



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 12 (DECEMBER 2008)

JANUARY 2009

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 December 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.

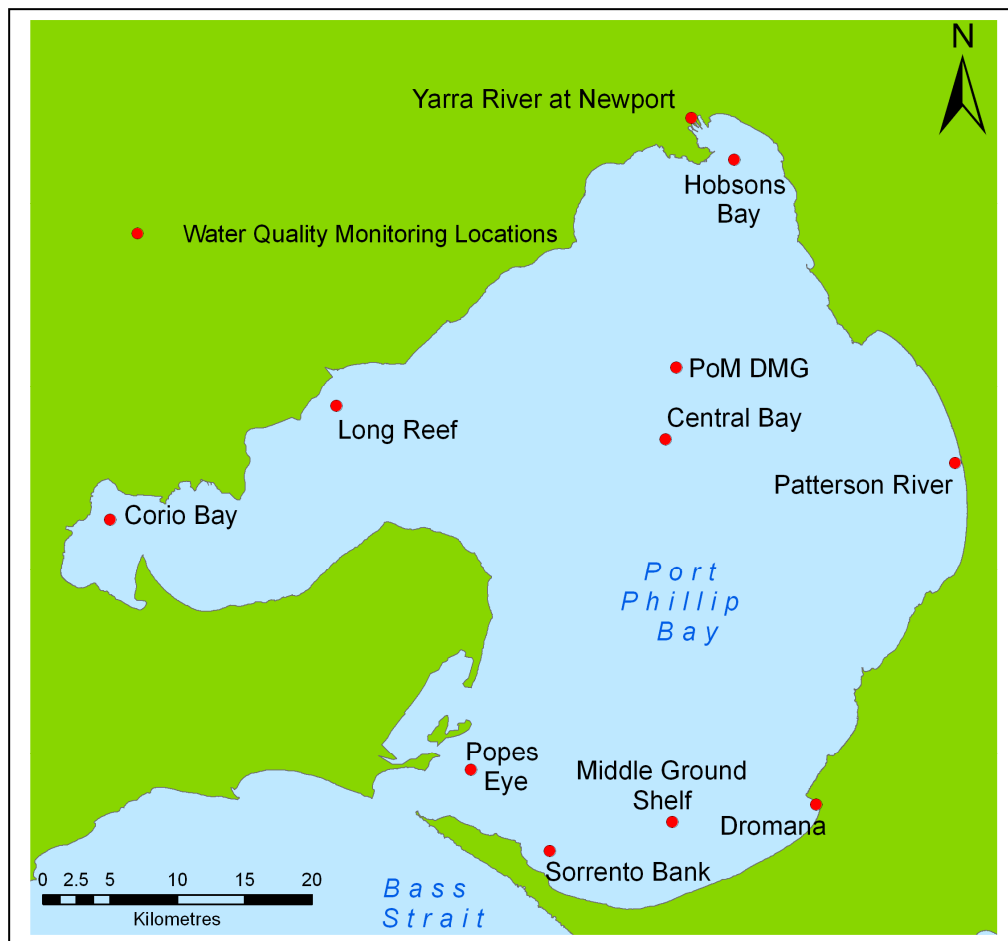


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY

MATERIALS AND METHODS

The materials and methods for this program are described in the CDP Water Quality Detailed Design document CDP_ENV_MD_023 Rev 1.1 (PoMC 2008).

EXCEPTIONS

There were no new exceptions to the Water Quality detailed design document 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 for various parameters.

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 EWMA control limits were exceeded four times. There were no exceedences of the Shewhart control limits (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 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.

TABLE 1 PHYSICO-CHEMICAL PARAMETERS (NST – No Sample Taken; NVR – No Valid Result)

Date	Sampling Site	Depth m	Dissolved Oxygen		Salinity g/L	Secchi disc depth m	Temperature °C	Turbidity NTU	Total Suspended Solids ¹ mg/L	PAR micro Einsteins/m ² /sec
			mg/L	% saturation						
08/12/08	Yarra River at Newport	0.5	8.0	106	34.2	1.9	19.1	2.1	4.8	108.7
08/12/08	Yarra River at Newport	10.5	NST	NST	NST		NST	3.8	NST	4.1
08/12/08	Hobsons Bay	0.5	7.1	95	36.7	2.8	18.6	1.5	2.4	1594.6
08/12/08	Central Bay	0.5	7.3	95	37.0	7.2	17.0	0.8	<1.5	343.9
08/12/08	PoM DMG	0.5	7.3	95	37.0	6.5	17.2	<0.5	<1.5	995.8
09/12/08	Corio Bay	0.5	7.3	96	38.0	5.1	17.5	<0.5	<1.5	516.4
09/12/08	Long Reef	0.5	7.3	96	37.2	5.3	17.6	0.6	<1.5	345.1
08/12/08	Patterson River	0.5	7.3	97	35.5	>3.0 ²	18.9	0.8	2.2	100.0
08/12/08	Dromana	0.5	7.8	106	36.8	5.0	19.8	1.0	<1.5	81.8
08/12/08	Middle Ground Shelf	0.5	7.2	94	36.8	9.2	17.3	<0.5	<1.5	258.9
09/12/08	Sorrento Bank	0.5	7.3	93	36.5	>3.0 ²	16.3	0.6	<1.5	113.2
09/12/08	Popes Eye	0.5	7.6	97	35.7	NVR ³	16.5	<0.5	<1.5	113.6

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. Limit of Reporting (LOR) has been amended where previously reported as Limit of Detection (see Exception Report ER080901)
2. Secchi disc visible on bottom.
3. No Valid Result due to the tide impact on secchi disc trajectory.

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
08/12/08	Yarra River at Newport	0.5	6.8	20.0	2.9	<1.2	2.9	34.2	135	213	239
08/12/08	Hobsons Bay	0.5	7.2	8.8	2.0	<1.2	<2.4	9.3	211	251	196
08/12/08	Central Bay	0.5	7.3	5.8	1.9	<1.2	<2.4	1.9	106	144	138
08/12/08	PoM DMG	0.5	7.4	5.7	1.9	<1.2	<2.4	2.5	107	136	141
09/12/08	Corio Bay	0.5	7.6	6.0	2.1	<1.2	<2.4	2.2	147	181	184
09/12/08	Long Reef	0.5	6.3	15.0	1.7	<1.2	<2.4	28.8	126	155	220
08/12/08	Patterson River	0.5	8.8	6.8	10.8	<1.2	10.8	7.4	139	193	167
08/12/08	Dromana	0.5	9.0	6.8	2.9	<1.2	2.9	4.2	120	163	140
08/12/08	Middle Ground Shelf	0.5	6.6	5.2	2.0	<1.2	<2.4	2.0	108	131	128
09/12/08	Sorrento Bank	0.5	7.9	5.6	1.9	<1.2	<2.4	4.0	75	119	117
09/12/08	Popes Eye	0.5	8.6	6.5	3.7	<1.2	3.7	6.5	65	91	105

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 (see Exception Report ER080901).

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 ¹	EWMA		Measured Value ¹	EWMA	
08/12/08	Yarra River at Newport	0.5	46.2	64.4	28	74	87	120
08/12/08	Hobsons Bay	0.5	53.9	69.3	19	73	90	90
08/12/08	Central Bay	0.5	44.3	51.3	<18	59	65	126
08/12/08	PoM DMG	0.5	44.5	50.7	<18	60	65	123
09/12/08	Corio Bay	0.5	52.6	65.7	<18	70	84	107
09/12/08	Long Reef	0.5	41.1	105.0	23	64	128	105
08/12/08	Patterson River	0.5	47.7	57.7	20	67	75	141
08/12/08	Dromana	0.5	31.0	39.0	<18	46	52	63
08/12/08	Middle Ground Shelf	0.5	36.9	40.8	<18	50	53	74
09/12/08	Sorrento Bank	0.5	27.4	28.5	<18	39	38	52
09/12/08	Popes Eye	0.5	<7.5	19.0	<18	<18	29	27

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 (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								
08/12/08	Yarra River at Newport - total	0.5	1.9	2.3	<2	<0.2	<0.5	<1	<0.1	1.2	0.4	11
08/12/08	Yarra River at Newport - dissolved	0.5	NAR	-	NAR	NAR	NAR	NAR	NAR	NAR	NAR	<5
08/12/08	Hobsons Bay - total	0.5	2.4	2.8	<2	<0.2	<0.5	<1	<0.1	1.4	<0.2	<5
08/12/08	Central Bay - total	0.5	2.3	2.8	NST ¹	<0.2	<0.5	<1	<0.1	0.7	<0.2	<5
08/12/08	PoM DMG - total	0.5	2.2	2.7	NST ¹	<0.2	0.7	<1	<0.1	1.4	<0.2	<5
09/12/08	Corio Bay - total	0.5	2.4	2.8	NST ¹	<0.2	<0.5	<1	<0.1	1	<0.2	<5
09/12/08	Long Reef - total	0.5	2.6	2.9	NST ¹	<0.2	0.5	<1	<0.1	1.7	0.4	<5
08/12/08	Patterson River - total	0.5	2.4	2.7	NST ¹	<0.2	<0.5	<1	<0.1	0.8	<0.2	<5
08/12/08	Dromana - total	0.5	2.3	2.6	NST ¹	<0.2	<0.5	<1	<0.1	0.8	<0.2	<5
08/12/08	Middle Ground Shelf - total	0.5	2.2	2.5	NST ¹	<0.2	<0.5	<1	<0.1	0.5	<0.2	<5
09/12/08	Sorrento Bank - total	0.5	2.0	2.3	NST ¹	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
09/12/08	Popes Eye - total	0.5	1.8	2.1	NST ¹	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5

NOTES:

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 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						
08/12/08	Yarra River at Newport	0.5	4.01	2.10	0.59	1.45	2.4E+06	1.9E+06	5.0E+04	4.7E+05
08/12/08	Yarra River at Newport	10.5	NST ¹	-	NST ¹	0.78				
08/12/08	Hobsons Bay	0.5	1.12	1.39	<0.18	0.28	8.5E+05	6.7E+05	2.7E+04	1.5E+05
08/12/08	Central Bay	0.5	0.42	0.66	<0.18	0.24	2.3E+05	1.0E+05	1.4E+04	1.1E+05
08/12/08	PoM DMG	0.5	0.32	0.56	<0.18	0.11	2.2E+05	7.6E+04	2.0E+04	1.2E+05
09/12/08	Corio Bay	0.5	0.44	0.65	<0.18	0.21	5.4E+05	2.0E+05	7.0E+04	2.7E+05
09/12/08	Long Reef	0.5	0.47	1.09	<0.18	0.35	3.4E+05	1.6E+05	3.4E+04	1.5E+05
08/12/08	Patterson River	0.5	0.89	0.92	<0.18	0.19	8.4E+05	6.4E+05	2.3E+04	1.8E+05
08/12/08	Dromana	0.5	0.69	0.71	<0.18	0.36	5.6E+05	4.4E+05	6.6E+03	1.1E+05
08/12/08	Middle Ground Shelf	0.5	0.28	0.55	<0.18	0.14	3.4E+05	2.4E+05	1.0E+04	9.4E+04
09/12/08	Sorrento Bank	0.5	0.48	0.63	<0.18	0.27	4.9E+05	3.3E+05	8.0E+03	1.5E+05
09/12/08	Popes Eye	0.5	0.34	0.54	<0.18	0.18	2.0E+05	1.4E+05	1.0E+04	5.4E+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.

Blue coloured cells indicate a result outside SEPP objective (annual 90th percentile) (see Appendix 1, Table 7 for details).

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.

REFERENCES

PoMC 2008, Water Quality Detailed Design CDP_ENV_MD_023 Rev1.1, Port of Melbourne Corporation, September 2008.

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).

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.
The EWMA is a statistic that averages the data in a way that gives less weight to data as they are further removed in time. To do this EWMA applies weighting factors which decrease exponentially over time. This gives relatively greater importance to recent observations while still not discarding older observations entirely.
EWMA is being used in this context to detect persistent changes from a baseline 'target' concentration, usually the historical mean of the data, which may reflect long term changes in water quality. An upper control limit for the EWMA has been calculated to assist in deciding whether a persistent change from the target value may have occurred
- 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).

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 1.1 (available on the Channel Deepening Project website www.channelproject.com).

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)				Attenuation of PAR			Turbidity			Suspended Solids (mg/L)		Chlorophyll-a (ug/L)		Channel Deepening PARAMETER														
			Min for 1m below surface	Min 1m above bottom	Lower limit for 90th percentile	Min percentage concentration	Salinity variation	Temperature (°C)	Secchi disc depth (m)	Annual 90th percentile	NTU	Annual 50th percentile	Annual 90th percentile	Annual 50th percentile	Annual 90th percentile	Chlorophyll-a (ug/L)	Annual 90th percentile	Ammonium (µg/L)	Nitrate plus nitrite (µg/L)	Total nitrogen (µg/L)	Phosphate (µg/L)	Total Phosphorus (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	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		>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

ANZECC trigger values not highlighted

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	8/12/2008	8/12/2008	8/12/2008	8/12/2008	9/12/2008	9/12/2008	8/12/2008	8/12/2008	8/12/2008	9/12/2008	9/12/2008	
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	
Genus	Species											
	Estimate Cells/L											
Total Phytoplankton	2.4E+06	8.5E+05	2.3E+05	2.2E+05	5.4E+05	3.4E+05	8.4E+05	5.6E+05	3.4E+05	4.9E+05	2.0E+05	
Diatoms	1.9E+06	6.7E+05	1.0E+05	7.6E+04	2.0E+05	1.6E+05	6.4E+05	4.4E+05	2.4E+05	3.3E+05	1.4E+05	
Dinoflagellates	5.0E+04	2.7E+04	1.4E+04	2.0E+04	7.0E+04	3.4E+04	2.3E+04	6.6E+03	1.0E+04	8.0E+03	1.0E+04	
Other flagellates	4.7E+05	1.5E+05	1.1E+05	1.2E+05	2.7E+05	1.5E+05	1.8E+05	1.1E+05	9.4E+04	1.5E+05	5.4E+04	
Diatoms												
<i>Amphora</i>	sp.		x			3.3E+03	x	1.7E+04	3.3E+03	x	8.0E+03	2.0E+03
<i>Ardissonea</i>	<i>crystallina</i>						x		x		x	x
<i>Attheya</i>	sp.							3.3E+03				
<i>Cerataulina</i>	<i>pelagica</i>	1.0E+04	x									
<i>Chaetoceros</i>	spp.	1.1E+06	4.7E+05	3.2E+04	4.0E+04	3.0E+04	4.8E+04	4.4E+05	2.3E+05	7.0E+04	1.3E+05	3.6E+04
<i>Cocconeis</i>	spp.		1.0E+04	1.0E+04		3.7E+04	4.0E+04	2.0E+04	1.7E+04	4.0E+03	1.2E+04	1.4E+04
<i>Coscinodiscus</i>	spp.		x			x				x		
<i>Cylindrotheca</i>	<i>closterium</i>	1.0E+04	6.7E+03	x	4.0E+03	3.7E+04	2.2E+04	2.3E+04	3.3E+03	4.0E+03	1.6E+04	6.0E+03
<i>Dactyliosolen</i>	<i>blavyanus</i>			x		x		x	3.3E+03	x	x	
<i>Dactyliosolen</i>	<i>fragilissimus</i>	x	3.3E+03					1.7E+04	x		x	8.0E+03
<i>Ditylum</i>	<i>brightwellii</i>	1.0E+04	x					x				
<i>Entomoneis</i>	sp.	1.0E+04	3.3E+03			x		6.7E+03			2.0E+03	
<i>Eucampia</i>	<i>zodiacus</i>	6.0E+04	1.3E+04								x	
<i>Fragilaria</i>	sp.	x	x			x	2.0E+03	x		2.0E+03	2.0E+03	x
<i>Fragilariopsis</i>	sp.					x	4.0E+03	6.7E+03	x			6.0E+03
<i>Grammotophora</i>	<i>marina</i>						x		x		2.0E+03	
<i>Guinardia</i>	<i>flaccida</i>		x	4.0E+03	x			x	x	2.0E+03	x	x
<i>Hemiaulus</i>	<i>hauckii</i>			x	2.0E+03			x		2.0E+03		
<i>Leptocylindrus</i>	<i>danicus</i>	x	3.7E+04	x	x			3.3E+04	1.2E+05	1.0E+05	1.0E+05	2.8E+04
<i>Licmophora</i>	sp.	1.0E+04				x	2.0E+03	3.3E+03	x		x	x
<i>Navicoid</i>	spp.	1.0E+04	6.7E+03		x	6.7E+03		6.7E+03	1.0E+04	4.0E+03	1.4E+04	x
<i>Nitzschia</i>	spp.	1.0E+04	6.7E+03	4.0E+03	x	2.0E+04	2.2E+04	6.7E+03	1.3E+04		8.0E+03	4.0E+03
<i>Pleurosigma</i>	sp.			x	x		x	x		x	4.0E+03	x
<i>Pseudo-nitzschia</i>	<i>delicatissima</i> group		4.4E+03						x		x	
<i>Pseudo-nitzschia</i>	<i>pungens/multiseris</i>	5.6E+03					x	1.0E+02	x	4.0E+02		
<i>Rhizosolenia</i>	spp.	x	x	x	6.0E+03	x	x	6.7E+03	3.3E+03	6.0E+03	x	x
<i>Skeletonema</i>	<i>japonica/pseudocostatum</i>	2.7E+05	2.7E+04				x	x	3.0E+04		x	3.0E+04
<i>Striatella</i>	<i>unipunctata</i>					3.3E+03		3.3E+03			4.0E+03	x
<i>Surirella</i>	sp.					x						
<i>Thalassiosira</i>	sp.	x		1.0E+04	x					4.0E+03		
<i>Thalassiosira</i>	<i>cf. mala</i>	3.6E+05	7.7E+04	4.0E+04	2.4E+04	6.0E+04	1.6E+04	5.0E+04	1.0E+04	4.0E+04	3.4E+04	4.0E+03

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	Popes Eye	
Collection Date	8/12/2008	8/12/2008	8/12/2008	8/12/2008	9/12/2008	9/12/2008	8/12/2008	8/12/2008	8/12/2008	9/12/2008	9/12/2008	
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	
Genus	Estimate Cells/L											
Total Phytoplankton	2.4E+06	8.5E+05	2.3E+05	2.2E+05	5.4E+05	3.4E+05	8.4E+05	5.6E+05	3.4E+05	4.9E+05	2.0E+05	
Diatoms	1.9E+06	6.7E+05	1.0E+05	7.6E+04	2.0E+05	1.6E+05	6.4E+05	4.4E+05	2.4E+05	3.3E+05	1.4E+05	
Dinoflagellates	5.0E+04	2.7E+04	1.4E+04	2.0E+04	7.0E+04	3.4E+04	2.3E+04	6.6E+03	1.0E+04	8.0E+03	1.0E+04	
Other flagellates	4.7E+05	1.5E+05	1.1E+05	1.2E+05	2.7E+05	1.5E+05	1.8E+05	1.1E+05	9.4E+04	1.5E+05	5.4E+04	
Dinoflagellates												
<i>Alexandrium catenella</i>	x											
<i>Alexandrium pseudogonyaulax</i>	x	x		5.0E+01		x	x					
<i>Alexandrium tamarense</i>					x		x					
<i>Amphidinium spp.</i>			x	x							x	
<i>Ceratium tenue</i>		x	x	x		x	x	x	x		x	
<i>Ceratium tripos</i>				x					x	x		
<i>Dinophysis acuminata</i>		1.0E+02		x	x							
<i>Gonyaulax spp.</i>	x			x			x					
<i>Gymnodinium spp.</i>	5.0E+04	1.7E+04	1.0E+04	6.0E+03	1.0E+04	1.2E+04	1.3E+04	x	6.0E+03	2.0E+03	4.0E+03	
<i>Heterocapsa rotundata</i>		1.0E+04	4.0E+03	1.2E+04	6.0E+04	2.0E+04	1.0E+04	3.3E+03	4.0E+03	6.0E+03	6.0E+03	
<i>Noctiluca scintillans</i>			x	x					x	x		
<i>Peridinium spp.</i>			x	x		x			x			
<i>Polykrykos schwartzii</i>					x							
<i>Preperidinium meuneri</i>		x										
<i>Prorocentrum gracile</i>		x	x	x							x	
<i>Protoceratium reticulatum</i>		x	x	x	x				x			
<i>Protoperdinium spp.</i>	x	x	x	x	x		x	3.3E+03	x	x	x	
<i>Pyrocystis lunula</i>			x									
<i>Scrippsiella spp.</i>			x	2.0E+03		2.0E+03						
Chrysophytes												
<i>Calycomonas sp.</i>		3.3E+03	4.0E+03	1.0E+04	3.3E+03			3.3E+03	4.0E+03			
Prymnesiophytes												
<i>Chrysochromulina spp.</i>	5.0E+04	2.0E+04	2.4E+04	1.6E+04	5.3E+04	1.8E+04	3.0E+04	2.0E+04	1.4E+04	2.6E+04	8.0E+03	
<i>Emiliania huxleyi</i>	4.0E+04	3.3E+03	3.6E+04	3.8E+04	1.7E+04		1.7E+04	1.3E+04	3.0E+04	4.0E+04	1.8E+04	
<i>Prymnesium patelliferum</i>										2.0E+03		
Cryptophytes												
<i>Hemiselmis sp.</i>	1.7E+05	3.0E+04	2.0E+04	2.4E+04	7.3E+04	3.8E+04	4.3E+04	1.3E+04	1.8E+04	2.6E+04	1.4E+04	
<i>Leucocryptos marina</i>	1.0E+04		x	2.0E+03		4.0E+03			2.0E+03			
<i>Plagioselmis prolunga</i>	7.0E+04	3.7E+04	6.0E+03	1.2E+04	5.0E+04	2.4E+04	3.0E+04	1.7E+04	1.4E+04	1.6E+04	6.0E+03	
<i>Teleaulax acuta</i>	4.0E+04	1.3E+04	2.0E+03	2.0E+03	6.7E+03	2.0E+03	1.0E+04	3.3E+03		6.0E+03		
Prasinophytes												
<i>Pyramimonas spp.</i>	7.0E+04	3.7E+04	6.0E+03	8.0E+03	4.7E+04	2.6E+04	1.3E+04	6.7E+03	1.0E+04	2.6E+04	8.0E+03	
<i>Tetraselmis spp.</i>	2.0E+04	3.3E+03	8.0E+03	8.0E+03	1.7E+04	2.2E+04	3.3E+04	1.0E+04	2.0E+03	4.0E+03	x	
Euglenophyta												
<i>Eutreptiella spp.</i>		6.7E+03	4.0E+03	2.0E+03	6.7E+03	1.2E+04		2.3E+04				
Other												
<i>Dictyocha octonaria</i>	x											
<i>Haramonas dimorpha</i>						9.0E+02						
<i>Unidentified choanoflagellates</i>			2.0E+03			2.0E+03						
<i>Mesodinium rubrum</i>						x						
Comparative data in the report												
VSQAP Phytoplankton action levels in per litre (DPI, 2008)	cells	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	5600	4400				x	100	x	400	x	
<i>Rhizosolenia cf chunii</i>	10 000	x	x	x	x	x	x	x	x	x	x	x
<i>Alexandrium catenella</i>	100	x										
<i>Alexandrium minutum</i>	100											
<i>Alexandrium tamarense</i>	100							x				
<i>Dinophysis acuminata</i>	1 000		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

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