

Macleay Estuary Information Register

APPENDIX A - MACLEAY RIVER ESTUARY INFORMATION AND DATA REGISTER

Reference No.	Subject	Full Title	Year	Author/s	Format	Abstract	Custodian Name	Custodian Contact details	Statement of Use to Estuary Management Planning Process	Comments
1	Erosion studies	<i>Report by Departmental committee on Macleay River Erosion</i>	1934	Departmental Committee on Erosion, Lands Department	Report - Hardcopy	This report presents an overview by the Departmental Committee on Erosion on the major causes of bank erosion in the Macleay River downstream of Kempsey. Floods, wind-wave action and tidal currents were identified as the major causes of bank erosion in 1934. Other contributing factors identified include river traffic, shoaling of straight reaches, removal of natural protective cover and cultivation of banks and cattle grazing. Dredging of the channel (inclusive of dredging the crossings - riffles) was identified as having negligible influence on extent and severity of bank erosion.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Identifies the nature and extent of bank erosion in 1934 and the three major causes (floods, wind-wave action and tidal currents). Assessment of issues relevant to Section 10.2 (Riparian land management and bank erosion). Planform map of bank erosion with severity mapped as serious, less and slight. Sketches of dredging works and quantification of volumes of sediment removed. Limitations of report include the qualitative assessment of the controls on bank erosion.	
2	Geology and Geomorphology	<i>A reconnaissance of soils of the Kempsey District</i>	1963	P.H. Walker	Journal	A comprehensive investigation of soil characteristics for the lower Macleay River assessing residual and depositional landscapes, their pedological attributes and their agricultural potential.	University of Wollongong Library	CSIRO Soils and Land Use Series No. 44	Does not directly relate to any Section 10 issues but provides some background on soil characteristics for the deltaic plain and the potential problems with acid sulphate soils.	
3	Geology and Geomorphology	<i>Weathering and soil development on a sequence of river terraces</i>	1969	R. Brewer and P.H. Walker	Journal	This study outlines the nature of soil development on five alluvial terraces in the Macleay valley at Belgrave Falls. It investigates the degree of weathering and the extent of clay illuviation with soil profiles of differing ages.	University of Wollongong Library	<i>Australian Journal of Soil Research</i> , 20, 293-305.	Does not directly relate to any Section 10 issues but provides some background on soil characteristics for terraces in the lower Macleay valley.	
4	Geology and Geomorphology	<i>Depositional and soil history along the lower Macleay River, New South Wales</i>	1970	P.H. Walker	Journal	Outlines aspects of soil attributes for the lower Macleay River floodplains and terraces. Presents a geomorphic evolutionary model of the lower Macleay River (with radiocarbon dates)	University of Wollongong Library	<i>Journal of the Geological Society of Australia</i> , 16 (2): 683-696	Does not directly relate to any Section 10 issues but provides geomorphic context to Section 10.2 and 10.13	

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5	Geology and Geomorphology	<i>Underfit analysis of the Lower Macleay River Basin: Problems of the application of a model</i>	1971	A.K. Milne	Journal	This paper provides an assessment of riffle-pool spacing for the Macleay River around Bellbrook examining the relationship between bankfull discharge, meander wavelength and riffle-pool spacing.	University of Wollongong	<i>Geographical Education</i> , 1 (3), 239-252.	Does not directly relate to any Section 10 issues.
6	Floods and Flood Studies	<i>New South Wales Coastal Rivers Floodplain Management Studies - Macleay Valley Volume 2</i>	1980	Laurie, Montgomeries & Pettit Pty. Ltd.	Report - Hardcopy	This report is a compilation of cost/benefit analyses and hydrological data in the form of two primary appendices	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Does not directly relate to any Section 10 issues but provides a good overview of the hydrological data for rainfall and flood events on the Macleay River. It also provides a good insight into the various economic assessments done on flood mitigation and flood damage.
7	Floodplain management	<i>New South Wales Coastal Rivers Floodplain Management Studies - Macleay Valley Summary Report</i>	1980	Laurie, Montgomeries & Pettit Pty. Ltd.	Report - Hardcopy	Outlines a summary of the physical extent of flooding, the nature of past flood mitigation works and makes recommendations for future drainage improvements.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	This summary document deals indirectly with issues relating to Land use Planning and Development Control (Section 10.1) providing a useful but dated assessment of previous works stemming from a drainage improvement perspective.
8	Floods and Flood Studies	<i>Macleay River Flood Study</i>	1989	Public Works	Report - Hardcopy	Outlines the hydrological and hydraulic modelling undertaken on the Macleay River calibrated to the historical 1949, 1963, 1977 and 1980 floods.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Does not directly relate to any Section 10 issues but provides an excellent summary of hydrological records for a number of large rainfall and flood events (e.g. 1949, 1963, 1977 and 1980). This desktop hydraulic modelling uses a quasi 2D model that does not incorporate sediment transport and therefore provides little insight into the spatial and temporal dynamics of sedimentation.

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9	Management Plans & Studies	<i>Estuary Management Manual</i>	1992	New South Wales Government	Report - Hardcopy	<p>Outlines the NSW government's approach to estuary management planning. Describes the 8 step estuary management process, factors affecting the administration of estuaries, government financial assistance, a glossary, and 14 appendices dealing with estuary management issues and the physical, chemical and ecological processes occurring in estuaries.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>Outlines the 8 step estuary planning process. Does not directly relate to any of the Section 10 issues.</p>
10	Floodplain management	<i>Lower Macleay Floodplain Management Study</i>	1997	Webb, McKeown & Associates Pty. Ltd.	Report - Hardcopy	<p>This report provides an assessment of the RUBICON flood modelling for the Lower Macleay River while also providing an operational outline of flood control measures. Cost/benefit analyses for flood protection for rural and urban areas are presented with pros and cons assessed for various structural works. Recommendations are made for: village floodwater mitigation, structural options, suggested operational changes, drainage modification, data collection and legal/legislative options.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>Does not directly relate to any Section 10 issues but provides the hydraulic context to floodplain inundation thus indirectly engages with Sections 10.1, 10.3 - 10.5. This study is primarily a desktop study that makes recommendations for the Floodplain Management Plan.</p>
11	Management Plans & Studies	<i>Lower Macleay Floodplain Management Plan</i>	1999	Webb, McKeown & Associates Pty. Ltd.	Report - Hardcopy	<p>Outlines various recommendations for flood mitigation works for villages on the lower Macleay focussing on flood control for the 1 in 100 flood at Frederickton, Smithtown, Gladstone and Jerseyville. In addition, recommendations are made for issues such as water quality and acid sulphate soils.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>This report provides a series of recommendations weighted towards improved flood control for the villages of the lower Macleay. In addition it deals directly with Sections 10.3 - 10.5 and 10.11 but does answer the critical questions regarding wetland management, acid sulphate soils and water quality. Furthermore, this desktop study highlights some of the potential impacts of increased levee construction in the Kinchela and Belmore areas (i.e. reduced inundation of wetlands in small floods < 4.6 - 4.9 m).</p>
12	Floodplain management	<i>Upper Belmore Floodplain Management Strategy</i>	2000	Webb, McKeown & Associates Pty. Ltd.	Report - Hardcopy (DRAFT)	<p>Draft document dealing with issues relating to the Upper Belmore floodplain including five major floodplain strategies that deal with floodgate and drain management, local floodgate and drain management groups and acid sulphate soils</p>	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	<p>Deals indirectly with Land Use planning and Development Control (Section 10.1), Floodplain Wetlands Management and Acid Sulphate Soil (Sections 10.3 and 10.4). It also addresses directly floodgate and drain management issues (Section 10.5) making recommendations for the Upper Belmore.</p>

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13	Water Quality	Heavy Metal Loadings of streams in the Macleay River catchment	2001	Paul Ashley and Ben Graham, Earth Science, University of New England, Armidale	Report - Hardcopy	This report quantifies heavy metal loadings in the Macleay catchment demonstrating the presence of a 3 - 90 X background level of Antimony (Sb) and 1 - 5 X background for Arsenic (As). Sources of heavy metals include sediment and tailings from historical mining operations such as the Hillgrove Mineral Field. Bakers Creek is shown to have exceptionally high loadings of heavy metals with a clear downstream dispersal pattern. Loadings remain beyond ISQC guidelines for Sb right to the Pacific with preferential accumulation on the southern side of the Macleay River.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 r.kemsley@kempsey.nsw.gov.au	Addresses Section 10.7 (sedimentation) and identifies the preferential accumulation of Antimony (Sb) & Arsenic (As) on the southern side of the Macleay River with levels up to 15X. Provides an important quantitative data set identifying heavy metal loadings throughout the catchment. In particular, this report identifies that levels of Sb are above ISQC guidelines in the floodplain and estuary area. Identifies the potential health risk of the heavy metal loadings in the floodplain area but demonstrates that there is no further uptake by oysters. Not tested on anything else. Based on field data and laboratory analysis.
14	Erosion studies	Macleay River Sand and Gravel Resource Assessment - Draft	2003	Patterson Britton & Partners Pty Ltd consulting engineers	Report - Hardcopy	Draft report including maps outlining the geomorphic characteristics of the Macleay River between Nulla Nulla Creek and Sherwood bridge crossing. Quantifies the rates of gravel extraction from 1997/98 to 2001/2002 and addresses the geomorphic impacts of gravel extraction. Emphasises the role of bedrock on determining channel stability and makes recommendations for changes to current gravel extraction practices.	DIPNR Kempsey	(02) 6563 1212	No direct implications for Estuary Planning Process however has some relevance as far as quantifying volumes of sediment removed from the central reaches of the non-tidal Macleay. This is relevant to Section 10.7 (sedimentation) in regards to providing a crude assessment of sediment supplied to the lower Macleay River. Results within the report are both field and desktop based, however conclusions on the geomorphic impacts of gravel extraction are extremely limited. Furthermore, estimates of current sediment transport rates and the relationship between tributary supply of sediment is poorly substantiated.
15	Water Quality	Macleay River Floodplain Post January and March 2001 Flood Event Water Quality Monitoring Report	2001	Ron Kemsley	Report - Hardcopy	Reports the results of pH and DO testing conducted post the January and March 2001 floods at 10 floodplain waterbody sites in the lower Macleay. Each site was sampled 17 times over the period March to May 2001. An attempt is made to link pH and DO levels to recorded fish kills over the period.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report provides an indication of the pH and DO response of floodplain waterbodies to flooding (relevant to Sections 10.4 and 10.11). It also provides basic information on the response of estuarine systems to flooding and implications for fish kills resulting from low DO concentrations (Section 10.10). Based on field testing.
16	Hydrographic, Tidal and Navigation Surveys	DIPNR Macleay River Estuary Tidal Data Collection April - May 2003. Report MHL 1250.	2004	Manly Hydraulics Laboratory, Dept of Commerce.	Report - Hardcopy	Describes the results of tidal gauging data collection undertaken at 29 sites in the Macleay estuary between 14 April and 23 May 2003. Tidal limits, tidal range, tidal lag and current velocities for all major estuarine waterways are recorded. In addition 59 water quality profiles were collected (excluding coliform and nutrient levels) between 14 and 16 April 2003.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 r.kemsley@kempsey.nsw.gov.au	Provides tidal process information directly relevant to Section 10.5 and a snapshot of estuarine water quality relevant to Section 10.11 (although no faecal coliform or nutrient analysis). This report was commissions implicitly to assist the estuary management process by providing base data for hydrologic modelling. Electronic data is available from the Manly Hydraulics Laboratory.

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17	Coastal Development and Infrastructure	<i>Kempsey Integrated Water Cycle Management Strategy. Part 1 : Concept Study Final Draft</i>	2003	Department of Land and Water Conservation	Report - Hardcopy	A final draft report dealing with issues related to an Integrated Water Cycle Management Strategic Plan for Kempsey Shire. Issues addressed include surface and groundwater supply, water quality of urban water supplies and resources, and sewerage and stormwater systems for urban and village centres. Includes comprehensive background information, a catchment and water resource audit, and urban area audit, and recommendations for potential actions to address identified issues.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Although only a draft final report was available, the document provides a very comprehensive source of detailed planning information related to future water management in the lower Macleay. The report has many implications for estuary management as deals with many facets of potential impact. The report provides entailed information pertaining to urban growth planning relevant to Section 10.1. There is particular focus on impacts associated with unsewered coastal villages and stormwater management (Section 10.11). It makes limited reference to the effects of greenhouse gases and climate change but does not provide an analysis of broader effects (Section 10.13).
18	Acid Sulphate Soils	<i>Agricultural Drainage in Acid Sulphate Soil Backswamps in New South Wales, Australia - Technical, Regulatory and Policy Responses</i>	2002	M.J.Tulau	Report - Electronic (PDF)	Most of the acid sulfate problem in New South Wales is caused by historical overdrainage of former backswamp wetlands for agriculture. The majority of this land is now privately owned and managed for agricultural production. Government, industry and the community have therefore generally sought solutions within a framework of generally maintaining current forms of land use and levels of productivity. The paper outlines a range of approaches that have been used for managing drained areas within this framework, and assesses the success of these solutions. The paper also outlines the range of regulatory powers available to governments for managing drained areas, examines their use, and assesses the success of these approaches. It is concluded that environmental outcomes have been marginal, incremental and subject to reversal. The paper explores opportunities for environmentally sustainable models of land management in backswamps in the context of the most recent research, and outlines a range of policy mechanisms which may be utilised. It is argued that governments need to make greater use of non-regu	Mitch Tulau, DIPNR Kempsey	(02) 6563 1212 mitch.tulau@dipnr.nsw.gov.au	Directly relevant to Section 10.4 Acid Sulphat Soils.
19	Miscellaneous	<i>Soil Landscapes of the Kempsey & Korogoro Point 1:100 000 Sheets Report</i>	1999	Atkinson, G.	Report - Hardcopy	A study of soils, geology, geomorphology, vegetation landuse and land capabilities of the area covered by the Kempsey & Korogoro Point 1:100 000 Australian Map grid sheet. Includes descriptions of 46 soil landscapes including their biophysical characteristics and land use qualities and limitations. Includes 18 appendices describing and interpreting various soil analyses and should be used in conjunction with an accompanying map.	DIPNR, Kempsey Office	PO Box 32 West Kempsey 2440 02 6563 1212	A useful resource for regional planning and for background information on a variety of biophysical and land capability characteristics. The data are generally of high quality but general in nature. For many management issues more detailed investigations may be necessary but the report provides a very useful context for planning and designing more detailed studies. The comprehensive scope of this report makes it relevant to: 10.1 Land Use Planning & development; 10.3 Floodplain Wetlands management; 10.4 ASS management; and, 10.9 Habitat protection
20	Water Quality	<i>Macleay River Catchment : Assessment of Water Quality Monitoring Programs</i>	2000	Sue Botting	Report - Hardcopy	Collates and describes water quality data collected in the Macleay Valley over the period from approximately 1987 to 2000. An assessment of the adequacy of the dataset to identify any potential water quality problems is provided. The report also assesses the adequacy of the dataset to be used as a baseline for future monitoring; to identify areas of poor water quality from an aquatic ecosystem and human health perspective; to diagnose likely causes of poor water quality, and; to identify areas of good stream health. 4 areas of recommendation are also made concerning data management, modifications of existing programs, identification of areas of poor water quality, and public involvement.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	A very comprehensive assessment directly relevant to Section 10.11. Includes many references to estuarine areas. The report overviews all available WQ monitoring programs undertaken between 1987 and 2000 and includes a "Strategic Plan for Water Quality monitoring in the Macleay River Catchment" as Appendix 1.

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21	Fisheries & Aquaculture	Scientific reports on the recovery of the Richmond and Macleay Rivers following fish kills in February and March 2001	2002	Steve Kennelly and Tracey McVea (Editors), NSW Fisheries	Report - Hardcopy	Major floods occurred in the Richmond and Macleay River systems in February and March 2001, followed by major fish kills. The rivers were subsequently closed to fishing for 41/2 months. Monitoring of the recovery of fish, crustaceans and water quality was undertaken over a 12 month period, the results of which are presented in a series of discrete reports compiled into this document. Fish surveys dealt with species of commercial and recreational interest. Surveys of day-time recreational fisheries are also included. The data from sampling showed that fish and crustacean populations recovered to levels sufficient to sustain normal commercial and recreational fishing within 41/2 months. Recommendations for a regular monitoring program are made as are suggestions for further development of a robust sampling strategy.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The report deals primarily with recovery of fish populations after fish kills and as such is relevant directly to Section 10.10. In particular recommendations for future monitoring relate to the question "What strategies need to be in place to ensure our fisheries continue to be productive?". Describes several of the factors that relate to fishing closures.
22	Historical & Cultural	Macleay River. Report on the entrance to, by Sir John Coode, K.C.M.G to the Legislative Assembly of New South Wales 1891	1891	Sir John Coode (appendix by Captain Howard)	Report - Hardcopy	Described four options for improving the entrance of the Macleay River based on the prevailing conditions around 1885-1888, also includes an in-depth description of the Macleay River Estuary physical environment, navigability, flooding effects, dredging, and land use in the late 1880s.	Macleay Valley Historical Society	Available for on site viewing by appointment. Maybe available through the State library.	Provides historical context to the changes in the Macleay estuary's physical conditions including bank condition and entrance conditions. Provides historical background to Section 10.2 Riparian Land Management and Bank Erosion, and 10.3 Wetland and Floodplain Functioning and Management.
23	Historical & Cultural	Between Wind and Water - A history of the ports and coastal waterways of New South Wales	1997	Leone Coltheart	Book	Documents the history of public works in NSW estuaries. Valuable reference to the settlement histories of many NSW coastal river systems including shipping, transportation, and landuse.		Available through interlibrary loan	Provides historical context to Section 10.2 Riparian Land Management and Bank Erosion. Information is presented in terms of the contribution of the Public Works Department over 100+ years. Although it presents a good grasp of the issues it does not contribute significantly to how to solve issues of estuary management.
24	Flood Mitigation	Macleay River County Council FLOOD MITIGATION, 13th Annual Meeting and Study Tour of the Australian National Committee of the International Commission on Irrigation and Drainage.	1966	Anon. (potentially Macleay River County Council)	Report - Hardcopy	Details the history of the Macleay Valley Flood Mitigation Scheme plus estimates the benefits and associated costs of works undertaken up until 1966. Gives a summary of up-river and down-river works with examples including at Sherwood, Majors Creek, Eden Street embayment, East Kempsey Training wall, Austral Eden bank protection and drain, Gladstone headworks, and Belmore River Floodway. Includes 12 photos and 3 diagrams.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Historical context of flood mitigation works both up-river and downstream of Kempsey prior to 1966.

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25	Flood Mitigation	Submission for Commonwealth Financial Assistance, NSW Flood Mitigation Programme 1976-1982	1975	Anon. (represents 15 east coast Shire Councils)	Report - Hardcopy	A submission seeking funding of \$33,163,300 for a six year programme to continue flood mitigation works in 15 east coast shires north of Sydney. Includes brief notes on the history of flood mitigation works in NSW from 1900 onwards. Includes Macleay River County Council submission details.	Ron Kemsley (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Historical context to flood mitigation programmes in NSW.
26	Water Quality	Water Quality in the Macleay River - Northern Rivers Study No. 8	1987	State Pollution Control Commission	Report - Hardcopy	Presents the results of water quality sampling in the Macleay River undertaken between June 1984 and June 1986. 36 sites were sampled including 25 estuarine sites. Includes sewerage treatment plant and industrial site sampling. Sampling dates were selected to represent pre-determined flow regimes as opposed to fixed interval sampling. Extensive professional analyses including nutrients. Draws conclusions as to potential sources of poor water quality including an assessment of the effects of flood mitigation.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Background information for 10.4 Acid Sulphate Soil Management. Provides baseline data for Section 10.11 Water Quality covering a range of flow regimes. Additionally, describes impacts on water quality associated with point sources and agricultural inputs.
27	Water Quality	Water quality and river flow interim environmental objectives	1999	NSW Environmental Protection Authority	Report - Hardcopy	This document sets out broad goals and guidelines for achieving improved river health outcomes in the Macleay River catchment. Interim water quality objectives with key indicators and numerical criteria are provided.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The objectives and guidelines have been tailored to suit the water management committee approach which was discontinued in 2004, however the interim water quality objectives, key indicators and numerical criteria are still relevant to Section 10.11 Water Quality.
28	Floodplain Management	Sustainable land management of coastal floodplains in northern NSW - Macleay River Catchment Final Report	2002	Marcus Riches and Simon Walsh, NSW Fisheries	Report - Hardcopy	180 floodgates have been identified within the Macleay Valley. An assessment was made to prioritise the 180 floodgates to determine their suitability for active management and reduce negative effects of their operation. 24 gates were selected as high priority for active management. The report outlines a methodology for developing floodgate management plans, giving two examples of implementation in the lower Macleay (Marriot's floodgates and Clancy's floodgates)	Ron Kemsley (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Provides examples of alternative floodgate management which may help restore floodplain and wetland function and reduce the negative effects of over-drainage (relevant to Sections 10.3, 10.4, and 10.5). Indirectly deals with Section 10.11 Water Quality by referring to acid drainage.

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29	Water Quality	DLWC Water quality monitoring at Yarrahapinni Wetland. Report MHL986.	2001	Manly Hydraulics Laboratory, NSW Dept of Public Works and Services	Report - Hardcopy	This study presents brief interpretations of water quality data collected from the Macleay River (the entrance and Double Island) and Yarrahapinni Wetlands (Middle Island) over the period March 1996 to February 1999. Water level (tidal range), conductivity, pH, temperature, and DO were monitored at fixed short-term intervals. The study was undertaken prior to the planned re-opening of one of the Yarrahapinni floodgates and showed characteristic acid sulphate responses to critical rainfall events.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Gives baseline water quality information relevant to Sections 10.3, 10.4, 10.5, and 10.11 and combined with data collected post opening of the floodgate gives an indication of potential recovery of ecosystem functioning with modified floodgate operation.
30	Water Quality	Monitoring of Macleay River in the vicinity of Christmas Creek. Report MHL853.	1997	Manly Hydraulics Laboratory, NSW Dept of Public Works and Services	Report - Hardcopy	The purpose of this monitoring exercise was to capture baseline environmental data which outline the physical, biological and chemical status of the Macleay River in the vicinity of Christmas Creek. The monitoring was undertaken at 4 locations to provide a baseline from which to assess potential impacts on the river of any proposed relocation of effluent discharge. Temperature, salinity, pH, turbidity, DO, velocity, sediment type and size, total phosphorous, total nitrogen, and orthophosphate were sampled on 29 January 1997. Monitoring of E.coli plus a survey of benthos macroinvertebrates, fish, and instream and riparian flora were also undertaken between 21 and 24 January 1997.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	WQ sampling was limited to a single day and was potentially confounded by heavy rainfall during the second of 2 passes over the 3 sites. As such only limited conclusions can be drawn although the data adds to the general estuarine water quality dataset and therefore is of some use to Section 10.11. A small number of sediment samples were taken and grain size analyses done which are of limited use to Section 10.7 Sedimentation.
31	Water Quality	Water quality monitoring program - Belmore River Landcare Group Progress Report 1990-1992	1992	Roger Stanley, David Miller, Gavin Pryde and Jason Berrigan, CALM NSW.	Report - Hardcopy	Reports the results of community water quality monitoring in the Belmore River area over the period from Spring 1990 to December 1991. Parameters tested were pH, Dissolved Oxygen and salinity and where pH<4 or DO<4mg/L, iron and aluminium levels were tested by Kempsey Shire Council. Attempts are made to link reported fish kills in the Belmore River system and associated drains to pH, oxygen availability and aluminium concentrations. Recommendations for a continued WQ monitoring program are also suggested.	Ron Kemsley	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Some relevance to Section 10.11 although data quality is an acknowledged issue. Recommendations on floodgate management are relevant to Section 10.5.
32	Air Photography Resources	United Photo and Graphic	n/a	anon.	Photography	Allows searching of historic and archival aerial photography by 1:100 000 map sheet. Includes flight paths for aerial photography from early 1940s over the Macleay Estuary area.		www.unitedphoto.com.au	Not directly relevant but has broad application for understanding changes in land use and physical estuary characteristics and may allow interpretation of rates of change of landscape features and processes (potential relevance to 10.2 and 10.3).

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33	Air Photography Resources	Air Photo library index abstract	2003	anon.	Photography	Provides an index by area of available aerial photography resources. Resources can be obtained through Land and Property Information (02) 6332 8123.	www.lpi.nsw.gov.au	Not directly relevant but has broad application for understanding changes in land use and physical estuary characteristics and may allow interpretation of rates of change of landscape features and processes (potential relevance to 10.2 and 10.3).
34	Digital Data Resources	North Coast Assessment - Available Digital Data Sets (GIS layers)	2004	anon.	Digital data	Provides a table of current natural resource management related GIS (geographical information systems) digital data sets held mostly by NSW Government Agencies with some datasets from Commonwealth Agencies and Local Government. The list was compiled for the North Coast Assessment Process and contains Keyword Identifier, data layer name, capture scale, data currency, custodian, GIS format, storage medium, attributes, comments and any restrictions on use.	Download PDF for viewing. Contact appropriate agencies for access requirements.	A comprehensive list of available datasets relevant to natural resource management, many with direct and/or broad relevance to estuary management planning. Availability of datasets is not known with the table indicating some restriction on access and use.
35	Miscellaneous	Stressed Rivers Assessment - Macleay River	1999	DLWC	Report - Hardcopy	The stressed rivers approach incorporates the assessment and classification of environmental and hydrological stress and conservation value of rivers. This is then used to determine priorities and policies. This approach will ensure that these actions are taken according to the needs of individual streams and that the impact on the rural community is focused where it is likely to make a real difference to river health and water use opportunities. This report includes the subcatchment results, ie. report cards which contains very useful information on geology, tree cover, average lot size, land capability, number of licences, licenced area, flow, stream gauges and river styles. Hydrological stress rating is derived from proportioning current water extraction to the streamflow estimate. The full development stress rating is based on if all existing licences were active. Environmental stress is based on river health factors such as bank and bed erosion, riparian vegetation, land use, fish barriers, water quality, macroinvertebrates, algal blooms, fish kills, point source discharge, levee banks and acid runoff. The overall str	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The stressed rivers assessment was undertaken to assist the NSW Water Reforms process. The assessment is catchment focussed with the entire Macleay estuary summarised as a single "Coastal Macleay" subcatchment. The report contains broad statistics in the subcatchment descriptions but is not of direct relevance to any of the identified Section 10 issues with the exception of 10.12 River Health for which the desired outcomes are not clearly defined.
36	Miscellaneous	State of the Rivers and Estuaries Report - Mid North Coast Catchments	1994-1995	DLWC	Report - Hardcopy	A report on waterway health and management for water users and resource managers. The main objectives of the report are to: provide information about the status and condition of the Mid North Coast waterways; indicate the accessibility of the information; prevent duplication of effort and improve communication between those concerned with the management of estuarine and riverine resources; present information on benchmarks and trends for assessment of the cumulative effects of management policies and programs; identify unresolved or emerging issues; identify substantial gaps in the information; and; to provide a basis of current data collection and monitoring programs.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report is essentially an audit of the current state of knowledge and issues relevant to North Coast rivers and estuaries. Although the information is some 10 years old it is still of broad relevance to the estuary management planning process. The focus of the assessment is on several systems so the depth of information is somewhat limited. The report provides useful background information relevant to the Macleay estuary including wetland management (Section 10.3); "estuarine management" including limited information on dredging (10.7); floodplain management (10.5); freshwater gravel extraction rates (10.7); and, commercial fishing (10.10). Other topics discussed in the report are limited in detail and probably more adequately addressed in other studies/reports.

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37	Fisheries & Aquaculture	NSW North Coast Sustainable Aquaculture Strategy - Land based aquaculture	2000	Y.Stone, D.Ogburn, I.Baulch. NSW Dept. Urban Affairs and Planning, NSW Fisheries.	Report - hardcopy	Aquaculture is one of the fastest growing industries in the world. New South Wales is well placed to take advantage of growth opportunities largely because of its climate and relatively clean environment. The strategy contains two components - a best management practice component and an integrated approval process component - which are intended to ensure development in an efficient and sustainable manner. The strategy concerns land based aquaculture only.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	As the strategies stated intention is to streamline approval processes for some types of land-based aquaculture, the chapters relating to planning approval is particularly relevant to Section 10.1 Land Use Planning and Development Control. The strategy also has obvious relevance to Section 10.10 Fish and Shellfish Management despite most of the critical questions and identified issues in this section being concerned with water-based aquaculture.
38	Flood Mitigation	Macleay River Flood Mitigation Model Investigation - Manly Hydraulics and Soils Laboratory Report No.105	1963	Lesleighter, E.J.	Report - Hardcopy	Details the development of a model to test the effects of various flood mitigation works proposals on flood levels at Frederickton and Kempsey. Looks at effects of existing levees and headworks plus proposals for the removal of Pola Creek Island, for a Kempsey training wall, and for raising of the Eden Street embankment.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Provides historical context to flood mitigation work and an example of the modelling techniques used to determine the effects of works on flood levels.
39	Flood Mitigation	Structural Flood Mitigation Works and Estuarine Management in NSW - Case study of the Macleay River	1985	Middleton, M.J., Rimmer, M.A., Williams, R.J.	Journal	In many estuaries of New South Wales agricultural, urban and industrial activities have benefited at the expense of naturally occurring attributes such as commercial and amateur fisheries, wildlife habitats, recreational resources, and aesthetic and cultural values. The successful future management of the estuarine environment is contingent on a number of factors, including a paucity of baseline data, a lack of predictive models, the difficulty of quantifying natural attributes, and a previous tendency to assess development proposals on an individual basis. This paper describes some short-comings of the existing management approach to estuaries by examining the adverse environmental effects of structural flood mitigation works on the Macleay River Estuary. Desirable considerations for future estuary management are discussed.		Coastal Zone Management Journal, volume13, no.1	The concepts in this report are still relevant but the data is probably dated. There is probably more recent data available. Nevertheless the report identifies the need for cumulative assessment of development proposals (Section 10.1); provides an assessment of approaches to reducing the effects of flood mitigation including through environment compensation and habitat restoration (10.3); gives a limited overview of drainage history suitable for background use only (10.5); describes changes to estuarine vegetation over the period 1956-1981 (10.9); and, describes decreases on commercial fish catches between - 1970-1985 and suggests a link to flood mitigation structures (10.10).
40	Fisheries & Aquaculture	The ecological effects of structural flood mitigation works on fish habitats and fish communities in the lower Clarence River system of south-eastern Australia.	1994	D.A. Pollard and T.C. Hannan	Journal	Investigates the effects of flood mitigation structures on the quality of estuarine and freshwater fish habitats in the lower Clarence River system. Surrounding land use, fringing vegetation, habitat disturbance, distance from the sea, salinity and water temperatures were all compared at 13 sites within both "natural streams" and drains. The study found that although salinity was similar between gated and ungated sites (gate leakage), fringing vegetation (especially mangroves) and overhanging terrestrial vegetation were much less at gated sites and surrounding landuse was generally more intense. Fish assemblages were generally higher (both numbers of species and abundance) in ungated natural tributaries and in drains downstream of floodgates, with highest numbers of commercial fish species also. Fish access was concluded to be highly restricted above gates. The report recommends that gates be left open at all times except immediately prior to and during floods as a mechanism for improving fish habitat and communities.		Estuaries, volume 17, no.2, pp427-461. June 1994.	Although this study was conducted in the Clarence River system, the findings are relevant to the Macleay Estuary. The report deals with Section 10.3 particularly factors related to modified vegetation in drainage systems. The recommendation related to floodgate operation is relevant to Section 10.5. The findings also relate generally to Sections 10.9 and 10.10.

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41	Fisheries & Aquaculture	<i>Oysters - Independent review of the relationship between healthy oysters and healthy rivers. Final Report.</i>	2003	Healthy Rivers Commission.	Report - Hardcopy	Provides a review of the current status of the NSW oyster industry including an assessment of the industry's viability in the face of decreasing production and various land and water management issues, institutional and organisational issues, and planning issues. The report draws on community and stakeholder views, the findings of an inquiry into the Wallis Lake incident, a stakeholder workshop, and independent expert advice in the form of the comprehensive "Safeguarding environmental conditions for oyster cultivation in NSW" report by Ian White (included as an appendices). The HRC report provides 5 recommendations which are intended to contribute significantly to the maintenance of a sustainable and viable oyster industry in NSW.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The hRC report provides a thorough overview of issues, risks, and opportunities for the oyster industry. Specifically the report recommends actions on identifying through planning processes and statutory instruments (SEPP62) areas where oyster growing should be deemed the priority land use, in effect making the consideration of other adjacent land uses subject to their impact on oyster growing (relevant to Section 10.1). Additionally, recommendations related to improving land and water management through assistance programs (incentives, subsidies, etc.) and to improving industry sustainability through organisation and promotion are included (Section 10.10). The report does not address the question of "abandoned" oyster leases.
42	Miscellaneous	<i>Independent advice on dredging of river entrances and lower estuaries.</i>	2002	Coast and River Environmental Engineering (for the Healthy Rivers Commission)	Report - Hardcopy	Some 6 primary government agencies, the Coastal Council, and more than a dozen local government authorities are regularly concerned with decision making on dredging of river entrances and lower estuaries. A summary of issues related to the four main types of dredging purposes occurring in lower estuary and entrance areas (including port dredging, naturally open entrance dredging, dredging of ICOLLS, and commercial sand extraction) is provided. The range of available data from primary agencies that may assist more effective decision making processes are outlined. Recommendations for improving the decision making processes are also provided for each of the 4 types of dredging identified. Appendices provide comparative data on NSW estuaries including entrance conditions, water area (km ²), mangrove area (km ²), and average annual fish catch.	Healthy Rivers Commission	http://www.hrc.nsw.gov.au/	A useful overview of dredging in estuaries in NSW. Includes supporting information on issues related to increased recreational pressure for maintenance dredging of entrances, navigable depths of waterways (both relating to Section 10.8), ICOLL dredging, and commercial sand extraction all of which are relevant to the Macleay Estuary area (Section 10.7 Sedimentation issues).
43	Miscellaneous	<i>Independent inquiry into North Coast Rivers - Final Report</i>	2003	Healthy Rivers Commission.	Report - hardcopy	This report is the culmination of the Healthy Rivers Commission independent and public inquiry into the health of NSW North Coast rivers. The report is based on extensive public, agency, and stakeholder submissions (175 in total) to the Commission's Draft Issues Statement released in 2002. The purpose of the report is to recommend to the NSW Government long-term river health goals and management strategies to achieve these goals. 10 recommendations are provided.	Healthy Rivers Commission	http://www.hrc.nsw.gov.au/	This document contains 10 main areas of recommendation including to river health goals (relevant to Section 10.12); sustainable agriculture (Sections 10.1 and 10.2); sustainable aquaculture (10.10); fisheries management (10.10); regional planning (10.1,10.10, 10.12); estuarine dredging (10.7); and, navigation and river health (10.2,10.6,10.7). Additionally, recommendations and supporting information relating to the joint accountabilities of government departments and to water cycle management are relevant to estuary management planning but not addressed in the Section 10 summary.
45	Geology and Geomorphology	<i>River Styles in the Macleay Catchment, North Coast, NSW</i>	1999	R. Ferguson, G.Lampert, and G. Brierley, Dept of Physical Geography, Macquarie University.	Report - Hardcopy	A broad-based catchment wide geomorphic characterisation of the Macleay Valley's major streams and rivers is described. The characterisation is described in terms of "river styles" which provide a physical template of the river system. An assessment of the condition of each river style of the assessed waterways is provided along with management priorities and options for maintaining and improving river health. 3 maps included.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The river styles methodology is a broad-based technique covering the whole of the Macleay catchment. Although limited reference is made to the tidal reaches the main focus of the report is on freshwater systems. Consequently the document has little relevance to Section 10 issues as other documents probably more adequately address estuarine issues. Qualitative information on sedimentation is limited and no quantitative information is provided.

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46	Management Plans & Studies	Macleay Total Catchment Management Strategy	~1994	Macleay TCM Committee	Report - Hardcopy	The Macleay TCM strategy outlines strategies, actions and outcomes to improve the condition of the Macleay catchment's land, water and vegetation resources. The focus is on cooperative action by agencies, NGOs and landholders to achieve improved natural resource management outcomes in the valley.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Although superseded by the Catchment Management Board Blueprints and more recently by Catchment Management Authority Plans, the TCM Strategy provides interesting reading as many of the identified issues and strategies are still current. The more recent CMA Plans are probably of more relevance to Section 10 issues as they have replaced the TCM Strategies.
47	Historical & Cultural	TCM Community Study - Macleay Catchment	1996	Woolcott Research Pty Ltd	Report - hardcopy	The purpose of the TCM Community Study was to provide actionable and appropriate data which could be used in the development of a detailed marketing strategy aimed at promoting a good understanding of TCM within the community and encouraging participation. Areas of investigation included awareness of local environmental issues, awareness of environmental programs, perceptions of the state of the environment, attitudinal segmentation, and perceptions of TCM objectives. The findings included that 32% of people were unable to identify any environmental issues in their area, spontaneous awareness of environmental programs was low, community identified issues are similar to TCM committee identified issues, and waterways and water quality are regarded as being in poor condition. The majority of those surveyed support the aims of TCM so it is concluded that there are no concept barrier to adoption.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The study does not directly relate to any of the issues identified in the Section 10 summary. However, community perceptions and attitudes are fundamental to natural resource management. May form a basis for comparison of future attitudinal surveys although the data is not estuary specific.
48	Water Quality	Guidelines for managing risks in recreational waters - Draft May 2004	2004	National Health and Medical Research Council	Report - Hardcopy (DRAFT)	The primary aim of these guidelines is to assist local/State/Territory authorities and other stakeholders to assess and manage recreational water bodies under their jurisdiction. The guidelines focus on local assessment and management of hazards and factors that may lead to hazards. The report considers physical hazards, pathogens (faecal contamination potential), algal and cyanobacterial quality, and chemical contamination. The draft report describes how to apply the guidelines and actions to take if guidelines are exceeded.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Directly relevant to Section 10.11 Water Quality and 10.8 Tourism Management which both raise issues in relation to faecal contamination. Also relevant to Section 10.6 Boating as boat users often have primary contact with recreational waters.
49	Groundwater	Groundwater characteristics of the Kempsey District, NSW	1961	P.H.Walker, CSIRO Division of Soils.	Report - Hardcopy	A limited survey of groundwater levels and characteristics was carried out between September 1959 and July 1960. The objects of the study were to find out the magnitude of groundwater salinity in various parts of the landscape, and to measure the variation in salinity with water table height associated with seasonal change. The survey concluded that salinity of rivers, swamp water and groundwater change markedly with season. The highest salt values in groundwater occur in the lowlands of the Macleay floodplain adjacent to swamplands. Groundwater salinity and acidity can be increased through undue interference by man such as overextraction.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relevant to Section 10.11 Water Quality although groundwater is not an identified issue. Also relevant to Section 10.4 as the report has a limited discussion on potential acid sulphate soil impacts.

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50	Groundwater	<i>The NSW Groundwater Quality Protection Policy</i>	1998	DLWC	Report - hardcopy	The NSW Groundwater Quality Protection Policy is a component of the State Groundwater Policy Framework. This policy document outlines objectives and principles specifically designed to protect groundwater resources against pollution. The policy includes background information on the functioning of groundwater resources and systems as well as a range of policy implementation strategies.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Despite the fact that groundwater issues are not specifically acknowledged in the Section 10 summary, the policies, principles and objectives are likely to be relevant to Section 10.11 Water Quality.
51	Floodplain management	<i>Lower Macleay Floodplain Management Strategy: Aquatic Ecology and Fisheries. Review of existing information.</i>	1996	The Ecology Lab Pty Ltd	Report - Hardcopy	The lower Macleay floodplain has been changed physically due to extensive flood mitigation works. Earlier studies have indicated that these works have had potential or actual effects on the aquatic ecology of the floodplain, such as fish kills and reduced estuarine production. The aim of this report is to collate and review existing information with respect to aquatic ecology and fisheries, identify data needs, and contribute to a process of evaluating management options. Sources of information included published scientific papers, reports prepared by or on behalf of the NSW Government, Kempsey Shire Council, and consultation with stakeholders.	Kempsey Shire Council	In: Status Report to the Floodplain Management Committee Meeting, 16 February 1996	This report reviews the various alterations to the Macleay River estuary and the state of knowledge of the effects of these alterations on the aquatic ecosystem. Specifically, the review focuses on changes to estuarine habitats; seasonal movements of aquatic organisms; and the effects of salinity, acidification, de-oxygenation and heavy metal toxicities on aquatic organisms. As such the report provides useful information on Sections 10.3, 10.4, 10.5, 10.9, 10.10, 10.11, and 10.12 as well as providing recommendations for areas of future research to fill current knowledge gaps.
52	Water Quality	<i>Yarrahapinni Stuarts Point Pollution Study</i>	1975	Dept of Public Works, Hydraulics and Soils Laboratory.	Report - Hardcopy	This study was requested by the Macleay River County Council to undertake a study of the effect of drainage improvements on post-flood pollution on the Stuarts Point area. A one-dimensional numerical model of the channel system was used based on the transport of material by stream velocities. The study found that no increased pollution was occurring.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The one dimensional model used is probably very limited in predicting pollution effects due to the confounding effects of tidal processes that operate in the area of study. Additionally no analysis of pollution from Acid Sulphate Soils or low DO water was undertaken even though drainage is now known to exacerbate these pollution effects.
53	Floodplain management	<i>Summary notes of the Macleay Coast, Estuary and Floodplain Workshop, South West Rocks, 4 May 1999</i>	1999	Anon.	Report - hardcopy	Outlines the various programs being implemented as of May 1999 in the Macleay Estuary and floodplain area. Shows program name, funding, aim, activities, and outputs/outcomes.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	No direct relevance to Section 10 issues but a useful snapshot of programs occurring at the time.

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54	Flood Mitigation	<i>Flood Mitigation on the Macleay River</i>	1976	Anon. (Address given by Councillor D.E. Hopkins)	Report - Hardcopy	The history of flood mitigation works on the Macleay Valley is provided. An overview of programs implemented, their costs, and operation is detailed along with a review of their effects on flood mitigation. The basic intentions of the scheme are also explained.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Thorough overview of the flood mitigation program as implemented up until 1975. Provides historical context to the questions contained in Sections 10.2 Riparian Management and Bank Erosion, 10.3 Floodplain Wetland Management, and 10.5 Floodgate and drain management.
55	Water Quality	<i>Kempsey Shire Urban Stormwater Management Plan 2000-2005</i>	2000	Kempsey Shire Council	Report - Hardcopy	Outlines issues, strategies and actions for urban stormwater management within Kempsey Shire.	Kempsey Shire Council (02) 6266 3200	Relates to Section 10.11 Water Quality. It is not clear whether the plan is binding on council or not. The copy provided was incomplete, missing the first 28 pages.
56	Water Quality	<i>South West Rocks Sewerage - Review of effluent disposal options.</i>	1980	Department of Public Works	Report - hardcopy	This report reviews the various effluent disposal options available for the proposed South West Rocks sewerage scheme. The general criteria for each option are presented and each option evaluated on technical, economic, environmental and aesthetic grounds. Disposal in the hind dunes behind Front Beach and Saltwater Creek is recommended.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	The report is interesting reading as it shows the state of knowledge of effluent effects at the time of writing. It is probably too dated to be of direct relevance to the Estuary Management Planning process although it does provide some historical background.
57	Acid Sulphate Soil	<i>Acid Sulphate Soil Priority Management Areas on the Lower Macleay Floodplain</i>	1999	Tulau, M.J. & Naylor, S.D.	Report - Hardcopy	A comprehensive overview of the nature and extent of Acid Sulfate Soils in the Lower Macleay Floodplain. Includes an introduction to acid sulfate soils, a biophysical background to the issue in the Lower Macleay, and examination of the interrelationship of ASS and land management, an overview of planning and policy issues and more detailed discussion of each of six priority areas in the Lower Macleay (Yarrhapinni, Collombatti-Chybucca, Belmore, Frogmore, Kinchela, and Raffertys). Includes maps of each priority area and a useful bibliography.	Mitch Tulau, DIPNR Kempsey (02) 6563 1212 mitch.tulau@dlpnr.nsw.gov.au	A very useful and concise overview of the ASS issue in the Lower Macleay Floodplain. A good quality report that should be used as a starting point in any examination of this issue and which has been cited as a background source in most subsequent reports. The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and. 10.11 Water quality.

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58	Floodplain Management	<i>Environmental Management Issues of the Coastal Floodplains of New South Wales</i>	1996	Webbnet Land Resources Pty Ltd	Report - Hardcopy	An overview of issues related to the environmental management of coastal floodplains in NSW produced through a review and collation of technical reports, strategic plans, workshop proceedings and consultations with stakeholders. Identifies 35 major issues under four broad categories: water, land, riparian zones, and, land use planning and management. Identifies 12 priority areas for further work and 18 recommendations relating to further studies, monitoring, analysis and evaluation, liaison between stakeholders and the formation of working parties	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpr.nsw.gov.au	A very broad, statewide overview that touches on all aspects of floodplain management. It may provide a general guide for placing issues within the Lower Macleay in broader context but its usefulness is limited because of its broad rather than deep coverage of the issues and by the absence of any data or input from Macleay Valley stakeholders.
59	Acid Sulphate Soil	<i>The Macleay River Floodplain, Land Use and Acid Sulfate Soils</i>	1996	Naylor, S	Report - Hardcopy	A short overview of ASS in the Macleay River Floodplain. Includes a discussion of land use history and patterns, floodplain mitigation and drainage, the nature and distribution of ASS in the Macleay. It includes an A3 map of the distribution of ASS in the Macleay and some useful schematic diagrams describing ASS formation and distribution.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpr.nsw.gov.au	The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and, 10.11 Water quality. Much of the material covered here is treated in more detail in subsequent reports (particularly Tulau and Naylor, 2000). However, the map and schematic diagrams presented here may be useful.
60	Acid Sulphate Soil	<i>Acid Sulfate Soils in the lower Macleay Catchment, Northern NSW, Australia</i>	2000	Gough, V.	Report - Hardcopy	This study covers the nature and significance of ASS, the biophysical characteristics of ASS in the Lower Macleay, and a discussion of the regulatory and market-based policy instruments available for their management	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report is of limited use. It is not concise, contains much that is extraneous and occasionally inaccurate. Its main contribution purports to be the discussion of various market-based instruments for improving the management of ASS but even this analysis is over simplistic, ignores some important social and biophysical constraints and leads to erroneous conclusions. Some of the original sources cited in this report (e.g. James, D (1997) <i>Environmental Incentives – Australian experience with Economic Instruments for Environmental Management</i> , Dept Environment, Sport and Territories, Canberra, Australia) would be useful if market-based management solutions are being considered.
61	Acid Sulphate Soil	<i>Collombatti-Clybucca Acid Sulfate Soils Hot Spot – Final Report</i>	2004	Kempsey Shire Council	Report - Hardcopy	Describes the results of the Collombatti-Clybucca ASS Hot Spot project. Gives a brief background to ASS in the area then details the work implemented including: installation of sluice gates to allow neutralisation and dilution of acid waters by small volumes of sea-water; fencing of scald areas to facilitate natural regeneration; scald revegetation trials; placement of small weirs to retain water within drains in order to maintain a positive hydraulic gradient from the drains to the surrounding floodplains. Results indicate that each of these measures has had beneficial outcomes though management of the sluice gates has proved difficult.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and, 10.11 Water quality. While the results presented here are positive and are likely to have broader applicability throughout the Lower Macleay, they are based on data from a very short time period and follow up evaluations would be advisable before firm conclusions are drawn

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62	Fisheries & Aquaculture	<i>Macleay River Fishing Port Facilities Management Plan</i>	1992	Gutteridge Haskins & Davey	Report - Hardcopy	Evaluates the nature of the commercial fishing industry in the Macleay District with particular reference to the adequacy of the fishing port facilities. The size of ships in the fleet is limited by the condition of the entrance bars at the Macleay River and South West Rocks Creek (Back Creek). Given these limitations, and the absence of long-term cost effective measures for 'improving' the entrances, the industry is commercially viable at current fleet numbers. The physical separation of the fleet moorings (12 at Jerseyville, 3 at the New entrance, 6 at SWR Creek) is not ideal nor is the location of the co-operative at Jerseyville. A new facility incorporating the co-operative, marine services and slipway and about 40 commercial, charter and recreational berths at the New Entrance would be of benefit to the commercial fishing and tourism industries.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	This report relates directly to 10.6 - Boating Use as and proposes new moorings and associated facilities near the Macleay River Entrance for commercial and recreational users. It is also of some relevance to 10.8 - Tourism Management as the proposed facilities are intended to cater to the needs of the tourism sector (particularly fishing charter operators and recreational fishing). It is of only limited relevance to 10.10 - Fish & Shellfish Management because the proposed facilities are intended to cater primarily to those operating offshore.	
						Includes maps of existing facilities and concept plan for proposed new facility				
63	Fisheries & Aquaculture	<i>South West Rocks Fishing Port Siltation Investigation</i>	1990	Foster, D.N.	Report - Hardcopy	An investigation into methods of mitigating siltation of the bar of South West Rocks Creek (Back Creek) in order to improve navigability for the commercial and recreational fishing fleet. Recommends maintenance dredging using land based plant facilitated by the extension of the eastern training wall	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The issues examined affect the current use and possible future development of the South West Rocks Creek port for both commercial and recreational users. It is therefore directly relevant to 10.6 - Boating Use and 10.7 Sedimentation and indirectly relevant to 10.8 Tourism Management. Dredging of the entrance and extension of the training wall could also adversely affect sand delivery to Back Beach.	
64	Miscellaneous	<i>Soil Landscapes of the Macksville & Nambucca 1:100 000 Sheets Report</i>	2000	Eddie, M.W.	Report - Hardcopy	A study of soils, geology, geomorphology, vegetation landuse and land capabilities of the area covered by the Macksville & Nambucca 1:100 000 Australian Map grid sheet. Includes descriptions of approximately 50 soil landscapes including their biophysical characteristics and land use qualities and limitations. Includes 18 appendices describing and interpreting various soil analyses and should be used in conjunction with an accompanying map.	DIPNR Kempsey	(02) 6563 1212	A useful resource for regional planning and for background information on a variety of biophysical and land capability characteristics. The data are generally of high quality but general in nature. For many management issues more detailed investigations may be necessary but the report provides a very useful context for planning and designing more detailed studies. The comprehensive scope of this report makes it relevant to: 10.1 Land Use Planning & development; 10.3 Floodplain Wetlands management; 10.4 ASS management; and, 10.9 Habitat protection	
65	Fisheries & Aquaculture	<i>Fish kill in the Belmore River, Macleay River drainage, NSW, and the possible influence of flood mitigation works</i>	1980	Richardson, B.A.	Report - Hardcopy	Examines the factors responsible for a large fish kill in the Belmore River following high rainfall and inundation of Belmore Swamp in March 1978. Water quality parameters investigated included water temperature, total suspended solids, dissolved oxygen, salinity and pH. While the data showed noticeable increases in suspended solids and decreases in pH, the fish kill was primarily attributed to a very rapid and severe decrease in dissolved oxygen. The deoxygenation was in turn attributed to the decay of water sensitive pasture plants that have replaced the meadow and swamp vegetation in Belmore Swamp as a result of drainage and flood mitigation works.	Ron Kemsley	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	A brief but important study that has implications for the management of backswamp areas throughout the Lower Macleay and the streams draining them (10.11 Water quality; 10.5 Floodgate & Drain Management; 10.10 Fish & Shellfish management; 10.3 Floodplain Wetlands Management; 10.9 Habitat Protection). While much recent effort has been invested in limiting acid drainage from the backswamps, the results suggest that this alone may not be sufficient to ensure adequate quality of discharge waters and protection of aquatic environments. If the results of this study are more generally applicable changes to floodgate and drain management may be required.	

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66	Marine, Beach & Dune Systems	Coastal Dune Management: A Manual of Coastal Dune Management and Rehabilitation Techniques	2001	NSW Dept of Land and Water Conservation	Report - Hardcopy	This manual covers dune and coastal zone processes, rehabilitation and management including: a general overview of processes and evolution, soils, climatic influences, vegetation and ecosystems, and fire management; planning and preparation of rehabilitation plans with particular reference to the needs of various users; dune reconstruction and protection techniques; management of weeds; and, revegetation. It has many photos and diagrams illustrating the various processes and techniques.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Because this document deals exclusively with coastal and dune environments it is of limited relevance to the management of floodplains and estuaries except in so far as dunes form a barrier protecting estuarine environments and therefore the degradation of the dunes may have flow on effects to the health of estuarine ecosystems.
67	Coastal Development & Infrastructure	South West Rocks Structure Plan Review	2003	Parsons Brinckerhoff Australia Pty Ltd	Report - Hardcopy	A review of the present structure plan for South West Rocks with recommendations for the development of a new structure plan. It identifies further information that is required for effective planning and principles that should drive the development of a future plan. The review identifies many issues raised during consultation with the local community (2 workshops) and government agencies and authorities. It examines the regulatory and planning framework relevant to SWR (summarised in Table 3.1). It evaluates environmental opportunities and constraints (summarised in Table 4.5). It includes figures of land use zones, the 1:100 year flood extent, and key fauna habitats and corridors.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	This review was limited to issues relevant to the immediate area of SWR, specifically the area bounded by Jerseyville (S), Arakoon (E), the Macleay River (W) and Trial Bay (N). It raises a long list of issues which reflect community and government agency concerns of direct relevance to 10.1 – Land Use Planning & Development Control. Several recommendations are made as to how these concerns can be accommodated within a future structure plan.
68	Marine, Beach & Dune Systems	Stuarts Point Coastline Hazard Advice	2000	Specialist Coastal and Flood Services Branch, DLWC	Report - Hardcopy	Evaluates the coastal dune system in the vicinity of Stuarts Point with respect to the following coastline hazards: short-term beach erosion; slope instability/reduced bearing capacity; long-term recession; oceanic inundation; and, climatic change. The evaluation was requested by the Urban Water Branch so that any proposed effluent infrastructure could be placed outside the influence of coastal hazards. The report briefly describes the various hazards, the methods used to assess them and the results of the assessment. It concludes that the area is not subject to long-term recession but that the other hazards are present. As a result it defines zone widths of 40, 60 and 75 metres as the landward limits of hazards for the immediate, 50 year and 100 year planning horizons, respectively. Includes graphical results of analyses and several aerial photograph mosaics including diagrams of 100 year coastline hazard line.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	This document deals exclusively with coastal and dune environments it is of limited relevance to the management of floodplains and estuaries except in so far as it places constraints of the location of infrastructure and therefore is of relevance to 10.1 – Land Use Planning and Development Control.
69	Acid Sulphate Soil	Collombatti-Clybucca Acid Sulfate Soil 'Hot Spot' Area Management Plan- Final Report	2003	Enginuity Design	Report - Hardcopy	This management plan was commissioned to provide detail on proposed management strategies for the Collombatti-Clybucca ASS 'Hot Spot' Area Project. It includes a brief overview of the problem of ASS in the area; a description of the processes of plan development; a discussion of the various existing drainage and flood mitigation works; an environmental overview including biophysical background, zoning land use and tenure, socio-economic factors, and Aboriginal heritage issues. It reviews potential mitigation strategies related to prevention, dilution, containment and neutralisation. It proposes: the fitting of sluice gates to the Clybucca Floodgate to allow neutralisation and dilution of acid discharge by sea water; the fencing of scalded areas to facilitate regeneration; and the construction of low level weirs in several of the drains to maintain positive hydraulic gradients from the drains to the surrounding soils. It reviews the planning and regulatory framework covering the proposals, discusses the potential environmental impacts and proposes performance indicators. It contains several maps of the area and photos of exis	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report is best used in conjunction with Tulau & Naylor 1999 (which provides a better overview of the ASS issues of the Lower Macleay) and Kempsey Shire Council 2004 (which reviews the effectiveness of the works proposed in this plan). This report is most useful for its discussion of why particular mitigation works were chosen over others and for its comprehensive review of the planning and regulatory framework affecting the works. The ASS issue has implications for a range of floodplain and estuary management issues including: 10.4 Acid Sulphate Soil management; 10.5 Floodgate & Drain Management; 10.2 Floodplain Wetlands Management; 10.1 Land Use Planning & Development Control; and 10.11 Water quality.

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70	Acid Sulphate Soil	Seasonal and Stratigraphic Controls in Coastal Flood Plain Soils	1971	Walker, P.H.	Report - Hardcopy	Describes the nature and extent of soils of the Macleay River coastal floodplain with respect to texture, salt, pH, geomorphology and groundwater characteristics. Identifies the presence of ASS, called 'cat-clays' after the name given to similar deposits found in the Netherlands	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	This document has important historical relevance to 10.4 Acid Sulfate Soil Management in that it was the first survey to identify and describe ASS (cat-clays) in the Lower Macleay and discuss their management implications. However, the mapping and descriptions of the soils and their properties have been superseded by the Soil Landscape maps and reports of the area (Atkinson 1999, Eddle 2000) while a better discussion of the nature, distribution and management of ASS in the Lower Macleay can be found in Tulau and Naylor 1999.
71	Hydrographic, Tidal & Navigation Surveys	Marine Seismic Reflection survey off South West Rocks, Trial Bay near Kempsey	1973	Lean, J.	Report - Hardcopy	An offshore seismic reflection survey of Trial Bay in 1972 revealed a low bedrock ridge extending NW of Point Briner. Depths to bedrock decrease from 20 metres near shore to 16 m over the ridge. The maximum thickness of sediment was 18 m with the greatest accumulation landward of the ridge. Includes maps of depth to bedrock, sediment thickness and location diagram.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	This is an offshore survey and so is of limited relevance except in so far as the presence of the bedrock ridge may enhance accumulation of sediment at the mouth of South West Rocks Creek and thereby limit its usefulness as a port (10.6 – Boating Use)
72	Management Plans & Studies	Estuary Management Manual	1992	New South Wales Government	Report - Hardcopy	Outlines the NSW government's approach to estuary management planning. Describes the 8 step estuary management process, factors affecting the administration of estuaries, government financial assistance, a glossary, and 14 appendices dealing with estuary management issues.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Outlines the 8 step estuary planning process. Does not directly relate to any of the Section 10 issues.
73	Estuarine Habitats	Water Habitats of the Nambucca, Macleay and Hastings Catchments - North Coast Water Habitats Study Report #3. Report prepared for the Mid North Coast Water Management Committee.	2001	NSW National Parks and Wildlife Service Northern Directorate	Report - Hardcopy	Compilation of information of practical assistance to the Water Management Committees in their planning activities. Overviews Water Habitat types and their water requirements and sensitivity to water management activities and threats to these habitats types . Summarises Threatened Species and Protected Areas under variety of recognised listings and differing legislative mechanisms (needs updating for more recent listings). Mapping identifies Estuarine Wetlands, Freshwater Wetlands, Rainforest, Riparian Vegetation, Floodplain Forests, Moist Coastal Vegetation Communities and identifies significant species which may utilise these habitats. No assessment of conservation values for the areas mapped was undertaken for this study. Includes maps.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Identifies 6 water habitat types and their water requirements and sensitivity to management activities from the perspective of water extraction. Relates to Section 10.1 (Land Use Planning and Development Control) in that it lists protected areas and rare and threatened flora and fauna species known at the time. However, there has been considerable expansion to the legislation covering threatened species since 2001 and this needs updating. Useful discussion material relating to 10.2 (Riparian Land Management & Bank Erosion) from the perspective of significant fauna species and the need for a mosaic and diversity of habitat types. Contains information useful for determining a broader definition of KEY Habitats than identified in Section 10.9 (Habitat Protection). Does not address status / condition of the habitats listed. Instream habitats are not addressed in this Report. Raises issue of seagrass beds and relationship to freshwater discharge from adjacent unconfined aquifers - needs more investigation. Identifies importance of maintaining a diverse mosaic of vegetation types. Identifies threat from decreased freshwater input (due to uncontrolled extraction) likely to increase salinity and impacting on productivity and decline in health and viability of estuary system. Useful in that it allows comparison with Hastings and Nambucca catchments. Also covers freshwater reaches.

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74	Wetlands	Environmental impact statement for the proposed restoration of tidal inundation of Yarrahapinni Wetland, Mid-North Coast, NSW. Prepared for Yarrahapinni Wetlands Reserve Trust.	1997	SWC Consultancy - a division of Shortland Wetlands Centre Ltd	Report - Hardcopy	Compiles information relevant to the impacts of permanently opening the floodgates to restore tidal inundation to SEPP 14 Wetland #409. Identifies flora and fauna habitat issues which are now somewhat out-of-date. Includes Flora, Fauna and "Threatened Species likely to occur" lists. Investigates impacts on neighbours, landuse patterns, soils and erosion, hydrology, estuary function, water quality, flora and fauna habitat, aboriginal heritage and socio-economic impacts.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3200	Relevant to 10.2(Riparian Land Management), 10.3(Floodplain Wetlands Management), 10.4 (Acid Sulphate Soils Management), 10.5(Floodgate and Drain Management), 10.9 (Habitat Protection) and 10.11 (Water Quality). Defines 13 Vegetation Communities and identifies significant flora fauna issues - although needs updating to current listings. Documentation is confined to the Yarrahapinni Wetland.	Background document.
75	Recreation and Tourism	A proposal to build a boardwalk at the Yarrahapinni Wetland - Environmental Impact Statement.	2000	Yarrahapinni Wetlands Reserve Trust	Report - Hardcopy	Assesses proposal for a Boardwalk as part of a community awareness and education program for the rehabilitation of the wetland and wetlands in general. Includes 8-point checks for species listed under the Threatened Species Conservation Act(1995).	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relevant to 10.3 (Floodplain Wetlands Management) and 10.8 (Tourism Management). Briefly discusses some issues and potential long and short terms impacts from proposal. Includes some information on Aboriginal Heritage which has not been listed as a Section 10 issues. Documentation is confined to the Yarrahapinni Wetland.	Background document.
76	Management Plans and Studies	Yarrahapinni Wetlands Reserve Plan of Management 2001	2000	Yarrahapinni Wetlands Reserve Trust	Report - Hardcopy	Legal and working framework which guides the Wetlands Reserve Trust's management of the wetlands in accordance with the Crown Lands Act. Documents natural resources and describes 5 Management Units and identifies Management Directions, Key Actions and Performance Targets under 9 categories of Management Guidelines. Lists plant species and significant fauna (TSCAct 1995 and CAMBA/JAMBA)	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Demonstrates the level of documentation required for Management Plans. Relevant to 10.2(Riparian Land Management), 10.3(Floodplain Wetlands Management), 10.4 (Acid Sulphate Soils Management), 10.5(Floodgate and Drain Management), 10.9 (Habitat Protection) and 10.11 (Water Quality). Raises discussion on long term role of the Wetlands Trust and the need to develop appropriate income opportunities. Includes some information on Aboriginal Heritage which has not been listed as a Section 10 issues. Documentation is confined to the Yarrahapinni Wetland.	To what degree has the Plan been implemented? 1 floodgate opened on a trial basis for 12 months. Issues with impact on neighbouring properties unresolved? Need to purchase more land to resolve neighbour impacts. Need to deal with impacts on Oyster/Fishing Industry. Funding stream opportunities have changed (previously NHT and DLWC) Issues with funding availability? What opportunities through CMA. No time-frames evident for implementation. Are Annual Reports addressing Performance Measures on Management Actions. Trust currently without funds for works.
77	Wetlands	Yarrahapinni Wetland Vegetation Monitoring - Final Report to Yarrahapinni Reserve Trust	2004	Justine Graham and John Duggin, Ecosystem Management, University of New England	Report - Hardcopy	16 field trips between March 2000 and December 2003 monitoring 7 vegetation communities, soil and water quality within the Yarrahapinni Wetland. Graphs and raw data presented covering the intervals of fire, flood, tidal inundation (opening gates), flood and floodgate closure. Photographic records presented. No clear summary of findings or conclusions included.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3200	Potentially relevant to 10.3 (Floodplain Wetlands Management), 10.4 (Acid Sulphate Soils Management), 10.5 (Floodgate and Drain Management) and 10.11 (Water Quality) if findings drawn out and / or monitoring extended as changes in vegetation cover and species composition may take longer to be apparent.	Appendix 1 Conference Presentation CD not included

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78	Estuarine Habitats	<i>The Importance of groundwater to seagrass habitats at Stuarts Point</i>	2002	Dr Pia Laegdsgaard NSW Dept. of Land & Water Conservation	Report - Hardcopy	This Report investigates the relationships between Seagrass in the Macleay River and its relationship with aquifer discharges (quantity and quality) from the Stuarts Point aquifer. Higher levels of nutrients in the discharged water causes stress to Seagrass by the increase in growth of algae, epiphytes and phytoplankton on the Sea grass leaves. Documents the function, environmental requirements Seagrass distribution has been mapped from 1956 - 1997 and an increase in area noted. Recommendation for on-going monitoring and investigation are made.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Useful background information for 10.1 (Landuse Planning and development Control) as it highlights the need to consider groundwater (quantity and quality) implications on lands above aquifers on aquatic habitats within adjacent rivers. Health of seagrass also has implications for control of sediment loads in river. Relevant to 10.7 (Sedimentation), 10.9 (Habitat Protection), 10.11(Water Quality) and 10.12 (River Health).	Useful document - photographs showing healthy leaves and those stressed with macro algal epiphytes and dense filamentous algae coating
79	Wetlands	<i>A Survey of Wetlands of Coastal New South Wales - Technical Memorandum NO.5 CSIRO Division of Wildlife Research</i>	1970	G N Goodrick	Report - Hardcopy	This Report was prepared by CSIRO Division of Wildlife Research and the NSW NPWS in 1970 and documents survey works undertaken on the wetlands of coastal NSW as the basis for a waterfowl conservation program by NSW NPWS. 14 ecological types of wetland defined and the distribution and extent of each type listed geographic districts. The report draws attention to the impact of flood mitigation on wildlife and stresses the need to preserve areas for wildlife.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Provides an historical perspective to the issues we trying to address in this Estuary Management Plan process (10.3 Floodplain Wetlands Management, 10.9 Habitat Protection). Map not attached to the Report.	Interesting historical perspective. Map not attached - may be of historical interest and useful for comparative purposes.
80	Wetlands	<i>NSW Wetlands Management Policy ACTION PLAN</i>	1998/99	Dept. of Land and Water Conservation	Report - Hardcopy	Sets priorities for wetland management in NSW in accordance with NSW Wetlands Management Policy. 9 Principles, 15 Strategies and 33 Actions are listed for implementation through a co-operative process requiring participation of community, all State Govt agencies, local government and industry.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Does not specifically relate to any Section 10 issues. Sets a legislative framework for taking actions.	Specialist Advisory Groups such as NSW Wetland Action Group (WAG) were disbanded in 2003 and replaced by the over-arching Natural Resources Commission which administers the Natural Resources Commission Act 2003.
81	Wetlands	<i>Wetlands of the Lower Macleay Floodplain, Northern Coastal New South Wales - Proceedings of the Linnean Society NSW 111(3) 1989</i>	1989	R L Pressey	Journal	432 wetlands on the lower Macleay floodplain were mapped and an inventory of species made. Wetlands were grouped according to their size and the number of plant taxa within.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Does not specifically relate to any Section 10 issues apart from being of some historical use in describing wetlands as it was the first more comprehensive study undertaken.	

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82	Estuarine Habitat	Mapping of Bass Habitat in the Macleay, Hawkesbury and Shoalhaven Rivers - Interim Report for the Recreational Freshwater Trust Expenditure Committee (NSW Fisheries, Port Stephens Fisheries Centre)	2004	G West, R Laird, RJ Williams	Report - Hardcopy (DRAFT)	This Interim Report maps aquatic habitat elements (Mangrove, Saltmarsh, Zostera and Other) for the 3 rivers. Ortho-rectified aerial photographs were processed and digital images were examined and overlain with data collected in the field. Features of particular relevance such as snags, eroded banks and cover of vegetation were classified in terms of their extent as either point, line or polygon features. Digital data may also be available on finalisation of the documentation during 2005.	Greg West Scientific Officer - Habitat Mapping	NSW Dept of Primary Industries (Incorporating NSW Fisheries) Taylors Beach Rd, Taylors Beach 2316 (02) 49821232	Important baseline information relevant to Section 10.1 (Landuse Planning and Development Control), 10.2 (Riparian Land Management) and Bank Erosion)10.6 (Boating Use), 10.7 (Sedimentation), 10.9 (Habitat Protection) and 10.10 (Fish and Shellfish Management). An important starting point for monitoring and evaluating changes and prioritising remedial bank stabilisation and revegetation activities. The Macleay Arm was not included in this project but will be included in the more comprehensive 2005 mapping.	In addition, NSW Fisheries has provided a digital data layer of Aquatic Habitat / Macrophyte mapping (Mangroves, Saltmarsh, Zostera and Others) based on 1985 aerial photography. An updated survey as part of the Comprehensive Coastal Assessment is being undertaken in February 2005 and this will be a more definitive survey defining weed species distribution such as <i>Elodea sp.</i> and <i>Egeria sp.</i>
83	Estuarine Habitat	Estuarine Fisheries Resources of Two South-east Australian Rivers	1993	RJ West	Thesis	A Thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the School of Biological Sciences, University of New South Wales. Describes changes in area (km2) for Seagrass, Mangrove and Saltmarsh from 1947, 1962, 1981, and 1986 for the Tweed, Clarence and Macleay Rivers.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	Baseline information on changes over time and useful to current investigations by NSW Fisheries. Relevant to Section 10.1 (Landuse Planning and Development Control), 10.2 (Riparian Land Management) and Bank Erosion)10.6 (Boating Use), 10.7 (Sedimentation), 10.9 (Habitat Protection) 111	Whole document unavailable when compiling database.
84	Riparian and Floodplain Vegetation	Saltwater Creek Catchment - Flora and Fauna Study, South West Rocks prepared for Kempsey Shire Council Coastal and Estuary Management Committee	2003	Kendall & Kendall Pty Ltd	Report - Hardcopy	Outlines the flora and fauna communities and species within the catchment of Saltwater Creek. The study concentrates on species and communities dependent on surface or near surface water table regimes. Conservation values of flora and fauna species and communities on a Regional, State and National basis are included and Management Recommendations on nutrient contamination, weeds and buffers to adjoining development areas are made for this sensitive intermittently open coastal creek / lagoon system.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	This report focuses on a small target area but provides good relatively up-to-date information on the conservation status of a diversity of species for the Macleay coastal / estuary zone. Management recommendations have some relevance to the need for development controls adjoining significant remnant areas therefore addresses Section 10.1(LandUse Planning and Development Control), 10.2 (Riparian Land Management & Bank Erosion) and 10.9 (Habitat Protection)	
85	Riparian and Floodplain Vegetation	Vegetation Survey of Saltwater Creek, Arakoon State Recreation Area, NSW	1995	Laura Dwyer	Report - Hardcopy	This report documents vegetation communities along a transect from Saltwater Creek through to the back dune.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report focuses on a small target area and does not relate directly to any Section 10 issues. It may be of interest when for a specific monitoring project on weed invasion or disturbance in this particular locality.	

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86	Miscellaneous	<i>Threatened Species of the Lower North Coast of New South Wales</i>	2000	Threatened Species Unit, NSW National Parks and Wildlife Service	Report - Hardcopy	This booklet provides Threatened Species profiles for the lower north coast and includes Fishes.	NSW National Parks and Wildlife Service, Coffs Harbour (02) 6651 5946	Relevant reference information when considering Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection). Updates to the threatened species listings need to be checked for on a regular basis.
87	Riparian and Floodplain Vegetation	<i>Riverbank Restoration for the Nambucca Estuary - A Decision Making Guide</i>	2000	Nambucca Valley Landcare Inc./ Coastcare	Report - Hardcopy	This booklet provides valuable information for revegetation activities in the Nambucca estuary and addresses the significance of Mangroves and estuarine dependent Fish. Species for use in revegetation are listed according to zones through the estuary.	John Schmidt, DIPNR Kempsey john.schmidt@dipnr.nsw.gov.au (02) 6563 1212	Relevant reference information when considering Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection). A similar guide targeting the Macleay River is proposed as part of the Data Compilation process to aid in decision making regarding revegetation works.
88	Fisheries and Aquaculture	<i>NSW Fisheries 'Policies and Guidelines' - Aquatic Habitat Management and Fish Conservation 1998/1999</i>	1998/99	NSW Fisheries	Report - Hardcopy	This document defines and describes aquatic habitats, fish and fish resources. It details the Legislative framework, provides guidelines on a wide range of activities and defines biodiversity conservation and habitat rehabilitation activities.	NSW Fisheries NSW Fisheries Office of Conservation, Level 1, Sydney Fish Markets, Gipps St, Sydney (02) 9566 7800	Particularly relevant to Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection). The document is targeted at local and state government authorities, proponents of developments and their advisors and individuals or organisations concerned with the planning and management of aquatic resources.
89	Fisheries and Aquaculture	<i>Indigenous Fisheries Strategy and Implementation Plan</i>	2002	NSW Fisheries	Report - Hardcopy Report - Electronic (Internet)	This Strategy identifies 4 specific initiatives (Building Respect for Aboriginal Tradition and Culture, Engaging Aboriginal Communities in Fisheries Resource Management, Social and Economic Development, Indigenous Employment Opportunities) and sets down Actions and Priorities to achieves these objectives.	NSW Fisheries NSW Fisheries Office of Conservation, Level 1, Sydney Fish Markets, Gipps St, Sydney 02 9566 7800	Relevant to Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection). Acknowledges Aboriginal Heritage and raises this issue for management of the estuary. Needs to be incorporated into strategic planning.

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90	Riparian and Floodplain Vegetation	Bellinger River - Estuary Revegetation Guide	not dated	Stuart Johnstone for Bellinger Valley Landcare / Coastcare	Report - Hardcopy	This booklet provides valuable information for revegetation activities in the Bellinger estuary and describes erosion processes and the values of vegetation. Species for use in revegetation are listed according to zones through the estuary.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au
91	Riparian and Floodplain Vegetation	Rainforests of the Lower Macleay River Flats	1984	Alex Floyd, NSW National Parks and Wildlife Service	Report - Hardcopy	Reviews status of the original rainforest of the lower Macleay floodplain. Identifies 3 small sites of Subtropical rainforest. Lists flora species and their abundance.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Provides important floral listings for comparison with current situation and current legislation. Relevant to Section 10.1 (Land Use Planning and Development Control), 10.2 (Riparian Land Management and Bank Erosion) and 10.9 (Habitat Protection).
92	Riparian and Floodplain Vegetation	Rainforest Islands on the Lower Reaches of the Northern Rivers of NSW	1978	Alex Floyd, NSW National Parks and Wildlife Service	Report - Hardcopy	Briefly overviews rainforest islands on the Tweed, Richmond, Richmond, Clarence, Bellinger, Macleay, Hastings, Manning and Hunter and their status.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Provides interesting historical context to status of these remnants. New listings under Threatened Species Conservation Act set a framework to assist conservation. Relevant to Section 10.1 (Land Use Planning and Development Control) and 10.9 (Habitat Protection).
93	Riparian and Floodplain Vegetation	Report on Forests of Shark Island	1977	Alex Floyd, NSW National Parks and Wildlife Service	Report - Hardcopy	Describes the Shark Island rainforest and provides a species list and levels of abundance.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Provides interesting historical context and the most comprehensive listing of species for this site to-date. Relevant to Section 10.1 (Land Use Planning and Development Control) and 10.9 (Habitat Protection). Weed control works have been undertaken as part of a Coastcare Grant provided to South-west Rocks Dune Care and Kempsey Council. Works undertaken between February 2002 and February 2004. Need for continuity of works and integration with Aboriginal community? Status of ownership and implementation of long-term conservation management.

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94	Floods and Flood Studies	Interim Flood Assessment Report - Comparison of Route Options	2003	Webb McKeown and Associates Pty Ltd	Report - Electronic (CD)	The purpose of this interim report is to evaluate the flooding impacts associated with alternative route options for the proposed Kempsey to Eungai Pacific Highway upgrade. Hydrologic and hydraulic modelling was undertaken to evaluate the 2 options, the eastern option and the western option. A range of different sized bridge and floodway designs were trialled. The report details the effects on flood levels in areas adjacent to, upstream of, and downstream of the proposed routes. No recommendation is made of which route is preferred from a flooding perspective. Recommendations are suggested for how to improve the model accuracy once a preferred route is selected and further flood investigations are carried out.	Parsons Brinckerhoff Pty Ltd (02) 9743 0333 sydney@pb.com.au	Any significant alteration to the flood regime or floodplain topography or structure has obvious implications for the estuary management process. However, until the route is chosen and designs finalised it is difficult to predict what effects are likely to occur.
95	Floods and Flood Studies	Supplementary Flood Investigations - Eastern Route Options	2004	Webb McKeown and Associates Pty Ltd	Report - Electronic (CD)	The potential impacts of the Eastern Route Option for the Kempsey - Eungai Highway Bypass on flooding has been identified as a major concern. In order to investigate this issue further, more detailed flood modelling of the eastern route option using a fully two dimensional RMA-2 hydraulic model was undertaken. Such an approach provides a better spatial representation of results to help determine more accurately the likely size and location of any impacts. A property survey was also conducted so that the social and economic costs of any flood impacts could be calculated and the number of properties affected determined. Three options were modelled for the full range of design events to determine the changes in flood behaviour, the number of properties affected, and increases in potential flood damages. A summary of the results obtained is presented along with a discussion of the potential flood mitigation measures considered. The results conclude that even with substantial bridge and floodplain openings that there would be substantial impacts.	Parsons Brinckerhoff Pty Ltd (02) 9743 0333 sydney@pb.com.au	This report goes into more detail than the previous related study, and uses more accurate modelling techniques to determine flood effects. A detailed floodplain survey and 2003 bathymetry of the river bed were used to refine the model. The findings have important ramifications for floodplain management and may have as yet undetermined effects on sedimentary and estuarine processes.
96	Flood Mitigation	Issues in flood mitigation and land management on the lower Macleay River	1996	J.W.S.McKenzie, Sloane, Cook & King Pty Ltd	Report - Hardcopy	Reviews the status of issues that were current in 1989 as identified in the "Review of land and water impacts on fisheries and agricultural resources in the lower Macleay - Working Party Report". The report assesses the progress in addressing the issues and identifies additional issues related to land and water management in the lower Macleay. The report focuses on technical issues, equity issues, fisheries impacts and implementation problems.	Ron Kemsley, Kempsey Shire Council In: Status Report to the Floodplain Management Committee Meeting, 16 February 1996	This report updates the "State of Play" of floodplain management issues as reviewed initially in the 1989 Working Party Report on Land and Water Impacts on Fisheries and Agricultural Resources in the Lower Macleay. Although it is a less thorough document its value is in its identification of particular problems of implementation of management improvements specifically relating to Section 10.3 Floodplain and Wetland Management and 10.5 Floodgate and Drainage Management. It identifies areas of equity and coordination as the primary barriers to improving the situation as it was in 1996.
97	Floodplain management	Status Report to Floodplain Management Steering Committee Meeting, 16 February 1996	1996	Webb McKeown and Associates Pty Ltd	Report - Hardcopy	Documents the various issues raised at 3 community meetings held in the lower Macleay to discuss floodplain management. The report summarises the various issues and provides possible solutions as a starting point for further discussion at a Floodplain Management Steering Committee Meeting. The report also contains a submission from the Belmore Kinchela Landholder's Association and two sub-consultant reports addressing "Aquatic ecology and fisheries" (The Ecology Lab Pty Ltd) and "Issues in flood mitigation and land management (by Sloane Cook & King Pty Ltd).	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Provides a comprehensive list of community concerns relating to flood mitigation, agricultural resources, floodgate and drain management, and equity issues for 3 different areas of the lower Macleay floodplain. Issues and concerns raised are relevant to Section 10.3, 10.4, and 10.5.

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98	Miscellaneous	Soil, water and pasture enrichment of antimony and arsenic within a coastal floodplain system	2005	M.Tighe, P.Ashley, P.Lockwood, S.Wilson	Journal (In press)	This study builds a previous work by Ashley and Graham (2001), and sets out to determine the spatial and vertical distribution of Arsenic (As) and Antimony (Sb) contamination across the Macleay Coastal floodplain and to investigate possible uptake of these contaminants into selected pasture species.	Article in press	Contact Matt Tighe (02) 6773 3691 mtighe@metz.une.edu.au	Directly relevant to Section 10.7 Sedimentation including critical question 2 and issue 3. May also assist in answering questions related to swamp infilling if further studies of Lead 210 of Caesium 238 are undertaken. May also be relevant to Section 10.10 Fish and Shellfish although no current health guidelines exist for Sb contamination in Oysters. Relevant to Section 10.11 Water Quality as the study shows elevated levels of As and Sb in surface waters, exceeding guidelines for drinking quality and freshwater ecosystem protection guidelines.
99	Acid Sulphate Soil	Macleay River Catchment Acid Sulphate Soil Remediation Projects Review	2001	anon.	Report - Hardcopy - Proceedings	This report is a summary of presentations provided to the Macleay River Catchment ASS Remediation Projects Review, 29 May 2001. A comprehensive overview of projects underway at the time is provided. Presentations include "Seven Oaks Drain Projects and the Upper Belmore Floodplain Management Strategy", "Yarrhapinni Wetlands Restoration", "Kinchella Creek Active Water Management Trial", "Rafferty Drain Community Water Quality Monitoring", "Macleay Floodplain Project", Floodplain Water Quality Monitoring Program", "Fish Passage and Habitat Restoration Floodgate Opening", and "Acid Sulphate Soils Hotspots Program".	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The presentations contain information of relevance to programs dealing with Sections 10.3, 10.4, 10.5, 10.9, 10.11 and 10.12. The proceedings probably contain the most up-to-date information in written form on the progress of programs in addressing floodplain management and is fairly comprehensive.
100	Geology and Geomorphology	Transport, retention and transformation of material in Australian estuaries.	1998	Bradley Eyre	Journal	Episodic freshwater flows control the transport, retention and transformation of material in most Australian estuaries, and for only a small part of the year during high flow events do most Australian rivers and estuaries contribute a significant amount of material to the continental shelf. Research and monitoring efforts need to be directed towards evaluating the role episodic freshwater discharges play in the functioning of Australian estuaries.		In: <i>Estuaries</i> , Vol.21, No.4A, pp.540-551	This paper deals primarily with "Wet and dry tropical and subtropical" estuaries of which the Macleay River is one example. It draws on research over a wide range of estuaries but makes particular reference to studies on the Richmond River. The information is generic in nature but is of relevance to Section 10.7 Sedimentation as it describes the hydrological conditions affecting transport and deposition of sediments to the continental shelf and likely areas of accumulation under different flow regimes. Contains useful references on sedimentation and examples of studies (eg. Sediment budget for the Brisbane River Estuary)
101	Management Plans and Studies	Integrated Catchment Management Plan for the mid-north coast catchment 2002	2003	DLWC	Report - hardcopy	The integrated catchment management plan or Catchment Blueprint is an advisory plan intended to guide land managers in the mid-north coast area towards sustainable natural resource management. The plan contains 79 prioritised management actions. Measurable improvements on catchment health and sustainable and productive land use are the intended outcomes.	DIPNR Kempsey	(02) 6563 1212	Includes targets and actions relevant to estuary management however the blueprints are currently being revised into a Northern Rivers Catchment Management Plan by the newly formed Northern Rivers Catchment Management Authorities.

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102	Erosion studies	Design Report for river bank remediation - Stuarts Point Caravan Park	2003	GHD Pty Ltd	Report - Hardcopy (DRAFT)	Investigates the causes and options for the treatment of bank erosion occurring at the Stuarts point Caravan Park foreshore.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relevant to Section 10.2 Riparian management and bank erosion but is limited in its application as it deals specifically with erosion occurring at the caravan park. The report deals with the erosion as if it is a fluvial (freshwater system) despite the fact that the site is in the estuary arm. Options are given for treatment but the geomorphological investigations supporting the options is limited.
103	Marine, Beach & Dune Systems	Proposed maintenance dredging - Macleay River. Review of Environmental Factors.	1994	Sinclair Knight Merz Pty Ltd, for NSW Public Works.	Report - Hardcopy	The review of environmental factors details the potential environmental impacts associated with the proposed trial of maintenance dredging at the Macleay River entrance. The purpose of dredging at the entrance was to alleviate the difficult navigation conditions that had resulted from shoaling.	Dave Hanslow, DIPNR Newcastle	dave.hanslow@dipnr.nsw.gov.au	Although dredging in the Macleay River is not identified specifically in the section 10 issues summary, this REF contains some information of relevance to the Estuary Management Planning process, for example Section 10.7 Sedimentation. In addition some information on maritime archaeological significance and commercial uses of the estuary are provided.
104	Floods and Flood Studies	Kempsey evaluation of options for flood protection	1985	Webb McKeown and Associates Pty Ltd	Report - hardcopy	A pseudo two-dimensional mathematical model was used to determine flood effects in the area between Kempsey railway bridge and Frederickton. The model was calibrated using 1949 and 1980 flood data and tested on 1963 flood data for accuracy of predictions. The likely effects on the township of Kempsey of 4 flood protection options are assessed. Economic costs and aesthetic impacts are also discussed. In addition, options for "river improvement works" such as dredging are discussed as methods for reducing flood heights at Kempsey, although no recommendation for such works is made due to the need for guaranteed on-going works to make any such improvements worthwhile.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The report is relevant to flood related questions although more recent modelling has been done and techniques improved. Morphological changes to the channel between 1963 and 1980 between the railway bridge and second lane are relevant to Section 10.2. Raises issues with the Kempsey Traffic Bridge rating curve, estimating that it predicts 50% higher discharge values and suggests that it is reassessed for any future relevant studies. The report also refers to a "special" survey of the left and right banks between Kempsey and Frederickton to determine the validity of conversion of previous datum to a common AHD. Alludes to the effects of flood mitigation works on raising flood heights above the Kempsey traffic bridge.
105	Flood Mitigation	Report of the Macleay Valley Flood Mitigation Committee (The Jacka Report)	1953	Macleay Valley Flood Mitigation Committee	Report - Hardcopy	The floods of 1949 and 1950 were devastating to the Macleay Valley. In 1951, the Macleay Valley Flood Mitigation Committee, chaired by Mr C.K. Jacka was set up to review options for flood control in the Macleay Valley. The committee considered a joint submission by Macleay Valley local councils, reports by government departments, and representations by drainage unions and local landholders and farmers. Options for flood mitigation dams, river improvement works, drainage, hydroelectricity, and improvements to dam management and administration were investigated. The Committee's report of 1953 recommends flood "mitigation" as the only viable option as opposed to flood "control". The report also rules out dams as an effective option due to costs and instead puts forward a proposal for a valley-wide scheme which involved extensive drain construction and enlargement, headwater construction, levee construction and enlargement, river bank protection, ocean cuts training walls, and dredging at a total estimated cost of 1,090,000 pounds. Contains several maps and appendices outlining government department opinion of the day.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	This report resulted in major changes to the lower Macleay floodplain and river, with a massive works program instigated in its wake over the subsequent 2 decades. It provides historical context to the Macleay Valley Flood Mitigation Scheme and is relevant to Sections 10.2, 10.3 and 10.5. The report also recommends that controls over land use and development be carefully considered as major flooding can not be controlled (Section 10.1). Interestingly, no recommendation is made for the extensive upstream flood mitigation works which occurred in many tributary and freshwater reaches of the river post 1960. Several cross-sections are provided along with a longitudinal profile of the estuary with greater detail around Kempsey.

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106	Flood Mitigation	<i>Overall Plan of Flood Mitigation for the Lower Valley. Report by the Council's Civil Engineer reviewing the 1953 proposals of the Macleay Valley Flood Mitigation Committee.</i>	1962	Macleay River County Council	Report - Hardcopy	<p>Following the release of the 1953 Jacka Report and the subsequent decision in 1954 to delegate to the Macleay Valley County Council the powers and duties relating to flood mitigation, works proceeded on the lower Macleay Flood Mitigation Scheme. This report reviews the recommendations of the Jacka Report and the progress to date and proposes a detailed program of further works to be undertaken. The main focus is to improve flood efficiency and to construct works which protect areas below Kempsey from a flood of 16' on the Kempsey Traffic Bridge guage. The requirement to reduce periods of inundation to between 6-10 days necessitates the construction of new drains and improvement in the capacity of existing drains. Further extensive areas requiring bank protection works are identified and techniques for stabilisation proposed along with approximate scale of works and costings. The 1953 scheme of works estimated to cost 1,090,000 pounds is replaced by a far more detailed and comprehensive scheme costing 1,660,000 pounds. Priorities are allocated for 67 planned works. 8 maps and 2 figures are included.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>A comprehensive plan for the continuation of flood mitigation works which reviews and re-evaluates the scheme proposed by Jacka in 1953. Provides historical context to the Macleay Valley Flood Mitigation Scheme relevant to Section 10.2, 10.3, and 10.5. The revised scheme was developed by the Council Engineer and it is unclear how much community input was involved. It emphasises several times the aim to reduce inundation periods on pastures and is equally concerned with drainage as with flood protection.</p>
107	Management Plans and Studies	<i>Saltwater Creek and Lagoon, South West Rocks. Estuary Management Study and Plan.</i>	2005	WBM Oceanics Pty Ltd, Newcastle	Report - hardcopy (DRAFT)	<p>Outlines a management process (in accordance with the provisions of the NSW Estuary and Coastal Policies) that is intended to be followed in order to achieve long-term sustainability of Saltwater Creek and Lagoon with regard to ecological, economic and social values. The plan (once finalised from its draft form and adopted) is intended to be used by Council to guide future works programs and policy changes.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>Currently in a preliminary draft phase and so not yet reviewed.</p>
108	Hydrographic, Tidal and Navigation Surveys	<i>South West Rocks Creek - Review of hydrographic surveys</i>	1986	A.Griffiths, District Engineer, Public Works, Coffs Harbour	Report - Hardcopy	<p>Reviews 25 years of hydrographic surveys on South West Rocks Creek and comments on changes in creek and entrance conditions over the period.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>Relates to Section 10.7 Sedimentation, particularly questions and issues related to "Back Creek".</p>
109	Coastal Development and Infrastructure	<i>Draft assessment of crown lands at Fisherman's Reach</i>	2001	DLWC	unpublished	<p>The assessment applies to a part of the Macleay Arm bed and was undertaken to rationalise future allocation of licences for waterfront structures over Crown Land. The assessment recommends subject to public comment and review that conditions requiring sharing of facilities be incorporated into existing occupations at first opportunity, that any new licences be subject to shared use conditions, that the number of permitted jetties be limited to a maximum of 8 between Auld Street and Perrett Lane, and that an existing concrete boat ramp be transferred to Kempsey Council and dedicated a public boat ramp facility.</p>	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dlpnr.nsw.gov.au	<p>Relevant to Section 10.6 Boating Use as it deals with control of private foreshore structures and public boating facilities and sets a policy direction for Crown Lands in terms of foreshore structure management.</p>

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110	Flood Mitigation	Lower Macleay Valley Flood Mitigation - Review of Kinchela Creek and Belmore River Floodway capacities.	1994	NSW Public Works	Report - hardcopy	Assesses the actual floodway capacity of Kinchela Creek and Belmore River against the design capacity and finds that both floodways are operating below their design levels. Kinchela Creek is limited by the size of the two floodway structures while Belmore River is restricted by the channel size.	Kempsey Shire Council	(02) 6566 3200	Indirect relevance to Section 10.5 Floodgate and drain management although not pertinent to any of the identified issues. Is mostly concerned with the efficiency of existing works compared to their designed capacities.
111	Flood Mitigation	Raising of Kinchela Creek levees and associated works - Review of environmental factors	1997	Kempsey Shire Council	Report - Hardcopy	A proposal to raise Kinchela Creek and Belmore River levees to provide increased flood protection to local landholders is assessed for its environmental effects.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The modelling for the proposal relies on the RUBICON model developed for earlier flood modelling exercises (although new data has been put into the model increasing its accuracy). Although the document is a review of environmental factors it focuses heavily on the benefits for landholders and the "improved equity" scenario for sharing flooding problems. The information is broadly relevant to Sections 10.3, 10.4, 10.9 and 10.11 but is of most relevance to 10.5 Floodgate and drain management.
112	Flood Mitigation	Hat Head Levee hydraulic review	1994	Webb McKeown and Associates Pty Ltd	Report - Hardcopy	This report determines the 1 in 100 year flood levels in Korogoro Creek near Hat Head and assesses the adequacy of existing infrastructure (eg. levees, roads) to deal with floods of this magnitude and above. Korogoro Creek drains the Swan Pool and is part of the Belmore/Kinchela flood mitigation and drainage scheme.	Kempsey Shire Council	(02) 6566 3200	Indirectly relevant to Section 10.5. Contains new cross-section data for Korogoro Creek which may be of future monitoring use. Adds new data to the existing RUBICON flood model of the lower Macleay Valley.
113	Management Plans and Studies	Saltwater Creek Estuary Processes Study	2002	Manly Hydraulics Report 1126	Report - Electronic (CD)	The estuary processes study for Saltwater Creek has been undertaken as part of a process to develop an Estuary Management Plan (EMP) for the Creek. The study found that Saltwater Creek estuary is likely to be sensitive to environmental disturbance with issues such as artificial entrance opening, foreshore development, and nutrient loading likely to effect the creek ecology and condition. The height of the entrance berm is significant as it regulates to a large extent the water quality, water level and flooding, and ecological processes in the creek. The study recommends 4 areas of further investigation that would assist in the preparation of the EMP.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Saltwater Creek is a discrete catchment within the broader Macleay River catchment and is being addressed by a separate process from an Estuary Management Planning perspective. There is no direct relevance to the Macleay EMP process although the process has been well researched and written and provides some broad guidelines for what might be included in the Macleay EMP (although the scale in both geographical and in terms of breadth of issues is vastly different).

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114	Management Plans and Studies	Killick Creek Estuary Processes Study	2002	Manly Hydraulics Report 1125	Report - Electronic (CD)	The estuary processes study for Killick Creek has been undertaken as part of a process to develop an Estuary Management Plan (EMP) for the Creek. The study found that Killick Creek estuary has been impacted by a number of human induced changes to the system including flood mitigation works, mechanical and permanent opening of the entrance, and catchment development. The major concerns for the system include water quality and odour problems, floodgate management, sedimentation and entrance management, ecological health and recreational amenity. The study recommends 4 areas of further investigation that would assist in the preparation of the EMP.	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dlpr.nsw.gov.au	Although Killick Creek is linked to the Macleay River through Scotts Drain to Belmore Swamp, the creek is not actually part of the Macleay Estuary Management Plan study area. However, as the creek now functions as an ocean cut for release of flood waters from Belmore Swamp (as part of the Macleay Valley flood mitigation scheme) some of the information in the process study is of relevance to Section 10.3 Floodplain and wetland management and Section 10.5 Floodgate and drain management.
115	Groundwater	Groundwater for Stuarts Point Water Supply	1983	Ross, J.B.	Report - Hardcopy	Reports on construction of two production bores in coastal sands about 2 kilometres south of Stuarts Point. The bores were located 500 m apart to avoid interference. The predicted safe maximum yields of the bores were 23 and 13.5 L/s therefore it was concluded that the bores should be able to meet the requirements of Stuarts Point to the year 2006 with the exception of short periods of peak daily demand in excess of 3.15 ML/d. Water quality analysis indicated that the quality of both bores was generally good except for very high levels of iron which would require aeration and the addition of slaked lime. Includes location and depth to bedrock map, pumping test and water analysis tables and bore logs.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options
116	Groundwater	Submission the the Hon Chris Hartcher, MP, Minister for the Environment, concerning the establishment of borefields in the Hat Head National Park	1994	Kempsey Shire Council	Report - Hardcopy	A submission to establish four production bores on a road reserve in Hat Head National Park to augment the water supply of South West rocks by 3 ML per day. This submission was submitted during Stage 5 water restrictions in the 1994 drought and is based on an earlier (1987) unsuccessful submission which forms the bulk of the document as Appendix C. Includes location map and map of proposed borefield.	Kempsey Shire Council (02) 6266 3200	Relates directly to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options particularly in the South West Rocks and Hat Head areas which are to some degree isolated by the National Park and the Macleay River. It is also relevant to 10.3 - Floodplain Wetlands Management and 10.9 - Habitat Protection as any draw down of the coastal aquifer may affect wetlands within the National Park which are important habitats.
117	Groundwater	Public Works Department Kempsey Shire Water Supply Augmentation Stage 2: Geophysical Mapping of Sand Aquifers	1986	Mackie Martin & Assoc. Pty Ltd	Report - Hardcopy	Report on an exploration of sand aquifers along the coastal strip between Hat Head and South West Rocks using vertical electric soundings (VES). While 'useful' sand aquifers were identified along the entire coastal strip there was only one area with potential outside the Hat Head Nature Reserve. On the basis of these results it recommends proceeding to establish a borefield approximately 3-5 km north of Hat Head. The report notes that the VES survey needs to be confirmed by drilling and that there would be some likely impact on the adjacent reserve. Includes interpreted geological cross-sections, conceptual borefield diagram and results of VES survey. Accompanying map folder containing VES and locality plan, aquifer thickness isopachs and aquifer resistivity trends appear to be missing.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options. However this document may now be redundant as subsequent drilling indicated that the proposed site was underlain at places by clays at about 12 m thereby making it unsuitable as a bore field (see appendix C of 'Submission the the Hon Chris Hartcher, MP, Minister for the Environment, concerning the establishment of borefields in the Hat Head National Park')

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118	Groundwater	Lower Macleay Water supply Sherwood borefield recharge investigations	1977	Australian Groundwater Consultants Pty Ltd	Report - Hardcopy	Study showing that recharge of the Sherwood Borefield by the Macleay River is impeded by zones of low permeability but that there is a direct path of recharge from an abandoned channel. It recommends an artificial recharge scheme consisting of a diversion weir across the main channel of the Macleay to divert water to the abandoned channel. This would increase yield from less than 13000 cubic metres per day to approximately 27000 cubic m per d. Includes locality plan, geophysical exploration results including map (Appendix A), borefield management program (Appendix B) and method for checking hydraulic status of bores (Appendix C).	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates directly to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options.
119	Miscellaneous	State of the Environment supplementary report 2002-2003	2003	Kempsey Shire Council	Report - Hardcopy	A supplementary SoE report ancillary to the comprehensive SoE of 1999-2000 and supplementary reports in subsequent years. Its purpose is to provide an update on issues in previous reports, identify new issues and describe trends in environmental indicators. It lists a wide variety of pressures and responses under the general headings land, water, air, biodiversity, waste and toxic hazards, noise, aboriginal and non-aboriginal heritage. It also describes the Kempsey Shire Council management plan and reports on the achievement of goals outlined within the plan. It contains figures and tables on population growth projections, NPWS conservation areas, exotic weeds and feral animals, threatened flora and fauna, aboriginal heritage sites, environmental activities, and environmental studies and programs.	Ron Kemsley	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Because of its broad nature this SoE report is of relevance to all of the issues listed in Section 10.
120	Flood Mitigation	Macleay River Flood Mitigation Environmental Impact Statement – Additional Drainage: Seven Oaks Area	1978	Department of Public Works, NSW	Report - Hardcopy	An EIS for a proposal to deepen and widen approximately 16 km of drains as the final stage of flood mitigation in the Seven Oaks area. The aim of the works is to facilitate the rapid removal of the final few centimetres of floodwater and thereby reduce the effects on pasture. The study finds no adverse impacts, except the possibility of short term siltation as a consequence of the works, and therefore recommends that the proposal proceeds.	Ron Kemsley, Kempsey Shire Council	(02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	The nature of the works makes this report relevant to 10.5 – Floodgate and Drain Management. Because the works facilitate the drainage of low lying lands in ASS prone areas it is also relevant to 10.4 Acid Sulfate Soils and 10.3 Floodplain Wetlands Management
121	Management Plans & Studies	Hat Head National Park Draft Plan of Management	1997	NSW National Parks and Wildlife Service	Report - Hardcopy	This management plan provides descriptions of the biophysical environment of Hat Head National Park, its cultural heritage and its uses. It outlines objectives and strategies for managing the park, and develops a framework and policies for its management under the headings: Landforms, geology, soils and hydrology; Climate, native plants and animals; Introduced plants and animals; Fire management; Cultural Heritage; Promotion of the park; Recreation opportunities; Scientific use; and, Management operations. It outlines a strategy for implementation of the plan including assigning relative priority to proposed activities. It includes an A3 size map of the park.	John Schmidt, DIPNR Kempsey	(02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	The Hat Head National Park includes remnants of previously more extensive freshwater wetlands (10.3 – Floodplain Wetlands Management) and is also an important recreation and tourism resource (10.8 – Tourism Management) and protects many important natural features (10.9 – Habitat Protection).

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122	Hydrographic, Tidal and Navigation Surveys	South West Rocks Creek Hydraulic Investigations of Boat Harbour Proposal	1980	Department of Public Works, NSW	Report - Hardcopy	This study was undertaken in response to concerns about a proposed boatharbour development in South West Rocks Creek (Back Creek). It involved collection and analysis of geological, hydraulic and hydrodynamic data, and numerical modelling and simulation. It predicts several adverse impacts including siltation of the channel entrance and harbour. It recommends that the proposed development not proceed. It suggests consideration of alternatives such as relocation of the boatharbour and/or a reduction in the scope of the work. It includes over 40 maps, figures and tables describing the proposal and data analyses as well as a number of plates (photographs).	John Schmidt, DIPNR Kempsey (02) 6563 1212 john.schmidt@dipnr.nsw.gov.au	Relevant to 10.6 – Boating Use and 10.8 – Tourism Management because SWR Ck harbour remains an important facility for recreational and commercial fishermen. The potential of the proposed works to reduce the tidal prism and therefore sedimentation transport capacity especially across the bar makes it relevant to 10.7 – Sedimentation. By its nature, the SWR Ck harbour is also susceptible to the impacts of 10.13 – Climate change and sea level rise.
123	Miscellaneous	Kempsey Water Supply Augmentation Stage 2B - Review of Environmental Factors	1993	Bruce Fidge & Associates	Report - Hardcopy	Reviews various options for improving water supply volumes, security and quality for the Kempsey Shire Council. It describes the scheme in place at the time of the report, and reviews various alternatives. It proposes a preferred scheme consisting of an off river storage dam and pumping station at Fattorini Creek, a service reservoir along Armidale Rd, 7 km of additional pipeline in Kempsey, trunk duplication between Frederickton and Bellimbopinni, augmentation of the South West Rocks borefield, and three additional bore pumps and a new reservoir at the Hat Head borefield. It describes the statutory requirements and environmental issues associated with the preferred option, especially the potential impacts on wetlands at Hat Head National Park. It includes maps of the existing and proposed works. Relevant correspondence and consultation is included in an appendix.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates directly to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options. Because of potential impacts on wetlands in Hat Head National Park this document is also relevant to 10.3 – Floodplain Wetlands Management and 10.9 – Habitat Protection
124	Groundwater	Kimpton Investments Pty Ltd – Additional groundwater assessment at Stuarts Point, NSW	1983	Coffey & Partners Pty Ltd	Report - Hardcopy	An additional assessment in support of a development proposal for the north-western boundary of Stuarts Point. Specifically this report examines the suitability of a proposed sewerage treatment and disposal area. It argues that the site has sufficient buffer from the Macleay Arm given the low horizontal velocity and high dilution potential of the aquifer. No domestic spear points are in the predicted flow paths, and in any case, the report argues that existing spear points are too shallow to be affected as the effluent is predicted to take a deep flow path. Includes maps, cross-section and water balance diagram, graphs of bore levels and rainfall-infiltration relationship	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates to 10.1 - Land Use Planning & Development Control as the ability to treat and dispose of effluent is a potential constraint on development in the Stuarts Point area. The specifics of this proposal may no longer be relevant as it would seem that it was not proceeded with.
125	Groundwater	Submission to the Hon Chris Hartcher, MP, Minister for the Environment, concerning the establishment of borefields in the Hat Head National Park	1994	Kempsey Shire Council	Report - Hardcopy	A submission to establish four production bores on a road reserve in Hat Head National Park to augment the water supply of South West rocks by 3 ML per day. This submission was submitted during Stage 5 water restrictions in the 1994 drought and is based on an earlier (1987) unsuccessful submission which forms the bulk of the document as Appendix C. Includes location map and map of proposed borefield.	Ron Kemsley (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Relates directly to 10.1 - Land Use Planning & Development Control as the availability of potable water can constrain development and land use options particularly in the South West Rocks and Hat Head areas which are to some degree isolated by the National Park and the Macleay River. It is also relevant to 10.3 – Floodplain Wetlands Management and 10.9 – Habitat Protection as any draw down of the coastal aquifer may affect wetlands within the National Park which are important habitats.

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126	Fisheries & Aquaculture	<i>Review of Land and Water Management Impacts on Fisheries and Agriculture Resources in the Lower Macleay - Working Party Report</i>	1989	North Coast Agricultural Institute, NSW Agriculture and Fisheries	Report - Hardcopy	Available published information on the linkages between fish kills, fish decline and the agronomy of soils of the lower Macleay is reviewed with specific reference to the effect of flood mitigation and drainage works. Although these works have achieved their original aims of minimising nuisance flood impacts and maximising drainage, the ecology of permanent and seasonal swamps has been changed, grazing productivity reduced, and water quality degraded. Four initiatives are suggested to alleviate these problems including establishing a water quality monitoring program, establishing a Lower River Land and Water Care Committee, establishing a public enquiry, and preparing a detailed floodplain management plan.	Ron Kemsley, Kempsey Shire Council (02) 6566 3248 ron.kemsley@kempsey.nsw.gov.au	Comprehensive and well researched analysis of issues related to flood mitigation, agricultural and fisheries productivity, and of the effects of drainage on water quality and fisheries resources. Very useful summary of the issues and background to flood mitigation and drainage effects on a range of estuary related parameters.
127	Historical and Cultural	<i>Clybucca Historic Site - Draft Plan of Management</i>	2005	NSW NPWS	Report - Hardcopy	A description of the Historic Site and its cultural and natural heritage significance and management issues is provided and desired outcomes and strategies to achieve these outcomes are listed.	NSW NPWS Planning Officer, NSW NPWS 2444	P O Box 61 Port Macquarie The NSW NPWS is inviting comments on this plan by Monday 30th May.
128	Wetlands	<i>Macleay Wetlands Management Plan</i>	1999	North Coast Environemnt Council Inc	Report - Hardcopy and Electronic	This mapping defines 21 Vegetation Units representing 40,232 hectares and lists species recorded in 15 of the vegetation units. Bird species, Threatened species and Jamba and Camba listings are also made. A history of the Macleay Valley Wetlands is included and covers geomorphology, aboriginal history, european settlement and wetland management and flood mitigation. Recommendations are made for the 5 main wetland areas and project proposals made for MASSLAG.	Terry Parkhouse	Important information relevant to Section 10.2 (Riparian Land Management and Bank Erosion), 10.3 Floodplain Wetlands Management, 10.5 Floodgate and Drain Management, 10.9 (Habitat Protection). Problems associated with transferral into a digital layer in Arcview have caused distortions which reduces the usability of the mapping. Document provides important and useful information.