

7 CONCLUSIONS AND RECOMMENDATIONS

The Parramatta River Estuary CZMP has been prepared by Cardno on behalf of the Parramatta River Estuary Management Committee in accordance with the requirements of the *Coastal Protection Act 1979*, and with reference to the relevant guidelines, including the *Guidelines for Preparing Coastal Zone Management Plans* (DECCW, 2010b) and the *NSW Estuary Management Manual* (NSW Government, 1992; recently superseded).

The Plan includes an implementation strategy consisting of 67 prioritised actions proposed for execution within 10 years after the Plan is adopted. The strategy clearly identifies the responsible organisation for implementation of each management action, be it the Committee as a whole or by one of the 11 authorities that hold representation. The estimated capital cost of implementation is \$19.4 million, with annually recurrent costs (assuming 10 years of implementation) of \$1.6 million.

In addition to these 67 prioritised actions a further 16 management actions were identified as generic actions of significant benefit or high priority that may be implemented by any council or authority in the event the necessary resources become available. These generic actions have been provided as a stand-alone list.

The management actions within the implementation strategy (Section 5) have been prioritised to assist in allocating resources when carrying out the Plan, however, it is acknowledged that the resources required to progress the Plan are significant, and that a flexible approach to undertaking works should be adopted. For example, there may be grants or other funding opportunities that arise from time to time that will allow the Committee to select certain types of lower priority management actions for implementation before higher priority actions.

In order to measure the success of implementation of the Plan, a monitoring and evaluation strategy is also included (Section 6) that provides for regular assessment against a range of KPIs, as well as more regular monitoring of estuarine health. The Parramatta River Estuary CZMP should be regarded as a 'living document' that is reviewed and updated over time in accordance with the principles of adaptive management. The monitoring and evaluation strategy will be a key input into this process.

When the Plan is updated after the first period of implementation, the first activity that should be undertaken is a review of the key management issues, aims and objectives to confirm that they remain relevant. At this time the management options (and particularly their prioritisation) should also be reviewed. It may be that emerging issues have developed since adoption of this Plan and hence the list of high priority management options may require revision. Once these tasks have been undertaken, the list of management actions within the implementation strategy can then be reviewed. This will initially involve the removal from the strategy of any actions that have been completed. At this time, additional management actions that address the updated list of high priority management options can be considered for incorporation into the updated implementation strategy within the Plan. New management actions may be carried across from the management recommendations made in the *Estuary Processes Study* (AECOM, 2010) where they remain relevant. However, it may be necessary to consider developing new management actions that more adequately address the management priorities at that time.

The Parramatta River Estuary CZMP represents a comprehensive document that provides for the coordination of management initiatives by the Committee members. Successful implementation of the Plan

will require the continued cooperation of the many stakeholders under the guidance of the Parramatta River Estuary Management Committee.

8 QUALIFICATIONS AND ASSUMPTIONS

The following qualifications and assumptions apply to this Plan:

- The development of the Plan commenced prior to release of the new *Guidelines for Preparing Coastal Zone Management Plans* (DECCW, 2010b). Every effort has been made to meet the minimum requirements of the Guidelines in so far as is reasonably practical.
- The assessment of the potential impacts associated with the management options and management actions is preliminary in nature and is not intended as an exhaustive assessment. It has been assumed that the appropriate level of environmental impact assessment would be undertaken prior to the initiation of any on the ground works, and that appropriate mitigation measures and environmental safeguards will be put in place to minimise impacts associated with the works. The preliminary actions costings for on the ground works include a budgetary allowance for the required environmental impact assessment where indicated.
- It has also been assumed that any relevant approvals, permits or licences required under the legislation would be obtained for any works implemented under this Plan.
- The feasibility and sustainability of management actions identified in the implementation strategy have not been considered in detail during the preparation of this Plan, but have relied upon information presented in the *Parramatta River Estuary Processes Study* (AECOM, 2010) or provided by the Committee members. Where feasibility investigations were considered to be an important component of the implementation process for a particular management action, this has been identified in the implementation strategy. However, the need for further consideration of feasibility and sustainability should be assessed prior to initiation of any of the actions.
- The cost estimates shown in the implementation strategy are indicative and have been used for comparative purposes only. Detailed cost estimates should be obtained prior to initiation of any of the management actions.

9 REFERENCES

- AECOM (2010) *Parramatta River Estuary Processes Study*. Prepared for the Parramatta River Estuary Committee. October 2010.
- ANZECC (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, Canberra. October 2000.
- Applied Ecology (2010) *Lane Cove Estuary Saltmarsh Monitoring Manual*. Prepared for the Lane Cove River Estuary Management Committee. April 2010.
- Bartlett, P. (2007) New Dawn for Harbour's Fish as Scales Tip in their Favour. *Sydney Morning Herald*: 28-29/07/07, pp. 3.
- Birch, G.F., Eyre, B., and Taylor, S.E. (1999) The distribution of nutrients in bottom sediments of Port Jackson (Sydney Harbour), Australia. *Marine Pollution Bulletin*, 38 (12): pp. 1247-1251.
- Birch, G.F., and Taylor, S.E. (2004) *The Contaminant Status of Sydney Harbour Sediments. A Handbook for the Public and Professionals*. Environmental, Engineering and Hydrogeology Specialist Group, Geological Society of Australia Public Education and Information Monograph No. 1, pp. 100.
- Cardno (2008) *Parramatta River Estuary Data Compilation and Review Study*. Prepared for Parramatta City Council, the Department of Environment and Climate Change, and the Sydney Metropolitan Catchment Management Authority, on behalf of the Parramatta River Estuary Management Committee. July 2008.
- Cardno (2010) *Working Together to Sustain the Parramatta River – Monitoring and Evaluation Report*. Prepared for Parramatta City Council. August 2010.
- CCBC (2010) *Resourcing Strategy: Asset Management Plan*. City of Canada Bay. March 2010, pp. 51.
- Chessman, B. (2003) *SIGNAL 2.iv A Scoring System for Macroinvertebrates ('Water Bugs') in Australian Rivers Users Manual*. Monitoring River Health Initiative Technical Report, Report No. 31. Commonwealth of Australia. September 2003, pp.: 34.
- Creese, B., Glasby, T., West, G., and Gallen, C. (2009) *Mapping the Habitats of NSW Estuaries*. NSW Department of Industry and Investment NSW – Fisheries Final Report Series No. 113 ISSN 1837-2112.
- CSE (2012) *Assessment of the Science Behind the NSW Government's Sea Level Rise Planning Benchmarks*. Prepared by the NSW Chief Scientist and Engineer, April 2012.
- DEC (2004) *Waterwatch Australia National Technical Manual*. Waterwatch Australia Steering Committee, Australian Government Department of Environment and Heritage.
- DECC and SMCMA (2009) *Environmentally Friendly Seawalls. A Guide to Improving the Environmental Value of Seawalls and Seawall-lined Foreshores in Estuaries*. Prepared by the NSW Department of Environment and Climate Change and the Sydney Metropolitan Catchment Management Authority. June 2009, pp.: 27.

- DECCW (2009) *NSW Sea Level Rise Policy Statement*. October 2009, pp.: 9.
- DECCW (2010a) *NSW Natural Resources MER Strategy 2010-2015 Implementation Plan (Version 1.1)*. NSW Department of Environment, Climate Change and Water. October 2010, pp.: 66.
- DECCW (2010b) *Guidelines for Preparing Coastal Zone Management Plans*. NSW Department of Environment, Climate Change and Water. December 2010.
- DECCW (2010c) *New South Wales Natural Resources Monitoring, Evaluation and Reporting Strategy 2010-2015*. NSW Department of Environment, Climate Change and Water. December 2010.
- DECCW (2010d). *Coastal Risk Management Guide: Incorporating Sea Level Rise Benchmarks in Coastal Risk Assessments*. NSW Department of Environment, Climate Change and Water.
- DLG (2010) *Planning a Sustainable Future. Planning and Reporting Guidelines for Local Government in NSW*. Division of Local Government, Department of Premier and Cabinet. January 2010, pp. 23.
- DoP (2010) *NSW Coastal Planning Guideline: Adapting to Sea Level Rise*. NSW Department of Planning. August 2010.
- EarthTech (2007) *Sydney Metropolitan Catchment Management Authority Waterways Health Strategy*. Prepared by EarthTech for SMCMA. June 2007, pp. 129.
- EarthTech (2008) *City of Canada Bay Estuary Vegetation Management Plan*. City of Canada Bay. September 2008, pp. 78.
- Geoscience Australia (2012) *OzCoasts: Australian Online Coastal Information – Sedimentation Rates*. Australian Government, Geoscience Australia. Accessed on 28/06/2012, at www.ozcoasts.gov.au/indicators/sediment_rates.jsp.
- Green, R.H. (1979) *Sampling design and statistical methods for environmental biologists*. Cambridge University Press: Cambridge, England.
- I&I NSW (2010) *NSW Weeds Action Program Guidelines for Applying for Funds 2010–2011*.
- I&I NSW (2011) *Primefact 737: Sydney Harbour and Northern Beaches Recreational Fishing Guide*. January 2011.
- McLoughlin, L. C. (2000) Estuarine Wetlands Distribution along the Parramatta River, Sydney, 1788-1940: Implications for Planning and Conservation. *Cunninghamia*, 6 (3): pp. 579-610.
- NHMRC (2008) *Guidelines for Managing Risks in Recreational Waters*. National Health and Medical Research Council, Australian Government, February 2008.
- NPWS and SOPA (2003) *Plan of Management for Newington Nature Reserve*. Jointly prepared by the NSW National Parks and Wildlife Service and the Sydney Olympic Park Authority. January 2003, pp.: 137.
- NRMMC (2007) *National Protocol for Monitoring of Cyanobacteria and their Toxins in Surface Waters*. Natural Resource Management Ministerial Council. Draft (Under Review). Canberra.

NSW Government (1992) *Estuary Management Manual*. Prepared by the NSW Government. October 1992, pp. 198.

NSW Government (2009) *NSW Sea Level Rise Policy Statement*. NSW Department of Environment, Climate Change and Water. October 2009.

NSW Government (2010) *Metropolitan Plan for Sydney 2036*. NSW Department of Planning. December 2010.

NSW Natural Resources and Environment CEO Cluster Group (2006) *NSW Natural Resources Monitoring, Evaluation and Reporting Strategy*, August 2006.

NSW Water Resources Council (1993) *NSW Rivers and Estuaries Policy*. NSW Government. August, 1993, pp. 40.

OEH (2011) *Parramatta River*. Accessed on 13/09/2011, at:
www.environment.nsw.gov.au/estuaries/stats/ParramattaRiver.htm.

OEH (2013) *Assessing Estuary Ecosystem Health: Sampling, Data Analysis and Reporting Protocols*. NSW Natural Resources Monitoring, Evaluation and Reporting Program. Prepared by NSW Office and Environment and Heritage, pp. 38.

PCC (2009) *The Parramatta River Foreshore Plan 2009-2016*. Parramatta City Council, pp. 70.

Roper, T., Creese, B., Scanes, P., Stephens, K., Williams, R., Dela-Cruz, J., Coade, G. and Coates, B. (2011). *Assessing the Condition of Estuaries and Coastal Lake Ecosystems in NSW Technical Report - NSW State of the Catchments 2010*. NSW Office of Environment and Heritage, Sydney.

Scanes, P., Coade, G. and Dela-Cruz, J. (2009) *Monitoring, Evaluation and Reporting Sampling Protocols*. Department of Environment, Climate Change and Water. November 2009, pp.: 24.

SHFT (2003) *The Plan*. Published by the Sydney Harbour Federation Trust, pp. 197.

SMCMA (2009) *Sydney Metropolitan Catchment Action Plan*. Sydney Metropolitan Catchment Management Authority, pp. 225.

SMCMA (2012a) *Botany Bay Water Quality Improvement Program*. Accessed on 27/06/2012, at:
www.sydney.cma.nsw.gov.au/bbccil/.

SMCMA (2012b) *Draft Catchment Action Plan 2012 A Plan for Sydney's Liveability*. Sydney Metropolitan Catchment Management Authority, pp. 245.

SOPA (2010) *Parklands Plan of Management*. Prepared for the NSW Government by the Sydney Olympic Park Authority. November 2010, pp.: 62.

South Australian EPA (2007) *Community Estuarine Monitoring Manual*. Environment Protection Authority.

Standards Australia (1998a) *AS/NZS 5667.1:1998 Water Quality - Sampling - Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*. Standards Australia, New South Wales.

Standards Australia (1998b) *AS/NZS 5667.6:1998 Water Quality - Sampling - Guidance on Sampling of Rivers and Streams*. Standards Australia, New South Wales.

Standards Australia (1999) *AS/NZS 5667.12:1999 Water Quality - Sampling - Guidance on Sampling of Bottom Sediments*. Standards Australia, New South Wales.

Sydney Ferries (2012) *Annual Report 2011-12*. Published by Sydney Ferries, pp. 104.

Total Earth Care (2009) *Weed Mapping in the Sydney Metropolitan CMA Region: Tussock Paspalum*. Report prepared for SMCMA, August 2009.

West, G. and Williams, R.J. (2008) *A Preliminary Assessment of the Historical, Current and Future Cover of Seagrass in the Estuary of the Parramatta River*. NSW Department of Primary Industries – Fisheries Final Report Series No. 98 ISSN 1449-9967.

West, G., Williams, R.J. and Laird, R. (2004) *Distribution of Estuarine Vegetation in the Parramatta River and Sydney Harbour, 2000*. Report Prepared for NSW Maritime and Australian Maritime Safety Authority. NSW Department of Primary Industries – Fisheries Final Report Series No. 70 ISSN 1449-9967, December 2004.

WRL (2011) *Sydney Harbour Catchment Water Quality Improvement Plan: Data Compilation and Review*. By D.S. Rayner, B.M. Miller, W.C. Glamore and G.P. Smith. Prepared by the Water Research Laboratory, UNSW, WRL Technical Report 2011/07, August 2011, pp.: 77.

Underwood, A.J. (1994) On Beyond-BACI: Sampling designs that might reliably detect environmental disturbances. *Ecological Applications*, 4 (1), pp. 3-15.

Underwood, A.J. (1992) Beyond BACI: The detection of environmental impacts on populations in the real, but variable, world. *Journal of Experimental Marine Biology and Ecology*, 161, pp. 145-178.

Underwood, A.J. (1991) Beyond BACI: Experimental designs for detecting human environmental impacts on temporal variations in natural populations. *Australian Journal of Marine and Freshwater Research*, 42, pp. 569-587.

You, Z.-J., Lord, D. and Watson, P. (2009) *Estimation of Relative Mean Sea Level Rise from Fort Denison Tide Gauge Data*. Coastal Unit, NSW Department of Environment, Climate Change and Water. Australian Coasts and Ports Conference Wellington, New Zealand, September 2009.