Mersey-Forth Water Management Review

TECHNICAL AND SOCIAL STUDY 2013

Mersey River Water Quality Assessment

A collaborative approach to assessing and addressing water quality in the Mersey River

We seek opportunities to enhance environmental and cultural values

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Executive Summary

Hydro Tasmania initiated a review of its water and land management operations in the Mersey and Forth River catchments in 2011. In the stakeholder consultation stage of the Mersey-Forth Water Management Review water quality was identified as a significant issue of concern in the lower Mersey River.

Users of the lower catchment have concerns that deteriorating conditions in the river have a negative impact on recreational and tourist activities, and on the environment. To address this concern the Mersey River Water Quality Assessment Project was initiated by Hydro Tasmania.

The aim of the project was to engage State Government Agencies, local Councils and other key stakeholders to assess and cooperatively address the perceived poor water quality in the lower Mersey River, and work towards achieving a more sustainable future for the river. The engagement led to a number of outcomes.

The Environmental Protection Authority Division undertook an initial desktop assessment of water quality in the Mersey River Catchment, and sampled and assessed what local stakeholders refer to as a 'black water event'. The Department of Primary Industry, Parks, Water and Environment's in-situ water quality continuous monitoring equipment was upgraded to gain greater understanding of water quality and the conditions that lead to pollution events.

A stakeholder water quality group was established and a number of stakeholder meetings were held. The group was expanded to incorporate a broader group of interested stakeholders as a need for an integrated, community lead initiative was identified. With guidance from NRM North, the stakeholder group agreed water quality improvement in the Mersey River requires a collaborative approach to develop and implement an action plan. Leadership of the process is critical.

A number of recommendations from water quality stakeholders and from Hydro Tasmania have emerged from the engagement process and are presented. A key recommendation is for the Councils of the Mersey River Catchment to join forces, take the lead, and establish a partnership agreement and terms of reference, between the Councils and the broader stakeholder group, to develop and implement a prioritised action plan for the Mersey River catchment.

With collaboration and communication channels opened and stakeholder participation established, Hydro Tasmania envisages that with Council leadership a more sustainable economic, social and environmental future for the Mersey River is possible. Committed to sustainable management of waterways in the Mersey-Forth catchments Hydro Tasmania will continue to support the development and implementation of an action plan for the Mersey River in collaboration with stakeholders.

Acknowledgements

A number of organisations and people have contributed their time and knowledge in a collaborative process aimed at addressing water quality issues in the Mersey River. The Environment Protection Authority Division (EPA), the Department of Primary Industries, Parks, Water and Environment (DPIPWE), Devonport City Council, Kentish and Latrobe Councils, Latrobe Landcare Inc., Mersey Estuary Group, Mersey Irrigators, Devonport Anglers Club, NRM North, Cradle Coast NRM, Tas Water, and Dulverton Waste Management are thanked for their participation and support for this study.

Greg Dowson (EPA), Amanda Locatelli (NRM North) and Martin Read (DPIPWE) have provided invaluable insight and input. Marie Egerrup, Greg Carson and Simon Gartenstein have assisted in the review of the report.

Kentish Hills Retreat in Sheffield and Axeman's Hall of Fame in Latrobe are thanked for their hospitality.

Cover photograph: Mersey River below Rowallan

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List of Abbreviations and Acronyms

DOC	Dissolved organic carbon
DPIPWE	Department of Primary Industries, Parks, Water and Environment
EMPCA	*Environmental Management and Pollution Control Act 1994*
EPA	Environment Protection Authority Tasmania
NRM	Natural Resource Management
TEER	Tamar Estuary and Esk Rivers Program
TOC	Total organic carbon

1. Introduction

1.1 Introduction

Photograph 1.1: Mersey River at Latrobe

Hydro Tasmania initiated a review of its operations in the Mersey and Forth River catchments in 2011 (Hydro Tasmania, 2011). In the stakeholder consultation stage of the Mersey-Forth Water Management Review it was identified that water quality is a significant issue of concern in all waterways of the Mersey-Forth catchments (Hydro Tasmania, 2012). In particular, the lower Mersey River (Photograph 1.1) was highlighted for perceived declining water quality conditions and the subsequent negative impacts these conditions were having on recreational and tourist activities, and on the environment. Concerns have included:

- Visibly poor water quality with increased turbidity;
- Events called 'black water events', which occur within 48 hours of flooding or rainfall, when the water turns blackish-brown, last for approximately 10 days and lead to the disappearance of fish and absence of platypus;
- Grey, black and green slime growing in still or slow flowing water;
- Rafts of dirty foam;
- Smelly water;
- Undrinkable water;
- A deterioration in fish quality; and
- Alleged industrial sewage discharges.

Stakeholder opinion was that there is no overall catchment management approach, limited resources to deal with the situation, and little will to address water quality issues. Falling between the jurisdiction of four Councils and two Natural Resource Management (NRM) groups, the Mersey River lacks a coordinating body to address water quality issues. Stakeholders agreed that a collaborative project, in conjunction with all stakeholders, would be the best way forward.

While Hydro Tasmania is responsible for water quality and quantity released from Lake Parangana into the Mersey River (Photograph 1.2), it is not responsible for water quality downstream of Parangana Dam that is influenced by land use activities along the river and its tributaries. As discussed in Sections 3.1 and 3.4 land use activities can have significant impacts on water quality.

On occasion Hydro Tasmania has been requested to mitigate deteriorating water quality conditions through additional water releases. With dilution of pollution not considered to be sustainable practise, and not actually reduce the mass load that can still modify ecosystem condition and affect the public utility of the water body, identification and proactive management of sources of pollution are the preferred and more effective steps to providing solutions to water quality issues. Collaboration with those organisations responsible

Photograph 1.2: Mersey River below Lake Parangana

for protecting river water quality and water use is considered essential to address the problem of perceived, deteriorating water quality conditions that may result from point and diffuse sources of pollution.

As part of the Mersey-Forth Water Management Review process Hydro Tasmania initiated a technical and social study in an attempt to address water quality conditions in the Mersey River. This report outlines the collaboration and outcomes that have been achieved through this study, and presents the recommended way forward.

1.2 Aim and objectives

The aim of this Mersey River Water Quality Assessment Project was for Hydro Tasmania to participate in a collaborative approach with the State Government Agencies, local Councils and other key stakeholders to assess and cooperatively address the occurrence of poor water quality in the lower Mersey River, and work towards achieving a more sustainable future for the river.

To this end the following objectives were identified:

1. Meet with State Government Agencies to clarify roles and responsibilities for the monitoring and management of water quality;
2. Convene meetings with Mersey River Catchment local Councils and key stakeholders to discuss water quality conditions in the river, advise stakeholders to notify the EPA in the event of poor water quality being observed, and initiate collaboration in addressing concerns; and
3. Sample “black water events”, if possible, and evaluate whether a more detailed investigation is required.

2. Stakeholder Consultation

2.1 Roles and responsibilities

The legislative roles and responsibilities of State Government Agencies and local Councils in addressing water quality conditions in the Mersey River were clarified and are as follows.

The Environmental Protection Authority (EPA) Division of the Department of Primary Industries, Parks, Water and Environment (DPIPWE) is Tasmania's principal environmental regulator. The EPA administers the *Environmental Management and Pollution Control Act 1994* (EMPCA) and is an integral part of Tasmania's Resource Management and Planning System. The EPA's purpose "is to regulate developments and activities that may impact on environmental quality and to promote best practice, sustainable environmental management" (EPA TAS, 2013). The EPA is the organisation responsible for water quality in Tasmania and has established processes and procedures to investigate water quality issues.

Councils also apply EMPCA in the regulation of unscheduled and Level 1 activities, and have responsibilities to monitor recreational sites in the summer as part of their public health responsibility.

The Water and Marine Resources Branch of DPIPWE monitors water quality and flows at sites across Tasmania, excluding most of the catchments managed by Hydro Tasmania. Water use and allocation of water resources is their key focus.

2.2 Stakeholders involved in the water quality assessment project

With the aim of addressing water quality conditions in the Mersey River, from March 2012 to July 2013, Hydro Tasmania held meetings with Regulatory Agencies, local Councils, other key stakeholders (involved from the start of the project), and a broader group of stakeholders from Natural Resource Management and other organisations within the catchment (Table 2.1). Initially the Natural Resource Management Agency for the Mersey River (Mersey NRM) was involved however this group was disbanded shortly thereafter.

The aims and outcomes of the stakeholder meetings are presented in Table 2.2. The significant outcomes from the overall process are discussed in more detail in Section 3.

Table 2.1: Stakeholders involved in addressing water quality conditions in the Mersey River

Stakeholder Group	Organisation	Name of Participant
State Government Agency, DPIPWE	EPA	Greg Dowson, Chris Fabian
	Water and Marine Resources	Martin Read
Local Councils	Latrobe Council	Michelle Dutton, Glenys Nicholls
	Kentish and Latrobe Council	Georgina Crantock
	Devonport City Council	Bruce Harpley, Phil Murray
Natural Resource Management Agencies	Cradle Coast NRM	Richard Ingram, Mark Wisniewski
	NRM North	Amanda Locatelli
Local Organisations	Latrobe Landcare Inc.	Ron Hedditch, Noelene Hedditch, Phillip Hedditch
	Devonport Anglers Club	Peter Maloney
	Mersey Irrigators	Kem Perkins
	Mersey Estuary Group	Merv Tippett
Industry and Management Authorities	Dulverton Waste Management	Alison Holmstrom
	Tas Water	Sarie Los

Table 2.2: Stakeholder meetings, aims and outcomes through the Water Quality Assessment Project

Date	Stakeholder Group	Aims of Meeting	Outcomes
9 March and 3 April 2012	State Government Agency (DPIPWE)	• Clarify roles and responsibilities; and • Discuss best approach to address water quality conditions.	• EPA to undertake a desktop assessment of available information; • Agreement to purchase water quality probes to upgrade the Water Assessment Branch (DPIPWE) monitoring station at Latrobe on the Mersey River; and • Watching brief to be maintained.
13 June 2012	State Government Agency, local Councils and local organisations	• EPA to present results of a desktop assessment of existing water quality conditions and an overview of potential sources of pollution in the catchment; and • Stakeholders to discuss water quality concerns regarding the lower Mersey River.	Agreement was reached on the following: • A collaborative effort would be required to address concerns; • The immediate objective would be to monitor a "black water event"; • Stakeholders would notify the EPA when the next "black water event" was present in the river; • EPA to be prepared to take samples when required; • Reconvene to discuss the way forward after results of a monitoring event are available; and • Install a water quality probe at the DPIPWE flow gauging site.
9 May 2013	State Government Agency, local Council and local organisations	• To update stakeholders on the status of actions undertaken since June 2012; and • To discuss and reach agreement on the proposed way forward in improving water quality conditions in the Mersey River.	Agreement was reached on the following: • Water quality in the Mersey River is of key importance and it is a risk not to address the issue; • A collaborative approach where all parties participate and contribute, in kind or resources, is essential for conditions in the Mersey River to be improved and sustained. Broader catchment stakeholders need to be involved; and • The integrated catchment management approach as used by NRM North and supported by Cradle Coast NRM needs to be considered.
8 July 2013	State Government Agency, local Councils and local organisations, NRM Agencies, industry, and management authorities	• To bring together a broader stakeholder group with interest in the Mersey River; • NRM North to present the TEER program and potential options for the way forward; • The group to discuss and reach agreement on the key steps required to improve water quality conditions in the Mersey River; and • To identify a leading organisation and champion to take the process forward.	• Broad stakeholder group interest and collaboration established; • Evidence of successful waterway management through regional partnerships presented; • Benefits, challenges and insights of collaborative partnerships identified; • Agreement that an integrated collaborative catchment approach is required; and • Support in principle to develop an integrated catchment management approach and plan.

3. Outcomes

The stakeholder engagement throughout the Water Quality Assessment Project provided a number of outcomes (Table 2.2). Some of the key outcomes are discussed in more detail.

Desktop assessment and identification of potential sources of point and diffuse sources of pollution in the Mersey River catchment resulted in a number of outcomes (Table 2.2). Some of the key outcomes are discussed in more detail.

3.1 Desktop assessment and identification of potential sources of point and diffuse sources of pollution in the Mersey River catchment

To evaluate water quality in the catchment the EPA carried out an initial desktop assessment of the Mersey River. This included an identification of the existing protected environmental values for the river, an assessment of water quality conditions and an overview of potential sources of pollution in the catchment.

In summary the desktop assessment determined that there are point and diffuse sources of pollution in the catchment that could potentially impact upon water quality. Some sites are connected to sewer and some are not, and the extent of their potential to pollute has not been fully determined. Point sources include sewage treatment plants at Sheffield, Railton and Latrobe, and the Railton Cement Works. Also dairies, abattoirs, chemical works, factories, quarries and landfills are potential pollution sources. Diffuse pollution sources include agricultural and forestry operations. Due to a number of both point source and diffuse sources of pollution in the catchment it is difficult to identify any particular activity that may be the specific cause of the water quality issues in the Mersey River.

While there are water quality monitoring sites in the Mersey River, the data for these sites have not yet been comprehensively analysed and it is recognised that historical sampling efforts have not been focused enough to enable all sources of pollution to be identified. Initial studies in the 1990's show a general decline in water quality and deterioration in macroinvertebrate species and abundance the further one progresses downstream (Mersey River Working Group, 1998). However, since the commencement of environmental flow releases in 1999, monitoring has shown significant improvements in fish and macroinvertebrate communities particularly in the middle to upper Mersey River (DPIW, 2009). It is clear that more work is required to link the events and conditions that lead to declines in water quality.

3.2 Upgrade the in situ water quality monitoring equipment in the lower Mersey River

DPIPWE has been monitoring water quality at the gauging station site in the Mersey River at Latrobe for some years (Photograph 3.1 and Photograph 4.1). In collaboration with Hydro Tasmania, in-situ water quality monitoring equipment was upgraded in January 2013 to continuously monitor temperature, conductivity, and turbidity. This will enable a greater understanding of water quality, and the conditions that lead to pollution events, to be gained. The site at Latrobe should establish the conditions around the priority pollutant issue, i.e., 'black water' events emanating from upper catchment flows and further water quality information under different flow regimes.

Photograph 3.1: Water quality monitoring site (top) and station on the Mersey River at Latrobe (above). Photographs courtesy of DPIPWE's Water Monitoring Section.

3.3 Notification of poor water quality conditions

Community involvement in notifying the EPA and assisting them to acquire evidence during pollution incidents was identified as being essential. In the event of poor water quality conditions, such as black or highly turbid water, or dead fish in the Mersey River, stakeholders were asked to contact the EPA on the **Incident Response Number**:

1800 005 171 or at **http://epa.tas.gov.au/epa**.

Once notified, EPA Compliance and Regional Support – Environmental Operations Officers would collect water samples and have the samples analysed.

3.4 Monitoring a 'black water event'

Historically the permanently flowing waters of the Mersey River have been assessed as being of good quality (DPIPWE, 2013). In the lower Mersey River stakeholders have regularly complained of deteriorating conditions and 'black water' events, but the characteristics of these events have never been determined. A key objective of the project was therefore to monitor a 'black water event' and stakeholders agreed to notify the EPA when 'black water' was present in the river.

On 26 March 2013 the Latrobe Landcare Group Inc. observed a 'black water' event and notified the EPA. The EPA took samples and the analytical results were assessed and reported by the EPA (Appendix A). While the event sampled had missed the main spike, that had been detected through the continuous flow and turbidity measurements, the results did show elevated turbidity and suspended particulate material during the high flow event. Total organic carbon (TOC) and dissolved organic carbon (DOC) indicated humic tannin waters.

The Kentish and Latrobe Council Environment Officer advised that there had been a sewage spill on 25 March at Gilberts Green.

It was evident from the monitoring of this one event that without more consolidation of data and information, and critical assessment, it is not possible to get a clear picture of water quality conditions or develop appropriate water quality management strategies. Further investigation is required.

3.5 Collaborative partnership

From the outset stakeholders considered that the solution to the problems of the Mersey River requires further investigation and a collaborative effort. As the process unfolded it became clear, and it was agreed, that resolution requires a systematic and participatory process of collective stakeholders. The approach applied by NRM North, in the Tamar Estuary and Esk Rivers Program (TEER), through establishing a technical committee to work towards developing a Waterway Action Plan/ Catchment Plan for the Mersey River was proposed.

All of the stakeholders present at the meeting held on 8 July 2013 agreed that a long term solution to addressing conditions in the Mersey River requires the following:

- Leadership from within the Mersey River catchment to take this matter forward to be addressed collaboratively;
- Councils need to bring their commitment, expertise and combined strength to the process;
- Collaborating organisations need to be asked for support, funding or in kind support, data and expertise, as appropriate. A partnership agreement and a term of reference for the broader stakeholder group to be established;
- Available information needs to be collated, updated, critically assessed and made available through a central repository;
- The development and implementation of a prioritised action plan for the Mersey River catchment;
- In the future, opportunities for external funding should be investigated; and
- Clarification from DPIPWE, regarding the review of the Water Management Plan due in July 2015, is required.

4. Recommended Way Forward

Photograph 4.1: Lower Mersey River between Latrobe and Devonport

All participants in this stakeholder engagement process were in agreement that water quality in the Mersey River is of key importance and that it is a risk to economic, social and environmental values to not address the issue. It is recommended that stakeholders be heard and action initiated to prevent continued and further deterioration of the Mersey River.

NRM North and Cradle Coast NRM have given in principle agreement to assist in the development of an appropriate methodology and collaborative planning approach for a catchment based action plan. It is recommended that available NRM skills and proven experience be harnessed to establish an integrated catchment management approach for the Mersey River catchment.

The EPA will be instrumental in developing proposed water quality guidelines and objectives and biological condition objectives for regions in Tasmanian and the Mersey River Catchment in particular.

Historically the Mersey River has been a focus of scientific investigation and management attention and much was documented and achieved. It is recommended that this wealth of available information be collated, updated and critically assessed to assist in the development of an action plan. Devonport City Council NRM officer has the knowledge and insight to collate available information and liaise with stakeholders. It is recommended that these efforts be supported by the Council.

5. Conclusion

The aim of the Mersey River Water Quality Project was for Hydro Tasmania to participate in a collaborative approach with the State Government Agencies, local Councils and other key stakeholders to assess and cooperatively improve water quality conditions in the lower Mersey River. Through this process an initial desktop assessment was undertaken and a 'black water' event was reported on by the EPA. Water quality monitoring equipment was upgraded and is operational. A strong group of interested and concerned stakeholders has been established, communication channels have been opened, opinions and concerns voiced, collaboration initiated, and a way forward proposed.

It is considered that collaboration and cooperation between all stakeholders, to an agreed action plan for the Mersey Catchment, should ensure more effective management of the river and minimise the risk of conditions deteriorating. In this way it is envisaged that the Mersey River will be able to continue to support social, economic and environmental benefits, and enhanced values, into the future. However, to succeed the process needs leadership and commitment and it is considered that a collaborative initiative between the Councils, together with the NRM's and stakeholders, has the greatest chance of success.

Tasmania's renewable energy resources in the Mersey-Forth catchments will continue to be harnessed for power generation and Hydro Tasmania remains committed to sustainable management of the water resources. To this end Hydro Tasmania will support, where possible, the development and implementation of an action plan for the Mersey River in collaboration with stakeholders.

Photograph 5.1: Mersey River at Latrobe

6. For More Information

The fact sheet for this study is available at **www.hydro.com.au/MFWMR-studies**.

To see all the Mersey-Forth Water Management Review technical and social studies go to **www.hydro.com.au/MFWMR-studies**.

Find out more about the Mersey-Forth Water Management Review at **www.hydro.com.au/MFWMR**.

7. References

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Appendix

A. Report into the Mersey River "Black Water Discolouration Investigation" by the Environmental Protection Authority.

Greg Dowson
Water Specialist
EPA Division
DPIPWE

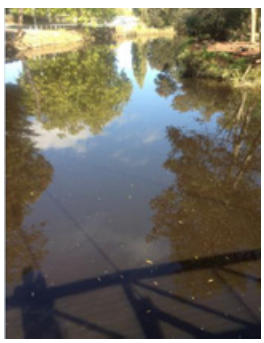
Mersey River "Black Water" Discolouration

On 26th March 2013 water quality measurements and samples were collected by Chris Fabian, EPA Division (Department of Primary Industry, Parks, Water and Environment), at Bells Parade and Warrawee Forestry Reserve in response to a discolouration "black water" event in the Mersey River. Reports of these events had been raised previously and a strategy for assessing such events was developed. This included the refurbishment of the gauging station in Mersey River at Shale Road for continuous flow and turbidity measurements, and the collection of water samples of the event.

A) **Sample locations**

Images taken at Bells Parade



B) **Results**

Field measurements:

Bells Parade Hydrolab Recordings on 26 March 2013 by Chris Fabian (EPA Div.)

Approximate Depth	Temperature C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH	Time
0.5 metre	17.08	0.146	8.23	6.01	14:52
2.0 metre	17.03	0.157	8.44	6.26	14:54

Warrawee Forest Reserve Hydrolab Recordings on 26 March 2013 (EPA Div.)

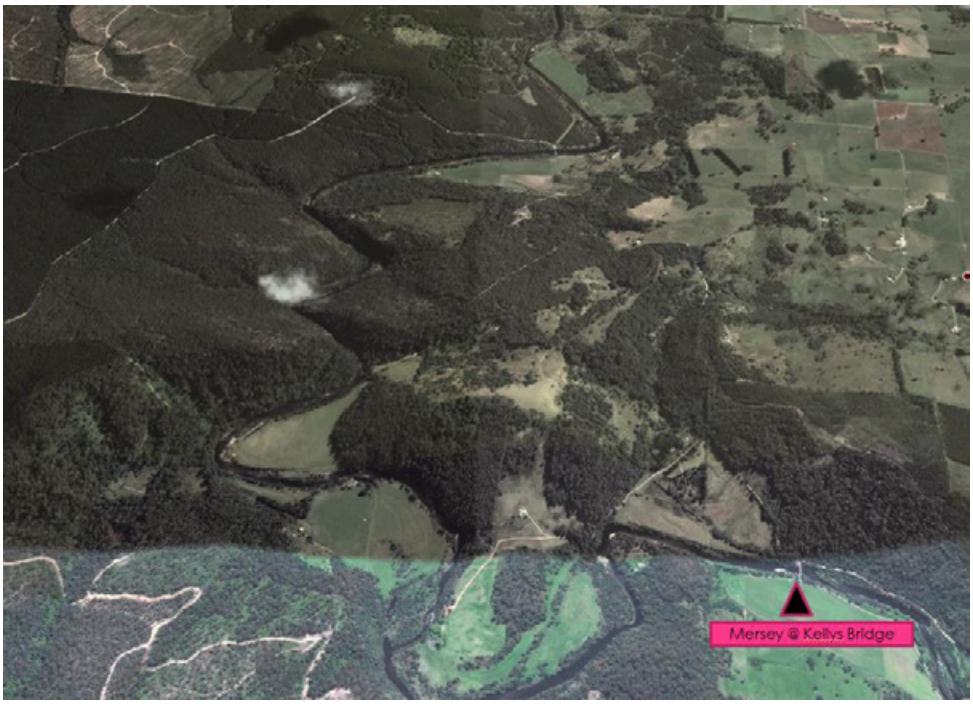
Approximate Depth	Temperature C	Conductivity mS/cm	Dissolved Oxygen mg/L	pH	Time
1.0 meter	16.81	0.126	8.51	6.15	15:47

Lab Analysis:

Method	Analyte	Sample Id.: / Units / Sampled On :	234211 Bells Parade 26/03/13 13:55	234212 Warrawee 26/03/13 14:55
1007-Water	Colour True	CU	99	104
1009-Water	Turbidity	NTU	3.8	3.0
1404-Water	DOC*	mg/L	5.9	6.0
	TOC*	mg/L	6.0	6.4

C) **Historic water quality**

Mersey River at Kellys Bridge



Site (2242) WMP-MERS, Mersey River at Kellys Bridge (ALL),MRHI, NWMP, WMP-MERS,

1995-2008	Dissolved Oxygen Percent Saturation	Field Cond @ TRef 25 uS/cm (25 TRef)	Turbidity NTU	Water Temperature Degrees C	pH field - sensor TC
Maximum	104.8	284	5.25	17.4	8.95
95th Percentile	104.165	247.1	4.7	16.48	8.81
80th Percentile	102.26	201	2.77	15.56	8.4
Median	98.45	177.3	1.76	13.1	7.835
20th Percentile	94.64	150.14	1.07	10.7	7.16
5th Percentile	92.735	103.895	0.92	9.73	6.81
Minimum	92.1	91.1	0.8	9.7	6.5
Sample Number	2	28	21	27	26

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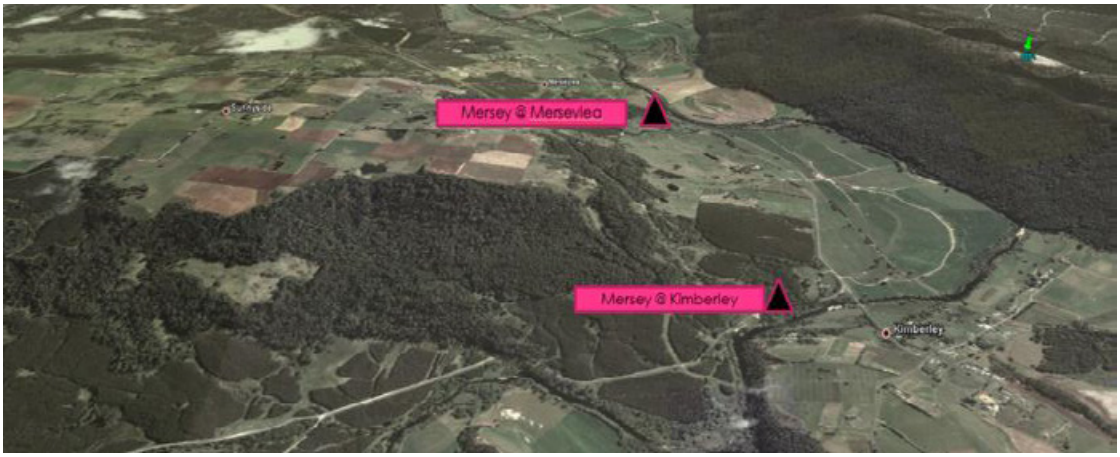
Mersey River downstream from Merseylea



Site (2240) WMP-MERS, Mersey River downstream of Merseylea (ALL),WMP-MERS,

1998-2004	Dissolved Oxygen Percent Saturation	Field Cond @ TRef 25 uS/cm (25 TRef)	Turbidity NTU	Water Temperature Degrees C	pH field - sensor TC
Maximum	106.1	204	37.1	18.8	8.66
95th Percentile	105.705	201.6	24.8745	18.73	8.59
80th Percentile	104.52	193.2	1.802	18.36	8.436
Median	102.15	173.3	1.125	16.55	8.335
20th Percentile	99.78	143.2	1.062	13.48	7.528
5th Percentile	98.595	135.58	0.8355	12.28	6.8445
Minimum	98.2	133.3	0.72	12	6.61
Sample Number	2	9	8	8	8

Mersey River at Shale Road

Site (2238) WMP-MERS, Mersey River at Shale Road (ALL),WMP-MERS,

1997-2004	Dissolved Oxygen Percent Saturation	Field Cond @ TRef 25 uS/cm (25 TRef)	Turbidity NTU	Water Temperature Degrees C	pH field - sensor TC	AUSRIVAS Band	OE50	OE50Signal
Maximum	102.2	236	5.85	18.2	8.82	4	0.72	0.95
95th Percentile	102.2	232.75	3.9975	17.875	8.5925	4	0.72	0.95
80th Percentile	102.2	209.8	2.57	16.3	8.348	3	0.72	0.95
Median	102.2	183	1.4	14.65	8.135	1.5	0.67	0.92
20th Percentile	102.2	159.34	1.27	13.76	7.866	0	0.51	0.81
5th Percentile	102.2	141.38	1.0555	11.53	7.3085	0	0.51	0.81
Minimum	102.2	138	1.01	10.1	6.86	0	0.51	0.81
Sample Number	1	14	14	14	14	12	6	6

epa TASMANIA
ENVIRONMENT PROTECTION AUTHORITY

D) **<u>Examples of activities with potential point and diffuse inputs into the Mersey</u>**

Railton Cement Works – washouts report to Caroline Creek

Dulverton Waste Depot and Composting Site

Cultivation upstream of Lovetts Flats

Mole Creek Quarry

E) Discussion

The Mersey catchment is not untypical of other catchments were sources of point and diffuse pollution have the potential to impact on the water quality under different flow events.

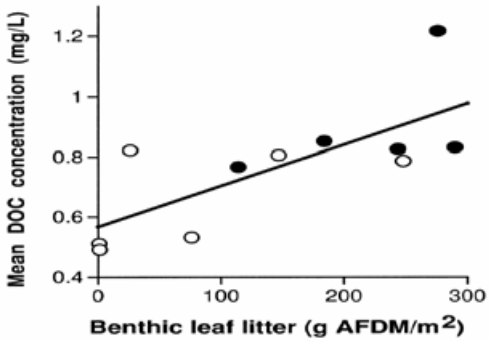
Ron Hedditch indicated to Chris Fabian (EPA Division) on the 26 March 2013 the colour of the water where samples were collected at Bells Parade represented the water of concern, i.e., black water, even though it appeared less discoloured. The observed colour and results of the samples represent an influence of humic staining from degrading vegetative material which can be from natural processes. Potential sources of dissolved organic carbon (DOC) would be from the forest canopy and floor, pools of decaying litter and humus, soil organic matter, plant roots and fungi, wetland peat deposits, and aquatic sediments and detritus. It is important to note that DOC, under natural conditions, is an important component of the carbon cycle and energy balance in streams.

The DOC levels in the lakes in the headwaters of Mersey (2001-2004) are summarised as follows:

	Dissolved Organic Carbon mg/L
Median	2.35
80th Percentile	3.68
90th Percentile	6.33
95th Percentile	12.675
Sample Number	22

The median and 80th% ile DOC levels in the lakes have been recorded in other catchments with wet and dry sclerophyll forests.

A general example of the relationship of leaf litter and DOC concentrations is provided below:



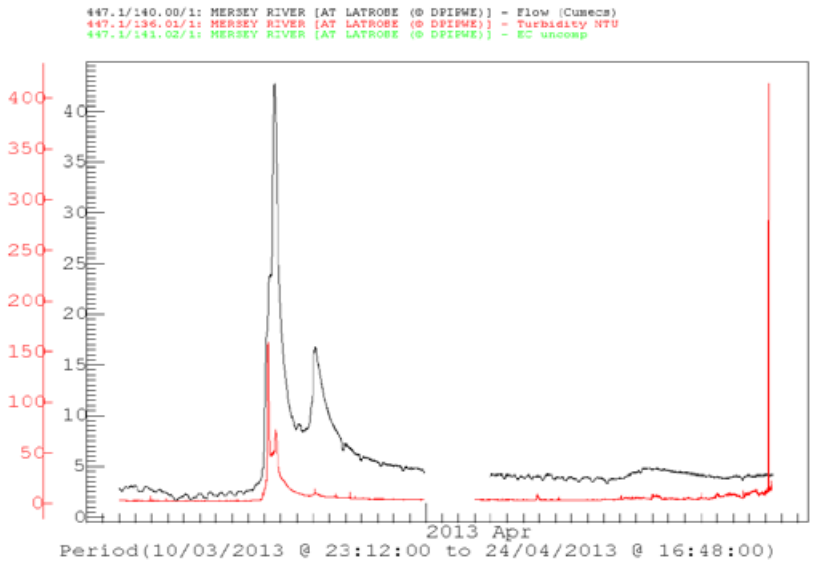
Turbidity has been historically recorded at generally low levels but a maxima of 37.1 NTU (and 80th ile of 1.8 NTU) in the Mersey River downstream at Merseylea has been recorded over the 1998-2004 period.

The grab samples collected at Bells Parade and Warrawee Forestry Reserve represent low turbidity and above the 80th ile levels for DOC determined in lakes at the head waters of the Mersey River.

The Dasher tributary entering into the Mersey River above Kimberly would also potentially be a source of diffuse pollutants such as suspended particulate matter and turbidity.

The gauging station, Mersey River at Shale Road (7184), up stream of Latrobe, where flow and turbidity continuous telemetered data is recorded, is detailed below

The graph of the outputs from this gauging station prior to and after the sampling of the discolouration “black water” event is as follows:



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The first spike of turbidity is responding initially with rising limb of hydrograph but not sustained, while the second spike is not flow related and appears to be anomalous. If the spike is not due to a "fault" then possibly local disturbance by wildlife such as a platypus has occurred in the immediate vicinity of the probe.

Clearly from the graph the samples collected on the 26th April missed a significant flux of suspended material on the 21-22nd April. The continuous turbidity recorded however does match that collected and analysed on the 26th April.

F) Conclusions

The event sampled is only a snap shot and has missed the spike that has been detected through the continuous flow and turbidity measurements. These measurements do show significant elevated turbidity (and suspended particulate material) during high flow events. Also there is movement of humic waters as indicated by the total organic carbon (mostly as dissolved) from the catchment into the estuary. These elevated levels may however be at levels which are typical for this catchment with the natural processes continuing to release humic waters into the catchment downstream from the lakes.

A detailed desk top assessment of the catchment is recommended using previous reports as a guide to develop water quality management strategies through an environmental management assessment program framework.

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