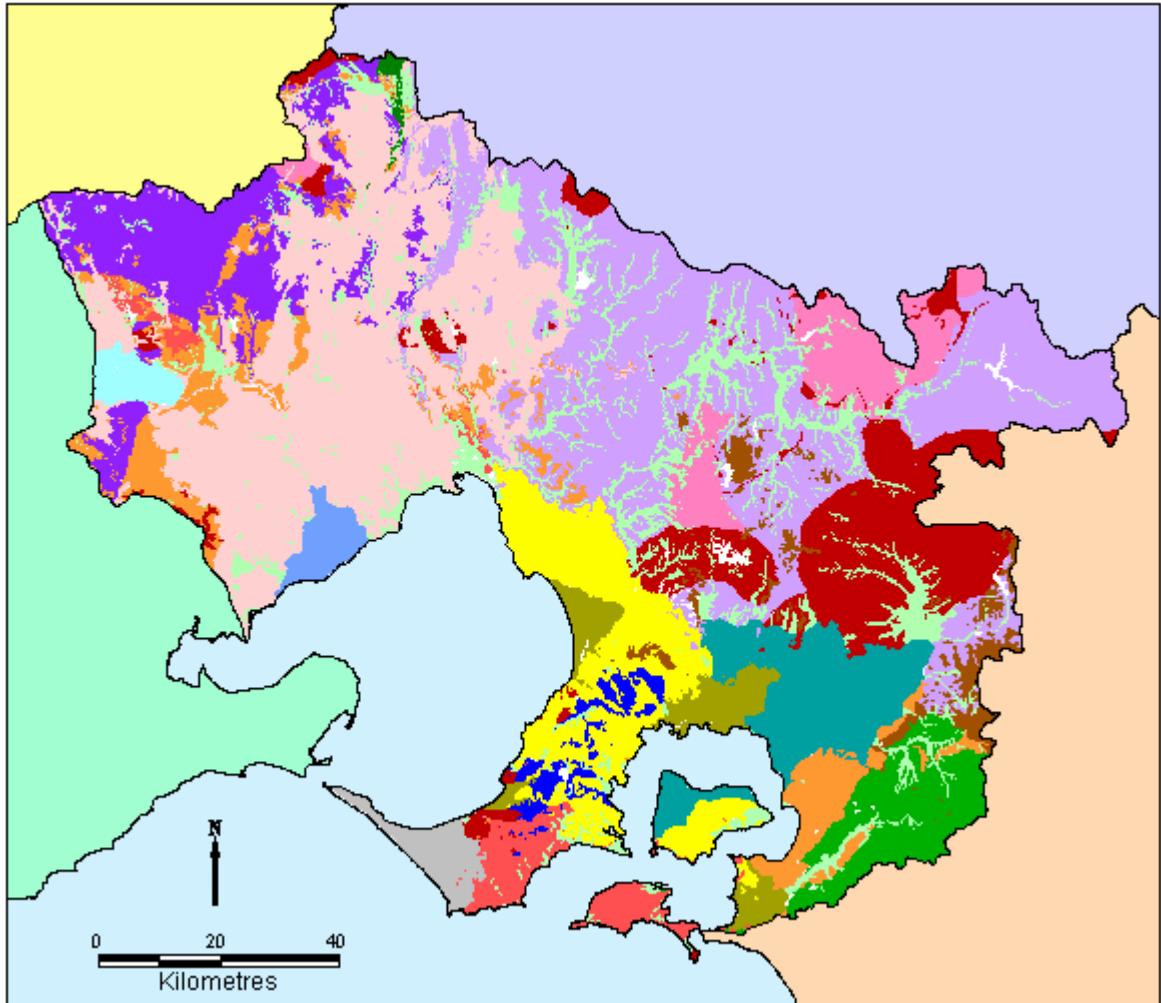


Port Phillip and Westernport Groundwater Flow Systems



Port Phillip and Westernport



CATCHMENT MANAGEMENT
AUTHORITY

Cite this document as: Dahlhaus P.G., Heislars D.S., Brewin D., Leonard J.L., Dyson P.R. & Cherry D.P. (2004). Port Phillip and Westernport Groundwater Flow Systems. Port Phillip and Westernport Catchment Management Authority, Melbourne, Victoria.

Authored by Peter Dahlhaus¹, David Heislars², Darrell Brewin³, John Leonard⁴, Phil Dyson⁵ & Don Cherry²

¹ Dahlhaus Environmental Geology Pty Ltd, Buninyong

² Primary Industries Research, Victoria, Bendigo

³ Darrell Brewin and Associates Pty Ltd, Torquay

⁴ John Leonard Consulting Services Pty Ltd, Carnegie

⁵ Phil Dyson and Associates Pty Ltd, Strathsfieldsaye

for the Port Phillip and Westernport Catchment Management Authority

Port Phillip and Westernport



© Port Phillip and Westernport Catchment Management Authority

Published by the Dept of Primary Industries (DPI) on behalf of the Port Phillip and Westernport Catchment Management Authority

Frankston, Victoria, Australia

www.ppwpcma.vic.gov.au

Port Phillip and Westernport Groundwater Flow Systems.

ISBN: ISBN 1 74146 113 8



The Port Phillip and Westernport Catchment Management Authority acknowledge:

- *The Victorian Government for funding this publication through the Department of Sustainability and Environment.*
- *The Department of Primary Industries for organising and coordinating this project. In particular, the efforts of Julie White & Viv Amenta are acknowledged.*
- *The participants of the groundwater flow systems workshop, October 14th to 16th, 2003*

Disclaimer

This publication may be of assistance to you, but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence that may arise from you relying on any information in this publication.

Summary

Eighteen groundwater flow systems have been delineated in the Port Phillip and Westernport Catchment Management Authority region based on the model put forward by the National Land and Water Resources Audit. Of these, 15 are predominately local groundwater flow systems, 2 are predominately intermediate, and one is predominately a regional flow system. Consensus on the flow systems was an outcome of a three-day workshop held in October 2003, and subsequent discussions with regional experts.

Groundwater flow systems are intended to characterise similar landscapes in which similar groundwater processes contribute to similar salinity issues, and where similar salinity management options apply. They comply with a national salinity evaluation framework being developed under the National Action Plan for salinity and water quality to characterise catchments in terms of their response to salinity management options.

While groundwater flow systems provide a useful tool in the understanding of salinity processes, confidence in management options for the protection of different classes of assets (water quality, environmental, agricultural, urban and engineering infrastructure, and cultural and heritage) requires confidence in the conceptual model of how the groundwater and salinity processes operate. To date there has been very little scientific validation of the flow systems or salinity process models in the Port Phillip and Westernport CMA region. However, the delineation of groundwater flow systems provides the most current and appropriate framework for the selection of salinity management options, as well as the opportunity to assess the knowledge gaps in the hydrogeology of the region.

Table of Contents

1	Introduction	1
1.1	<i>Scope, authorship and sources of information</i>	1
2	Groundwater Flow Systems	2
2.1	<i>PPWP CMA GFS</i>	2
3	GFS descriptions	4
3.1	<i>Landscape attributes</i>	4
3.2	<i>Hydrogeology</i>	4
3.3	<i>Salinity</i>	5
3.4	<i>Risk</i>	5
3.5	<i>Conceptual model(s)</i>	5
4	Salinity Management Options	5
4.1	<i>Salinity management and groundwater flow systems</i>	5
4.2	<i>Salinity management opportunities in dryland agriculture</i>	7
4.3	<i>Salinity management opportunities for irrigated agriculture and horticulture</i>	8
4.4	<i>Salinity management opportunities for urbanised environments</i>	9
4.5	<i>Planning frameworks</i>	9
5	Considerations in using GFS for salinity management	10
Port Phillip and Westernport Groundwater Flow Systems		11
Local flow systems in Quaternary sediments		12
Local flow systems in gravel and sand sediments		17
Local flow systems in the Nepean barrier dunes		22
Local flow systems in the Greenstone ranges		25
Local and intermediate flow systems in swamps and back-dune wetlands		29
Local and intermediate flow systems in weathered Older Volcanics		35
Local and intermediate flow systems in the fractured Older Volcanics.		39
Local and intermediate flow systems in the acid volcanics		42
Local and intermediate flow systems in the granitic rocks		45
Local and intermediate flow systems in the Brighton Group sediments		49
Local and intermediate flow systems in the Werribee Delta		54
Local and intermediate flow systems of the Rowsley Valley complex		59
Local and intermediate flow systems of the Mornington fractured bedrock		63
Local and intermediate flow systems of the Strzelecki Group rocks		67
Local and intermediate flow systems of the fractured Palaeozoic rocks		70
Intermediate and local flow systems in the weathered Palaeozoic rocks		74
Intermediate and regional flow systems of the Westernport plain		78
Regional and intermediate flow systems in the Volcanic Plains		82
References and Bibliography		87

1 Introduction

This report describes the Groundwater Flow Systems (GFS) for the Port Phillip and Westernport Catchment Management Authority (PPWPCMA) region. The groundwater flow systems have been delineated to assist in the development of the PPWPCMA Salinity Management Plan and are the outcome of a three-day workshop held on 14th to 16th October 2004 at Pakenham and Tynong North. Twenty-three invited experts and/or stakeholders in salinity and groundwater issues in the PPWPCMA region (Appendix A) attended the workshop, which was facilitated by Ray Evans, Phil Dyson and Darrel Brewin (all consultants).

The workshop and this report on the PPWPCMA GFS should be regarded as the initial attempt to delineate groundwater flow systems as a useful tool for salinity management. It is expected that aspects of the GFS models described in this report will be superseded by updated research information within the first five years of the PPWP Salinity Management Plan. As more information and data are provided through on-going research, all aspects of the GFS should be reviewed and the models modified where appropriate. Inevitably, a revision of the GFS will necessitate a reassessment of salinity risk and salinity management priority areas.

Apart from salinity management, the GFS framework also provides a useful disaggregation of the PPWPCMA landscapes for other current projects, such as the wastewater re-use projects at Werribee and Carrum, and the Cardinia Shire salinity management project (Pillai, 2002; SKM, 2003).

1.1 Scope, authorship and sources of information

The majority of the technical information on the flow systems has been compiled from the data and advice provided by the experts at the workshop, with limited verification. The delineation of the groundwater flow systems was largely the work of Peter Dahlhaus, John Leonard and Don Cherry. Detailed description of all of the groundwater flow systems has been compiled by Peter Dahlhaus and John Leonard. David Heislars, Darrell Brewin and Phil Dyson contributed the management options for those GFS in which salinity is an issue. Supplementary editing, modifications and corrections to all sections were contributed by all the authors.

Information on the various groundwater flow systems and their relation to salinity processes is generally scarce. Despite the number of intensive site-specific groundwater investigations that have been conducted throughout the greater Melbourne Metropolitan area, surprisingly little information has been published or is widely available. Most investigations have been undertaken for geotechnical investigations (eg. City Link tunnels) or contaminated site remediation (eg. Coode Island), and very few have been published. The most useful published investigations include those conducted by the past and present State government agencies involved in hydrogeology. However, these are mostly focused on groundwater resource management, and very few have focussed on saline groundwater flow systems. Aquifer parameters are sourced from the few reliably interpreted pumping tests that have been performed, and many are indicative only, being based on ranges for similar rock-types published in hydrogeological textbooks. The main reference sources are listed at the end of this report.