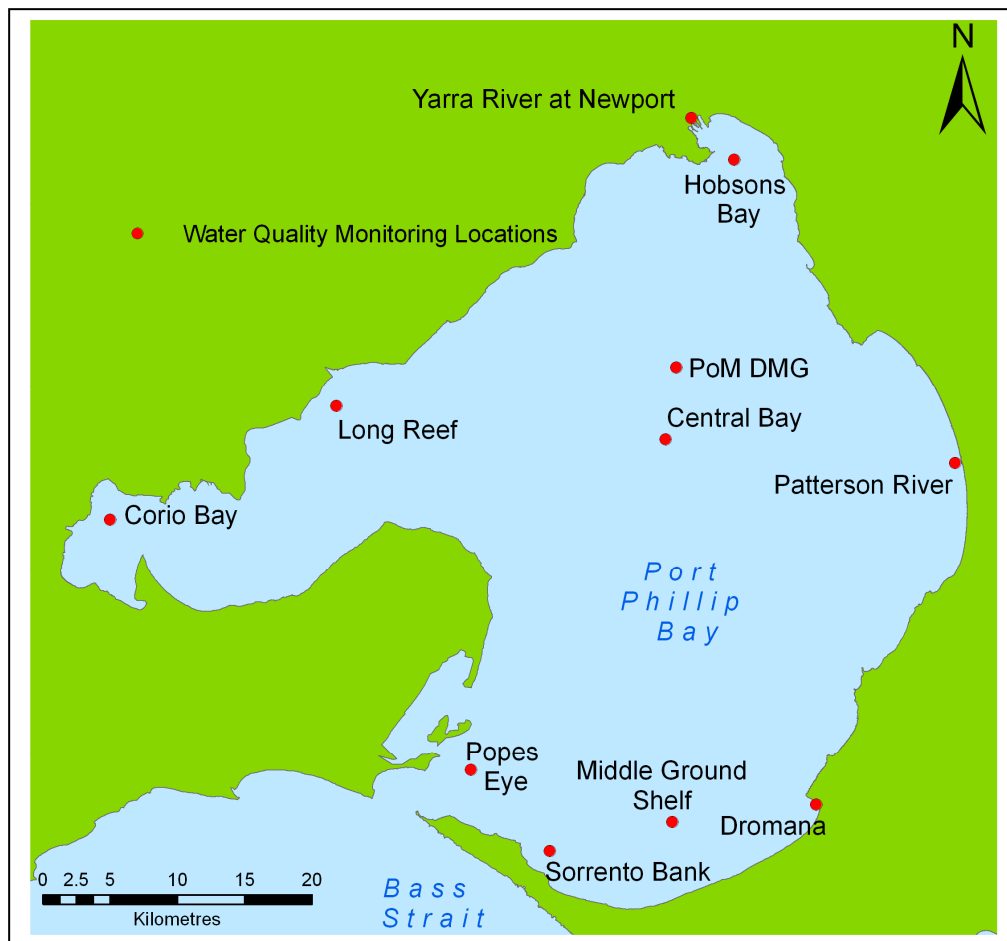


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY

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 seven times (see Tables 1 - 4).

No significant events were observed during the field sampling that would affect these results. The high total (particulate) result for zinc at Dromana on 15 October 2008 (Table 3) was confirmed by the laboratory through re-digestion and re-analysis of the sample. The corresponding dissolved fraction, that is available for uptake by organisms and is the basis for the zinc SEPP objective (Table 7), returned a value less than the limit of detection and no control limits have therefore been exceeded.

As described in section 4.1.3 of 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.

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 are two exceptions to the Water Quality Detailed Design document CDP_ENV_MD_023 Rev 0 during this reporting period. These are detailed in exception reports ER081001 and ER081002 respectively, and outlined as follows:

- A Limit of Reporting (LOR) was incorrectly applied to some nitrate plus nitrite EWMA values in Progress Report No 9 (Sept).
- The fluorescence (as *in situ* chlorophyll-*a*) value at Middle Ground Shelf of 0.17 mg/m³ was incorrectly reported as 1.76 mg/m³ in Table 4 of Edition 1 of this report (as published on the Office of the Environmental Monitor website on 13 November 2008). The correct value is presented in Table 4 of this (Edition 2) report.

The following previously issued exception reports still apply to this progress report:

- ER080702: A variation in the Limit of Reporting (LOR) for chlorophyll-*a* and phaeophytin-*a*.
- ER080901: A variation to the 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 ² NTU	Total Suspended Solids ² mg/L	PAR micro Einsteins/m ² /sec
			mg/L	% saturation						
14/10/08	Yarra River at Newport	0.5	8.1	101	35.8	1.8	15.3	2.9	5.4	607.6
14/10/08	Yarra River at Newport	14.5	NST	NST	NST		NST	7.8	NST	0.0
16/10/08	Hobsons Bay	0.5	8.0	99	36.7	2.8	15.1	2.1	4.3	270.3
16/10/08	Central Bay	0.5	8.2	99	36.8	6.9	13.4	<0.5	<1.5	80.5
16/10/08	PoM DMG	0.5	8.2	100	36.9	6.0	14.0	<0.5	<1.5	566.5
14/10/08	Corio Bay	0.5	8.1	103	37.7	>2.2 ¹	15.6	0.7	1.6	879.6
14/10/08	Long Reef	0.5	8.2	103	37.3	4.7	15.2	0.8	1.6	1492.0
15/10/08	Patterson River	0.5	8.0	100	36.8	>3.4 ¹	15.5	<0.5	<1.5	1424.5
15/10/08	Dromana	0.5	8.0	96	36.7	4.2	13.9	0.8	<1.5	270.9
15/10/08	Middle Ground Shelf	0.5	8.2	100	36.7	5.7	14.1	0.7	<1.5	1326.0
15/10/08	Sorrento Bank	0.5	8.0	98	36.6	>2.7 ¹	14.3	0.6	<1.5	643.5
15/10/08	Popes Eye	0.5	8.0	99	36.5	>9.8 ¹	14.4	<0.5	<1.5	451.6

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 ¹ µg/L	Nitrate plus Nitrite µg/L		Dissolved Organic Nitrogen µg/L	Total Nitrogen µg/L	
			Measured Value	EWMA			Measured Value ¹	EWMA		Measured Value	EWMA
14/10/08	Yarra River at Newport	0.5	16.1	24.0	17.2	<1.2	17.2	45.9	137	210	246
16/10/08	Hobsons Bay	0.5	<4.5	8.5	1.8	<1.2	<2.4	9.0	133	177	175
16/10/08	Central Bay	0.5	<4.5	5.2	1.4	<1.2	<2.4	1.8	105	124	139
16/10/08	PoM DMG	0.5	<4.5	4.9	1.5	<1.2	<2.4	2.8	120	141	144
14/10/08	Corio Bay	0.5	5.1	5.4	2.2	<1.2	<2.4	2.0	193	225	190
14/10/08	Long Reef	0.5	<4.5	19.6	2.5	<1.2	2.5	42.6	144	186	238
15/10/08	Patterson River	0.5	<4.5	6.2	1.6	<1.2	<2.4	7.3	118	140	164
15/10/08	Dromana	0.5	<4.5	6.2	1.9	<1.2	<2.4	5.2	100	131	137
15/10/08	Middle Ground Shelf	0.5	<4.5	4.6	1.6	<1.2	<2.4	2.1	102	123	129
15/10/08	Sorrento Bank	0.5	<4.5	5.2	1.3	<1.2	<2.4	5.1	98	120 ²	121
15/10/08	Popes Eye	0.5	<4.5	6.0	1.6	<1.2	<2.4	8.0	91	112	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 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).
2. Value rounded up to 120ug/L (no exceedence of ANZECC trigger value).

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

Date	Sampling Site	Depth m	Phosphate µg/L		Organic Phosphorus ¹ µg/L	Total Phosphorus µg/L		Silicate µg/L
			Measured Value	EWMA		Measured Value	EWMA	
14/10/08	Yarra River at Newport	0.5	93	68	20	112	89	206
16/10/08	Hobsons Bay	0.5	97	74	18	114	92	146
16/10/08	Central Bay	0.5	48	55	<18	60	68	95
16/10/08	PoM DMG	0.5	52	54	<18	63	69	93
14/10/08	Corio Bay	0.5	64	72	22	86	90	109
14/10/08	Long Reef	0.5	80	111	18	97	130	105
15/10/08	Patterson River	0.5	52	60	<18	65	75	107
15/10/08	Dromana	0.5	39	43	<18	52	55	85
15/10/08	Middle Ground Shelf	0.5	43	44	<18	54	57	108
15/10/08	Sorrento Bank	0.5	36	31	<18	46	41	100
15/10/08	Popes Eye	0.5	33	23	<18	43	33	84

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).

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 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								
14/10/08	Yarra River at Newport - total	0.5	2.5	2.4	<2	<0.2	<0.5	<1	<0.1	1.2	<0.2	<5
16/10/08	Hobsons Bay - total	0.5	2.7	2.8	<2	<0.2	<0.5	<1	<0.1	1.0	<0.2	<5
16/10/08	Central Bay - total	0.5	2.5	2.9	NST ¹	<0.2	<0.5	<1	<0.1	1.0	<0.2	<5
16/10/08	PoM DMG - total	0.5	2.5	2.9	NST ¹	<0.2	<0.5	<1	<0.1	0.7	<0.2	<5
14/10/08	Corio Bay - total	0.5	2.6	3.0	NST ¹	<0.2	<0.5	<1	<0.1	1.2	<0.2	<5
14/10/08	Long Reef - total	0.5	2.6	3.1	NST ¹	<0.2	<0.5	<1	<0.1	1.0	<0.2	<5
15/10/08	Patterson River - total	0.5	2.5	2.8	NST ¹	<0.2	<0.5	<1	<0.1	1.0	<0.2	<5
15/10/08	Dromana - total	0.5	2.9	2.8	NST ¹	<0.2	<0.5	<1	<0.1	1.2	<0.2	76
15/10/08	Dromana - dissolved	0.5	NAR	-	NST ¹	NAR	NAR	NAR	NAR	<0.5	NAR	<5
15/10/08	Middle Ground Shelf - total	0.5	2.6	2.7	NST ¹	<0.2	<0.5	<1	<0.1	1.0	<0.2	<5
15/10/08	Sorrento Bank - total	0.5	2.5	2.5	NST ¹	<0.2	<0.5	<1	<0.1	0.8	<0.2	<5
15/10/08	Popes Eye - total	0.5	2.2	2.3	NST ¹	<0.2	<0.5	<1	<0.1	0.6	<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.



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

Date	Sampling Site	Depth m	Chlorophyll-a		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 µg/L	EWMA						
14/10/08	Yarra River at Newport	0.5	1.63	1.62	<0.18	0.56	6.2E+05	1.6E+05	4.8E+04	4.0E+05
14/10/08	Yarra River at Newport	14.5	NST ¹	-	NST ¹	0.53				
16/10/08	Hobsons Bay	0.5	1.98	1.42	0.21	0.73	8.2E+05	4.2E+05	6.0E+04	3.4E+05
16/10/08	Central Bay	0.5	0.47	0.84	<0.18	0.32	2.4E+05	6.4E+04	3.6E+04	1.4E+05
16/10/08	PoM DMG	0.5	0.47	0.70	<0.18	0.13	2.1E+05	6.1E+04	2.0E+04	1.3E+05
14/10/08	Corio Bay	0.5	0.46	0.78	<0.18	0.23	1.6E+05	6.1E+04	1.7E+04	8.5E+04
14/10/08	Long Reef	0.5	1.12	1.18	<0.18	0.52	2.1E+05	6.0E+04	2.7E+04	1.3E+05
15/10/08	Patterson River	0.5	0.39	1.04	<0.18	0.11	1.6E+05	4.3E+04	9.2E+03	1.1E+05
15/10/08	Dromana	0.5	0.91	0.80	<0.18	0.42	3.4E+05	1.8E+05	2.0E+04	1.5E+05
15/10/08	Middle Ground Shelf	0.5	0.47	0.71	<0.18	0.17 ²	1.4E+05	2.5E+04	9.0E+03	1.1E+05
15/10/08	Sorrento Bank	0.5	0.70	0.73	<0.18	0.27	1.6E+05	6.0E+04	9.1E+03	9.3E+04
15/10/08	Popes Eye	0.5	0.58	0.62	<0.18	0.01	1.7E+05	8.5E+04	5.0E+03	8.1E+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.
2. The fluorescence (as *in situ* chlorophyll-a) value at Middle Ground Shelf of 0.17 mg/m³ was incorrectly reported as 1.76 mg/m³ in the previous published edition of this report.

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). These control limits have since been amended and are as issued by the Port of Melbourne Corporation on January 28, 2008.

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.

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 0 (available on the Channel Deepening Project website www.channelproject.com); limits amended by Port of Melbourne Corporation on January 28, 2008.



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 4 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.

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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	Popes Eye
Collection Date	14/10/2008	16/10/2008	16/10/2008	15/10/2008	14/10/2008	14/10/2008	15/10/2008	15/10/2008	15/10/2008	16/10/2008	15/10/2008
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Species										
Total Phytoplankton	6.2E+05	8.2E+05	2.4E+05	2.1E+05	1.6E+05	2.1E+05	1.6E+05	3.4E+05	1.4E+05	1.6E+05	1.7E+05
Diatoms	1.6E+05	4.2E+05	6.4E+04	6.1E+04	6.1E+04	6.0E+04	4.3E+04	1.8E+05	2.5E+04	6.0E+04	8.5E+04
Dinoflagellates	4.8E+04	6.0E+04	3.6E+04	2.0E+04	1.7E+04	2.7E+04	9.2E+03	2.0E+04	9.0E+03	9.1E+03	5.0E+03
Other flagellates	4.0E+05	3.4E+05	1.4E+05	1.3E+05	8.5E+04	1.3E+05	1.1E+05	1.5E+05	1.1E+05	9.3E+04	8.1E+04

Diatoms		Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
<i>Amphora</i>	<i>sp.</i>	8.0E+03	8.0E+03	x	x	1.0E+03	2.0E+03	2.0E+03	6.0E+03	1.0E+03	x	1.0E+03
<i>Ardissonea</i>	<i>crystallina</i>								x			x
<i>Asterionellopsis</i>	<i>glacialis</i>										x	
<i>Asteromphalus</i>	<i>sarcophagus</i>		x									x
<i>Bacillaria</i>	<i>paxillifera</i>	x			x							
<i>Campylodiscus</i>	<i>sp.</i>				x							
<i>Cerataulina</i>	<i>pelagica</i>								x			
<i>Chaetoceros</i>	<i>spp.</i>	4.0E+03	x	2.0E+03	2.0E+03	5.0E+03	1.0E+03	1.0E+03	1.2E+04	x	7.0E+03	9.0E+03
<i>Cocconeis</i>	<i>spp.</i>	8.0E+03	1.6E+04	4.0E+03	4.0E+03	9.0E+03	1.8E+04	1.2E+04	1.4E+04	2.0E+03	8.0E+03	1.0E+04
<i>Coscinodiscus</i>	<i>spp.</i>		4.0E+03			x						
<i>Cylindrotheca</i>	<i>closterium</i>	1.2E+04	3.2E+04	1.8E+04	1.2E+04	2.1E+04	1.0E+04	9.0E+03	7.8E+04	5.0E+03	1.3E+04	2.0E+04
<i>Dactyliosolen</i>	<i>fragilissimus</i>		8.0E+03									
<i>Entomoneis</i>	<i>sp.</i>	4.0E+03	4.0E+03	x	1.0E+03	x	1.0E+03	x	4.0E+03	x	x	x
<i>Fragilaria</i>	<i>spp.</i>		4.0E+03	4.0E+03	1.0E+03	3.0E+03	1.0E+04	1.0E+03			1.0E+03	1.0E+03
<i>Fragilariopsis</i>	<i>sp.</i>								8.0E+03			
<i>Grammotophora</i>	<i>marina</i>	x							x			
<i>Guinardia</i>	<i>flaccida</i>		x	x	1.0E+03				x	x	x	x
<i>Hemiaulus</i>	<i>hauckii</i>	x	8.0E+03	x					x			
<i>Leptocylindrus</i>	<i>danicus</i>		4.0E+03	4.0E+03	3.0E+03			1.0E+03	1.6E+04	9.0E+03	1.8E+04	7.0E+03
<i>Licmophora</i>	<i>sp.</i>	x	4.0E+03	x		7.0E+03	6.0E+03	x	2.0E+03	1.0E+03		x
<i>Minidiscus</i>	<i>trioctulatus</i>							4.0E+03				
<i>Naviculoid</i>	<i>spp.</i>	1.2E+04	1.6E+04		6.0E+03	2.0E+03	5.0E+03	4.0E+03	1.2E+04	3.0E+03	3.0E+03	5.0E+03
<i>Nitzschia</i>	<i>spp.</i>	1.6E+04	2.4E+04	x	1.3E+04	3.0E+03	2.0E+03	5.0E+03	2.0E+03	x	2.0E+03	2.0E+03
<i>Pleurosigma</i>	<i>sp.</i>	x	x	2.0E+03	8.0E+03	1.0E+03			x	x	x	1.0E+03
<i>Pseudo-nitzschia</i>	<i>pungens/multiseriata</i>	8.0E+02	x						x			
<i>Rhizosolenia</i>	<i>spp.</i>			x	x				2.0E+03			
<i>Skeletonema</i>	<i>japonica/pseudocostatum</i>			x			x		8.0E+03		3.0E+03	2.4E+04
<i>Striatella</i>	<i>unipunctata</i>		x						x		x	x
<i>Thalassiosira</i>	<i>sp.</i>	x	1.6E+04	x			x					
<i>Thalassiosira</i>	<i>cf. mala</i>	1.0E+05	2.7E+05	3.0E+04	1.0E+04	9.0E+03	5.0E+03	4.0E+03	1.2E+04	4.0E+03	5.0E+03	5.0E+03

NOTES

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

Blank cells denote 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.

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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	
Collection Date	14/10/2008	16/10/2008	16/10/2008	15/10/2008	14/10/2008	14/10/2008	15/10/2008	15/10/2008	15/10/2008	16/10/2008	15/10/2008	
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	
Genus	Estimate Cells/L											
Total Phytoplankton	6.2E+05	8.2E+05	2.4E+05	2.1E+05	1.6E+05	2.1E+05	1.6E+05	3.4E+05	1.4E+05	1.6E+05	1.7E+05	
Diatoms	1.6E+05	4.2E+05	6.4E+04	6.1E+04	6.1E+04	6.0E+04	4.3E+04	1.8E+05	2.5E+04	6.0E+04	8.5E+04	
Dinoflagellates	4.8E+04	6.0E+04	3.6E+04	2.0E+04	1.7E+04	2.7E+04	9.2E+03	2.0E+04	9.0E+03	9.1E+03	5.0E+03	
Other flagellates	4.0E+05	3.4E+05	1.4E+05	1.3E+05	8.5E+04	1.3E+05	1.1E+05	1.5E+05	1.1E+05	9.3E+04	8.1E+04	
Dinoflagellates												
<i>Alexandrium margalefi</i>									x			
<i>Alexandrium pseudogonyaulax</i>			1.0E+02	5.0E+01			x	2.0E+02	x	x	x	
<i>Alexandrium tamarense</i>					x							
<i>Amphidinium</i> spp.		x										
<i>Ceratium tenue</i>			x	4.0E+02	x			x	x			
<i>Ceratium tripos</i>									x			
<i>Dinophysis acuminata</i>		5.0E+01		x	1.0E+02	x				x		
<i>Gonyaulax</i> spp.	x		x		x	x		x	x		x	
<i>Gymnodinium</i> spp.	3.2E+04	3.2E+04	2.6E+04	1.3E+04	7.0E+03	1.9E+04	6.0E+03	1.0E+04	6.0E+03	7.0E+03	4.0E+03	
<i>Gyrodinium</i> spp.			2.0E+03	2.0E+03	x	2.0E+03	x	2.0E+03	1.0E+03		x	
<i>Heterocapsa rotundata</i>	4.0E+03	8.0E+03	6.0E+03	3.0E+03	8.0E+03	3.0E+03	3.0E+03	6.0E+03	2.0E+03	2.0E+03	1.0E+03	
<i>Noctiluca scintillans</i>			x	x	x				x			
<i>Oblea</i> sp.			2.0E+03		x							
<i>Peridinium</i> spp.	4.0E+03	8.0E+03	x	2.0E+03	x	x	x	2.0E+03				
<i>Phalacroma rotundata</i>										5.0E+01		
<i>Polykrykos schwartzii</i>		x			x							
<i>Prorocentrum dentatum</i>					1.0E+03							
<i>Prorocentrum gracile</i>			x	x								
<i>Prorocentrum triestinum</i>					1.0E+03	1.0E+03	x					
<i>Protoceratium reticulatum</i>			x	x					x			
<i>Protoperidinium</i> spp.		4.0E+03	x	x	x	x	x	x	x		x	
<i>Scrippsiella</i> spp.	8.0E+03	8.0E+03			x	2.0E+03	x					
Chrysophytes												
<i>Calycomonas</i> sp.			4.0E+03		1.0E+03		1.0E+04			1.0E+03		
<i>Dinobryon</i> sp.							x					
Prymnesiophytes												
<i>Chrysochromulina</i> spp.	3.2E+04	4.0E+04	2.8E+04	2.3E+04	1.3E+04	1.3E+04	1.5E+04	2.4E+04	1.3E+04	1.5E+04	5.0E+03	
<i>Emiliana huxleyi</i>	4.0E+03	1.2E+04	2.0E+04	3.8E+04	1.1E+04	3.7E+04	1.7E+04	2.2E+04	3.3E+04	3.2E+04	4.3E+04	
Cryptophytes												
<i>Hemiselmis</i> sp.	1.4E+05	9.6E+04	1.6E+04	2.1E+04	2.1E+04	1.8E+04	2.5E+04	3.2E+04	1.9E+04	2.1E+04	1.0E+04	
<i>Leucocryptos marina</i>	x	4.0E+03	x	2.0E+03		1.0E+03			2.0E+03	2.0E+03		
<i>Plagioselmis prolunga</i>	1.3E+05	9.6E+04	2.4E+04	1.1E+04	2.0E+04	2.5E+04	2.2E+04	3.4E+04	1.6E+04	1.4E+04	5.0E+03	
<i>Teleaulax acuta</i>	3.6E+04	2.4E+04	8.0E+03	4.0E+03	2.0E+03	7.0E+03	2.0E+03	8.0E+03	5.0E+03	1.0E+03	2.0E+03	
Prasinophytes												
<i>Pyramimonas</i> spp.	5.6E+04	6.4E+04	2.8E+04	2.1E+04	1.1E+04	1.8E+04	1.4E+04	2.4E+04	1.3E+04	7.0E+03	1.1E+04	
<i>Tetraselmis</i> spp.	8.0E+03	4.0E+03	1.4E+04	4.0E+03	4.0E+03	5.0E+03		4.0E+03	6.0E+03		5.0E+03	
Euglenophyta												
<i>Eutreptiella</i> spp.	x			1.0E+03	1.0E+03	3.0E+03	2.0E+03			x	x	
Other												
<i>Dictyocha octonaria</i>					x							
Unidentified amoeba				3.0E+03	1.0E+03							
VSQAP Phytoplankton action levels in cells per litre (DPI, 2008)	Comparative data in the report											
Taxa	Warning to growers	Yarra River at Newport	Hobsons Bay	Central Bay	PoM DMG	Corio Bay	Long Reef	Patterson River	Dromana	Middle Ground Shelf	Sorrento Bank	Popes Eye
<i>Pseudo-nitzschia</i> spp.	50 000	800	x						x			
<i>Rhizosolenia cf chunii</i>	10 000			x	x				x			
<i>Alexandrium catenella</i>	100											
<i>Alexandrium minutum</i>	100											
<i>Alexandrium tamarense</i>	100					x						
<i>Dinophysis acuminata</i>	1 000		50		x	100	x				x	
<i>Dinophysis caudata</i>	1 000											
<i>Dinophysis fortii</i>	1 000											
<i>Gymnodinium catenatum</i>	100											
<i>Karenia mikimotoi</i>	1 000											
<i>Karenia brevis</i>	1 000											
<i>Prorocentrum lima</i>	1 000											

NOTES

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

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