



BAYWIDE WATER QUALITY MONITORING PROGRAM

PROGRESS REPORT No. 3 (MARCH 2008) EDITION 2

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 March 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.

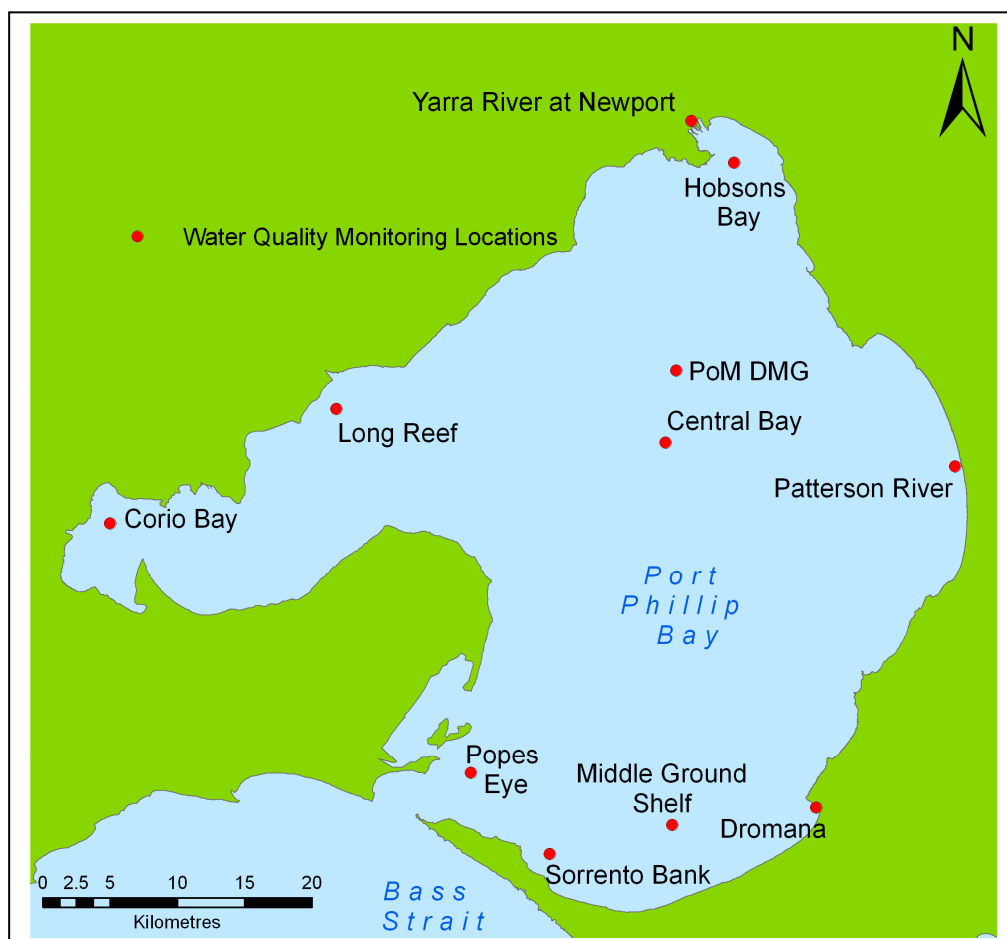


FIGURE 1 MAP OF SAMPLING SITES IN PORT PHILLIP BAY



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).

Within this reporting period the Shewhart control limits were exceeded twice and the EWMA control limits were exceeded five times (see Tables 1 - 4).

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

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

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.

Five exceptions to the Water Quality Detailed Design CDP_ENV_MD_023 Rev 0 were noted for this reporting period. They are detailed in Exception Reports ER080301, ER080304, ER080305, ER080306 and ER080307 respectively, and outlined as follows:

- ER080301. The monitoring was not undertaken within a two week window starting from the second Monday of the month. It was commenced on 12 March and was completed on 28 March.
- ER080304. Confirmation of SEPP segments for the 11 monitoring locations resulted in revised objectives being included in this report for two sites (see Table 7). Previous data for these two sites in Progress Report No. 1 and 2 are compared to the revised objectives and presented as Table 9 in Appendix 3 of this report.
- ER080305. Table 2 of Progress Report No. 2 incorrectly lists "Dissolved Organic Phosphorus" where it should be "Organic Phosphorus" as specified in the Detailed Design. To address this matter, errata are provided in this report as Table 10 in Appendix 3.
- ER080306. A change in method for the calculation of Dissolved Organic Nitrogen has resulted in not all sites having these results (see Table 2a).
- ER080307. Incorrectly calculated EWMA values were originally presented in Edition 1 of this report (as published on the Office of the Environmental Monitor website on 13 May 2008). Revised EWMA values are presented in Tables 2 – 4, and a summary of changes is provided as Table 11 within Appendix 3 in this (Edition 2) report.



TABLE 1 PHYSICO-CHEMICAL PARAMETERS

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						
19/03/08	Yarra River at Newport	0.5	7.0	99	37.2	1.4	21.9	4.08	7.2	1155.5
19/03/08	Yarra River at Newport	7.0	7.0	100	37.2		22.3	4.82	7.2	46.8 ¹
19/03/08	Hobsons Bay	0.5	7.4	103	37.4	0.9	20.9	4.51	9.0	714.6
19/03/08	Central Bay	0.5	7.3	99	37.4	4.2	19.7	1.15	1.9	568.5
19/03/08	PoM DMG	0.5	7.5	104	37.4	3.7	20.3	1.03	1.9	981.9
19/03/08	Corio Bay	0.5	7.0	98	38.5	2.3	20.6	2.22	4.7	45.3
19/03/08	Long Reef	0.5	7.3	102	37.9	2.6	21.1	1.62	3.2	92.1
19/03/08	Patterson River	0.5	7.4	104	37.6	>2.4 ²	21.3	1.02	2.0	410.1
12/03/08	Dromana	0.5	7.1	99	37.2	>5.0 ²	20.7	0.50	1.5	152.6
28/03/08	Middle Ground Shelf	0.5	8.0	106	37.2	4.8	18.0	0.90	1.3	91.5
28/03/08	Sorrento Bank	0.5	7.8	104	37.1	>2.6 ²	18.8	0.83	0.9	367.3
28/03/08	Popes Eye	0.5	7.9	105	37.2	6.5	17.9	0.62	0.4	736.6

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 *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, NAR - No Analysis Required)

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
19/03/08	Yarra River at Newport	0.5	14.2	6.4	5.8	<0.4	5.8	2.3	123	196	218
19/03/08	Yarra River at Newport	7.0	16.2	NAR	5.4	<0.4	5.4	NAR	NDA ¹	196	NAR
19/03/08	Hobsons Bay	0.5	5.9	5.8	2.5	<0.4	2.5	7.1	129	176	190
19/03/08	Central Bay	0.5	6.5	5.2	2.8	<0.4	2.8	1.3	122	159	149
19/03/08	PoM DMG	0.5	7.4	5.2	3.8	<0.4	3.8	1.5	135	175	149
19/03/08	Corio Bay	0.5	4.9	4.6	1.6	<0.4	1.6	1.3	NDA ¹	213	199
19/03/08	Long Reef	0.5	5.5	32.4	1.8	<0.4	1.8	28.2	161	207	276
19/03/08	Patterson River	0.5	8.5	6.6	2.6	<0.4	2.6	7.8	NDA ¹	171	186
12/03/08	Dromana	0.5	5.8	6.4	1.9	<0.4	1.9	1.8	NDA ¹	152	146
28/03/08	Middle Ground Shelf	0.5	4.9	5.0	2.3	<0.4	2.3	1.1	123	155	139
28/03/08	Sorrento Bank	0.5	6.9	6.1	2.5	<0.4	2.5	1.3	140	171	124
28/03/08	Popes Eye	0.5	5.4	5.9	2.0	<0.4	2.0	2.7	129	155	108

NOTES:

Yellow coloured cells indicate measured results above the Shewhart control limit (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).

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 (NAR - No Analysis Required)

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	
19/03/08	Yarra River at Newport	0.5	65	61	25	90	94	250
19/03/08	Yarra River at Newport	7.0	65	NAR	26	91	NAR	273
19/03/08	Hobsons Bay	0.5	61	66	23	84	90	194
19/03/08	Central Bay	0.5	58	58	15	73	73	141
19/03/08	PoM DMG	0.5	54	49	19	73	71	141
19/03/08	Corio Bay	0.5	72	78	29	101	100	123
19/03/08	Long Reef	0.5	88	139	31	119	160	198
19/03/08	Patterson River	0.5	60	62	3.2	82	81	79
12/03/08	Dromana	0.5	48	48	17	65	63	113
28/03/08	Middle Ground Shelf	0.5	47	45	18	65	65	89
28/03/08	Sorrento Bank	0.5	36	28	15	51	42	88
28/03/08	Popes Eye	0.5	48	21	17	64	33	96

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).



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

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								
19/03/08	Yarra River at Newport - total	0.5	3.4	2.9	<2	<0.2	0.7	1	<0.1	1.1	<0.2	<5
19/03/08	Yarra River at Newport - dissolved	0.5	3.4	-	NST	<0.2	<0.5	1	NAR	0.9	<0.2	<5
19/03/08	Yarra River at Newport - total	7.0	3.5	NAR	NST	<0.2	0.6 ³	1	<0.1	0.6	<0.2	8
19/03/08	Yarra River at Newport - dissolved	7.0	3.4	-	NST	<0.2	<0.5	1	<0.1	NVR	<0.2	7
19/03/08	Hobsons Bay - total	0.5	3.2	3.0	<2	<0.2	0.6	<1	<0.1	0.7	<0.2	<5
19/03/08	Hobsons Bay - dissolved	0.5	3.2	-	NST	<0.2	<0.5	<1	NAR	0.7	<0.2	<5
19/03/08	Central Bay - total	0.5	3.2	2.8	NST	<0.2	<0.5	<1	<0.1	0.6	<0.2	<5
19/03/08	Central Bay - dissolved	0.5	3.2	-	NST	<0.2	<0.5	<1	<0.1	0.9 ²	<0.2	5 ²
19/03/08	PoM DMG - total	0.5	3.3	3.1	NST	<0.2	<0.5	<1	<0.1	0.7	<0.2	<5
19/03/08	PoM DMG - dissolved	0.5	3.2	-	NST	<0.2	<0.5	<1	NAR	0.8 ²	<0.2	<5
19/03/08	Corio Bay - total	0.5	3.6	3.4	NST	<0.2	<0.5	<1	<0.1	1.9	<0.2	<5
19/03/08	Corio Bay - dissolved	0.5	3.4	-	NST	<0.2	<0.5	<1	<0.1	1.4	<0.2	<5
19/03/08	Long Reef - total	0.5	3.4	3.1	NST	<0.2	<0.5	<1	<0.1	0.6	<0.2	<5
19/03/08	Long Reef - dissolved	0.5	3.7	-	NST	<0.2	<0.5	<1	<0.1	0.7 ²	<0.2	8 ²
19/03/08	Patterson River - total	0.5	3.4	2.7	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	8
19/03/08	Patterson River - dissolved	0.5	3.3	-	NST	<0.2	<0.5	<1	<0.1	0.8 ²	<0.2	12 ²
12/03/08	Dromana - total	0.5	3.3	2.7	NST	<0.2	<0.5	1	<0.1	0.7	<0.2	8
12/03/08	Dromana - dissolved	0.5	2.8	-	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	14 ²
28/03/08	Middle Ground Shelf - total	0.5	3.3	3.0	NST	<0.2	<0.5	<1	<0.1	0.7	<0.2	<5
28/03/08	Middle Ground Shelf - dissolved	0.5	2.7	-	NST	<0.2	<0.5	2 ²	<0.1	<0.5	<0.2	<5
28/03/08	Sorrento Bank - total	0.5	3.0	2.7	NST	<0.2	<0.5	2	<0.1	0.6	<0.2	<5
28/03/08	Sorrento Bank - dissolved	0.5	2.6	-	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5
28/03/08	Popes Eye - total	0.5	3.4	2.6	NST	<0.2	<0.5	<1	<0.1	0.6	<0.2	<5
28/03/08	Popes Eye - dissolved	0.5	2.8	-	NST	<0.2	<0.5	<1	<0.1	<0.5	<0.2	<5



NOTES:

Yellow coloured cells indicate measured results above the Shewhart control limit (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).

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. Control limits not applicable to bottom samples, only derived for near surface results.



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) µg/L	Total Phytoplankton cells/L	Diatoms cells/L	Dinoflagellates cells/L	Other flagellates cells/L
			Measured Value	EWMA						
19/03/08	Yarra River at Newport	0.5	1.56	3.74	0.51	0.52	8.1 E+05	5.5 E+05	5.0 E+03	2.6 E+05
19/03/08	Yarra River at Newport	7.0	NST ¹	NST ¹	NST ¹	0.70				
19/03/08	Hobsons Bay	0.5	1.57	1.97	0.29	0.77	8.0 E+05	9.3 E+04	0.0 E+00	7.1 E+05
19/03/08	Central Bay	0.5	1.13	0.79	0.01	0.37	8.9 E+05	5.7 E+05	5.5 E+04	2.6 E+05
19/03/08	PoM DMG	0.5	0.94	0.56	-0.09 ²	0.29	6.2 E+05	4.9 E+05	1.0 E+04	1.3 E+05
19/03/08	Corio Bay	0.5	1.84	1.10	0.24	0.94	7.8 E+05	6.0 E+05	1.0 E+04	1.7 E+05
19/03/08	Long Reef	0.5	1.66	2.13	0.33	0.83	2.1 E+05	1.5 E+05	6.1 E+03	5.1 E+04
19/03/08	Patterson River	0.5	1.07	0.95	0.41	0.57	9.1 E+05	8.1 E+05	1.5 E+04	9.0 E+04
12/03/08	Dromana	0.5	0.46	0.69	0.12	0.29	3.8 E+05	2.2 E+05	3.8 E+04	1.3 E+05
28/03/08	Middle Ground Shelf	0.5	0.95	0.75	0.22	0.64	6.3 E+05	5.2 E+05	3.5 E+04	7.8 E+04
28/03/08	Sorrento Bank	0.5	0.72	0.57	0.02	0.27	3.3 E+05	2.8 E+05	2.5 E+03	4.3 E+04
28/03/08	Popes Eye	0.5	0.89	0.63	0.07	0.34	4.4 E+05	3.6 E+05	2.3 E+04	5.3 E+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.
2. Negative phaeophytin-a result due to matrix effects.



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.



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	*	*	*	1.06	*	NA
Dromana	222.84	11.03	5.71	89.64	75.42	3.58	*	NA	*	*	*	1.14	*	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- <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 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		Dissolved oxygen (% saturation)			Salinity variation	Temperature (°C)	Secchi disc depth (m)	Attenuation of PAR	Chlorophyll-a (ug/L)		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)	
	SEPP (WoV) schedule & segment	ANZECC Level of Protection	Min for 1m below surface	Min 1m above bottom	Lower limit for 90th percentile					Annual 90th percentile	Turbidity (NTU)															Annual median
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
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	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 Schedule F6 - Waters of Port Phillip Bay objectives.
ANZECC trigger values not highlighted.

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



APPENDIX 2

TABLE 8. PHYTOPLANKTON DATA

Analysis of phytoplankton species in water sample
Mar-08

		Dromana	Central Bay	Corio	Hobsons Bay	Long Reef	Patterson River	PoM DMG	Yarra River at Newport	Middle Ground Shelf	Popes Eye	Sorrento Bank
Collection Date		12/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	28/03/2008	28/03/2008	28/03/2008
Count Method		Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Species	Estimate Cells/L										
Total Phytoplankton		3.8E+05	8.9E+05	7.8E+05	8.0E+05	2.1E+05	9.1E+05	6.2E+05	8.1E+05	6.3E+05	4.4E+05	3.3E+05
Diatoms		2.2E+05	5.7E+05	6.0E+05	9.3E+04	1.5E+05	8.1E+05	4.9E+05	5.5E+05	5.2E+05	3.6E+05	2.8E+05
Dinoflagellates		3.8E+04	5.5E+04	1.0E+04	0.0E+00	6.1E+03	1.5E+04	1.0E+04	5.0E+03	3.5E+04	2.3E+04	2.5E+03
Other flagellates		1.3E+05	2.6E+05	1.7E+05	7.1E+05	5.1E+04	9.0E+04	1.3E+05	2.6E+05	7.8E+04	5.3E+04	4.3E+04
Diatoms												
<i>Amphora</i>	<i>sp.</i>				x	1.0E+03	1.5E+04				2.5E+03	2.5E+03
<i>Ardissonea</i>	<i>crystallina</i>			x								
<i>Asterionellopsis</i>	<i>glacialis</i>	6.0E+03								7.5E+03	1.5E+04	2.3E+04
<i>Anaulus</i>	<i>australis</i>											
<i>Asteromphalus</i>	<i>sarcophagus</i>		x					1.5E+04	x	2.5E+03	5.0E+03	x
<i>Bacillaria</i>	<i>paxillifera</i>			x	x					x		x
<i>Bacteriastrium</i>	<i>elegans</i>			2.0E+04		1.0E+03				x		
<i>Cerataulina</i>	<i>pelagica</i>		5.0E+03				x	x	1.0E+04	x	x	2.5E+03
<i>Cerataulina</i>	<i>sp.</i>											
<i>Chaetoceros</i>	<i>spp.</i>	8.4E+04	1.9E+05	4.3E+05	2.0E+04	8.6E+04	3.9E+05	1.2E+05	3.0E+04	4.1E+05	2.5E+05	1.8E+05
<i>Cocconeis</i>	<i>spp.</i>		1.5E+04	1.5E+04	1.0E+04	5.0E+03	5.0E+03		5.0E+03	5.0E+03	7.5E+03	1.3E+04
<i>Coscinodiscus</i>	<i>spp.</i>				x		x		x	x		
<i>Cylindrotheca</i>	<i>closterium</i>	1.6E+04	5.0E+03	5.0E+04	3.0E+04	1.4E+04	3.5E+04	1.0E+04	1.0E+04	1.5E+04	7.5E+03	x
<i>Dactylosolen</i>	<i>antarcticus</i>		5.0E+03			x	5.0E+03	5.0E+03	5.0E+03	1.3E+04	1.0E+04	5.0E+03
<i>Dactylosolen</i>	<i>fragilissimus</i>		5.0E+03	5.0E+03						x		2.5E+03
<i>Diploneis</i>	<i>sp.</i>	x						5.0E+03		2.5E+03		
<i>Ditylum</i>	<i>brightwellii</i>		5.0E+03							x		x
<i>Encyonema</i>	<i>sp.</i>	4.0E+03				1.0E+03						
<i>Entomoneis</i>	<i>sp.</i>		5.0E+03	x					5.0E+03	1.0E+04	2.5E+03	2.5E+03
<i>Eucampia</i>	<i>zodiacus</i>	2.0E+03	5.0E+04		x		x	x	x	x	2.5E+03	x
<i>Fallacia</i>	<i>sp.</i>											
<i>Fragilaria</i>	<i>sp.</i>	4.0E+03				2.0E+03						2.5E+03
<i>Grammotophora</i>	<i>serpentina</i>					2.0E+03						
<i>Guinardia</i>	<i>fiaccida</i>		5.0E+03				x			2.5E+03		
<i>Hemiaulus</i>	<i>hauckii</i>		1.5E+04	1.0E+04	x		5.0E+03	1.5E+04	1.0E+04	x	5.0E+03	1.0E+04
<i>Hemiaulus</i>	<i>sp.</i>	2.0E+03										
<i>Leptocylindrus</i>	<i>danicus</i>	1.0E+04	2.4E+05	2.0E+04	x	4.0E+03	9.0E+04	2.7E+05	2.5E+04	2.8E+04	1.8E+04	2.8E+04
<i>Leptocylindrus</i>	<i>minimus</i>					4.0E+03						
<i>Licmophora</i>	<i>sp.</i>	x		5.0E+03		6.0E+03			x			x
<i>Lioloma</i>	<i>sp.</i>					x						
<i>Lithodesmium</i>	<i>sp.</i>					x						
<i>Minidiscus</i>	<i>tricolulatus</i>	8.0E+03				2.0E+03						
<i>Minutocellus</i>	<i>sp.</i>					1.0E+03						
<i>Naviculoid</i>	<i>spp.</i>	2.0E+03		1.5E+04	5.0E+03	2.0E+03	1.5E+04		5.0E+03	5.0E+03		5.0E+03
<i>Nitzschia</i>	<i>spp.</i>		1.0E+04	1.5E+04	2.0E+04	8.0E+03	1.0E+04	1.0E+04	1.0E+04	2.5E+03	5.0E+03	2.5E+03
<i>Plagiotropis</i>	<i>sp.</i>											
<i>Pleurosigma</i>	<i>sp.</i>	x	1.5E+04	5.0E+03	x	x	x	1.0E+04	x	2.5E+03		x
<i>Proboscia</i>	<i>alata</i>		x		x		5.0E+03	x	x	x	5.0E+03	x
<i>Pseudo-nitzschia</i>	<i>delicatissima</i> group	4.0E+03	2.0E+03	4.0E+03	1.2E+03	5.0E+03	2.4E+03	4.0E+02	1.2E+03	5.0E+02	3.0E+03	4.0E+02
<i>Pseudo-nitzschia</i>	<i>galaxiae</i>		4.0E+02		1.2E+03	1.0E+03		4.0E+02	3.4E+03			
<i>Pseudo-nitzschia</i>	<i>pungens/multiseriis</i>	x	4.4E+03	1.6E+03	4.8E+03	x	9.8E+03	5.0E+03	1.2E+03	1.1E+03	9.4E+03	1.0E+03
<i>Pseudo-nitzschia</i>	<i>turgidula</i>			8.0E+02	8.0E+02	2.0E+03						8.0E+02
<i>Pseudo-nitzschia</i>	<i>turgidula/dolorosa</i>											
<i>Rhizosolenia</i>	<i>spp.</i>		5.0E+03		x		x		x	x	x	x
<i>Rhizosolenia</i>	<i>setigera</i>	4.0E+03										
<i>Skeletonema</i>	<i>costatum/pseudocostatum</i>	6.4E+04										
<i>Skeletonema</i>	<i>japonica/pseudocostatum</i>				x		2.2E+05		4.1E+05		5.0E+03	
<i>Striatella</i>	<i>unipunctata</i>					x					2.5E+03	
<i>Surirella</i>	<i>sp.</i>											
<i>Thalassionema</i>	<i>sp.</i>					1.0E+03				x	x	x
<i>Thalassiosira</i>	<i>sp.</i>					1.0E+03		5.0E+03		5.0E+03	2.5E+03	x
<i>Thalassiosira</i>	<i>cf. mala</i>	8.0E+03				4.0E+03	1.0E+04	2.0E+04	2.0E+04	1.0E+04	5.0E+03	1.0E+04



TABLE 8. PHYTOPLANKTON DATA (CONT'D)

	Dromana	Central Bay	Corio	Hobsons Bay	Long Reef	Patterson River	PoM DMG	Yarra River at Newport	Middle Ground Shelf	Popes Eye	Sorrento Bank
Collection Date	12/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	19/03/2008	28/03/2008	28/03/2008	28/03/2008
Count Method	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick	Sedgewick
Genus	Estimate Cells/L										
Total Phytoplankton	3.8E+05	8.9E+05	7.8E+05	8.0E+05	2.1E+05	9.1E+05	6.2E+05	8.1E+05	6.3E+05	4.4E+05	3.3E+05
Diatoms	2.2E+05	5.7E+05	6.0E+05	9.3E+04	1.5E+05	8.1E+05	4.9E+05	5.5E+05	5.2E+05	3.6E+05	2.8E+05
Dinoflagellates	3.8E+04	5.5E+04	1.0E+04	0.0E+00	6.1E+03	1.5E+04	1.0E+04	5.0E+03	3.5E+04	2.3E+04	2.5E+03
Other flagellates	1.3E+05	2.6E+05	1.7E+05	7.1E+05	5.1E+04	9.0E+04	1.3E+05	2.6E+05	7.8E+04	5.3E+04	4.3E+04
Dinoflagellates											
<i>Alexandrium</i> sp.					5.0E+01						
<i>Alexandrium pseudogonyaulax</i>											
<i>Amphidiniopsis</i> sp.											
<i>Amphidinium</i> sp.											
<i>Ceratium fusus</i>				x	x	x					
<i>Ceratium tenue</i>	x	5.0E+03	5.0E+03	x			x		x	x	x
<i>Ceratium tripos</i>				x	x	x			x	x	
<i>Dinophysis acuminata</i>						5.0E+01					
<i>Dinophysis/Phalacroma rotundatum</i>											
<i>Gonyaulax</i> spp.					x						
<i>Gymnodinium</i> spp.	1.4E+04	2.0E+04	5.0E+03		3.0E+03	5.0E+03	5.0E+03	5.0E+03	3.0E+04	2.3E+04	2.5E+03
<i>Gyrodinium</i> spp.	6.0E+03	1.5E+04			3.0E+03		5.0E+03			x	
<i>Heterocapsa rotundata</i>	1.0E+04	1.5E+04				5.0E+03			2.5E+03		
<i>Noctiluca scintillans</i>				x		x					
<i>Peridinium</i> sp.									2.5E+03		
<i>Preperidinium meuneri</i>	x										
<i>Prorocentrum gracile</i>				x							x
<i>Prorocentrum micans</i>	2.0E+03										
<i>Prorocentrum triestinum</i>	2.0E+03										
<i>Protoceratium reticulatum</i>											
<i>Protoperdinium</i> spp.		x		x	x	x			x		x
<i>Protoperdinium bipes</i>	2.0E+03										
<i>Protoperdinium claudicans</i>	2.0E+03										
<i>Protoperdinium pentagonum</i>											
<i>Scippisiella</i> spp.	x			x	x	5.0E+03			x	x	x
<i>Takayama pulchella</i>									2.0E+02		
Chrysophytes											
<i>Calycomonas</i> sp.	2.0E+03				3.0E+03	5.0E+03			2.5E+03		
<i>Ochromonas</i> spp.	8.0E+03				1.0E+03						
Prymnesiophytes											
<i>Calciopappus caudatus</i>											
<i>Chrysochromulina</i> spp.	4.0E+03	5.0E+03			1.2E+04	5.0E+03	5.0E+03	5.0E+03			2.5E+03
<i>Emiliania huxleyi</i>	8.0E+03	2.0E+03			2.0E+03		5.0E+03		1.0E+04	5.0E+03	
<i>Gephyrocapsa oceanica</i>	2.0E+03	5.0E+04	5.0E+03		1.0E+03	1.5E+04	5.5E+04	1.5E+04	1.5E+04	2.5E+03	7.5E+03
Cryptophytes											
<i>Goniomonas pacifica</i>	2.0E+03										
<i>Hemiselmis</i> sp.	2.4E+04	4.5E+04	4.5E+04	3.2E+05	6.0E+03	2.0E+04	1.0E+04	7.5E+04	1.8E+04	1.5E+04	1.0E+04
<i>Leucocryptos marina</i>	4.0E+03	5.0E+03	x	1.0E+04	2.0E+03			5.0E+03		2.5E+03	
<i>Plagioselmis prolunga</i>	5.2E+04	1.0E+05	8.0E+04	2.0E+05	1.5E+04	1.5E+04	1.0E+04	8.5E+04	2.0E+04	1.5E+04	7.5E+03
<i>Teleaulax acuta</i>	4.0E+03			2.5E+04	1.0E+03			2.0E+04	2.5E+03		
Prasinophytes											
<i>Micromonas pusilla</i>											
<i>Nephroselmis</i> sp.											
<i>Pterosperma</i> sp.											
<i>Pyramimonas</i> spp.	1.2E+04	3.5E+04	3.5E+04	1.5E+05	3.0E+03	1.0E+04	3.5E+04	5.0E+04	5.0E+03	1.0E+04	1.0E+04
<i>Tetraselmis</i> spp.	4.0E+03		5.0E+03	2.0E+04	1.0E+03	2.0E+04			2.5E+03	2.5E+03	5.0E+03
Euglenophyta											
<i>Eutreptiella</i> spp.				x	4.0E+03		5.0E+03		2.5E+03		
Other											
<i>Apedinella spinifera</i>											
<i>Ebria tripartita</i>								x			
<i>Unidentified bodonids</i>											
<i>Dictyocha fibula</i>									5.0E+01		

VQSAP Phytoplankton action levels in cells per litre (DPI, 2008)		Comparative data in the report										
		Dromana	Central Bay	Corio	Hobsons Bay	Long Reef	Patterson River	PoM DMG	Yarra River at Newport	Middle Ground Shelf	Popes Eye	Sorrento Bank
Taxa	Warning to growers											
<i>Pseudo-nitzschia</i> spp.	50 000	4000	6800	6400	8000	8000	12200	5800	5800	1550	12400	2200
<i>Rhizosolenia cf chunii</i>	10 000			0		0		0	0		0	0
<i>Alexandrium catenella</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Alexandrium minutum</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Alexandrium tamarense</i>	100	0	0	0	0	0	0	0	0	0	0	0
<i>Dinophysis acuminata</i>	1 000	0	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	0
<i>Dinophysis fortii</i>	1 000	0	0	0	0	0	0	0	0	0	0	0
<i>Gymnodinium catenatum</i>	100											
<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	0	0	0



NOTES

Sampling method of phytoplankton consisted of a qualitative sample using a ten minute net tow, and a quantitative grab sample using a water column hosepipe sampler enabling enumeration of phytoplankton.

“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.



APPENDIX. 3

TABLE 9. ERRATA FOR COMPARISON OF DATA FROM PROGRESS REPORT NO. 1 AND 2 TO REVISED SEPP OBJECTIVES FOR RELEVANT SITES

Date Sampled	Site	Secchi disc depth m	SEPP Objective - Inshore m	Chlorophyll-a µg/L	SEPP Objective – Inshore Annual median µg/L
1/11/07 ¹	Dromana	5.2	>3	0.39	1.5
29/11/07 ¹		5.0		0.45	
22/1/08 ¹		5.1		0.93	
21/2/08 ²		>4.6 ³		0.90	
1/11/07 ¹	Patterson River	>3.6 ³	>3	0.49	1.5
23/1/08 ¹		>3.9 ³		0.57	
21/2/08 ²		>3.5 ³		0.74	

NOTES

1. Refer Progress Report No. 1 (November 2007 – January 2008).
2. Refer Progress Report No. 2 (February 2008).
3. Secchi disc still clearly visible on the bottom.

TABLE 10. ERRATA FOR PROVISION OF ORGANIC PHOSPHORUS DATA TO REPLACE DISSOLVED ORGANIC PHOSPHORUS DATA FROM PROGRESS REPORT NO. 2

Date	Sampling Site	Depth m	Dissolved Organic Phosphorus µg/L	Organic Phosphorus µg/L
13/2/08	Yarra River at Newport	0.5	22	41
13/2/08	Yarra River at Newport	9.0	20	32
27/2/08	Hobsons Bay	0.5	20	31
27/2/08	Central Bay	0.5	17	23
27/2/08	PoM DMG	0.5	17	23
27/2/08	Corio Bay	0.5	21	31
27/2/08	Long Reef	0.5	15	27
21/2/08	Patterson River	0.5	9	20
21/2/08	Dromana	0.5	13	18
25/2/08	Middle Ground Shelf	0.5	29	38
25/2/08	Sorrento Bank	0.5	9	15
25/2/08	Popes Eye	0.5	12	13



TABLE 11. SUMMARY OF CHANGES TO EWMA VALUES IN PROGRESS REPORT NO. 3 FROM EDITION 1 (PUBLISHED ON 13 MAY 2008) TO EDITION 2 (THIS REPORT)

Date	Sampling Site	Depth m	Arsenic µg/L			Chlorophyll-a µg/L			Ammonium µg/L			Nitrate plus Nitrite µg/L		
			Measured Value	Incorrect EWMA	Revised EWMA	Measured Value	Incorrect EWMA	Revised EWMA	Measured Value	Incorrect EWMA	Revised EWMA	Measured Value	Incorrect EWMA	Revised EWMA
19/03/08	Yarra River at Newport	0.5	3.4	2.9	2.9	1.56	3.99	3.74	14.2	6.5	6.4	5.8	1.8	2.3
19/03/08	Hobsons Bay	0.5	3.2	2.6	3.0	1.57	2.15	1.97	5.9	9.4	5.8	2.5	15.5	7.1
19/03/08	Central Bay	0.5	3.2	2.5	2.8	1.13	0.79	0.79	6.5	5.9	5.2	2.8	0.9	1.3
19/03/08	PoM DMG	0.5	3.3	3.0	3.1	0.94	0.32	0.56	7.4	6.4	5.2	3.8	1.3	1.5
19/03/08	Corio Bay	0.5	3.6	3.1	3.4	1.84	1.06	1.1	4.9	6.5	4.6	1.6	1.1	1.3
19/03/08	Long Reef	0.5	3.4	2.9	3.1	1.66	2.36	2.13	5.5	59.2	32.4	1.8	25.4	28.2
19/03/08	Patterson River	0.5	3.4	2.5	2.7	1.07	1.18	0.95	8.5	7.0	6.6	2.6	13.4	7.8
12/03/08	Dromana	0.5	3.3	2.4	2.7	0.46	0.72	0.69	5.8	4.5	6.4	1.9	1.3	1.8
28/03/08	Middle Ground Shelf	0.5	3.3	2.9	3.0	0.95	0.52	0.75	4.9	6.6	5.0	2.3	1.0	1.1
28/03/08	Sorrento Bank	0.5	3.0	2.6	2.7	0.72	0.52	0.57	6.9	7.4	6.1	2.5	1.0	1.3
28/03/08	Popes Eye	0.5	3.4	2.4	2.6	0.89	0.57	0.63	5.4	6.6	5.9	2.0	2.2	2.7

NOTES

Incorrect EWMA data as originally published in Progress Report No.3 on the Office of the Environmental Monitor website on 13 May 2008 (see Exception Report ER080307).

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



TABLE 11. SUMMARY OF CHANGES TO EWMA VALUES IN PROGRESS REPORT NO. 3 FROM EDITION 1 (PUBLISHED ON 13 MAY 2008) TO EDITION 2 (THIS REPORT) (CONT'D)

Date	Sampling Site	Depth m	Total Nitrogen µg/L			Phosphate µg/L			Total Phosphorus µg/L		
			Measured Value	Incorrect EWMA	Revised EWMA	Measured Value	Incorrect EWMA	Revised EWMA	Measured Value	Incorrect EWMA	Revised EWMA
19/03/08	Yarra River at Newport	0.5	196	215	218	65	59	61	90	89	94
19/03/08	Hobsons Bay	0.5	176	211	190	61	71	66	84	91	90
19/03/08	Central Bay	0.5	159	151	149	58	60	58	73	74	73
19/03/08	PoM DMG	0.5	175	143	149	54	46	49	73	68	71
19/03/08	Corio Bay	0.5	213	203	199	72	85	78	101	104	100
19/03/08	Long Reef	0.5	207	322	276	88	141	139	119	172	160
19/03/08	Patterson River	0.5	171	190	186	60	62	62	82	76	81
12/03/08	Dromana	0.5	152	156	146	48	49	48	65	63	63
28/03/08	Middle Ground Shelf	0.5	155	138	139	47	48	45	65	65	65
28/03/08	Sorrento Bank	0.5	171	123	124	36	28	28	51	42	42
28/03/08	Popes Eye	0.5	155	102	108	48	16	21	64	30	33

NOTES

Incorrect EWMA data as originally published in Progress Report No.3 on the Office of the Environmental Monitor website on 13 May 2008 (see Exception Report ER080307).

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