WATERWATCH
Corangamite
Communities Caring For Catchments

CORANGAMITE WATERWATCH PROGRAM

WATER QUALITY REPORT - 2006

Swan Bay

Swan Bay Integrated Catchment Management Committee

Monitors: Sue Longmore, Michael Longmore, Jill Warneke, Wendy Kerry, Mal Kidson, Denise Moore and John Woods

Corangamite Waterwatch proudly supported by:

Barwon Water

CORANGAMITE CMA

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Introduction

Waterwatch is a national community water monitoring program with an environmental education and awareness focus. It brings together schools and community groups, Landcare groups, landowners, councils and water authorities to test the quality of their local stream or water body so that action can be taken to maintain or improve the water quality.

The Corangamite Region Waterwatch program is hosted by Barwon Water in partnership with Corangamite Catchment Management Authority and is sponsored by the National Action Plan.

These notes have been compiled by the Corangamite Waterwatch team and offer some reasons for the variations in the results. The problems are complex and the ideas presented here are designed to encourage discussion about the local waterways and the water quality issues that have been identified over the past 12 months. Waterwatch encourages groups to not only look at their own environment, but their whole waterway and catchment to find opportunities to improve their waterways.

It is important to realise that results can also vary with a number of factors including:

- the individual
- the expertise of the monitoring group
- time of day
- site of testing
- sampling method (eg. depth at which sample is taken)
- amount of recent rainfall
- seasonal variation
- accuracy of monitoring equipment

If you have any questions regarding the contents of this report, or would like further information about the Corangamite Waterwatch Program, please contact:

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Water Qualtiy Tests

The Corangamite Waterwatch Program test for a number of different parameters that indicate various physical and chemical properties and thus reflect the water quality in the rivers and streams. The following table lists the parameters tested and what they indicate.

Test	Unit	What Does This Test Measure?
Dissolved Oxygen	% sat	Dissolved oxygen measures the amount of oxygen gas dissolved into the water. The level of DO is affected by water temperature; higher temperatures result in lower amounts of dissolved oxygen.
pH	pH units	pH is a measure of the acidity or alkalinity of the water. pH levels above 7 are alkaline whilst pH levels below 7 are acidic. A pH of 7 is said to be neutral and in the middle of the pH range.
Temperature	^{o}C	Temperature is an important parameter to measure as fluctuations in water temperature can affect other parameters such as DO.
Conductivity	EC	Conductivity is a measure of the amount of dissolved salts in the water (salinity).
Turbidity	FAU	Turbidity is a measure of the clarity of water. The more suspended solids (eg. fine particles) the higher the turbidity.
Reactive Phosphate	mg P/L	Levels of phosphates indicate the nutrient status and organic enrichment of the water.

All of the physical and chemical parameters that are tested indicate a separate characteristic of the quality or health of the water in the rivers and streams. The following table lists the parameters that are tested within the Corangamite Waterwatch Program and gives a short description of why we test for them.

Test	Why do we test for this parameter?
Dissolved Oxygen	Dissolved oxygen varies according to the temperature of the water along with other factors including surface area (eg. if we have a high surface area to volume ratio, DO levels will generally be high). Very low levels of DO in the water will reduce the numbers of sensitive species in the ecosystem.
pH	pH levels above or below normal levels for a waterway may affect sensitive species. Extremely high or low levels may limit even the most hardy of species.
Temperature	Temperature has the same effect on aquatic ecosystems as pH. Too high or too low a temperature or severe temperature fluctuations may cause the death of even the most hardy of species. Temperature extremes may affect the way that larvae grow and result in species death over a longer period.
Conductivity	As with temperature and pH, the salinity of water can affect the way species within the ecosystem survive. Sensitive species die and reproduction of species may be affected if the water conductivity rises beyond normal ranges.
Turbidity	The turbidity of water can have a large effect on an ecosystem because the more cloudy the water, the less the sunlight penetrates it. This reduction in sunlight then reduces the ability of aquatic plants to photosynthesize and therefore their ability to make food for themselves and animals that feed on them. Reduction in photosynthesis also affects the amount of oxygen that is produced by plants in the water. This in turn leads to less oxygen being available for animals and plants to use.
Reactive Phosphate	If phosphate levels rise significantly above natural levels, they can lead to algal blooms, which in turn increase turbidity, pH and produce toxins that make the water unsafe to use.

Interpreting Data Using Condition Ratings - ANZECC and State Environment Protection Policy

ANZECC

All data reported in this report is compared with condition ratings based on Water Quality Guidelines for lowland rivers, ANZECC Guidelines, 1992. This method of assessment is widely used for snapshots of data eg when only limited data points are available for the sampling site.

ANZECC Water Quality Index (1992)

Parameter	Measurement	Ratings & Values				
		Excellent (4)	**Good (3)**	**Fair (2)**	**Poor (1)**	**Degraded (0)**
Dissolved Oxygen (DO)	% Saturation	81 – 110	71 – 80 111 – 130	51 – 70 131 – 150	41 – 50 151 – 160	< 40 > 161
pH	Units	6.5 – 7.5	6.0 – 6.4 or 7.6 – 8.0	5.5 – 5.9 or 8.1 – 8.5	5.0 – 5.4 or 8.6 – 9.0	<5.0 or >9.1
Reactive Phosphorus	mg P/L	< 0.01	0.011 – 0.025	0.026 – 0.05	0.051 – 0.1	> 0.1
Salinity (EC)	Electrical Conductivity (EC)	0 – 400	401 – 800	801 – 2,000	2,001 – 5,000	> 5,000
Turbidity (T)	FAU	< 10	10 – 20	20 – 30	30 – 50	> 50

The value of the rating can be added together to give a physico-chemical test water quality rating for the condition of the waterway. This rating is reported in the discussion section of the report. Similar condition scores can be performed on habitat and macroinvertebrate surveys (where the data is available) to give an overall waterway condition rating.

State Environment Protection Policy - SEPP (WoV)

Water quality can also be interpreted using the State Environment Protection Policy (Waters of Victoria) commonly referred to as SEPP (WoV)[1]. SEPP guidelines were developed by the EPA to provide a legal approach to environmental protection. Environment quality objectives ie the goal posts, are water quality or biological indicators set to protect the water environment. The SEPP describes the

(1) uses and values of the water environment (human consumption, irrigation etc) of the water environments and
(2) sets goal posts to know when they are protected and
(3) guidance on how to maintain them through an "attainment program".

The uses and values of the water environment are also called the beneficial uses ie those uses that depend on clean water eg human consumption or irrigation. The goal posts are the environment quality objectives that protect the water environment eg water quality or biological indicators.

SEPP was developed in conjunction with the Victorian River Health Strategy and is reviewed every 10 years. There are different types of water environment that SEPP defines as segments with different water quality objectives

[1] Policy Impact Statement State Environment Protection Policy (Waters of Victoria) Our Water, Our Future!, EPA, 2003. Publication available on internet http://www.epa.vic.gov.au/water/epa/wov.asp

1. Aquatic reserves of high conservation value with a water quality objective of "no variation from background condition"
2. Wetlands and Lakes (area that are wet on a regular or semi regular basis) that do not have a water quality objective yet
3. Rivers and Streams that range from forested areas and those that are cleared. The Corangamite region will have different water quality objectives for these different environments. The table on the following page has the description of rivers and streams and their associated water quality objectives used as the "goal posts" in the Corangamite Water Quality Reports.
4. Marine and estuarine water environments are diverse and environmental quality objectives are generally not set however Port Phillip Bay has specific protection and open coasts require a high level of ecosystem protection.

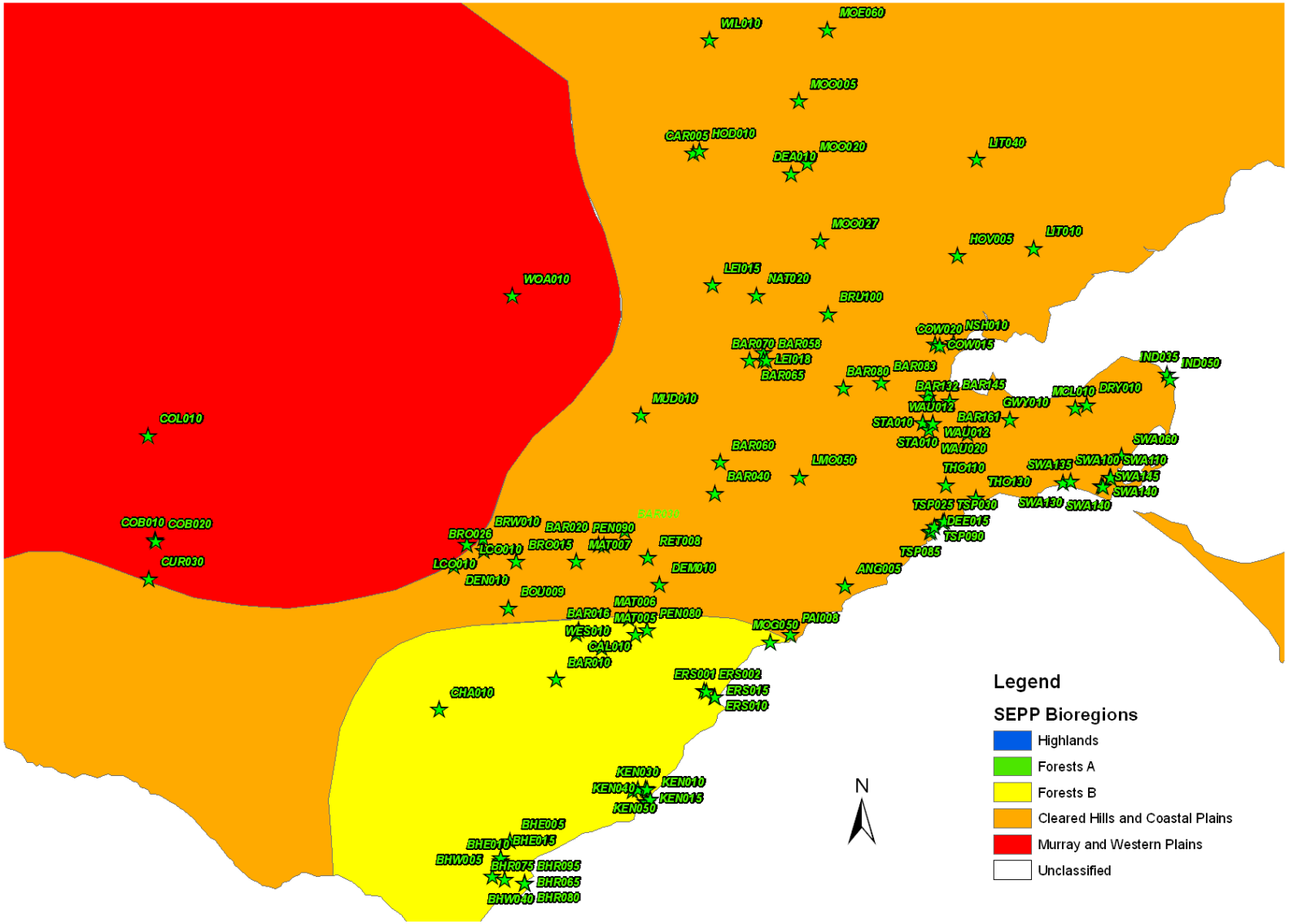
SEPP analysis can only be done where there are at least 11 data points for the year. SEPP analysis has been performed on all the river and stream data collected by Waterwatch monitors if there is enough data points collected. If insufficient data is able to be collected because of lack of water, this observation is mentioned in the results presentation.

The data is analysed statistically to calculate the 25^{th} and 75^{th} percentile ie the 75^{th} percentile is the value of the parameter (eg electrical conductivity) below which 75% of data points may be found. If the site data falls outside the required percentile, the water quality has not met the objective set to protect the uses and the values of the area. The result is that the objective is either met or not met.

SEPP Environmental Quality Objectives for the Corangamite region.

Segment	Indicator					
	Dissolved Oxygen (%sat)		Turbidity (NTU)	Electrical Conductivity (µS/cm)	pH units	
	25th percentile	maximum	75th percentile	75th percentile	25th percentile	75th percentile
Forested Areas – B						
Otway Ranges	90	110	5	500	6.4	7.7
All other areas	90	110	5	100	6.4	7.7
Cleared Hills and Coastal Plains						
Lowlands of the Barwon and Moorabool catchments	85	110	10	1500	6.5	8.3
Uplands of the Moorabool catchments	85	110	10	500	6.5	8.3
Murray and Western Plains						
Corangamite Basins	85	110	10	1500	6.5	8.3

The sites monitored in the Corangamite Waterwatch program fall into one of the segments Forests B, Cleared Hills and Coastal Plains, and Murray and Western Plains. Sites in the region have been mapped and are shown on the next page (map generated by Clare Marsh, Freshwater Services, EPA Victoria). The uplands of the Moorabool River are defined as having an altitude of more than 200m.



This map of the Corangamite region shows the location of monitoring sites in relation to SEPP bioregions

Waterwatch Monitoring Plan

Monitoring Purposes
- To implement a community based waterways monitoring program that will provide base line data contributing to a catchment-wide picture of waterway health and identify potential impacts on Swan Bay.

Information Users
- Swan Bay Integrated Catchment Management Committee (SBICMC)
- Local Councils- COGG, Queenscliff Borough Council
- Corangamite CMA
- Local schools, Landcare & Conservation groups
- Corangamite WaterWatch

Information Uses
- To aid in identification of waterway impacts on Swan Bay.
- Development of appropriate strategies addressing impacts.

Parameters Monitored
- Macro-invertebrate surveys one to four times a year at some sites
- Habitat Survey
- Physico-chemical parameters- pH, EC, Turbidity, D.O, Temp, Reactive phosphorous, Nitrate

Monitoring Sites
- All Waterwatch sites designated for the Swan Bay Catchment, SWA010- SWA150.

Monitoring Times
- Monthly- around mid month over a 1½ week period

Groups Involvement
- Bellarine Landcare, Bellarine Tree Group & Friends of Begola Wetlands
- Swan Bay Environment Association Volunteers & other community volunteers

Data Management and Presentation
- Forwarded to Swan Bay Catchment Facilitator then to Corangamite Waterwatch.
- Waterwatch Database
- Annual Water Quality Report

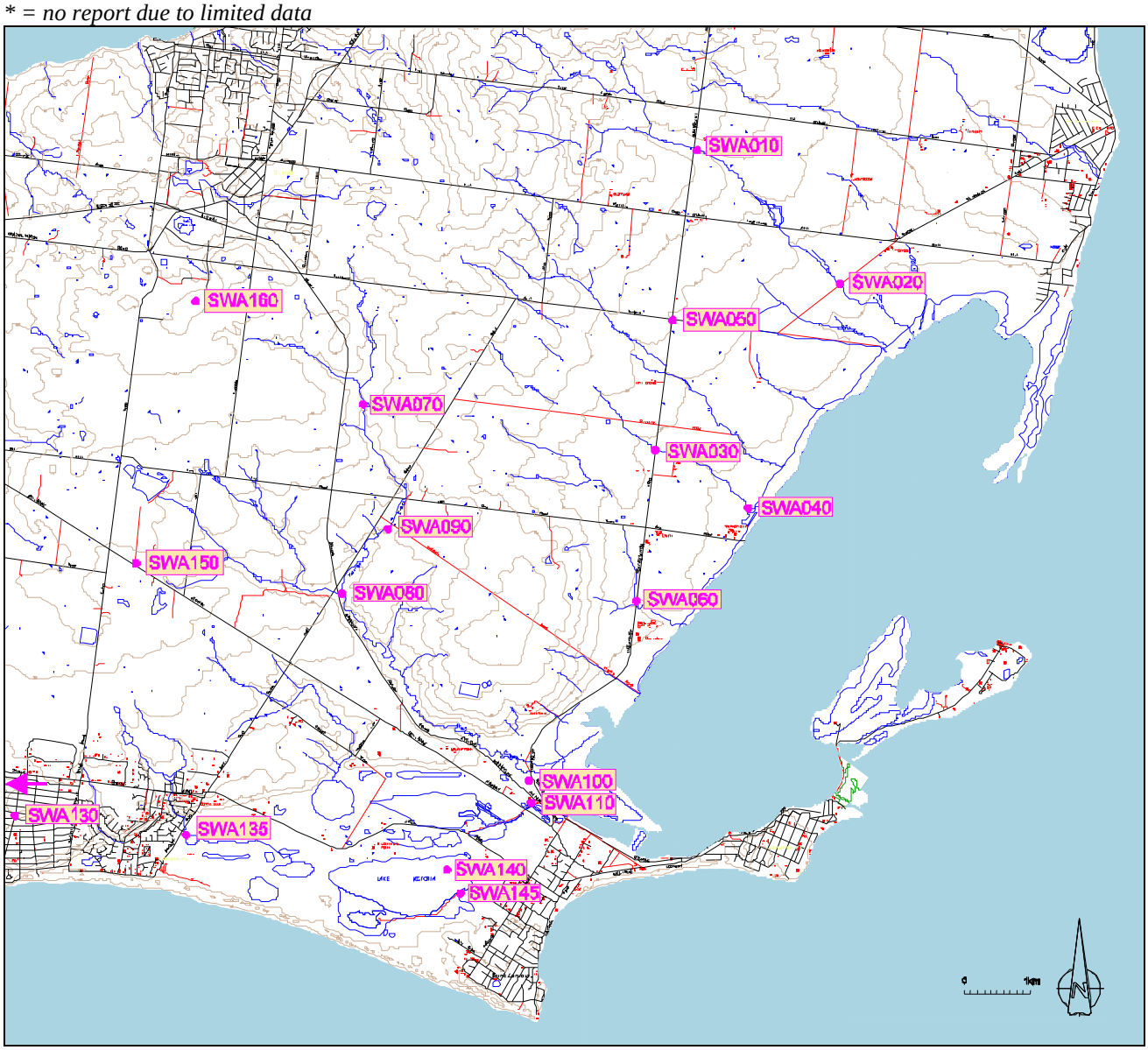
Data Credibility
- Regular calibration of meters.
- Participate in region QA/QC program.
- Attend local Waterwatch training sessions.
- Data needs to be credible enough to use in Water quality reports for Councils and Management authorities.
- Methods used as in Corangamite Region Waterwatch Field Manual.

Swan Bay Catchment Waterwatch Monitoring - Overview

Swan Bay Monitoring Sites

*SWA010 Old Tip Creek @ Queenscliff/Portarlington Road north of Murradoc Road**
*SWA060 Intersection of Queenscliff/Portarlington Road and Nye Road**
*SWA090 Yarram Creek @ Knights Road**
*SWA100 Yarram Creek @ Queenscliff/Portarlington Road**
SWA110 Lake Victoria Outfall @ Bellarine Highway, Point Lonsdale
*SWA120 Hesse Street Drain Outfall**
SWA130 Begola Wetlands
SWA135 Bonnyvale Wetlands @ Storm-water Drain intersection with Bonnyvale Road
SWA140 Hollywood Estate Storm water lagoon
SWA145 Lake Victoria
*SWA150 Yarram Creek Tributary @ Maddens Lane**
*SWA160 Drysdale Basin Reserve**

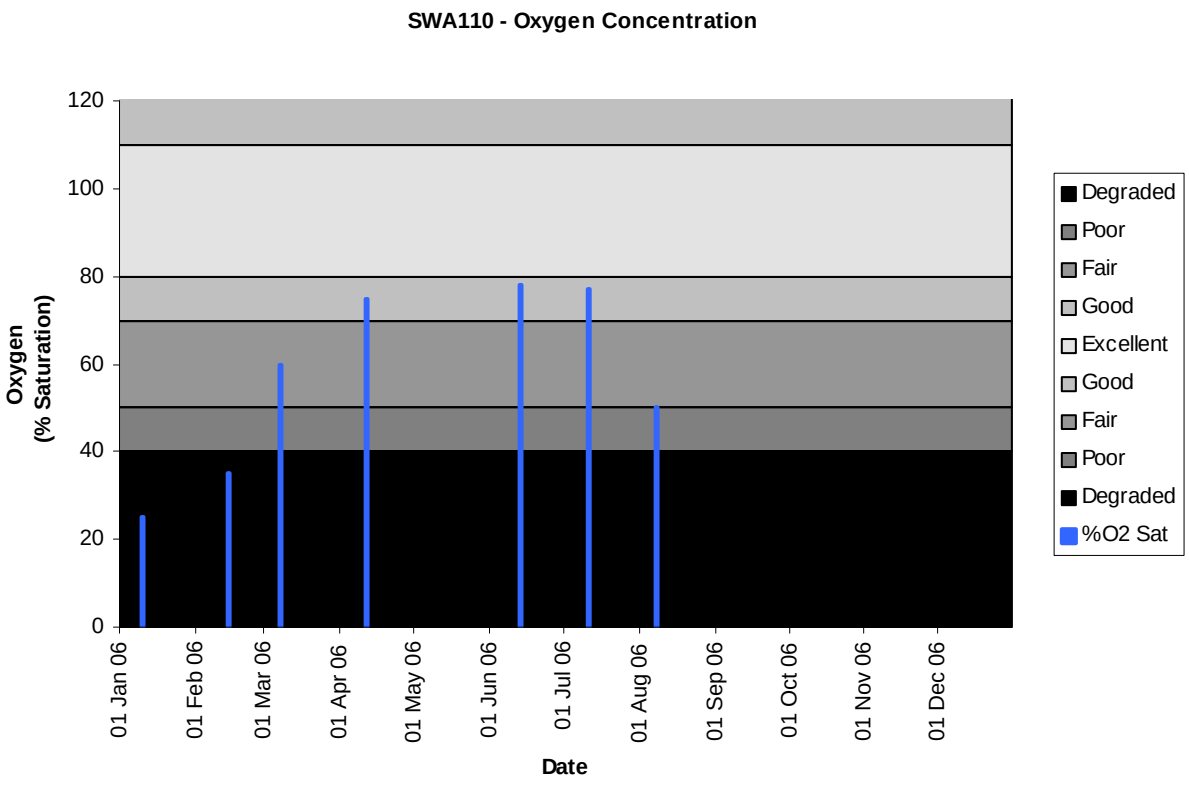
** = no report due to limited data*

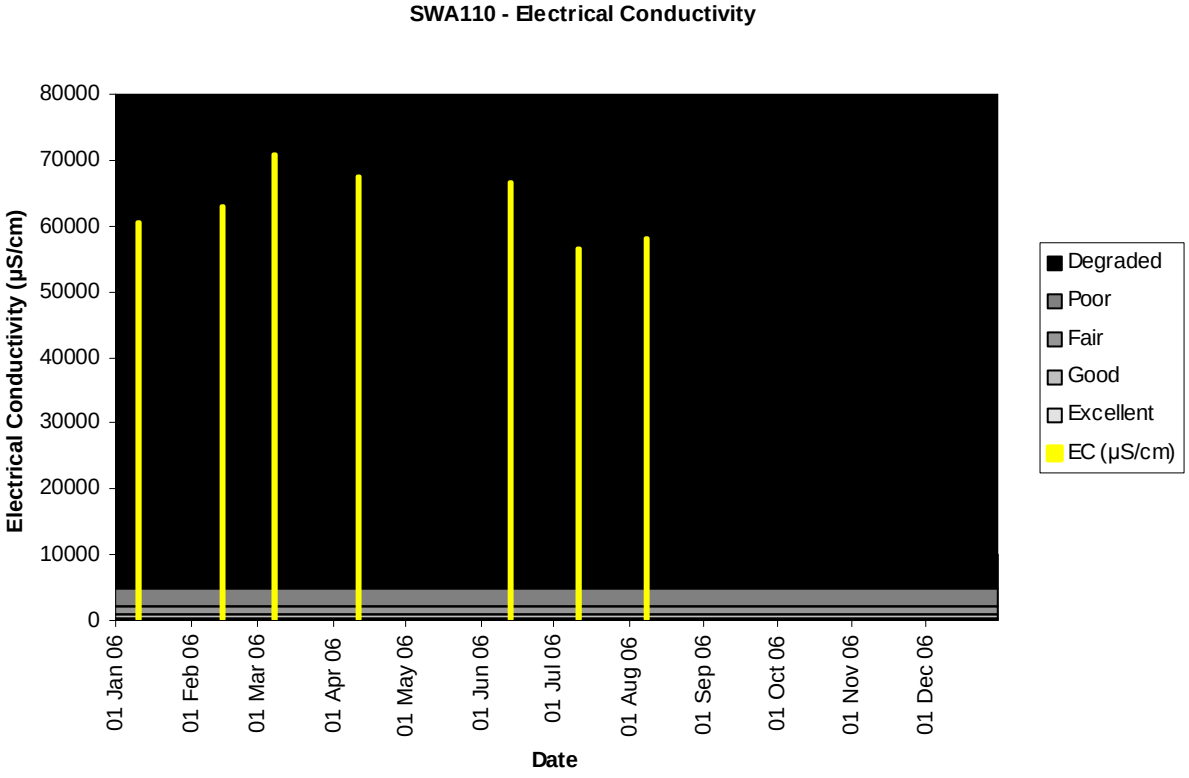


Map of Swan Bay district

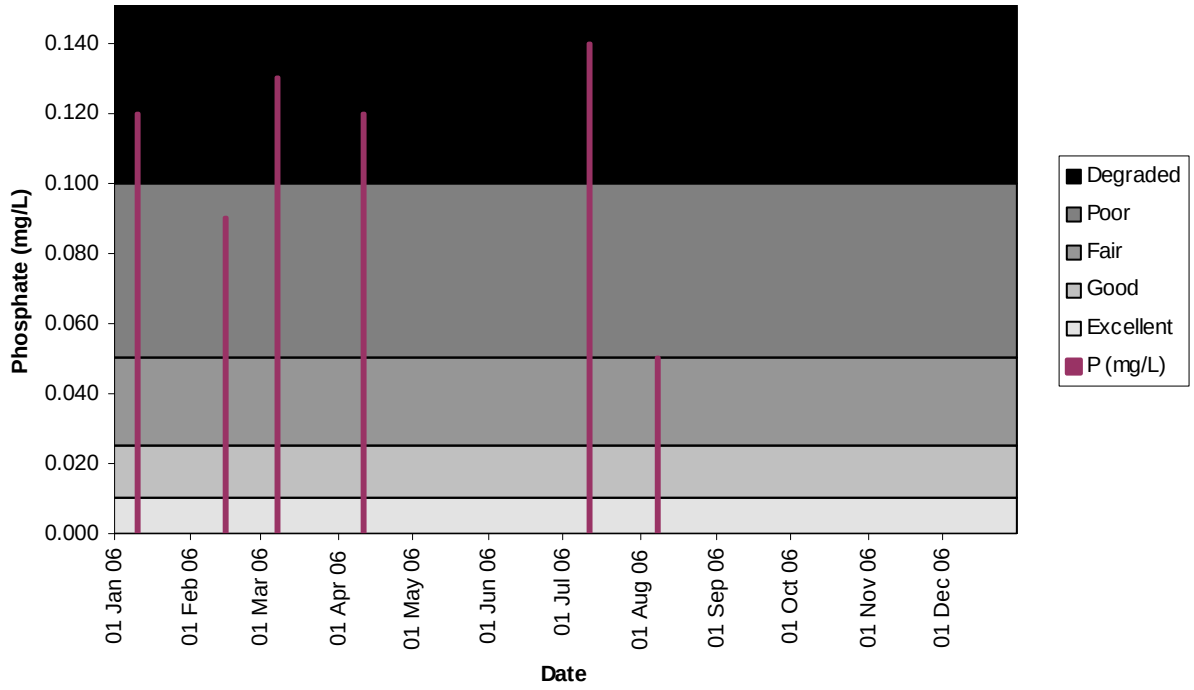
Swan Bay (Site Code SWA110)

Lake Victoria Outfall, Bellarine Highway

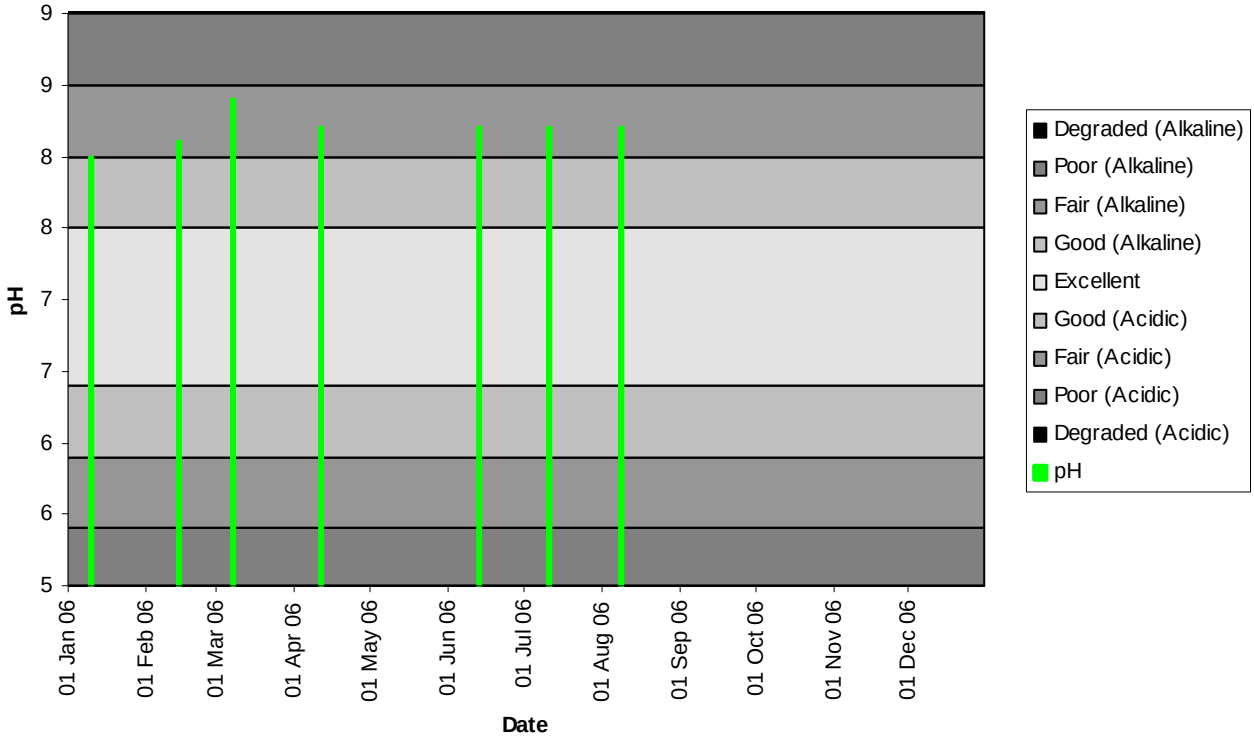


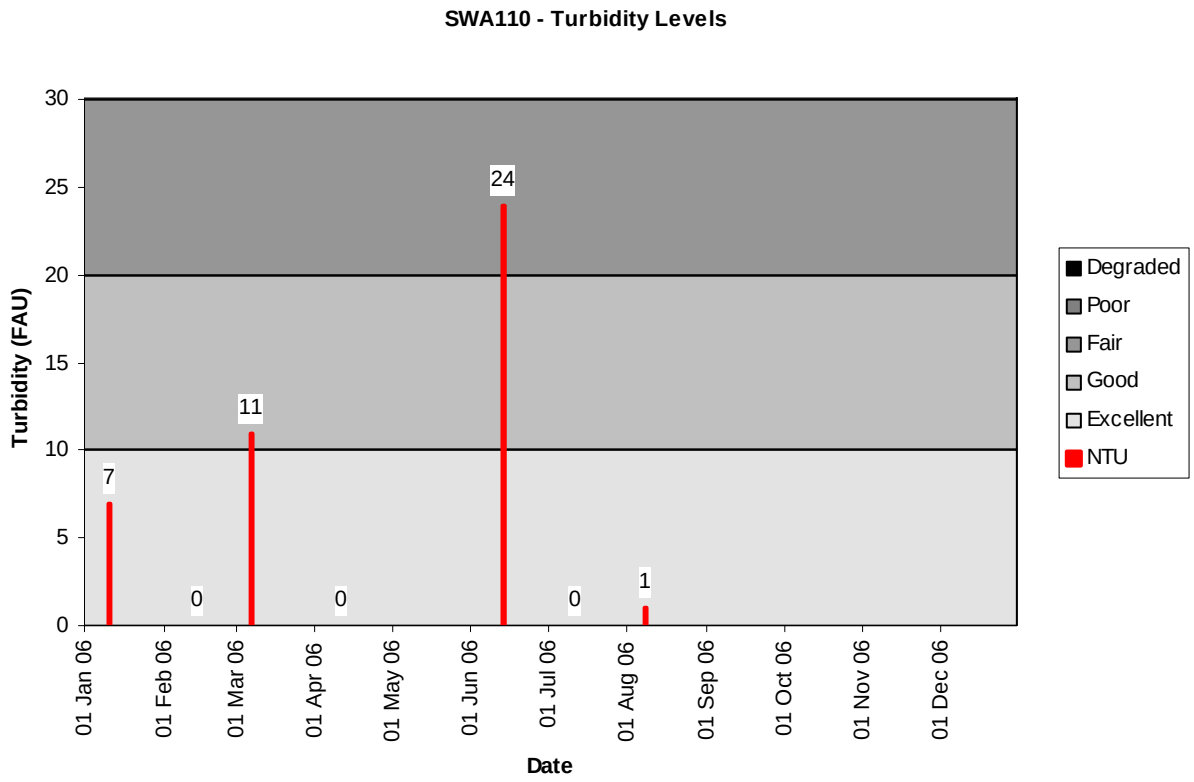


SWA110 - Phosphate Concentrations



SWA110 - pH Levels





Discussion

Water Quality values and ratings (ANZECC, 1992) Results

Site	Oxygen Saturation		Electrical Conductivity		Reactive Phosphorus		pH		Turbidity	
	Median	Rating	Median	Rating	Median	Rating	Median	Rating	Median	Rating
SWA110	68	Fair	61750	Degrd	0.12	Degrd	8.2	Fair	1	Exc

Each rating is given a value and the total sum of these value gives a water quality condition rating

Site	Oxygen Saturation	Electrical Conductivity	Reactive Phosphorus	pH	Turbidity	Total	Condition Rating
SWA110	2	0	0	2	4	8	Poor

The condition rating for SWA110 Lake Victoria outfall at Bellarine Highway indicated it had a poor condition rating. Condition ratings are based on Water Quality Guidelines for the Corangamite Region (freshwater flowing waterways). This site is very salty and is influenced by both the tides and drainage from hypersaline Lake Victoria. This should be considered when interpreting data.

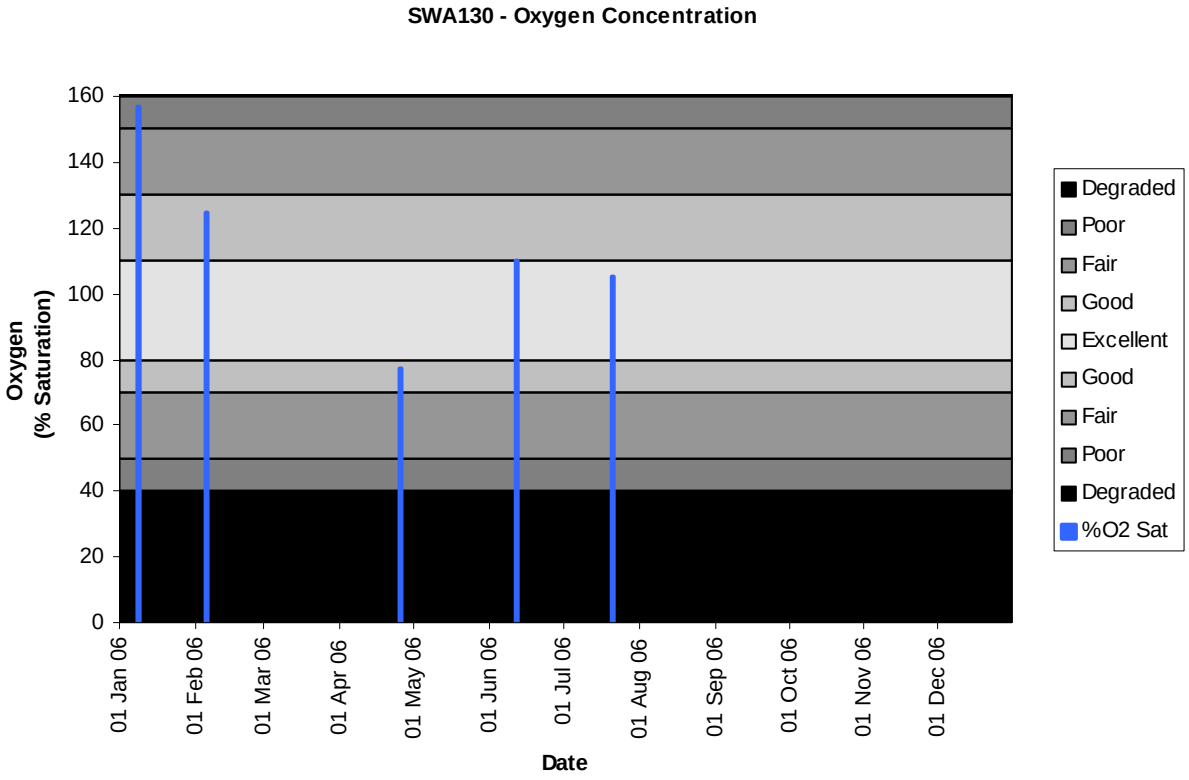
State Environment Protection Policy (Waters of Victoria) Results

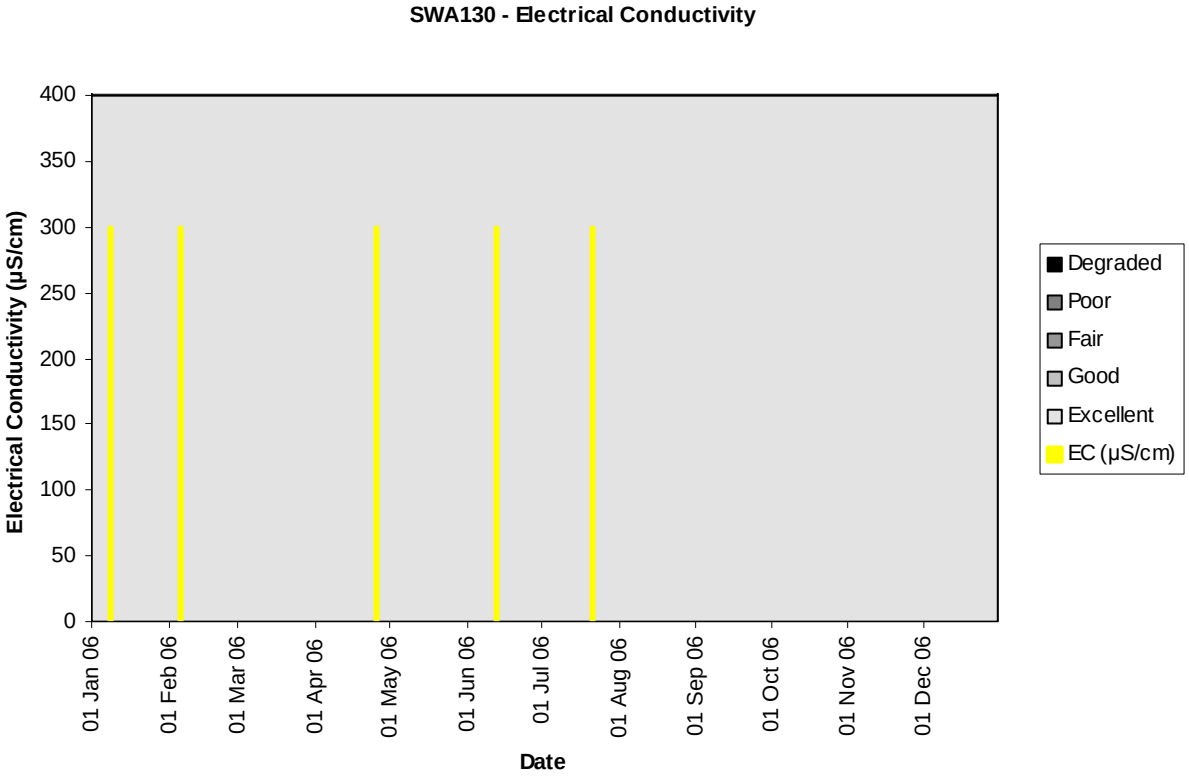
SEPP guidelines have not been developed for wetlands or lakes.

11/4/06 Stream habitat survey undertaken condition rating = fair
Refer to the Appendix B as per SWA110 for more detailed surveys.

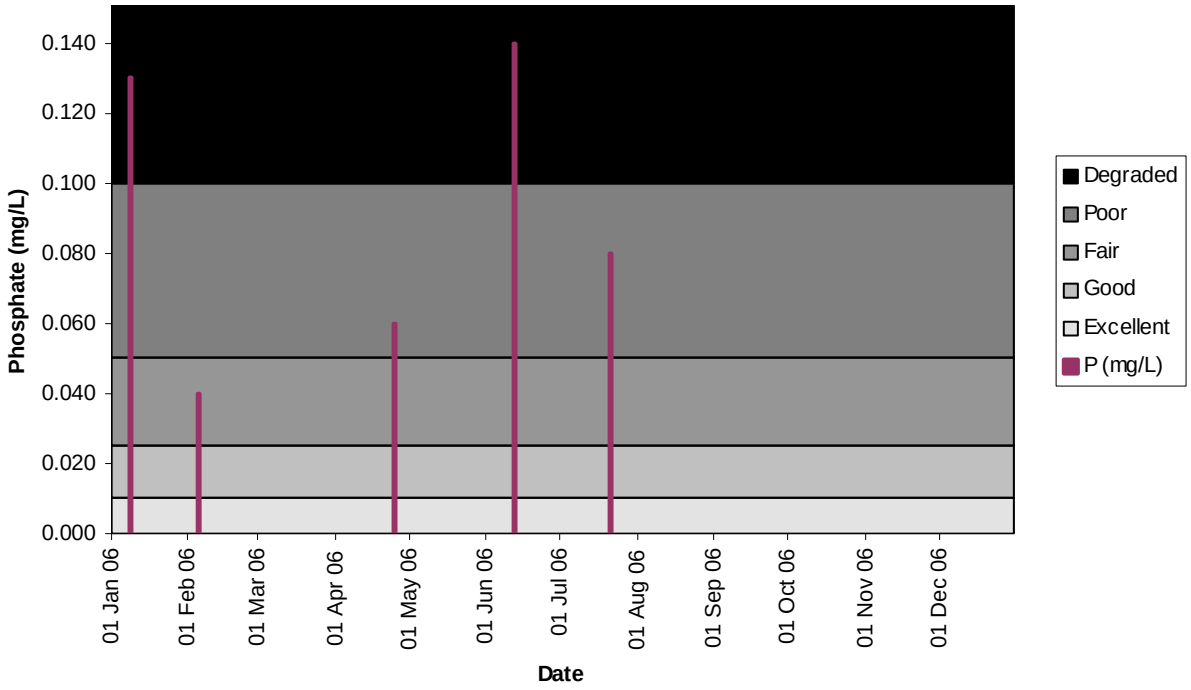
Swan Bay (Site Code SWA130)

Begola Wetlands

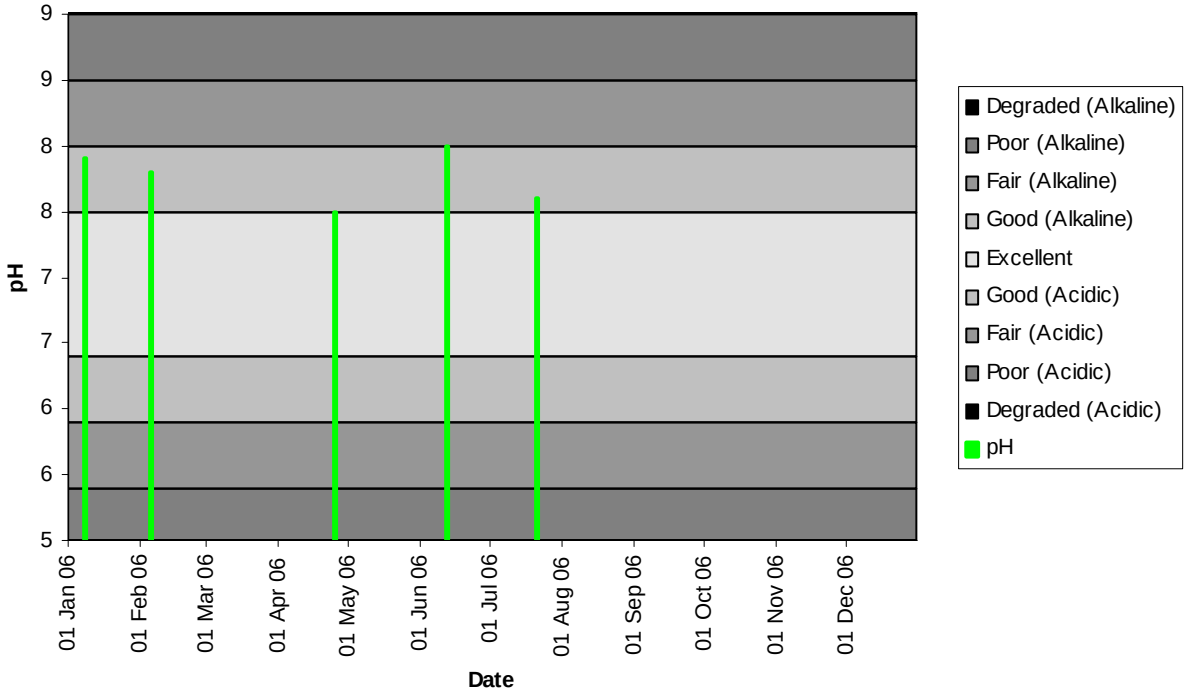


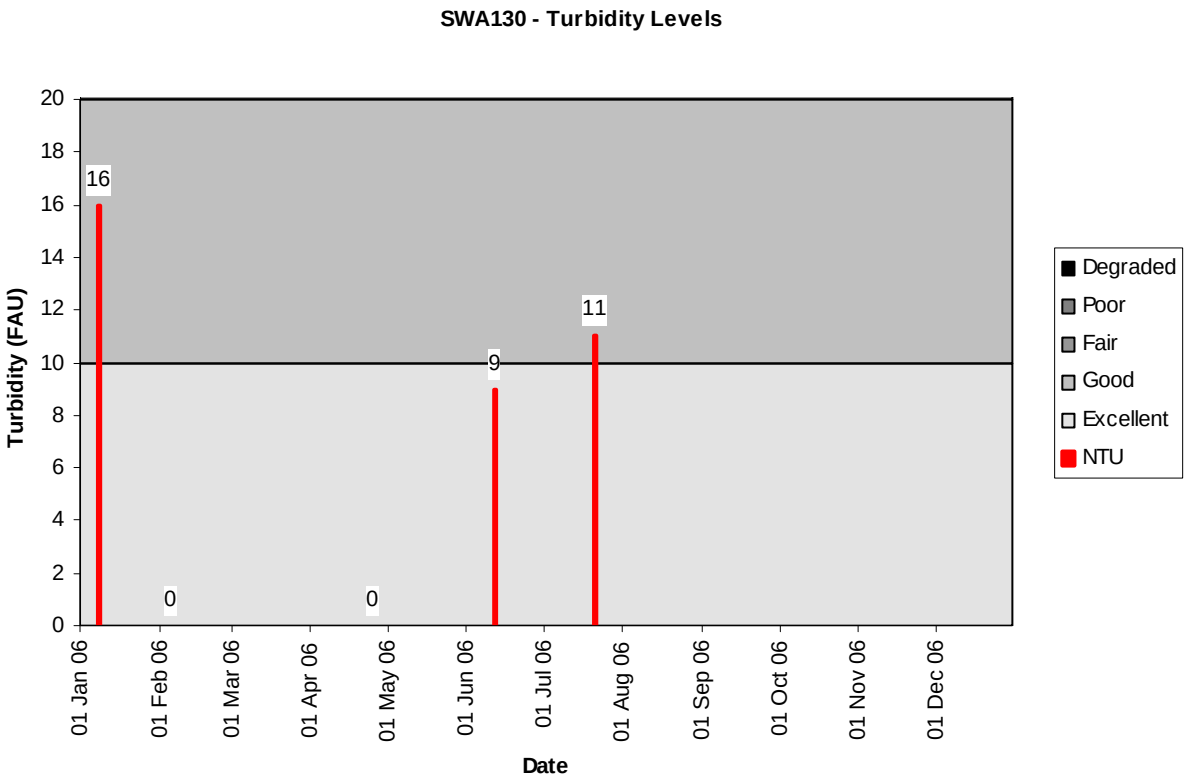


SWA130 - Phosphate Concentrations



SWA130 - pH Levels





Discussion

Water Quality values and ratings (ANZECC, 1992) Results

Site	Oxygen Saturation		Electrical Conductivity		Reactive Phosphorus		pH		Turbidity	
	Median	Rating	Median	Rating	Median	Rating	Median	Rating	Median	Rating
SWA130	110	Exc	300	Exc	0.08	Poor	7.8	Good	9	Exc

Each rating is given a value and the total sum of these value gives a water quality condition rating

Site	Oxygen Saturation	Electrical Conductivity	Reactive Phosphorus	pH	Turbidity	Total	Condition Rating
SWA130	4	4	1	3	4	16	Good

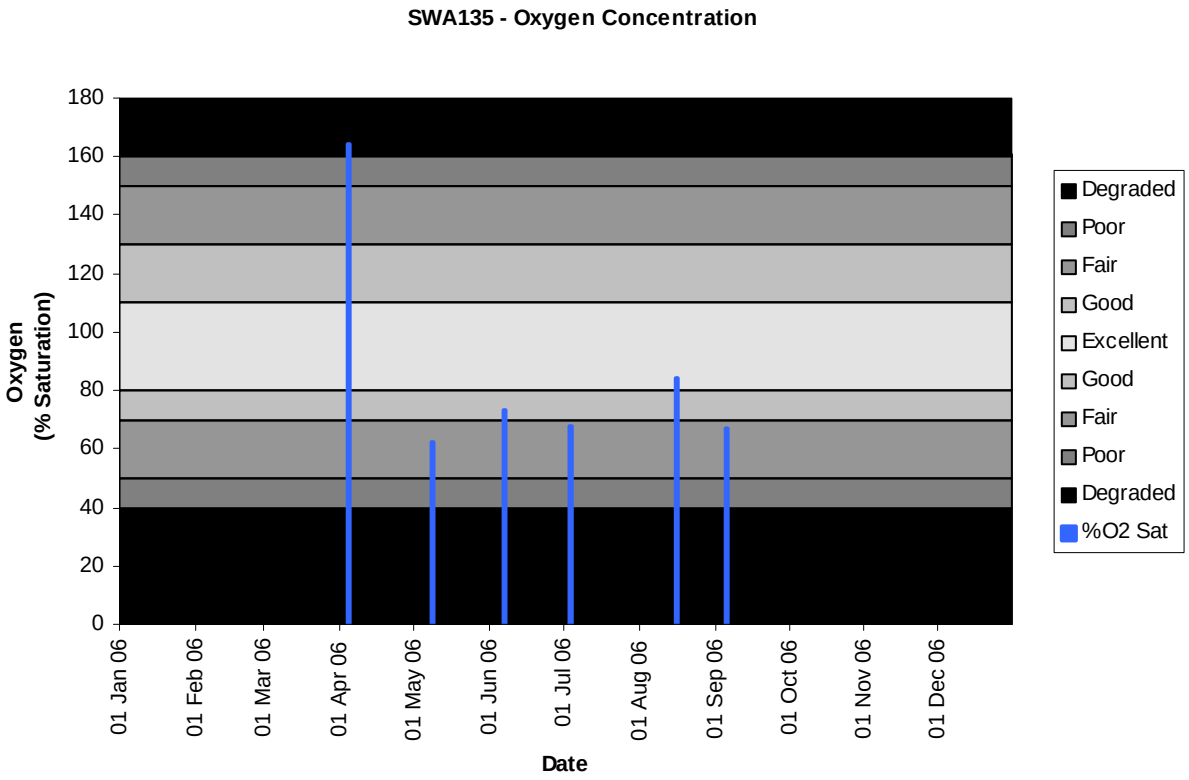
The condition rating for SWA130 Begola Wetlands indicated it had a good condition rating. Condition ratings are based on Water Quality Guidelines for the Corangamite Region (freshwater flowing waterways). This site is non-flowing and this should be considered when interpreting data.

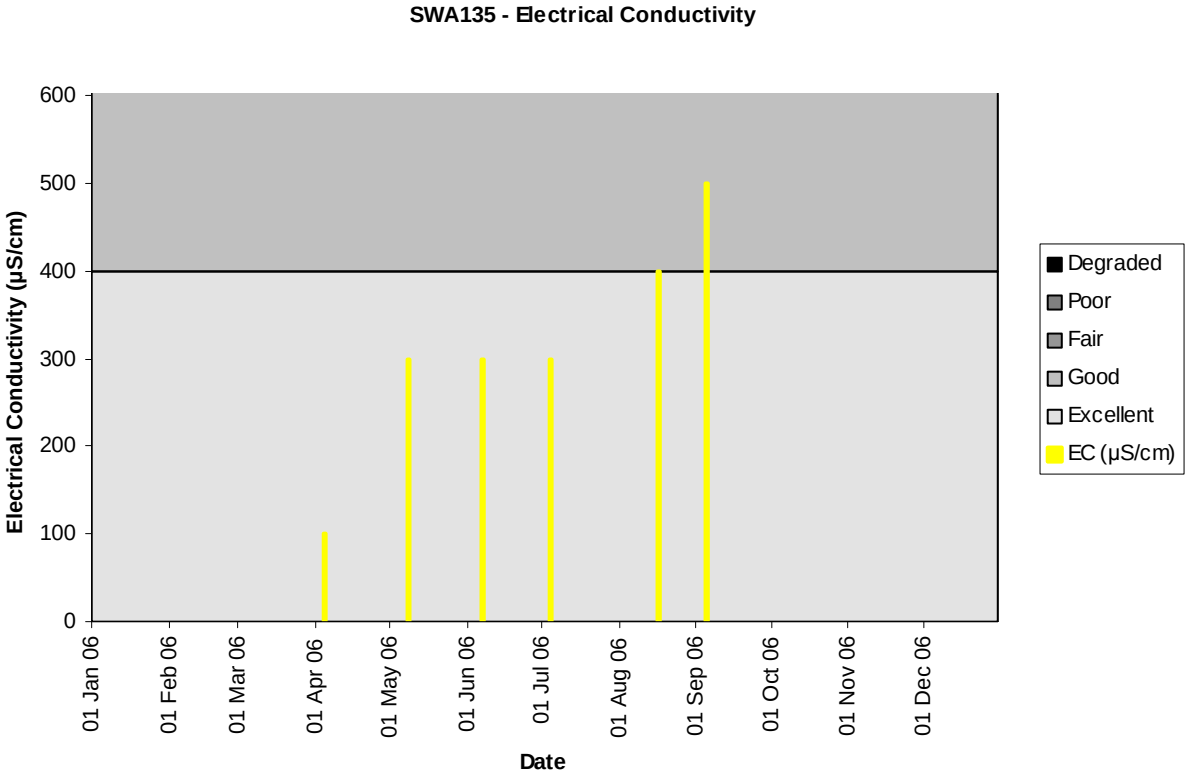
State Environment Protection Policy (Waters of Victoria) Results

SEPP guidelines have not been developed for wetlands or lakes.

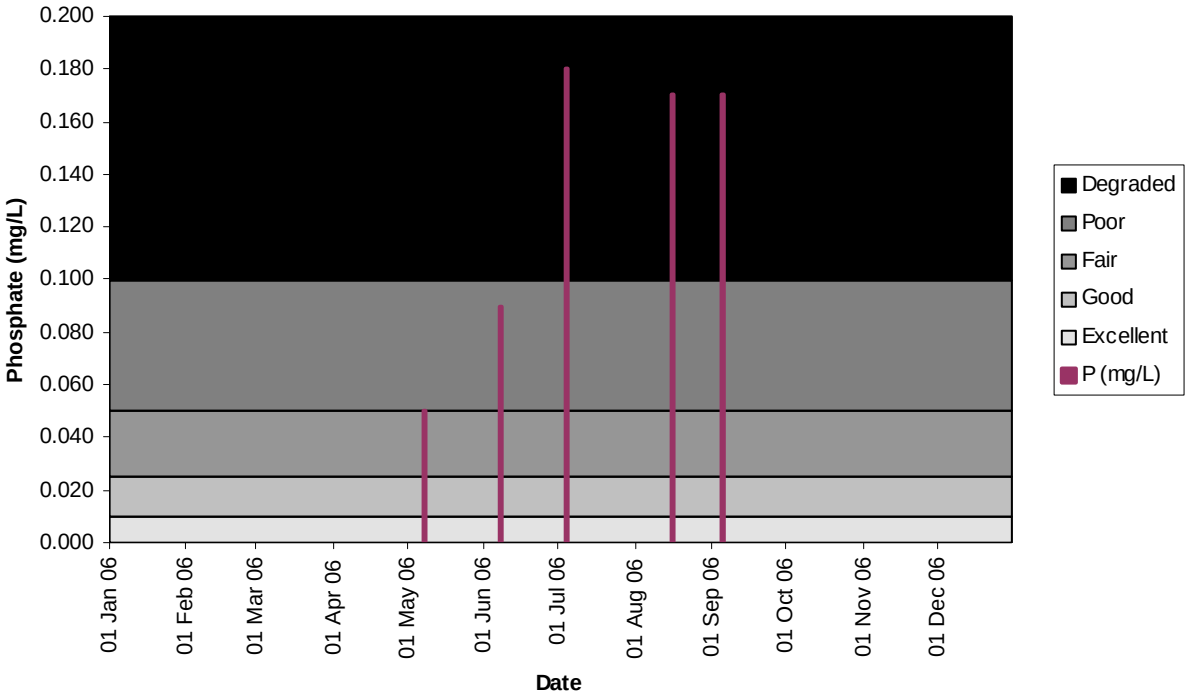
25/4/06 Habitat survey undertaken Condition rating =fair
Refer to the Appendix B as per SWA130 for more details
8/1/06 Macro-invertebrate survey undertaken Stream condition rating =fair
12/6/06 Macro-invertebrate survey undertaken Stream condition rating =fair
Refer to the Appendix C as per SWA130 for more details

Swan Bay (Site Code SWA135)
Bonnyvale Roads Wetlands

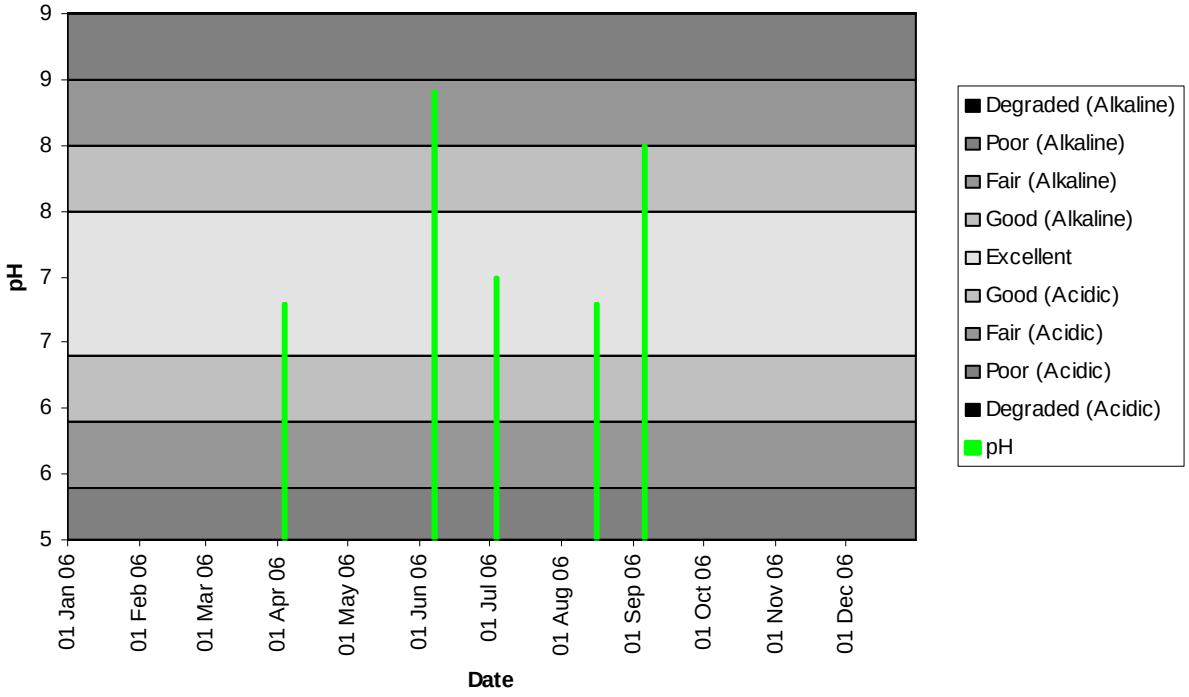


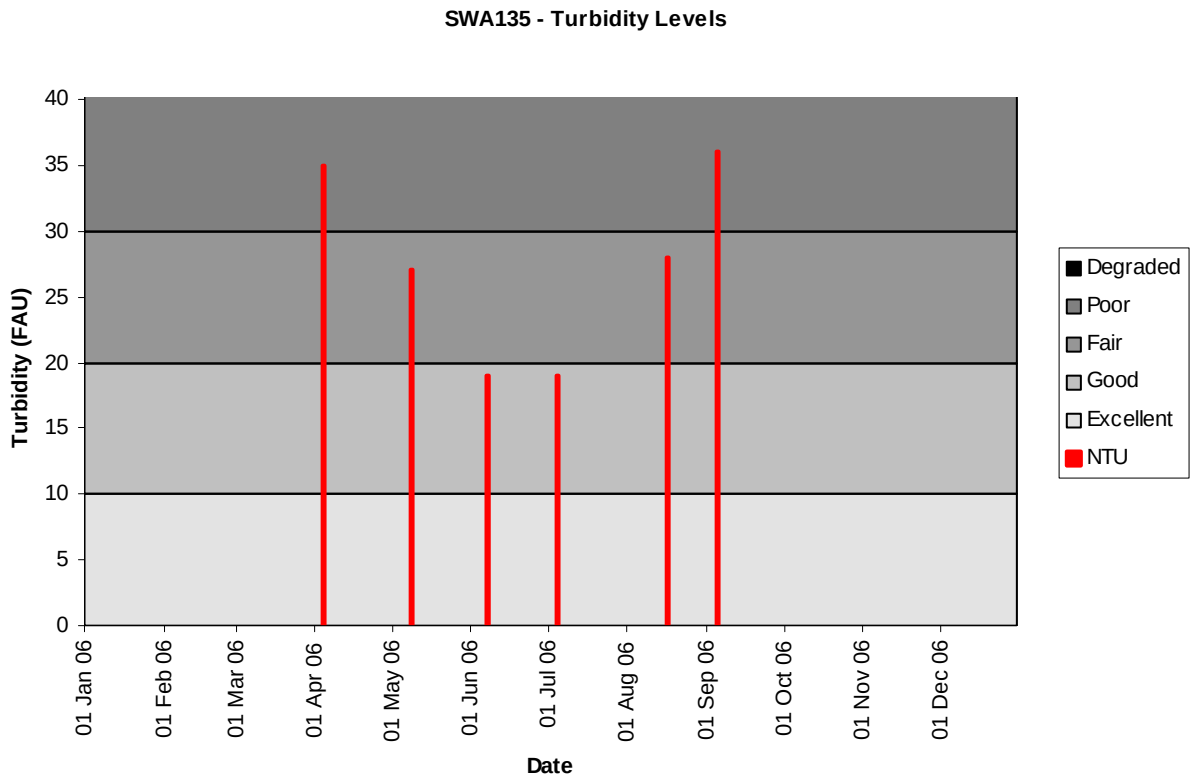


SWA135 - Phosphate Concentrations



SWA135 - pH Levels





Discussion

Water Quality values and ratings (ANZECC, 1992) Results

Site	Oxygen Saturation		Electrical Conductivity		Reactive Phosphorus		pH		Turbidity	
	Median	Rating	Median	Rating	Median	Rating	Median	Rating	Median	Rating
SWA135	68	Fair	300	Exc	0.17	Degrd	7.5	Exc	27	Fair

Each rating is given a value and the total sum of these value gives a water quality condition rating

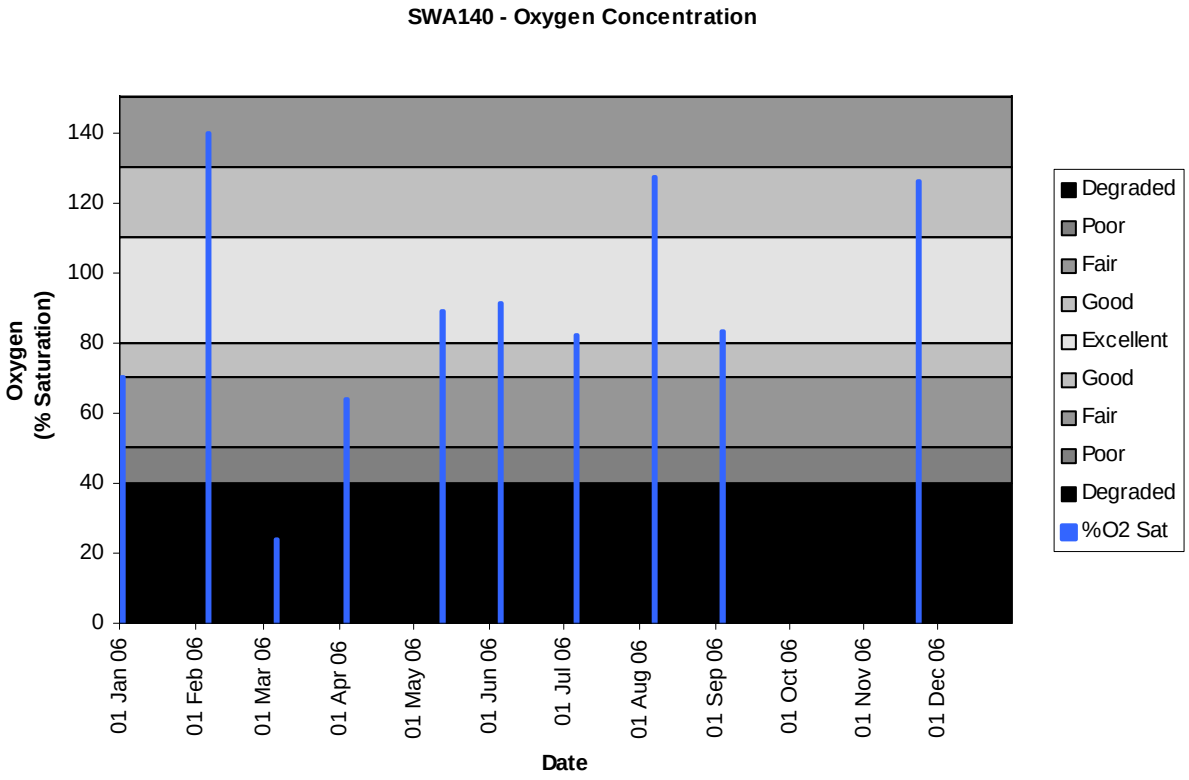
Site	Oxygen Saturation	Electrical Conductivity	Reactive Phosphorus	pH	Turbidity	Total	Condition Rating
SWA135	2	4	0	4	2	12	Fair

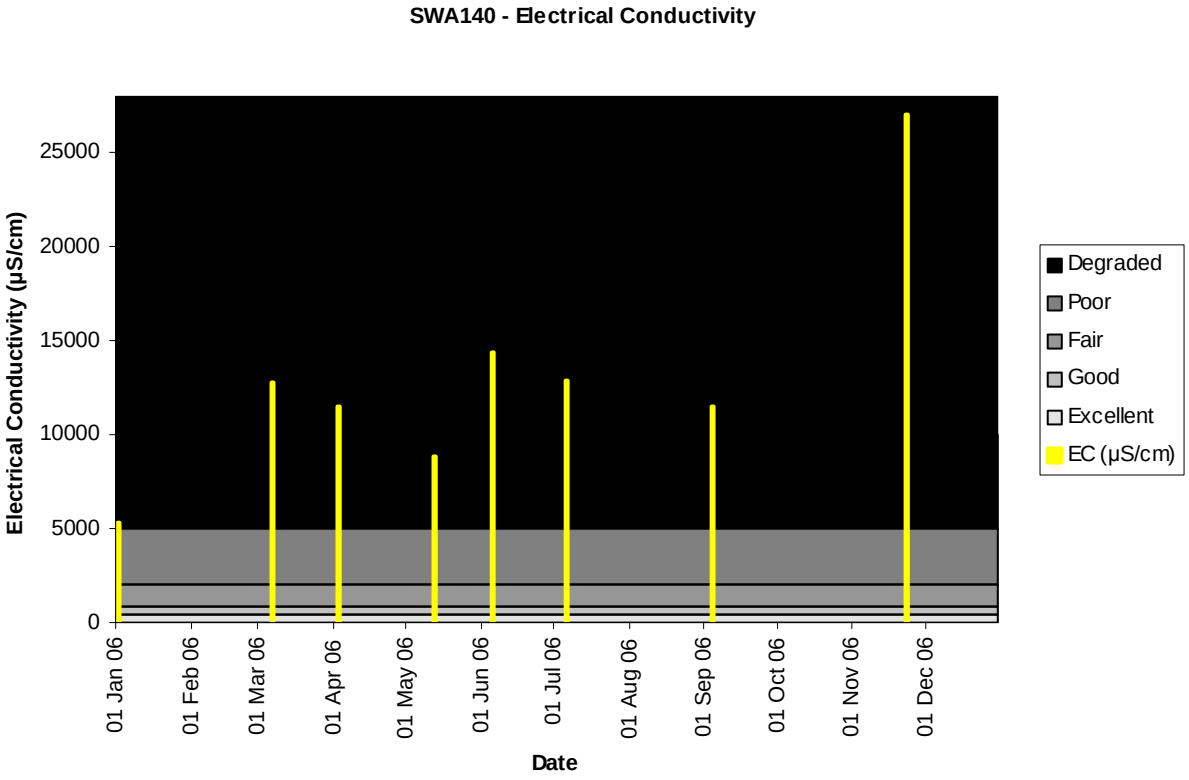
The condition rating for SWA135 Bonnyvale Wetlands indicated it had a fair condition rating. Condition ratings are based on Water Quality Guidelines for the Corangamite Region (freshwater flowing waterways). This site is non-flowing and this should be considered when interpreting data.

State Environment Protection Policy (Waters of Victoria) Results

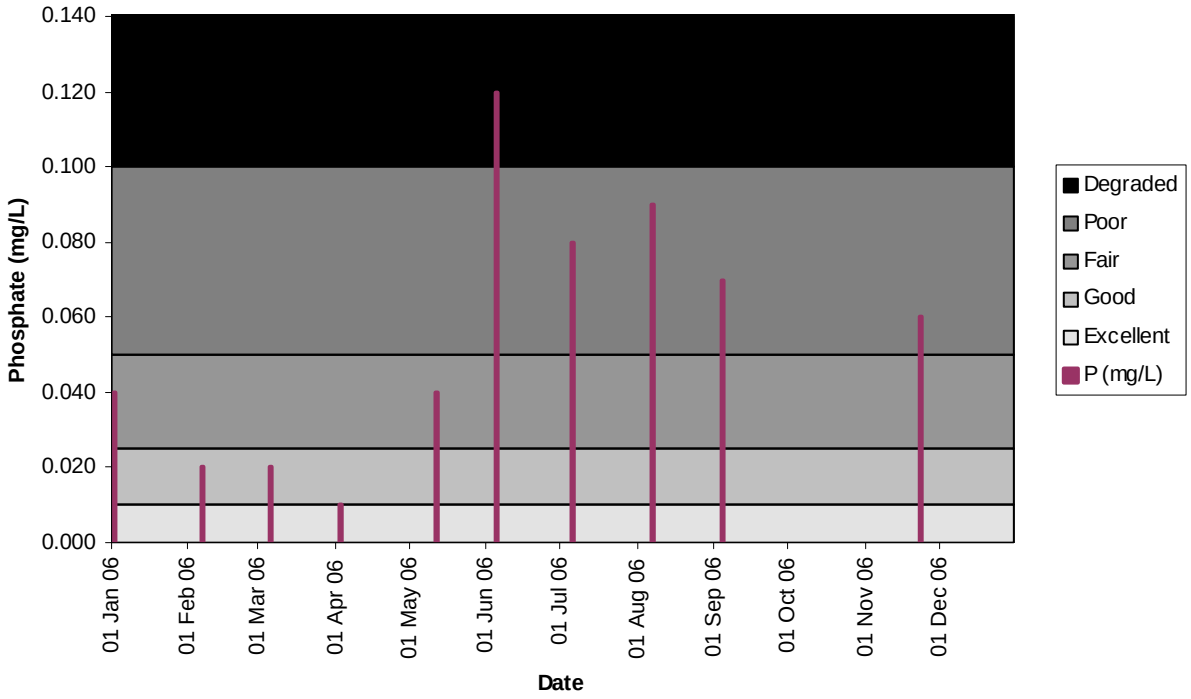
SEPP guidelines have not been developed for wetlands or lakes.

Swan Bay (Site Code SWA140)
Emily St. Wetland, Point Lonsdale

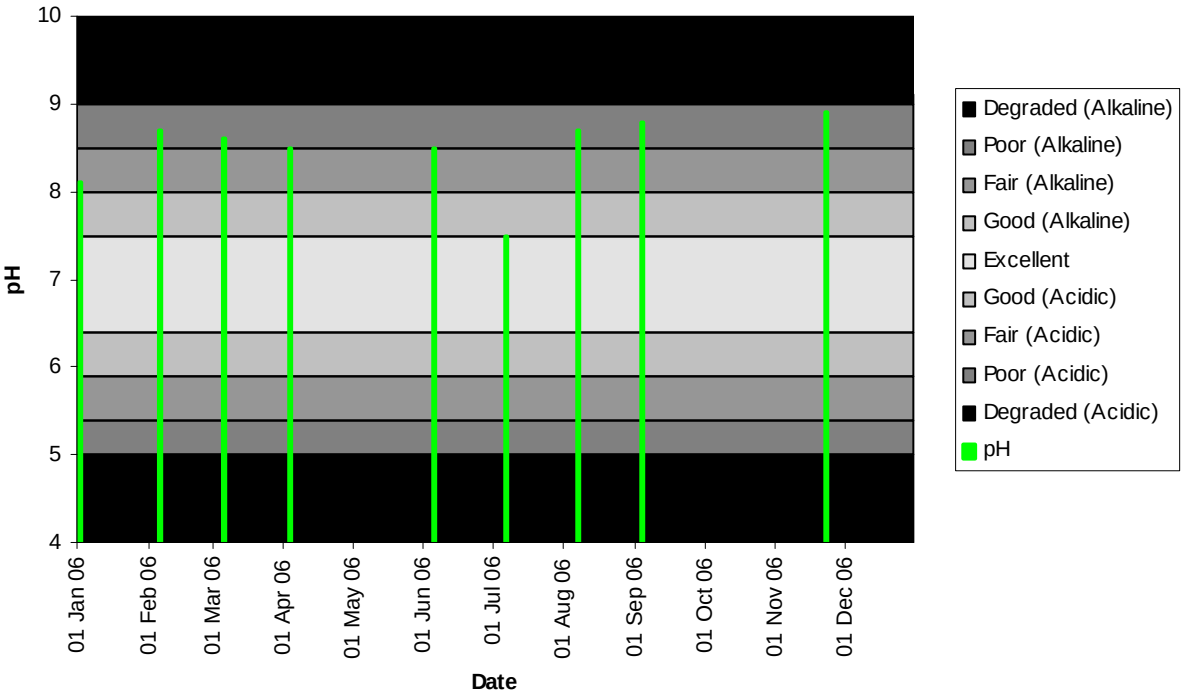


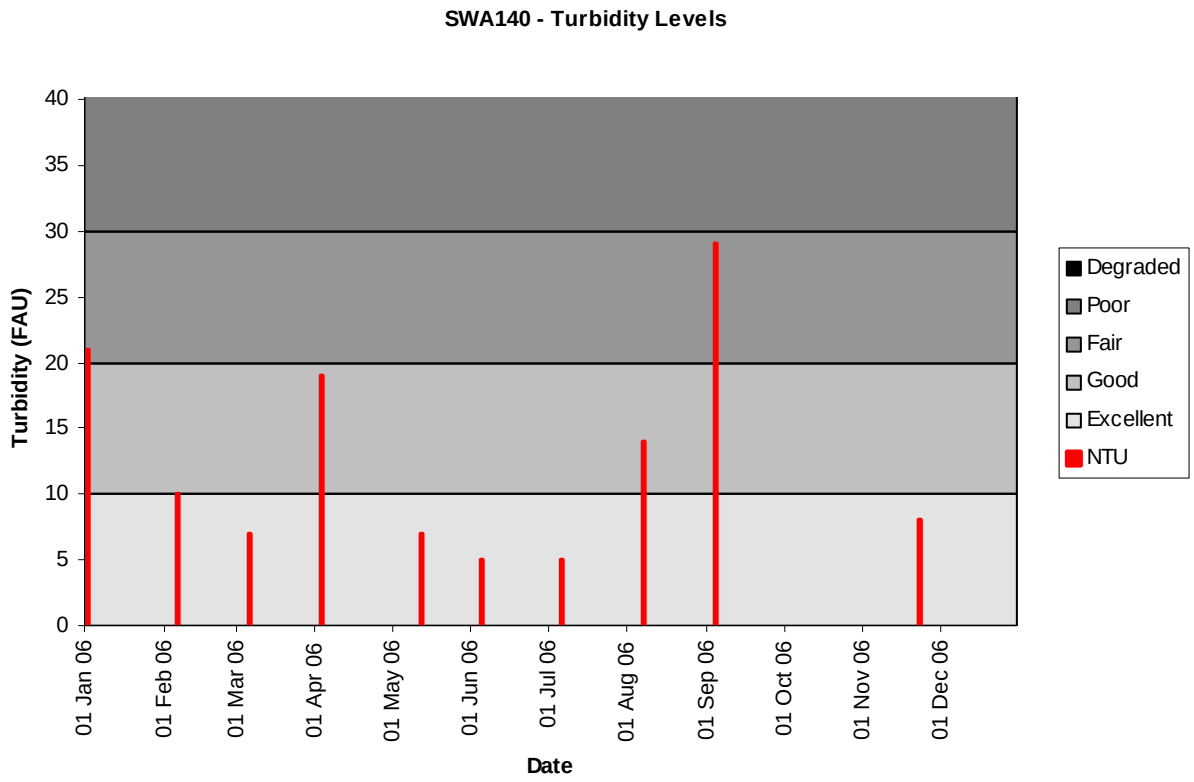


SWA140 - Phosphate Concentrations



SWA140 - pH Levels





Discussion

Water Quality values and ratings (ANZECC, 1992) Results

Site	Oxygen Saturation		Electrical Conductivity		Reactive Phosphorus		pH		Turbidity	
	Median	Rating	Median	Rating	Median	Rating	Median	Rating	Median	Rating
SWA140	86	Exc	11500	Degd	0.05	Fair	9	Poor	9	Exc

Each rating is given a value and the total sum of these value gives a water quality condition rating

Site	Oxygen Saturation	Electrical Conductivity	Reactive Phosphorus	pH	Turbidity	Total	Condition Rating
SWA140	4	0	2	1	4	11	Fair

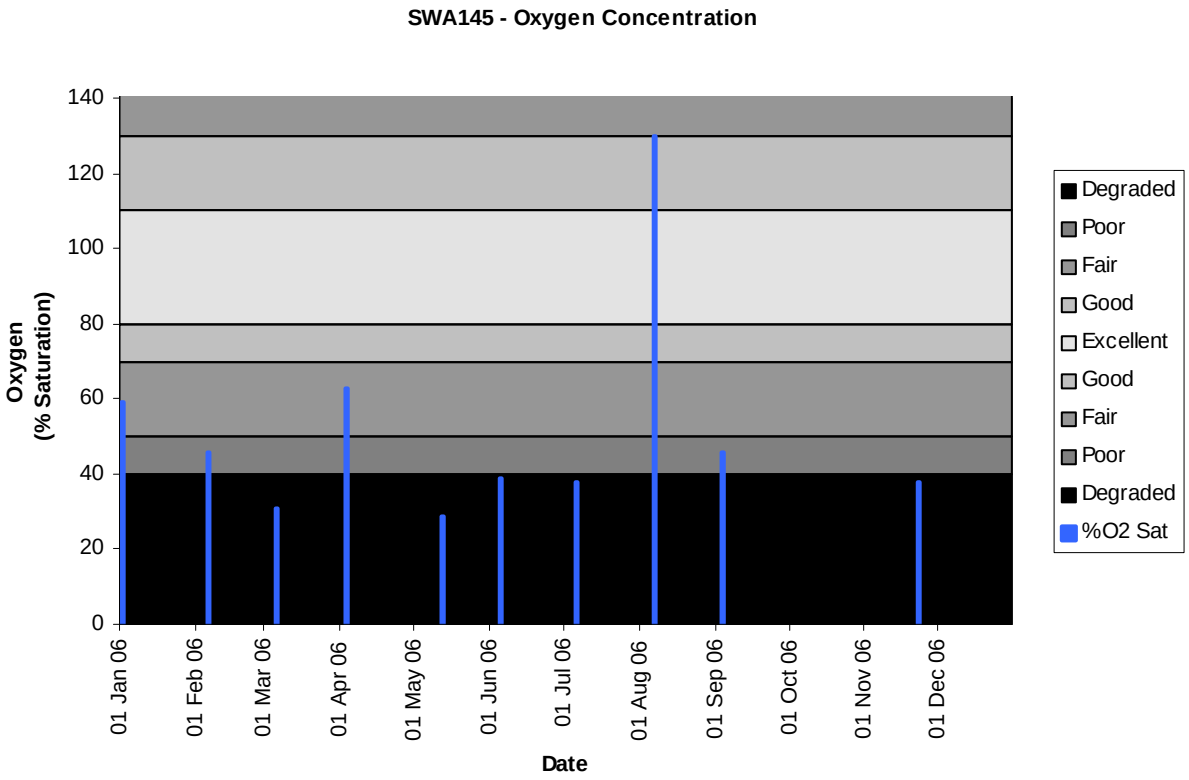
The condition rating for SWA140 Emily Street wetlands (Lake Victoria at Hollywood Estate) indicated it had a fair condition rating. Condition ratings are based on Water Quality Guidelines for the Corangamite Region (freshwater flowing waterways). This site is non-flowing and this should be considered when interpreting data.

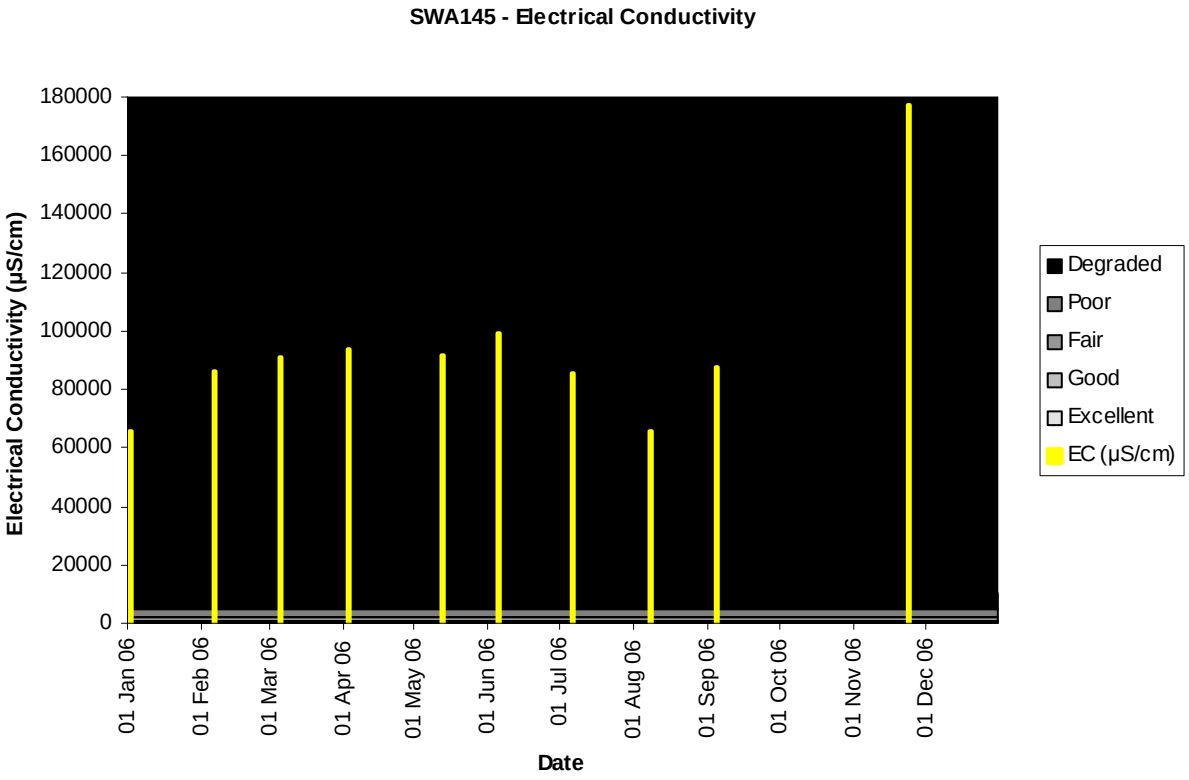
State Environment Protection Policy (Waters of Victoria) Results

SEPP guidelines have not been developed for wetlands or lakes.

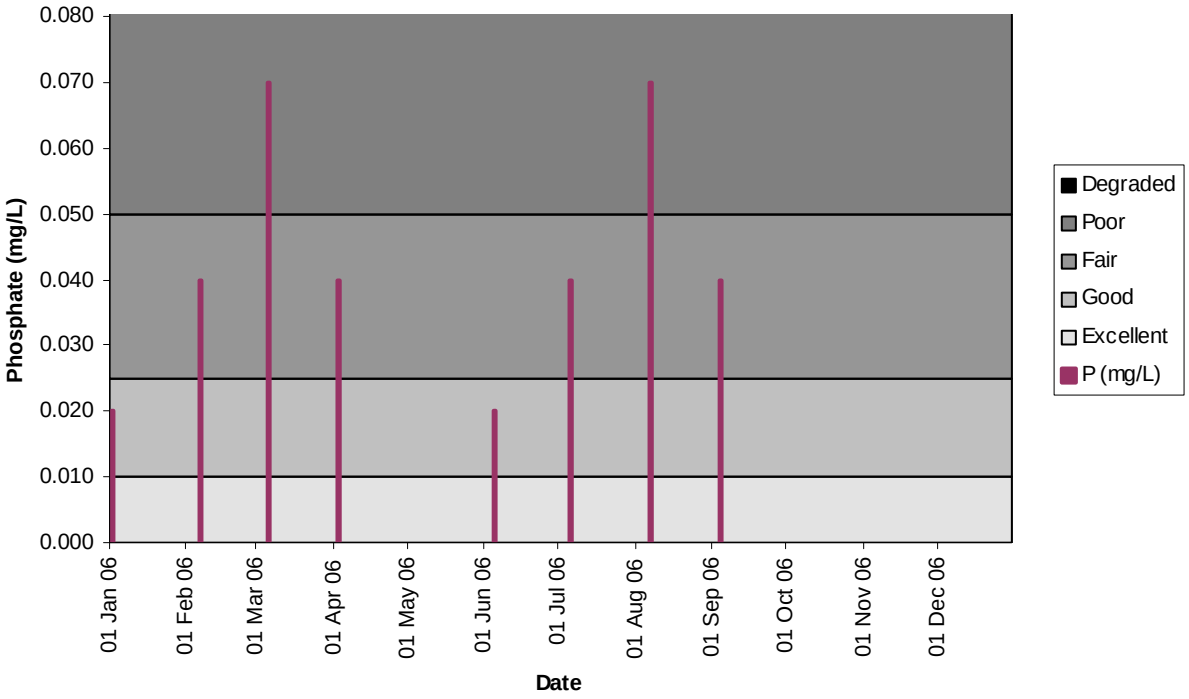
6/3/06 Habitat survey undertaken Condition rating =poor
Refer to the Appendix B as per SWA140 for more details

Swan Bay (Site Code SWA145)
Lake Victoria

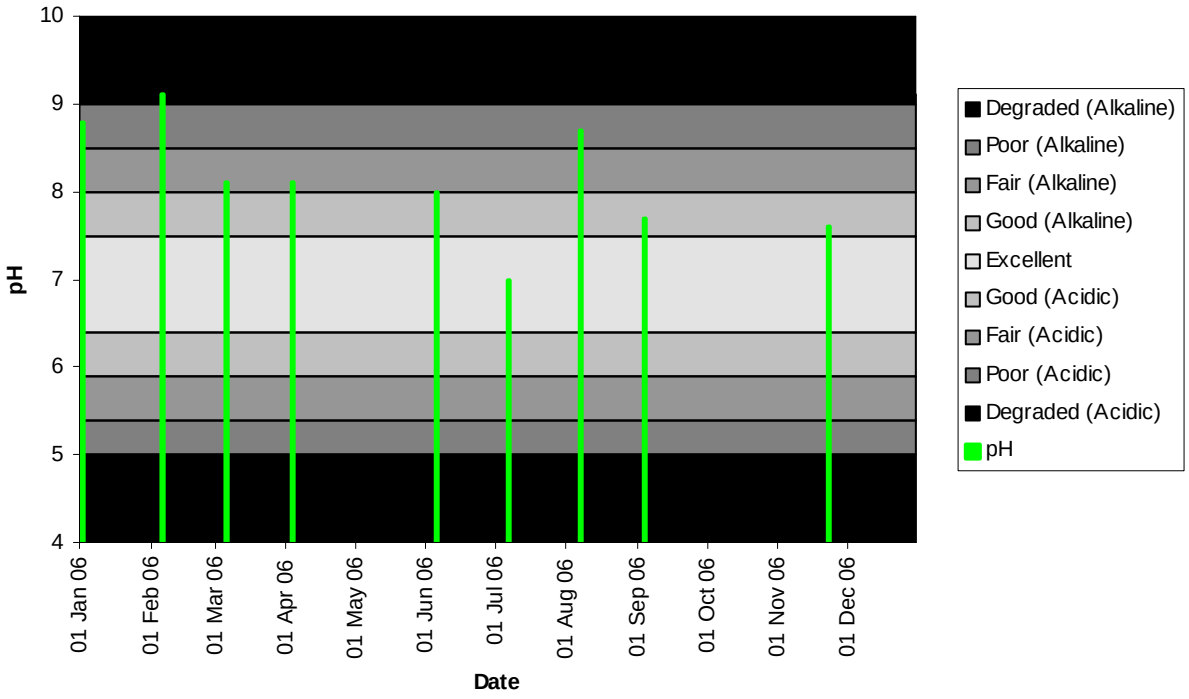


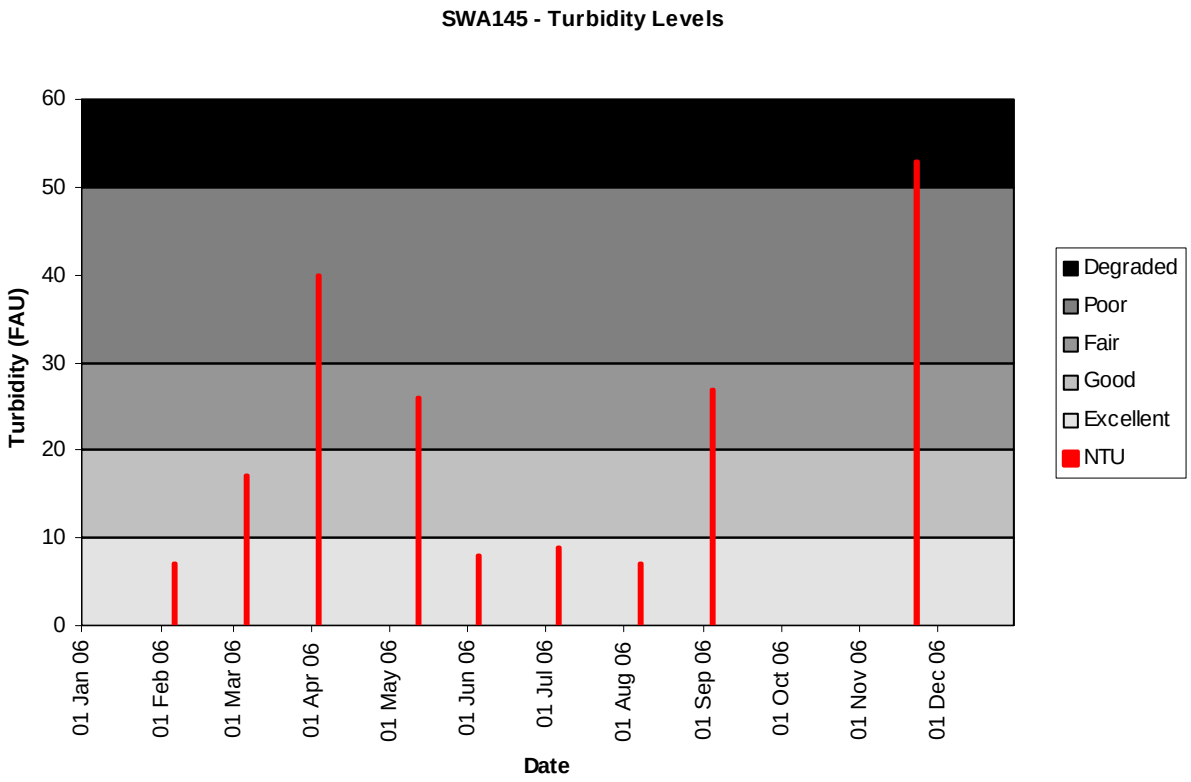


SWA145 - Phosphate Concentrations



SWA145 - pH Levels





Discussion

Discussion

Water Quality values and ratings (ANZECC, 1992) Results

Site	Oxygen Saturation		Electrical Conductivity		Reactive Phosphorus		pH		Turbidity	
	Median	Rating	Median	Rating	Median	Rating	Median	Rating	Median	Rating
SWA145	43	Poor	89250	Degd	0.04	Fair	8.1	Fair	13	Good

Each rating is given a value and the total sum of these value gives a water quality condition rating

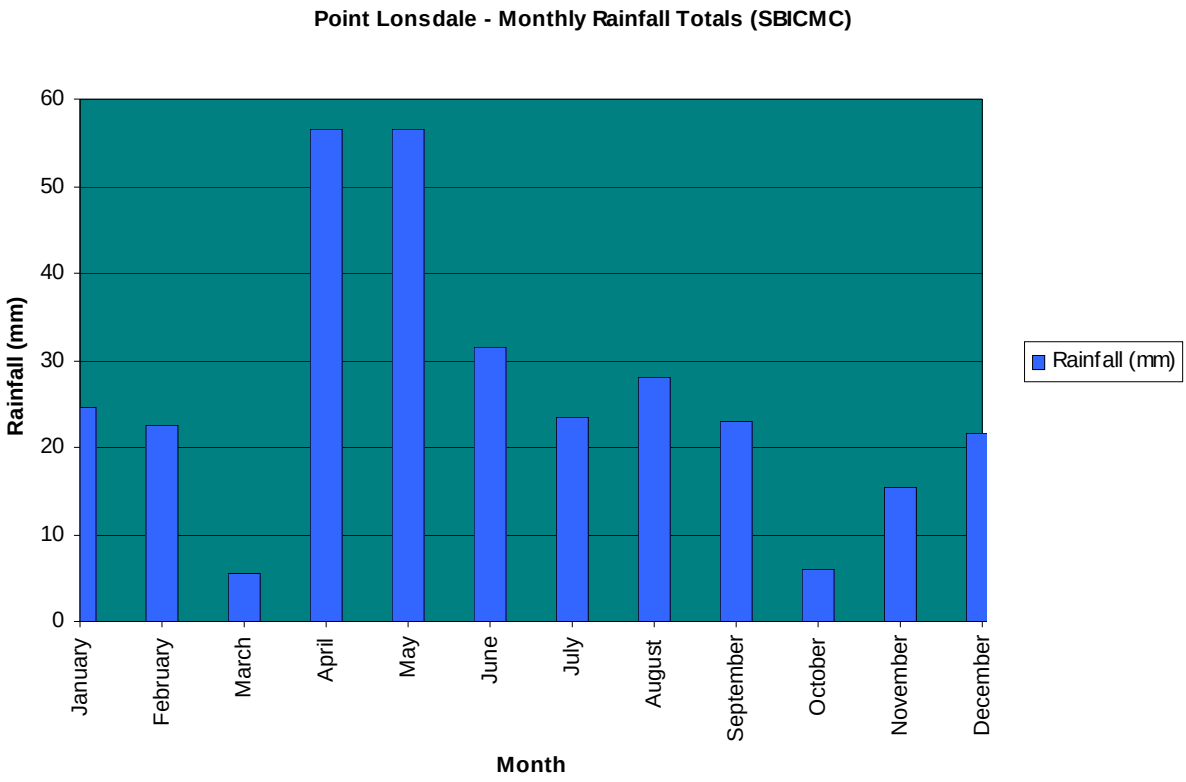
Site	Oxygen Saturation	Electrical Conductivity	Reactive Phosphorus	pH	Turbidity	Total	Condition Rating
SWA145	1	0	2	2	3	8	Poor

The condition rating for SWA145 Lake Victoria indicated it had a poor condition rating. Condition ratings are based on Water Quality Guidelines for the Corangamite Region (freshwater flowing waterways). This site is hypersaline and non-flowing and this should be considered when interpreting data.

State Environment Protection Policy (Waters of Victoria) Results

SEPP guidelines have not been developed for wetlands or lakes.

6/3/06 Habitat survey undertaken Condition rating fair
Refer to the Appendix B as per SWA145 for more details



Overall Results Discussion

The low rainfall averages for the year will have contributed to poorer water quality.

The overall waterway condition rating for the Swan Bay sites takes into account phys/chem. tests, habitat survey and macro-invertebrate survey. Begola Wetlands SWA130 has all these assessments performed in 2006 and obtained an overall fair rating.

The current guidelines only have limited relevance to this sort of system and possibly only long term monitoring will determine the baseline conditions in the Swan Bay catchment.

Recommendations

- Habitat Surveys of all sites should be carried out on an annual basis to assess decline or improvement in banks, in-stream cover, verge vegetation and any other factors that influence the water quality.
- Macro-invertebrate, fish and bird observations to complement habitat surveys.
- Continue education and awareness of stormwater issues relating to Swan Bay Catchment
- Identify possible sources of nutrients at sites where there are consistently poor and degraded condition ratings indicated and develop action plans to address the identified sources.
- Continue monitoring of stormwater influences on water quality in the catchment. Identify site where only rain event monitoring may be necessary.
- Continue long term monitoring to collect baseline data for the Lake Victoria system.

Data Confidence

As part of the implementation of the Corangamite Waterwatch Data Confidence Plan monitors are encouraged to participate in a number of QA/QC and training activities on an annual basis. This along with the water quality monitoring equipment used and its maintenance determines the standard of data collected. The table below indicates the standard of data collected by monitors for this report.

Monitoring Site - monitor	QA/QC	Training (formal/informal)	Equipment maintenance	Data standard
SWA060 – Sue Longmore	March July	March November	January October	Tertiary
SWA110 – Jill Warneke	July	November	January October	Tertiary
SWA130 – Wendy Kerry	July		January October	Tertiary
SWA135 – Denise Moore	March July	November	January October	Tertiary
SWA140,SWA145 – Mal Kidson	July	April	January October	Tertiary

Appendix A – Recorded Data

Site Code e.g. LAT001	Using date format 'dd/mm/yy'	% O2 Sat (%)	EC (uS/cm)	RPhos (mg/l P)	pH (Units)	Turb (FAU)
SWA110	10/01/2006	25	60500	0.12	8	7
SWA110	14/02/2006	35	63000	0.09	8.1	0
SWA110	07/03/2006	60	71000	0.13	8.4	11
SWA110	11/04/2006	75	67500	0.12	8.2	0
SWA110	09/05/2006	75	51040	0.11	8.2	1
SWA110	13/06/2006	78	66500		8.2	24
SWA110	11/07/2006	77	56500	0.14	8.2	0
SWA110	08/08/2006	50	58000	0.05	8.2	1
SWA130	08/01/2006	157	300	0.13	7.9	16
SWA130	05/02/2006	125	300	0.04	7.8	0
SWA130	25/04/2006	77	300	0.06	7.5	0
SWA130	12/06/2006	110	300	0.14	8	9
SWA130	21/07/2006	105	300	0.08	7.6	11
SWA135	04/04/2006	164	100		6.8	35
SWA135	08/05/2006	62	300	0.05		27
SWA135	07/06/2006	73	300	0.09	8.4	19
SWA135	04/07/2006	68	300	0.18	7	19
SWA135	16/08/2006	84	400	0.17	6.8	28
SWA135	05/09/2006	67	500	0.17	8	36
SWA140	02/01/2006	70	5300	0.04	8.1	21
SWA140	06/02/2006	140	12	0.02	8.7	10
SWA140	06/03/2006	24	12800	0.02	8.6	7
SWA140	03/04/2006	64	11500	0.01	8.5	19
SWA140	12/05/2006	89	8800	0.04		7
SWA140	05/06/2006	91	14400	0.12	8.5	5
SWA140	06/07/2006	82	12900	0.08	7.5	5
SWA140	07/08/2006	127	13	0.09	8.7	14
SWA140	04/09/2006	83	11500	0.07	8.8	29
SWA140	23/11/2006	126	27000	0.06	8.9	8
SWA145	02/01/2006	59	66000	0.02	8.8	0
SWA145	06/02/2006	46	86000	0.04	9.1	7
SWA145	06/03/2006	31	91000	0.07	8.1	17
SWA145	03/04/2006	63	93500	0.04	8.1	40
SWA145	12/05/2006	29	92000	0		26
SWA145	05/06/2006	39	99000	0.02	8	8
SWA145	06/07/2006	38	85500	0.04	7	9
SWA145	07/08/2006	130	66000	0.07	8.7	7
SWA145	04/09/2006	46	87500	0.04	7.7	27
SWA145	23/11/2006	38	177000	0	7.6	53
SWA145	05/12/2006	47	59000	0.07	9.2	2

Appendix B – Stream Habitat Survey Record

Site Habitat Assessment Report

Site & Date Information		Bank vegetation	Verge vegetation	In-stream cover	Bank erosion & stabilty	Riffles pools & bends
SWA110 11/04/2006	**Lake Victoria outlet @ Bellarine Hwy**	6 Fair	6 Fair	6 Fair	4 Good	3 Fair

Overall Assessment: Fair

Comments:
Coast beard heath, tea tree, knobby club sedge, wirilda, pimelea serpyllfolia, bidgee widgee, austrastipa, aceitus, weeds, glasswort

SWA130 25/04/2006	**Begola Wetlands @ Emperor Drive**	4 Poor	6 Fair	8 Good	4 Good	3 Fair

Overall Assessment: Fair

Comments:
Urban environment - little native vegetation at this end of thee wetland. New "borms" have been installed to help clean water (at West end) however even with very heavy rains last week to "pools" that should have developed behind them have not occurred. Are they working? Abundant wildlife - swans, ibis, dusky moorhens,ducks

SWA140 06/03/2006	**Lake Victoria @ Hollywood Estate**	6 Fair	4 Poor	4 Poor	5 Excellent	2 Poor

Overall Assessment: Fair

Comments:
Buffalo type grass surround. Glasswort close to water (prostrate form). A few planted native shrubs

SWA145 06/03/2006	**Lake Victoria**	8 Good	8 Good	4 Poor	4 Good	2 Poor

Overall Assessment: Fair

Comments:
Grasses and Sedges. Various bushes. ? Identity

Appendix C – Macro-invertebrate Survey Record

Site No: **SWA130** *Date:* **08/01/2006** *Time:* **4:00 PM** *Sample No:* **5052**

Site Description: **Begola Wetlands @ Emperor Drive**

Water Type: pond/wetland *Land Use:* urban - residential

SampleType: Sweep (Macros)

Invertebrate Name:	*BugScore*	*Result*
True Bugs	4	**1000**
Biting-midges	2	**10**
Total:	**6**	**1010**

Bug Abundance Category: **5**

Stream Condition Code: **Fair**

Site No: **SWA130** *Date:* **12/06/2006** *Time:* **12:00 PM** *Sample No:* **5446**

Site Description: **Begola Wetlands @ Emperor Drive**

Water Type: pond/wetland *Land Use:* urban - residential

SampleType: Grab (Chem) - Sweep (Macros)

Invertebrate Name:	*BugScore*	*Result*
Mayfly larvae	7	**1**
Water mites	5	**100**
Beetle larvae	4	**50**
True Bugs	4	**500**
Biting-midges	2	**20**
Total:	**22**	**671**

Bug Abundance Category: **5**

Stream Condition Code: **Fair**