National Estuaries Network

21st Meeting

15th – 17th November 2011, Townsville

Hosted by: QLD Dept of Employment, Economic Development and Innovation

Organisers and Conveners:

Rebecca Sheppard: QLD DEEDI
07 47 601556; Mob 0439 289022

Lynda Radke: Geoscience Australia (Canberra)
(02) 6249 9237; Mob: 0428 422 970

Burdekin Conference Room (Roundtable: 0747-601-538)

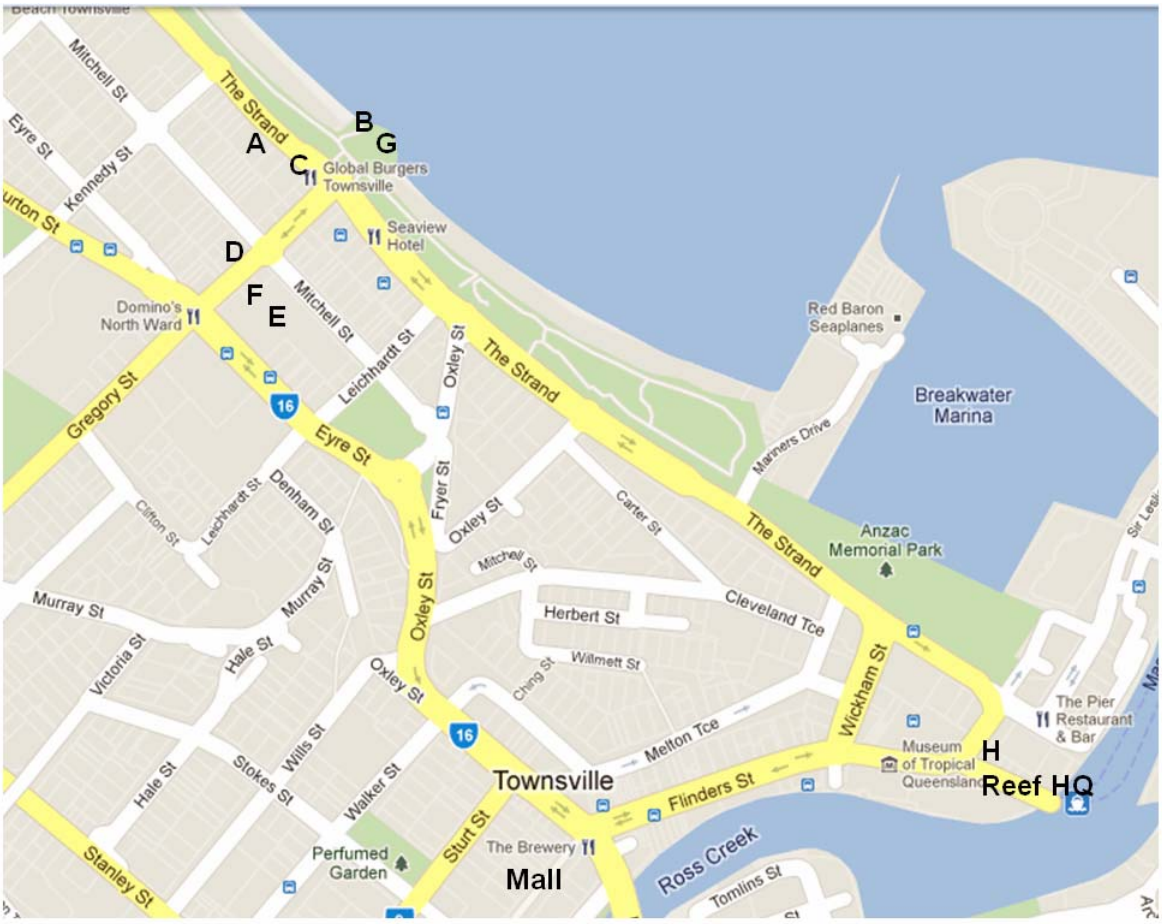
Attendees:

NSW	Kerryn Stephens	NSW Office of Environment and Heritage, Department of Premier and Cabinet Government
	Geoff Coade	NSW Office of Environment and Heritage, Department of Premier and Cabinet Government
Victoria	Greg Woodward	Vic. Department of Sustainability & Environment
	Fiona Warry	Vic. Department of Sustainability & Environment
Queensland	Rebecca Sheppard	Qld Dept of Employment, Economic Development & Innovation
	Dawn Couchman	Qld Dept of Employment, Economic Development & Innovation
	John Beumer	Qld Dept of Employment, Economic Development & Innovation
	James Udy	Qld Healthy Waterways
	Andrew Moss	QLD Dept. of Environment & Resource Management
Tasmania	Jason Whitehead	Tas. Dept. of Primary Industries, Parks, Water & Envt.
NT	Julia Fortune (phone hook-up)	NT Dept. of Natural Resources, Environment the Arts and Sport (08-8999-3475)
WA	Kerry Traylor (phone hook-up)	Swan River Trust (08-9335-1334)
National	Lynda Radke	Geoscience Australia
	Jonathan Hodge	CSIRO Land and Water
	Richard McKellar	National Climate Change Adaptation Research Facility, Griffith University
	Andy Steven	CSIRO Land and Water
	Arnold Dekker	CSIRO Land and Water

Monday 14th November

Check in to **Waters Edge, The Strand** (**A on map**).

Accommodation
Waters Edge The Strand
63 The Strand Esplanade, Townsville
Phone: 07 4721 1777 (*http://www.watersedgethestrand.com*)



For those who are keen on a pre-meeting dinner (Monday night) meet at the **C Bar** (opposite hotel, on Strand) (**B on Map**) at **7pm**.

North Ward Shopping Centre – Bakery, Subway, Newsagency, Chemist, Groceries **(E on map)**

Breakfast options
Coffee Club and Juliettes (C on map)
Three Loaves Bakehouse (F on map)
Bambinis (up from D on map)

Other nice restaurants
Jamaica Joes (G on map)
Seaview Hotel (Steakhouse)

Tuesday 15th November

NEN Meeting 9am – 5pm

Meet **8:15 am** in front of accommodation (**A on map**) for transportation to venue (about 5 min drive).

8:30-9:00 coffee

Meeting starts 9:00 am sharp

Burdekin Conference Room, DEEDI office, Oonoonba

If arriving separately go to DEEDI (old DPI Regional Office) at Oonoonba. Ask staff for directions to Burdekin Conference Room.

NEN Drinks/Dinner

Optional pre-dinner drinks (6:00pm) at **Jamaica Joes** (on Strand) **(G on map)**

Dinner is at 7 pm at **GYO Japanese restaurant (F on map).**

Note: Meal costs are covered by NEN Secretariat. Beverages are not included. Drinks can be purchased at the restaurant.

GYO Restaurant (F on map)
2/48 Gregory Street
North Ward QLD 4810
(07) 4771 5151

Tuesday 15th November, 2011

National Estuaries Network Meeting
Burdekin Conference Room, DEEDI office, Oonoonba

8:15	Meet 8:15 am in front of accommodation for pick up to venue
8:30 – 9:00	Tea, Coffee and settle in
9:00 – 9:15	**Rebecca Sheppard and Lynda Radke** Welcome, Housekeeping, Apologies & Introductions
9:15 – 10:40	**State/Territory Roundtable Update** (Each State/item – up to 20 min; Chair: Lynda Radke) *What's happening in estuary science/management in Australia* - each state and national representative to give a brief overview of estuary management/science within their jurisdiction. o **Qld** update (Dawn Couchman) o **NT** update (Julia Fortune; phone hook-up) o **NSW** update (Geoff Coade/Kerryn Stephens/Bob Creese) o **VIC** update (Greg Woodward/Fiona Warry)
10:40– 11:10	***MORNING TEA***
11:10– 12:30	**Continue with State Roundtable update** o **TAS** update (Jason Whitehead) o **CSIRO** update (Andy Steven) o **GA** update: (Lynda Radke)
12:30– 1:30	***LUNCH***
1:30 – 3:15	**Chair: Dawn Couchman** o J. Hodge – TERN Australian Coastal Facility (20 min) o Richard McKellar – NCCARF (40 min) o James Udy - Steps towards a national assessment of coast line assets (40 min)
3:15 – 3:45	***AFTERNOON TEA***
3.45 – 5.15	o Arnold Deckker -NPEI Feasibility report on operationalising earth observation for inland and near coastal waters (20 min) o Fiona Warry - Developing a fish-based index of estuarine condition, in Victoria (20 mins). o NEN members – NEN future in light of diminishing funds (20 min)
7 pm – late	***NEN Dinner***

Wednesday 16th November

NEN Fieldtrip 1: Hinchinbrook Island Channel/Estuary Cruise

Meet at **7:30am** in front of the Waters Edge to meet mini-bus to travel to Ingham (approx. 1.5 hrs). Morning tea at Tyto Wetland Centre, Ingham. Walk and tour of wetlands, information centre and gallery. 11am drive to Lucinda for lunch (11.30-12.30) and then boat trip through Hinchinbrook Channel. Boat departs at 12:30 pm and arrives back at 3:00pm. Drive back to Townsville with afternoon tea stop at Frosty Mango.

Tyto Wetland Centre - http://www.tytowetlands.com.au/experience.htm

The Tyto Wetlands, located in the town of Ingham, North Queensland incorporates lagoons, interpretive signs, hides and lookouts where visitors can appreciate over 200 different species of native birds amongst other wildlife. There is also a unique array of native Australian Flora for the keen nature observer. Tyto is a unique experience because it gives people the chance to observe this unique facet of nature while not interfering with the habitat and surrounds. The wetlands features extensive walking tracks which allow visitors to explore the park at their own pace.

Hinchinbrook Channel
http://www.hinchinbrookwildernesssafaris.com.au/tours.htm

Hinchinbrook Channel is a state marine park and a declared Fish Habitat Area. The untouched tropical waterways, marine life and the 26 species of mangroves that survive in the park are spectacular. This unique wilderness is heralded as the jewel of Queensland national parks and has world heritage status. A pristine paradise, Hinchinbrook Island is situated 5km off the North Queensland coast, between Lucinda and Cardwell, surrounded by marine parks.

Morning tea and lunch will be provided. **Afternoon tea at own cost.**

Arrive back at Waters Edge (accommodation) around 5:30pm

NEN Fieldtrip 2: Town Common wetlands, Rowes Bay mangroves and Louisa Creek

Meet at **7:30am** in front of the Waters Edge to meet DEEDI Officer, Alana O'Brien to commence fieldtrip.

Town Common Wetlands – saltmarsh, mangroves, Bohle R FHA, bird watching, lagoons, fishway construction.
Rowes Bay mangroves and tidal area
Castle Hill

Morning tea and lunch will be provided.

Arrive back at Waters Edge at 1:00 pm.

Dinner 7 pm at Jamaica Joes (G on map). Meal costs are not covered by NEN.

Thursday 17th November

NEN Science Symposium / Mini-Conference at Reef HQ Aquarium.

Check out of Waters Edge.

Meet **8am** in front of Waters Edge. Cars will take you to venue.

If you wish to walk, it will take approx. 15 minutes (approx. 1.5 kms). Turn right at front of accom (facing city) and walk along strand until you reach Flinders Street (on right). **Reef HQ** is on the left (**H on map**)

Mini-Conference Title – 'Research and management of North Queensland Ecosystems'.
(agenda on following page)

Conference Centre, Reef HQ Aquarium, Townsville

Conference registration 8:15 am
Conference starts at 8:45 am
Conference finishes at 3:30 pm with afternoon tea

Time to explore aquarium at lunch break.

Cars will be available to take people to airport at approx. 3:45pm (10 min drive to airport). Taxis can also be booked for airport transfers.

National Estuaries Network – Science Symposium, November 17th, 2011

"Research and Management of North Queensland Ecosystems"

Agenda and Session Times

Session & chair	Time	Topic	Speaker
	8.15 – 8.45am	*Registration* *Tea / coffee*	
	8.45	Welcome	Lynda Radke- NEN Mal Pearce - DEEDI
	9.00	Scene setting – North Queensland estuaries	Dr Marcus Sheaves, JCU
Session 1	9.10 – 9.30	Hi-Definition of Nursery Grounds – video techniques	Murray Bower
Kerryn Stephens (chair)	9.30 – 9.50	A framework for assessing estuarine risk and condition	Andrew Moss
	9.50 – 10.10	Sea Level rise, LiDAR and fish habitat vulnerability – Qld case study	Dawn Couchman
	10.10 – 10.30	One Fish, two fish, green fish, blue fish – comparisons of deep shoal grounds open and closed to fishing using baited video	Mike Cappo
	10.30 – 10.50	*Morning tea*	
Session 2	10.50 – 11.10	Reef Plan paddock to reef monitoring, modelling and reporting program	John Bennett
Lynda Radke (chair)	11.10 – 11.30	Managing coastal ecosystems from the paddock: the role of agricultural extension	Carla Wegscheidl
	11.30 – 11.50	Phytoplankton Blooms in the GBR waters; seasonal and spatial dynamics from ocean colour remote sensing data	Arnold Dekker
	11.50 – 12.10	Nekton display preferences when choices are available	Ross Johnstone
	12.10 – 12.30	Conservation genetics of the critically endangered narrow sawfish (*Anoxypristis cupsidata*) in northern Australian	Blanche Danastas
	12.30 – 12.50	Reef Rescue with Seagrass-Watch and extreme weather impacts on seagrass this year, including the flow on effects to dugong & turtle.	Len McKenzie
	12.50 – 1.30pm	*Lunch*	
Session 3	1.30 – 1.50	Taxon-specific responses to connectivity over a tropical coastal plain	Ben Davis
Dawn Couchman (chair)	1.50 – 2.10	Feeding across borders: The realisation of connectivity in intertidal habitats	Nina McLean
	2.10 – 2.30	Exposure of coastal wetland environments to pesticides	Aaron Davis
	2.30 – 2.50	Do environmentally-friendly vessel moorings reduce impacts on fish habitats? A Morton Bay case study	Rebecca Sheppard
	2.50 – 3.10	The importance of estuaries for the health of the Great Barrier Reef World Heritage area.	Donna Audas
	3.15 – 3.30pm	Summaries and close	John Beumer
	3.30pm	*Afternoon tea and finish*	

National Estuaries Network	Meeting No. 22 Townsville, QLD 15 November , 2011
AGENDA PAPER	State / Territory: Queensland (Fisheries)

Prepared by: Dawn Couchman
Position: Senior Fisheries Scientist (Fisheries Queensland)
Organisation: Department of Employment, Economic Development and Innovation

1. Update – Estuary Management

- **DataOceans project** within Fisheries Queensland. This project will provide an on-line portal for access to information on Qld fisheries catch and effort data as well as update the coastal wetlands information previously hosted on CHRIS. Project is on-going – no new progress to report. Malcolm Dunning (Malcolm.dunning@deedi.qld.gov.au) is the project manager and St John Kettle is the solutions architect.

- **State of the Environment Reporting 2011.** Fisheries Qld is providing input to the SOE 2011 Report, including information on fish stocks, habitat and aquaculture. Ongoing.
- **Fisheries Review** – conducted by McDonnell-Phillips and extending over all of fisheries roles; commenced in late October, scheduled to be completed mid-December.

- **Fish Habitat Management Review** – Ongoing. Habitat review findings and recommendations are currently being addressed - call for greater risk management of development approvals and increase in coverage of self-assessable codes. Recognition that Fisheries Act is the most effective statutory mechanism for management and protection of fish habitats for fisheries purposes - even though other agencies try to manage fishing through other management arrangements (Marine parks etc).

- **State Planning Instruments (SPI) program**. Contact: John Beumer at DEEDI and Mandie McPherson at DLGP.
    - DEEDI (Fisheries Qld) prepared a submission to support the development of a State Planning Policy (SPP) for Fish Habitat. The Qld Department of Local Government and Planning (DLGP) conducted a review and prioritisation process of all SPI / SPP submissions by State agencies, to develop the forward program for 2011-2012. This has been approved by Government. Preparation of the SPP for Fish Habitat has commenced. The SPP Fish Habitat which will provide direction on the following issues relevant to the Sustainable Planning Act 2009:
    - How planning instruments can protect the values and functions of fish habitats and consequently economic values of fisheries in Qld through strategic consideration of existing and proposed planning impacts on these habitats; and
    - How particular development can achieve the relevant policy outcomes for protecting fish habitats values and functions.

- **Declared Fish Habitat Area Network** : Contact: Kurt Derbyshire
    - The declared Fish Habitat Area Network Strategy http://www.dpi.qld.gov.au/28_16051.htm
    - FHA declaration proposal for Western Cape York at Pine River Bay near Weipa has been approved by Government with gazettal expected in November 2011.
    - FHA Status Report – a reporting framework is being finalised that will provide the basis for a regular report on the condition, management, benefits and key risks for individual FHAs and the FHA network and to make management recommendations

and/or actions, based on ratings, over the last 5 years. Issues for each FHA will be listed (where applicable) and recommendations made

- **Stock status of Queensland's fisheries resources 2009 – 2010**. Fisheries Queensland conducted four workshops in 2009–10 to determine the status of key stocks harvested in line, pot, net and trawl fisheries. A total of 62 stocks (49 east coast and 13 Gulf of Carpentaria stocks) were considered in this first round. Of these, one stock was determined to have an overfished status, 18 stocks were sustainably fished, three were not fully utilised and 25 were uncertain. No assessment was made for 15 stocks. – Report about to be released to Fisheries web site

- **Commercial fishing management updates –** Gladstone compensation issues – Contact Robin Hansen.

- **Recreational fishing -**Shane Griffiths (CSIRO) FRDC project "A coordinated national data collection for recreational fishing in Australia" - Contact Stephen Taylor

- **Offsets** - A new offset calculator is being developed for application for loss of fish habitats due to development. External consultant review of new calculator undertaken. Recommendations being considered. Contact Melissa Dixon.ph 07 3224 2241 melissa.dixon@deedi.qld.gov.au

2. <u>Update – Estuary Research</u>

- **Climate change project on fish habitat vulnerability** – Contact Dawn Couchman & John Beumer
  - Funding approved for 2.5 year Climate Q project for mapping fish habitat (marine plants as surrogate) vulnerability to climate change induced sea level rise. Final approval from steering committee received in early October 2010. Project to run from 1 October 2010 to 30 March 2013.
  - Audits undertaken for 8 sites in Moreton Bay. Next area of interest is Townsville, with 5-6 sites identified. Presentation on progress & status of the project will be given at the NEN science symposium.

- **Instream Structure Inventory (ISI) project progress** - Contact Mary Lawrence
  - Project (Apr11 - Mar12) managed by Fisheries Queensland and funded by SEWPaC through the Queensland Wetlands Program
  - Objective to conduct an inventory of instream structures in the Great Sandy Strait Ramsar site and 5 declared Fish Habitat Areas (FHAs) (Susan River, Fraser Island, Maaroom, Kauri Creek and Tin Can Inlet)
  - The project forms 3rd year of a 5 year Fisheries program to conduct instream structure inventories in declared Fish Habitat Areas and other protected areas (e.g. Ramsar, Indigenous Protected Areas)
  - Fisheries guidelines developed in the first year of the program will be used to conduct the inventory
  - A local multi-agency reference group has been established for local knowledge and input
  - An aerial survey undertaken and all ground survey work completed.
  - Information gathering / project awareness stakeholder workshops conducted.
  - Currently drafting a Response Action Plan (RAP) that will identify 'problem' structures and make management recommendations.
  - Council stakeholder meetings undertaken to review inventory results and garner support for the RAP
  - Upcoming stakeholder workshop in December to review draft RAP and recommendations

Communications

- Fisheries Queensland Facebook page Link for latest news and information including species identification. http://www.facebook.com/FisheriesQueensland?sk=wall

- Fisheries Queensland You Tube videos for recreational fishing and other information http://www.facebook.com/FisheriesQueensland?sk=app_57675755167

- Amazing Leptocephalus footage on You Tube – paste this address into your browser http://www.youtube.com/watch?v=Ee7IhNOCGhY

Significant Issues for Discussion

- **Gladstone Harbour fish issues** – Contact John Beumer
  - Large numbers of barramundi and several other species have been taken in the Gladstone Harbour and adjacent waterways in the last 3 months with lesions and other external damage. 30, 000 large barramundi estimated to have been washed over the Awoonga Dam wall in the early part of 2011. These survived but are now in poor condition, partly from the impact of the fall and partly from the lack of food resources, due to the loss of trophic levels as a result of the extensive freshwater inflows on estuarine faunal communities.
  - Gladstone Harbour is the site for extensive dredging and reclamation, associated with port development to allow access for vessels for LNG and coal exports. Commercial and recreational fishers claim that dredging has exacerbated the health of local fish stocks.
  - Pathology of barramundi samples has identified *Neobenedinia sp*., a monogenean trematode parasite, previously only recorded in barramundi farms.
  - Link to webpage for further information: http://www.dpi.qld.gov.au/28_20943.htm

- **Gladstone Harbour offsets** – Contact John Beumer
  - High level of development activity associated with construction of LNG and coal export facilities, including pipeline crossings,
  - Following EIS and other assessments of development impacts, approvals have generated offset requirements for marine fish habitats (Queensland) and for biodiversity (Queensland and Commonwealth).
  - These offsets may be delivered through equivalent habitat exchange and/or funding of appropriate projects that rehabilitate habitats, increase public awareness of habitats, establish fish-friendly structures to prevent further loss of habitats and to allow recovery of adjacent habitats, declared FHA investigation and enhanced management and habitat research.

National Estuaries Network	Meeting No. 22 Townsville, QLD 15 November , 2011
AGENDA PAPER	State / Territory: Queensland (Department of Environment and Resource Management)

Prepared by: Andrew Moss
Position: Principal Scientist
Organisation: Department of Environment and Resource Management

- **Long term monitoring of water quality in estuaries:** A report on the long term monitoring of central Queensland estuaries between 1993 and 2006 has been approved for release. The report will be put on the Queensland Department of Environment and Resource Management (DERM) website in the near future. It covers the results of monthly monitoring of nine estuaries and two inshore coastal areas and assesses both condition and trends in water quality. One of the main findings was that there were very few detectable trends in water quality over the 14 year study period except in cases where there were major upgrades to the quality of STP discharges. (Contact Andrew Moss: andrew.moss@derm.qld.gov.au)

- **Monitoring the impacts of the 2010/11 flood event on Moreton Bay**: Major flooding in Queensland over the 10/11 Christmas/New Year period resulted in large volumes of highly turbid freshwater entering Moreton Bay. A monitoring program to assess the impacts on the Bay was put together by government agencies and CSIRO. This has not been fully reported on yet but some information on water quality is available. In brief, although the flood was very significant, the immediate impacts on water quality were short lived and generally less significant than might have been expected. Increases in turbidity, nutrient and related algal activity lasted only about one month, after which water quality returned to near normal. Monitoring of sediment metals showed only minor exceedances of guidelines by one or two metals whilst levels of many metals in water did exceed guidelines for a short period. Monitoring of a range of organic toxicants also showed only minor exceedances of one or two substances. (Contact Michael Holmes: michael.holmes@derm.qld.gov.au)

- **Gladstone/Port Curtis dredging project**: Dredging to accommodate future LNG shipping in Port Curtis has commenced. This is one of the most intensively monitored projects in Queensland's history. A total of six continuous monitoring buoys are located in Port Curtis and at the offshore dredge spoil grounds. The buoys monitor temperature, conductivity, pH, dissolved oxygen and turbidity with data remotely downloaded each day. The impacts of dredging are managed through trigger values set for turbidity. Because of the considerable natural variation of turbidity across the neap-spring tidal cycle, the setting of appropriate turbidity thresholds is subject to ongoing debate. Any advice on this issue from other jurisdictions would be welcome (Contact Andrew Moss: andrew.moss@derm.qld.gov.au).

- **Queensland estuarine and marine habitat classification**: Under the Queensland Wetlands Program and in conjunction with Fisheries Queensland, a project to define a marine and estuarine habitat classification for the state is currently being undertaken. The outcome of this will be a scheme to classify sub-tidal habitats throughout the state. The classification methodology and map products will be applied to the Great Sandy Region and Central Qld Region. (Contact John Beumer: john.beumer@deedi.qld.gov.au)

- **Healthywaterways monitoring programs**: (1) A review of the new Monitoring and Evaluation framework for SEQ to meet future management is being undertaken. This includes TWCM, pollution trading and assessment of management action effectiveness as well as integrating social and economic values of waterways. (2) The 2011 Ecosystem Health Monitoring Program (EHMP) report card for SE Qld is now available. (Contact James Udy: james.udy@healthywaterways.org)

- **The Queensland Coastal Plan**: This comes into operation in August 2011. It will help protect coastal communities from threats, such as storm-tide surges and cyclones. The coastal plan applies state-of-the-art technology to map coastal hazard areas along Queensland's coastline. With this highly sophisticated mapping available, councils can make informed planning decisions for the future of their communities—helping manage growth and build more resilience to coastal hazards caused by climate change.

  The plan is made up of two parts—the State Policy for Coastal Management and the State Planning Policy for Coastal Protection (SPP). The management policy guides coastal land managers, like local government, in making the day-to-day decisions for managing coastal reserves, beaches and esplanades; the SPP is applied to planning and assessment decisions made under the *Sustainable Planning Act 2009*.

National Estuaries Network	Meeting No. 21 Townsville, Queensland 15 Nov, 2011
AGENDA PAPER	State / Territory: Northern Territory

Prepared by: Julia Fortune & John Drewry
Position: Scientist
Organisation: Aquatic Health Unit – Dept of Natural, Resources, Environment, the Arts and Sport.

1. Update – Estuary Management

Water Quality Protection Plan (WQPP)

- Phase 2 of the WQPP project is to finalise the Darwin Harbour Water Quality Protection Plan, and runs from January 2011 to June 2013. The WQPP will include: a revision of selected water quality objectives; identification of pollutant sources and targets; recommended management measures; processes for ongoing adaptive management and public involvement and reporting.
- An integrated decision support system is being developed for Darwin Harbour catchment to improve understanding of the effect of various processes and potential developments on water quality in the catchment. The DSS will combine both catchment and urban modelling and harbour water quality hydrodynamic modelling to help identify management actions (e.g., water sensitive urban design and riparian vegetation) to help protect water quality, and to predict their effects on water quality in the Darwin Harbour. The DSS will be available to stakeholders to assist them to help identify what, where, at what cost, trade-offs and how effective proposed management actions and scenarios would be on water quality. Collaborators on the DSS include BMT WBM Pty Ltd, Equatica Pty Ltd, isNRM Pty Ltd, The Australian National University and the Australian Institute of Marine Science.
- A new coordinator will be appointed in the new year with John Drewry leaving Australia to return to NZ.
- Ongoing stakeholder consultation will feature heavily over the course of the next year as the WQPP is finalised.
- WQIP Buffalo Creek catchment
    - A WQIP is proposed by the Commonwealth and will be developed by consultants Aurecon. Buffalo creek is a hypereutrophic system located east of Darwin. The system is subject to a waste discharge from the Leayner-Sanderson STP and is within a catchment subject to extensive urban development pressures. The process to develop the WQIP will be undertaken in parallel with the broader WQPP for Darwin Harbour.

- AHU intends on undertaking a review of the WQO's for the Darwin Harbour region in the next year. Further work will focus on accounting for the large variability associated with tidal regime and seasonality in the region.

2. Update – Estuary Research

- The closure of some Darwin beaches in 2010 and 2011 due to elevated *E. coli* and enterococci have caused community concern. A project with Charles Darwin University to select microbial indicators and conduct preliminary genetic profiling as a step towards source tracking was undertaken in June 2011. Results are expected to be made public by a Govt appointed taskforce later in November 2011.

- Baseline studies on phytoplankton communities are being conducted in the Elizabeth River estuary. Monthly samples of phytoplankton and measurement of water quality parameters including nutrients will document seasonal variation in phytoplankton community structure and provide important information for the assessment of future change.
- Other monitoring activities include ongoing quarterly harbour monitoring, monitoring in the Elizabeth River estuary, and collection of load-related data at several catchment gauge stations. Some progress on the collection of time series data is expected in the next year with a focus on the region subject to the Inpex LNG proposal.
- Shellfish and mudcrab study – bioaccumulation of metals, toxicants and EDC's is continuing with NTG providing funds to AIMS to extend this work for another year. Preliminary findings will be published in August 2012.
- BRUVS fish survey work and monitoring program underway in Darwin Harbour in collaboration with Fisheries and the Marine Biodiversity unit of NRETAS.
- Seagrass monitoring by Marine Biodiversity Unit is underway.
- Dolphin monitoring is currently being undertaken by NRETAS in Darwin Harbour. This includes an extensive aerial survey to the west along the coastline to the WA border.
- Benthic habitat mapping of Darwin Harbour was undertaken in collaboration with AIMS, Darwin Port Corporation and GA. It is expected that this will provide vital information on benthic habitat's and inform future monitoring and conservation effort in the region.

3. Significant Issues for Discussion

The EIS Supplement for the INPEX gas pipeline and processing project as released in May 2011. There are many issues such as the effects of proposed dredging and spoil disposal, possible underwater blasting, noise etc on the harbour and its fauna and flora. Other issues include development of appropriate trigger values for dredging management for coral protection. Management plans for a range development and operational phases will be presented to NTG this month.

There is an ongoing need to develop knowledge and policy associated with large dredging projects, and to improve the effectiveness of environmental regulation. Expert panels have been established by the Environment and Heritage Division who coordinate assessments to help guide monitoring and management requirements of these activities.

National Estuaries Network	Meeting No. 21 Townsville, Queensland 15 Nov, 2011
AGENDA PAPER	State / Territory: NSW

Prepared by: / Kerryn Stephens[1] / Geoff Coade[1] / Dr Bob Creese[2]
Position: Water, Wetland & Coast Division, OEH/ Scientific Services Division OEH / Bob?
Organisation: 1. Office of Environment & Heritage / 2. Department of Primary Industries

1. Update – Estuary Management

- At the last two NEN meetings amendment to the Coastal Protection Act (commenced on 1 January 2011) and adoption of Guidelines for preparing Coastal Zone Management Plans (adopted as Ministerial guidelines in December 2010), have been discussed.

  The new Minister for the Environment, announced in a media release on 14 September 2011 that she was seeking feedback on the arrangements for managing coastal erosion, coastal plans and coastal regulation and ideas for improvement.

  A coastal taskforce is being established to oversee the review and make recommendations to the Minister. OEH is currently undertaking a series of public workshops to to seek input on the review.

- OEH continues to support the development of coastal zone management plans (that address pressures on estuary health) and localised estuary health assessments. Both are priorities for funding under the NSW Estuary Management Program (grants for 2011/2012 have been awarded and funding applications for 2012/2013 are being sought from councils).
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2. Update – Estuary Monitoring & Research

- The coverage of estuarine macrophytes in NSW is mapped on a rolling 10 year program. This mapping uses the latest multiband ADS-40 imagery provided by LPMA NSW with the goal of mapping at least 11 estuaries per year. New methods are also currently being developed to map these habitats using object orientated image segmentation and classification techniques, allowing a move away from on-screen digitising to a more standardised and systematic methodology. This new technique is also being used in conjunction with very high resolution aerial imagery, obtained from low level helicopter flights, to map seagrass areas at a very fine resolution, providing detailed information about the density, composition and cover of the mapped seagrass beds.
  ONGOING. For further information, contact Greg West on greg.west@industry.nsw.gov.au

- Methods for small-scale rehabilitation of the seagrass *Posidonia australis*, which is declared as threatened in many NSW estuaries, is progressing steadily. The work (funded initially by the NSW Environmental Trust) has focussed on methods for rearing *Posidonia* from seeds and aims to enhance growth rates of the plants to hasten their establishment. Methods are also being developed for transplanting mature *Posidonia* plants. This work has also involved studies on segarass/sediment interactions to help identify the sediment requirements of these plants. Major field trials in Botany Bay will commence in November 2011,
  ONGOING. For more information, contact Tim Glasby on tim.glasby@industry.nsw.gov.au

- The two main invasive species in NSW estuaries are the green alga *Caulerpa taxifolia* and the European shore crab *Carcinus maenas*. NSW government scientists undertake regular surveys for these invaders in NSW estuaries. In addition, there are ongoing projects to investigate the potential impacts of *Caulerpa taxifolia* on seagrasses and, in collaboration with the University of Technology Sydney, impacts on estuarine invertebrates. In collaboration with Macquarie University and the Sapphire Coast Marine Discovery Centre in Eden, NSW DPI is also investigating the impacts of *Carcinus* on native species and the oyster farming industry. ONGOING. For more information, contact Tim Glasby on tim.glasby@industry.nsw.gov.au

- A comprehensive risk assessment project examining the threats to marine biodiversity in NSW (including in estuaries) has been initiated, partly as a response to the terms of reference for the current Independent Scientific Audit of NSW Marine Parks (see http://www.marineparksaudit.nsw.gov.au/). The project will use a QERA approach (Qualitative Environmental Risk Assessment) which relies on collating existing information and eliciting expert opinion from marine scientists working in NSW. NEW project – started July 2011, will run for approx. 18 months. For more information, contact Karen Astles on karen.astles@industry.nsw.gov.au
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- NSW OEH, Jervis Bay Marine Park and Katarina Mikac of the University of Wollongong have been collaborating to assess the effects of prohibition of bait pumping in inter-tidal sand flats in marine sanctuary areas on benthic macroinvertebrate abundance/diversity and benthic oxygen and nutrient cycling processes. This work is completed and is being reported. For further information – contact Nathan Knott on Nathan.knott@environment.nsw.gov.au

- The distribution of seagrasses and other submersed plants is largely determined by water quality, hydrodynamics, and sediment suitability. However, aquatic plants have also been observed to grow in conditions previously established as being too poor for survival. In order to understand how survival below these critical thresholds was possible, we tested the hypothesis that large and dense submersed plant beds improve water quality within the plant stand. Monitoring of plant structure, hydrodynamics, light availability, nutrient concentrations, and sediment characteristics was undertaken over the growing season. We found that plant beds trapped suspended particles, which increased light penetration and sediment nutrient levels. The growth of epiphytic algae on leaves was also reduced, further increasing light penetration. This work provided valuable quantitative relationships between plant structure and extent of influence on water quality. The findings will be used by scientists from OEH and DPI as part of a current effort to model seagrass habitat in Lake Macquarie and Tuggerah Lake. ONGOING. For further information – contact Renee Gruber on Renee.Gruber@environment.nsw.gov.au

- NSW OEH and Professor Rod Connolly of Griffith University are undertaking a study using stable isotope signatures and gut content analysis to assess the relative contribution of different primary producers to the nutrition of five common fish and macroinvertebrate species in Tuggerah Lakes and Lake Macquarie. The study has indentified differences between lakes, in particular the nitrogen content of primary producers (seagrasses and algae). The effect appears to be reflected through the broader food web. ONGOING. For further information – contact Aaron Wright at Aaron.Wright@environment.nsw.gov.au or Jaimie Potts at Jaimie.Potts@environment.nsw.gov.au

- NSW OEH is continuing to sample estuaries through spring/summer as part of the Monitoring Evaluation and Reporting (MER) process. 120 estuaries have been sampled so far and 20 more will be sampled this summer. Dissolved oxygen measures will be included this summer. Scores and grades have been calculated for all estuaries. In collaboration with UNSW (Prof Ian Suthers) OEH will test the feasibility of measuring zooplankton size/abundance characteristics as a potential indicator of estuarine condition. ONGOING. Contact Peter Scanes at Peter.Scanes@environment.nsw.gov.au.

- NSW OEH is working with four coastal local government Councils to develop consistent estuarine report cards including the indicators of chlorophyll-a, turbidity, dissolved oxygen,

seagrass health and riparian nativeness (naturalness). NEW. Contact Peter Scanes at Peter.Scanes@environment.nsw.gov.au

- NSW OEH, Larissa Schneider and Professor Bill Maher of University of Canberra are undertaking a study using a combination of stable isotope analysis to investigate selenium uptake and accumulation through the broader food web in Lake Macquarie. The study helps to better understand the trophic transfer of selenium and to validate models of Se transference that are being used overseas to manage Se inputs into aquatic ecosystems. Sediment cores have been collected and analysed to establish selenium input. Experiments will be undertaken to measure volatilisation of selenium from sediments. ONGOING. For further information – contact Jaimie Potts on Jaimie.Potts@environment.nsw.gov.au

National Estuaries Network	Meeting No. 21 Townsville, Queensland
	15 Nov, 2011
AGENDA PAPER	State / Territory: Victoria

Prepared by: Greg Woodward (Policy) & Fiona Warry (Research)
Position:
Organisation: Department of Sustainability and Environment

1. Update – Estuary Management

- Victorian Strategy for Healthy Rivers, Estuaries and Wetlands (Estuary policy)
-

2. Update – Estuary Research

- Index of estuarine condition – ongoing trial and development. DU sediment, hydrology and WQ themes; ARI-DSE doing fauna theme.
- Estuarine Habitat Mapping – scoping study to investigate rapid assessment of submerged aquatic habitat in estuaries in Melbourne Water region - Aims to support IEC trials.
- Estuarine Vulnerability to climate change – collating relevant spatial databases. Will be underpinned by DSE DEM and Janet Stein's river/stream network (under GEOFABRIC). Database coming along well, and will be a great asset in the future – pulling together environmental and biological data for estuaries across Victoria – with a focus on understanding and predicting climate change impacts on estuarine form and function.
- Functional links between estuaries and their catchments - ARC linkage project led by Monash Uni and ARI-DSE – just kicked off and seeks to investigate how land use changes affect estuarine ecological and biogeochemical function.
- Fisheries links with freshwater flows – being led by DPI – build on ARC linkage grant work in the Gippsland Lakes by testing models around flows links to black bream spawning in estuaries in Western Victoria.
- Effects of heavy metals and endochrine disrupting chemicals on estuarine fish health, development and reproduction – lead by Melbourne Uni/CAPIM
- NCCARF NARP estuarine and nearshore ecosystems bid successful – assessing alternative adaptive management strategies for management of estuarine and coastal ecosystems.

3. Significant Issues for Discussion

- Anglesea River (estuary) Fish Death event > Artificial openings

National Estuaries Network	Meeting No. 21 Townsville, Queensland
	15 Nov, 2011
AGENDA PAPER	State / Territory: South Australia

Prepared by: Patricia von Baumgarten (input from Tony Flaherty and Russell Seaman)
Position: Principal Marine Adviser
Organisation: DENR

3. Update – Estuary Management

- The Coorong and Lower Lakes Recovery Project, funded by the Australian Government's Murray Futures Program, is now being implemented.
- As part of this Program, estuary management is a priority, with several management actions being scoped to either export salt from the estuary or to deliver freshwater from the South East to the Coorong.
- Ecological restoration projects include investigating methods to re-establish Ruppia into the estuary.
- An extensive monitoring program will be commencing in 2011, which will use an indicator based approach. A range of biotic and non-biotic parameters will be collected.
- The Environmental Water Requirements for the Coorong and Lower Lakes have been developed through a collaboration of scientists and government managers. A synthesis of this report can be downloaded from: http://www.goyderinstitute.org/publications/2011/MDBPSR-peer-review.pdf
- Ongoing weed control and revegetation on-ground works in Onkaparinga, Bungala, Hindmarsh and Inman Estuaries with smaller estuaries OGW dealt with as part of coastal program ($65,000 p.a). Revised estuary water quality monitoring program for Onkaparinga Estuary implemented ($21,000 p.a.).
- Biological survey and development of Estuary Action Plan for Light River Delta ($77,000 over 2011-13)

4. Update – Estuary Research

- Ecological restoration research projects include investigating methods to re-establish Ruppia into the estuary.
- Other monitoring activities may lead into research components. For example, tracking the life cycle of Congolli and other species of interest.
- Research into benthic invertebrates continues with Flinders University leading the project.
- Scoping of Fleurieu Estuaries monitoring program.

5. Significant Issues for Discussion

- Basin Plan outcomes will determine the health of the only estuary within the MDB;
- Salinity still remains a problem within the Murray Mouth estuary and managers have not seen a conclusive signs of ecological recovery yet since the return of waters; and
- Restructure of NRM Ministerial Council to COAG standing council on environment and water.

National Estuaries Network	Meeting Townsville, QLD
	15 Nov, 2011
AGENDA PAPER	State / Territory: TASMANIA

Prepared by: Jason Whitehead
Position: DEP Scientist
Organisation: Derwent Estuary Program

STATEWIDE - Jason Whitehead, Jocelyn Phillips (DPIPWE), Christine Crawford (IMAS) *& others*

1. Update – Estuary Management

- In June 2011, the *Canal Estates (Prohibition) Bill 2011* was passed by the House of Assembly, with the support of the Labor government and the Tasmanian Greens. Following the approach adopted in New South Wales and Victoria, the Bill proposed a ban on residential canal estates throughout Tasmania. The Bill sought to give effect to a commitment made by former Premier, David Bartlett, in June 2010 following his decision to refuse the proposed Walker Corporation canal estate at Lauderdale.
    - The *Canal Estate (Prohibition) Bill* was subsequently defeated 10:4 in the Legislative Council. The principal reasons given for opposing the ban were that a stand-alone ban was unnecessary, as coastal development should be considered as part of the review of the Coastal Policy, and that a ban would send a signal to developers that Tasmania was ‗closed for business'.
- In April 2011 the Tasmanian Planning Commission (TPC) rejected the draft Tasmanian Coastal Policy. TPC found the draft policy deficient to the point that document would need major modifications. The Tasmanian Premier, Lara Giddings, has accepted the TPC recommendation. Tasmania continues to use the 'State Coastal Policy 1996', which doesn't cover the area of some of our estuarine systems (e.g. upper Derwent estuary).
- In October 2011 regional land use strategies were released by the Minister for Planning, Bryan Green MP. The regional land use strategies were prepared by the regional council bodies/authorities. Consistency in the new planning schemes will be achieved through applying the new planning scheme template for Tasmania (being developed by the TPC), with Planning Codes (formerly Schedules) being developed. Both are intended to be implemented across the State through Planning Directives. Info on regional strategies can be found at http://www.planning.tas.gov.au/the_planning_system/regional_planning
    - The land use strategies are projected from 2010 – 2035, and are down-loadable from: http://www.planning.tas.gov.au/the_planning_system/regional_planning
      Some progressive policies are included, for example in the 'Southern Tasmanian Regional land use strategy'
        - 2.3 "*Identify and protect areas that are likely to provide for the landward retreat of coastal habitats at risk from predicted sea level rise."*
- Detailed climate projections at high resolution across Tasmania have been created as a component of the 'Climate Futures Tasmania' research. The first reports released in October 2010, detailed general climate projection and impacts. The most recent report on extreme events, was released in October 2011. These reports can assist discussion of the impacts on estuarine flow, catchment land-use, etc. The reports are downloadable from: http://www.dpac.tas.gov.au/divisions/climatechange/adapting/climate_futures/climate_futures_for_tasmania_reports

- A Tasmanian Coastal Hazards Framework is being developed for the State which includes hazards such as bushfires, floods, coastal erosion and landslips. For more information contact Luke Roberts in SES Tasmania, Luke.Roberts@environment.tas.gov.au
- The Department of Primary Industries Water and Environment has developed a Coastal Erosion Policy - an internal policy for land-use decision-making on land at risk from natural coastal processes and hazards.
- A method to identify High Ecological Value Aquatic Ecosystems of national significance is being developed in Tasmania (DPIPWE and DSEWPAC in conjunction with the 3 NRM regions).
- *Work being undertaken by community groups in Tasmania can be seen by visiting the following websites: 'Southern Tasmanian Coastcare Association Tasmania' http://www.scat.org.au/index.php?option=com_content&view=article&id=15&Itemid=27 Wildcare website: http://www.wildcaretas.org.au/* Tasmanian Landcare Association http://www.taslandcare.org.au/tlca.html
- The Tasmanian Chapter of the 'Australian Coastal Association' was created on 5th February 2011. The community based Tasmanian ACA chapter has been established to improve the exchange of knowledge, provide a forum for discussion, and promote protection of coastal values.
- Factsheets have been released from IMAS for Tasmanian Estuaries, based on smaller estuaries along the north and east coasts.
    - A decision tree for monitoring and management of Tasmanian estuaries
    - Indicators of estuarine condition and thresholds of potential concern

2. Update – Estuary Research

- The Tasmanian Climate Change Office is working on the Tasmanian Coastal Adaptation Pathways project. This project is mapping areas predicted to be affected by sea level rise at street and infrastructure level, and will be providing a range of options to deal with this. The 4 areas covered in this project include: smaller regions within LaTrobe, St Helens, Kingborough and Clarence City Council areas. For more information contact John.Harkin@dpac.tas.gov.au
- Climate change range extensions are being recorded in Tasmania via a community science based project called 'RedMap', with observations being placed on the internet. It is possible to see the observation of new species occurring in some Tasmanian estuaries. Go to the RedMap website at: http://www.redmap.org.au/sightings/view/#survey
- New project 'risk assessment for the management of coastal bays and estuaries' to begin. IMAS project - funded by Winifred Violet Scott UTAS grant
- IMAS component of CERF Landscape Logic project 'Retrospective study of the effects of landuse on estuaries' has been completed and creation of web interface for data access soon to be released.
- Community science and diver based activities in Tasmania are well represented in a high-quality, *free, community magazine "Reef Life' developed entirely by recreational scuba divers, and can be accessed at the website:* http://www.tudc.org.au/news/marinelife.php

SOUTH-EAST TASMANIA

Derwent Estuary Program (DEP)- Jason Whitehead

1. Update – Estuary Management

- Work continues through C4OC grant to support WQIP and HCVAE recommendations, including:

  groundwater remediation (Nyrstar),
  WSUD, erosion control at building sites,
  weed control / containment (rice grass and karamu work continues),
  spotted handfish actions – breeding substrates planted out & in use (DEP, RLS, Veolia, Aquenal, IMAS)

2. Update – Estuary Research

- Review of Penguin monitoring of breeding sites & more detailed monitoring be undertaken by new DEP Biodiversity officer.
- 12 month upper Derwent *Ruppia* & seagrass ecophysiology study from Dec 2009 – report completed (IMAS – DEP CfoC funded)
- Wetlands mapping ground truth and survey report completed in November 2011 (DEP, UTas)
- Ambient and rec water quality monitoring on-going (DEP)
- mercury bioaccumulation study (IMAS PhD/Nyrstar/DEP) in progress
- Heavy metals in seafood (IMAS Nyrstar, Dept Human Health Services, ILF, Fishcare, TARFish, DEP – DEP CFoC project) – seafood advisory from Director of public Health issued & DEP brochure released in October 2011
- Catchment review water quality and flow completed – (consultant report funded by Hydro, NRM South, DEP)
- Deployed sensors (salinity, temperature) installed at Tasman Bridge (Hydro/Entura for DEP)
- Monitoring of water quality and phyto and zooplankton communities in Storm Bay at the entrance to the Derwent Estuary has been conducted monthly for two years in a collaborative project between IMAS and CSIRO MAR. Analysis of the first 12 months of data is provided in the final report to FRDC on 'Nutrient and Phytoplankton Data from Storm Bay to Support Sustainable Resource Planning'.

3. Update – Estuary Issues

- Wetlands and foreshore earthworks and landfilling.
- Marine pest monitoring is still not being systematically undertaken. This is obviously a risk as the Derwent has probably the second highest concentration of marine pests in the country (behind Port Phillip Bay) and marine pests have been identified as a key threatening process to ecosystems worldwide.

Huon Estuary & D'Entrecasteaux Channel – Jason Whitehead, Jill Pearson

1. Update – Estuary Management

- Review of ambient water quality monitoring data to occur & findings to be made available in a 'State of the Channel Report' (to be funded by Kingborough Council, DEP, NRM South, aquaculture industry, state government)

2. Update – Estuary Research

- Monthly ambient water quality monitoring continues (DPIPWE & Aquaculture Industry),and integration of sensor data into regional hydrographic models (CSIRO, TasMAN/TasITCT)

NRM South– Jill Pearson and Andry Sculthorpe

Moulting Lagoon & Apsely Marshes - Jill Pearson

1. Update – Estuary Management

- Scoping for key monitoring sites completed, plus assessment of stakeholder monitoring needs and capacity to support. Future implementation yet to be determined. (NRM South)
- CfoC application for weed control around Apsley Marshes submitted through 2011 -12 Business Plan competitive grants ground. Successful projects not yet announced.

2. Update – Estuary Research

- Preliminary report on the condition of freshwater, groundwater and estuarine assets in the Swan-Apsley Catchment completed (NRM South).
- Ecological Character Descriptions for Apsley Marshes and Moulting Lagoon (Ramsar wetland) still in final draft stage, awaiting final clearances from the Tasmanian Government and Australian Government.

Pittwater-Orielton (PWOL) – Jill Pearson and Andry Sculthorpe

1. Update – Estuary Management

- On-ground management actions as part of CFOC project nearly completed (e.g. fencing saltmarsh, weed control, reveg, community education). (NRM South)
- Stormwater Management Plan for PWOL (Sorell Council) due for completion end of November.
- Longer term Foreshore Action Plan due to be completed by the end of November. (NRM South)

2. Update – Estuary Research

- Ecological Character Description for PWOL (Ramsar wetland) still in final draft stage, awaiting final clearances from the Tasmanian Government and Australian Government.
- A report on the condition of Pitt Water Estuary and Orielton Lagoon has been completed (NRM South).
- Report card for the PWOL being developed (NRM South).

Little Swanport Estuary – Christine Crawford and others

2. Update – Estuary Research

- Book in press 'Value of Water in a Drying Climate'. Edited by Tor Hundloe and Christine Crawford. Looks at the value of water to the different users across the Little Swanport catchment and estuary, as a case study..

NORTH-EAST TASMANIA

Tamar Estuary & Esk Rivers Program (TEER)– Michael Attard

1. Update – Estuary Management

- Finished 2yr Ecosystem Health Assessment Program ambient water quality monitoring
- Launching 2011 Tamar Estuary Report Card and technical report early Dec 2011
- Establishing ambient water quality monitoring program in partnership with Ben Lomond Water to monitor sites in Zone 1 in the upper Tamar estuary and North and South Esk River tributaries
- Employed TEER stormwater officer

2. Update – Estuary Research

- Seafood safety samples taken for metal analysis- pacific oyster and recreationally targeted fin fish species.
- Commencing Freshwater Ecosystem Health Assessment framework to tie estuary into fresh water rivers in greater Tamar catchment.
- Gambusia (Mosquito fish) trapping and review of program

3. Update – Estuary Issues

- Embarking on public education process on sedimentation in the upper Tamar Estuary- Describing dredging history and natural values of upper estuaries and natural processors occurring in these sections of the estuary. Plan to use media and erect signage in public areas around upper estuary.

NRM North – Emma Williams

1. Update – Estuary Management

- NRM North has been working with landholders in the lower catchment area of the Lower Ringarooma River Floodplain Ramsar site (which includes the confluence and estuary of the Ringarooma and Boobyalla rivers) to undertake property management (whole farm) planning. NRM North has been able to work with landholders in the area to address natural resource management issues highlighted through this process, and we are funding on-ground actions to implement these improvements in property management.

NORTH-WEST TASMANIA

Cradle Coast NRM– Sue Botting

1. Update – Estuary Management

- Catchment revegetation works for the Sea Elephant estuary on King Island

Leven and Port Sorell Estuaries

2. Update – Estuary Research

- Continued monitoring of the Leven and Port Sorell estuaries by IMAS supported by NRM Cradle- Coast
- Bathymetric mapping of the Leven estuary, and a hydrodynamic model to be created by Jeff Ross with support and training from the Danish Hydrological Institute (DHI). IMAS undertaking work through Cradle-Coast NRM support.

SOUTH WEST TASMANIA

Macquarie Harbour – Greg Dowson, Michael Rushton, Neville Barrett, Wes Ford, and others

1. Update – Estuary Management

- Ambient water quality monitoring continuing (@quarterly) (EPA Division)

2. Update – Estuary Research

- A proposal to expand aquaculture operations in Macquarie Harbour is currently being considered under the provisions of the Marine Farming Planning Act 1995. These provisions require the preparation of an environmental impact statement that considers the impacts of the proposed expansion. This information will be considered by an independent and expertise based panel. This EIS and draft planning amendment will be released for public exhibition shortly.

3. Update – Estuary Issues

- Large aquaculture expansion proposed for Macquarie harbour.

Port Davey – Bathurst Harbour – Neville Barrett, and others

2. Update – Estuary Research

- IMAs are finishing up a report on the second baseline study of the benthic invertebrate community in Bathurst Channel - Port Davey
- Graham Edgar has a Winifred Violet Scott grant to look at the biology of the threatened Maugean (Port Davey) skate in Macquarie Harbour and Port Davey. This will look at the spatial and depth distribution of the skates in these areas as well as basic biology and movement patterns, and improving public awareness of the species to minimise fishery related interactions, particularly with recreational gill netting at other sites.

3. Update – Estuary Issues

- Continued education to prevent marine pest translocations into this area

National Estuaries Network	Meeting No. 21 Townsville, Queensland
	15 Nov, 2011
AGENDA PAPER	State / Territory: Western Australia

Prepared by: Helen Nice[1], Catherine Thomson, Vanessa Forbes[1], Malcolm Robb[1], Kieryn Kilminster[1], Steve Fisher[1], Zoe Goss[1], Kerry Trayler[2]

Position: Project managers

Organisation: 1.Department of Water – Water Science; 2.Swan River Trust

6. Update – Estuary Management

Swan Canning Estuary

- **River Protection Strategy**

A River Protection Strategy has been drafted to replace Riverplan and to reflect the new responsibilities set out in the *Swan and Canning Rivers Management Act 2006*. Under the Act, the creation of a Riverpark provided a new basis for management and the need to develop better ways for government, industry and the community to work together to sustain the health and enjoyment of the rivers. The draft Strategy is currently with the Minister for Environment and Water for his consideration.

- **Development of report cards**

The Trust is expected to report to the Minister, at least biennially, on the extent to which environmental and community benefit targets are being met in the Swan Canning Riverpark. The Trust has established a Technical Advisory Panel to inform the development of report cards. It is envisaged that water quality report cards being developed through the Department of Water for estuaries around the State, including the Swan-Canning estuary will be a component of the overall report card framework.

- **Dolphin & Estuarine Health Working Group Report**

In August 2010, in response to a series of dolphin deaths in the Swan-Canning Riverpark, the then Minister for Environment formed Dolphin and Estuarine working group, which was chaired by the Chief Scientist of Western Australia, Professor Lyn Beazley AO FTSE, to investigate the state of dolphin and estuarine health in WA. The Minister for Environment and Water is currently considering the findings and recommendations of the group's report. A recommendation is made for the appointment of an internationally recognised marine mammal expert to lead a science team to develop sound management practices for dolphin populations in WA's south-west estuaries. Additional recommendations include having agencies such as the Department of Environment and Conservation (DEC), Department of Water and Swan River Trust develop a more cohesive science structure involving Government, science institutions, industry and community. The report is publicly available from the DEC's website http://www.dec.wa.gov.au.

- **Non- nutrient contaminants program**

Two reports examining the ecotoxicology of contaminants in parts of the Swan Canning Riverpark were recently released by the Department of Water. The reports, commissioned by the Swan River Trust were prepared in response to the findings of a surveys of contaminants in estuarine sediments undertaken in 2009. That investigation identified hotspots of contamination in particular areas and the ecotoxicological investigations were aimed at understanding toxicity of sediments in key areas (Claisebrook, Bullcreek) to a select group of estuarine taxa. The reports are available on the Dept of Water website http://www.water.gov.au

Based on recommendations from these reports, work is continuing in the Claisebrook area of the Swan Estuary. Current work further investigates the contaminant sources contributing to this portion of the estuary and aims to determine whether ecological health has been/is likely to be affected in the receiving environment. Sediment ecotoxicological investigations, sediment infaunal surveys and sediment and water column contaminant assessments are currently underway.

These include the deployment of passive samplers at key locations in the estuary to measure concentration of PCBs, organochlorine pesticides, PAHs and other organic contaminants. Passive sampling devices were deployed at nine sites in the Swan Canning estuary in August 2011 and recovered in September 2011. Eight of the sites were located close to outlets from the arterial drainage system (including Claisebrook Main Drain), outlets from local drains or sites at which organic contaminants have previously been reported. The remaining site was chosen as a background site remote from potential contaminant sources. The aim of this study is to determine the contribution of these potential sources of contaminats to the estuary. The arterial drainage system contains both groundwater and stormwater, so August was chosen as the drainage water is likely to contain both. During the month long deployment the devices accumulate potential organic contaminants such as polycyclic aromatic hydrocarbons (PAHs), organochlorine (OC) pesticides, herbicides and polychlorinated biphenyls (PCBs) from the water column onto adsorbent materials. Because the passive samplers were deployed for a month there is a greater probability of capturing episodic releases of these contaminants to the estuary from stormwater and groundwater drainage than using conventional grab sampling. The large volume of water flowing past the devices during the deployment relative to a grab sample also results in much lower limits of detection for the contaminants. The devices are currently being analysed in the laboratory, with the report expected to be finalised early in 2012.

Also, in a related study, two passive samplers were deployed in and recovered from the Claisebrook Main Drain above the discharge point into the Swan estuary. Grab samples of water from these sites and from other points in the stormwater drainage network local to Claisebrook that ultimately flow into cove were collected to determine the above-mentioned organic contaminants as well as metals and nutrients. This sampling program coincided with the deployment of passive samplers in the Swan Estuary so the results can be compared. From this we hope to determine the contribution of the Claisebrook Main Drain to the contaminants previously reported in the estuary in vicinity of Claisebrook Cove, and perhaps the contribution of each of the local stormwater catchments to this overall input.

The Trust is also working to expand its drain stencilling program to more local councils/cities around the river and is working together with partner organisations, such as the Motor Trade Association, to target industry.

- **Upper Swan and Canning River – oxygenation projects**

The Canning River has two oxygenation plants that have operated for the last 13 years and are an integral part of the long term management of dissolved oxygen concentrations in the Kent Street weir pool. Artificial oxygenation intervention has also been proposed for the river in the vicinity of Hester Park; an area that experiences anoxia throughout the summer months. A small feasibility study is being undertaken to estimate of the oxygen demand of the water body and sediment in that stretch of the river. In addition, the study will review technologies available world wide and finally provide a recommendation of the types of technologies which are likely to be able to deliver the oxygen required and this in turn will inform selection of the technology installed at a third plant.

The upper Swan also has two oxygenation plants. The first plant was built in Guildford in 2008 while the second plant's construction at Caversham (5.2 km upstream) was completed in April 2011.

The Guildford plant range of influence was measured to ~5.6 km and it is anticipated that the Caversham plant will have a similar range. Unfortunately the monitoring undertaken last autumn at the Caversham plant was concluded prematurely owing to some technical difficulties within the plant and a serve storm event which flushed the system resulting in fresh well oxygenated conditions. A similar monitoring plan measuring the range of influence and the oxygen flux between the sediment water interface will be repeated this autumn.

- **Upper Canning issues: kent st weir management, fish survey, contaminants, phoslock (DoW)**

Kent Street Weir was installed in the Canning River in 1927 initially to prevent the encroachment of salt water into a fertile agriculture area; freshwater licences were allocated for irrigation purposes to adjoining lots. Since then the weir has been opened every winter for ~4 months depending on river flow. In the 1980's the weir pool experienced severe macroalgal growth problems – these were controlled by mechanical harvesting and herbicide. In the 1990's and 00's the problem was replaced with frequent blue-green algal blooms.

2010 was the first time the weir boards remained in place during winter due to the severe decline in rainfall (hence river flow). This year high tides have resulted in significant saltwater intrusion into the weir pool, with water at almost marine salinity. DoW, Water Science branch is investigating the health status of the weir pool. This project is multifaceted, with studies of sediment contamination and accumulation, pelagic fish and macroinvertebrate communities and the release of bottom water nutrients and metals associated with saline water intrusions. The final report is being prepared, including results showing contaminants in weir pool sediments exceeding environmental guidelines (accumulated from catchment inflow) and the weir pool environment itself supporting a depauperate ecology, mainly dominated by exotic fish and the hardy estuarine species. The information contained in the report will inform management to improve ecosystem health (and maintain associated values) whilst maintaining the original drivers for the weir (freshwater and water levels upstream).

- **Water quality improvement planning**

The Trust in partnership with the Department of Water and other relevant stakeholders has developed nine local Water Quality Improvement Plans (WQIPs) based on priority status in the Healthy Rivers Action Plan and modelling in the Swan Canning Water Quality Improvement Plan. The WQIPs aim to reduce nutrient loads into the Swan and Canning rivers through nutrient intervention and changed management practices. By using a treatment train approach, a combined set of management actions is applied along nutrient pathways. The WQIPS provide local councils and communities with a mechanism to prioritise recommendations and resources and seek funding to improve water quality in catchments contributing the greatest amount of nutrients. The Trust has provided investment of up to $125,000 for priority WQIPs to implement key actions for each catchment. To date the WQIPs have attracted investment from local, State and Federal Governments to the value of $3.5million and enable a number of onground and community education projects that will improve water quality entering the Swan Canning Estuary.

- **Drainage intervention works**

The Drainage Nutrient Intervention Program is trialing the application of constructed wetland and compensation basin restoration projects to principally improve water quality, but also habitat and amenity value at sites where they are implemented. Operation, monitoring and reporting of these projects will also provide a better understanding perform under Western Australian conditions.

An assessment is underway to determine the feasibility of a treatment system at the end of Ellen Brook, a major contributor of nutrients to the Swan River. A critical component of the feasibility assessment includes a pilot trial which will be used to test the mineral sand mining by-product Neutralised Used Acid (NUA) blended with other materials to improve water quality in actively pumped and gravity fed treatment systems. Findings from this trial will provide 'proof of concept' of the applicability of this material to be used as filter media in a treatment system to improve water quality. This work, which is funded through the Caring for Our Country program, has been informed and guided by over five years of research by CSIRO into NUA and other materials.

- **Foreshore protection**

The Trust Riverbank Program is building on the Foreshore Assessment and Management Strategy (2008) and Best Management Practice Guidelines for Foreshore Restoration 2010 by focussing Riverbank funding more proactively towards river-wide priorities and developing and implementing a Riverbank Extension Plan aimed at supporting and building the capacity of our 27 partner foreshore land managers.

- **Seagrass mapping (DoW)**

A baseline spatial survey was undertaken in March 2011 (first comprehensive survey since 1999), using underwater video camera. While the data has been interpolated to produce a distribution map, we are also using high quality satellite imagery to better delineate seagrass habitats. The method has been useful to cove the extent of the estuary, but we will look at a more targeted method to measure distinct changes in habitat extent and distribution.

South Coast

- **Water quality monitoring**

Estuary water quality monitoring has been conducted on a quarterly basis at the following estuaries across the south Coast region:

Broke Inlet, Walpole/Nornalup Inlet, Irwin Inlet, Parry Inlet, Oyster Harbour, Beaufort Inlet, Wellstead Estuary, Hamersley Inlet, Culham Inlet, Stokes Inlet and Bandy Creek Harbour.

In most of the estuaries the number of sampling parameters has been reduced. Surface chlorophyll *a* for example has replaced nitrogen and phosphorus as it is a surrogate or indicator of the nutrient status. Additional river sites close to each estuary have been added to the programs to understand the actual catchment nutrient contribution. All the estuary monitoring programs have been designed to align with ASSessment of Estuarine Trophic Status (ASSETS) Information will feed into the **Ass**essment of **E**stuarine **T**rophic **S**tatus (ASSETS) model that the DOW Water Science Branch has adopted to assess the condition of our Inlets and estuaries. Wilson Inlet, Torbay Inlet and Lake Powell have been monitored on a monthly to fortnightly basis.

There are a few issues with future estuary water quality monitoring as there will be no further operating funds beyond December 2011. We are currently highlighting this issue and hopefully we can include and consider estuaries in our current review of waterways activities on the South Coast. Other issues to be addressed include identifying the risks involved if the Department ceases all monitoring on the South Coast.

- **Wilson Inlet Bar Management**

This year the Wilson Inlet bar was manually opened on the 14th July 2011. An intensive monitoring program was initiated to determine the flow, nutrient and salinity characteristics in the early stages of the opening.

Monitoring included:

- Deployment of an ADCP Doppler in the main channel near the bar (to continuously record ebb and flood tides as well as flow rates)
- Recordings of flows (Manual and by boat) through Prawn rock channel and across the bar.
- Nutrient (TN and TP) sampling at the bar (nutrient concentrations and loads will be calculated)
- Salinity and oxygen profiles at the bar end of the Inlet across three transects to track the salt wedge movement. SURFER Plots will be developed to convey these results.
- Longitudinal transect from the Denmark Town bridge to the bar (nutrients and profile recordings)
- Pre survey of the bar was conducted 2009 before dredging of the bar deltas – a new survey will be conducted after the bar closes to assess the effectiveness of the dredging.
- Deployment of 4 oxygen and salinity loggers at 2 sites to determine when the salt wedge reaches each site and the depth of the salt wedge.
- Information will be compiled and reported (due date Feb/March 2012). It was the intention that a follow up intensive monitoring program would be activated to allow for comparison

- **Wilson Inlet Nutrient reduction plan review**

Funds have been awarded to Wilson Inlet Catchment Committee (WICC) to review the Wilson Inlet Nutrient Reduction Action Plan. A WICC officer has been appointed to manage and run the review with the Department of Water's support (including provision of data and calculation of catchment nutrient loads). DoW support of this initiative ensures protocols, plans and policies are in place to cover all aspects of management of Wilson Inlet, with the long term goal of reduced involvement in this catchment. In addition, valuable information about the success or otherwise of initiatives and management actions over the past 10 years will be gained from the process.

- **Wilson Inlet drainage review**

The Wilson Inlet Drainage review, commissioned by the EPA and completed in 2009, resulted in revision of the bar opening protocol for the inlet. Under the new protocol, the inlet remained closed in 2010 for only the second time since the early 1900's. Monitoring of seagrass, social perceptions, foreshore vegetation, and water quality has been undertaken to monitor the success of the protocol over time.

- **Submerged aquatic macrophytes mapping (*Ruppia megacarpa*)**

We conducted a seagrass mapping exercise with Vanessa to trial the use of a small underwater camera. Preliminary maps have been produced by kriging the data points in GIS. Some work needs to be done to validate the map against aerial/satellite imagery of the same time period.

- **Catchment monitoring**

A catchment water quality snapshot was conducted for the first time (one sampling event) in the Bremer Bay catchment (associated with the Wellstead Estuary) due to good rainfall and river flow. This data will be graphed and provide to the relevant catchment group and LGA.

The Department also conducted a water quality snapshot (3 sampling events following first flush and subsequent high rainfall events) in Albany Harbours in 2011 with particular focus on Yakamia creek which runs into Oyster Harbour. Data is being compiled and will be reported to relevant catchment groups and LGA to assist with management and on ground work activities. Currently there is a joint project planned to improve a portion of the upper Yakamia Creek.

- **Water sensitive design for the town of Walpole**

In partnership with the Shire of Manjimup, two drains on the foreshore of the Walpole Inlet were retrofitted to water sensitive urban design principals. The outcomes of this are the capacity building of shire staff to undertake other similar projects, a demonstration site, and treatment of nutrient and sediment loads that previously discharged directly to the inlet.

A consultant was engaged in 2010 to conduct a wide ranging water quality risk assessment for the Walpole Nornalup Inlet system. This included public perception of risk, analysis of water quality data and audits of local industry and business. Currently an operational plan is being prepared to implement the management recommendations from this work

- **Culham Inlet foreshore survey/plan**

DoW has provided extensive technical and management advice to the consultant engaged to draft a management plan for the Cullham Inlet foreshore. This is seen as a high priority as it has strong links to state development, with the expansion of mining and hence population in the area. In addition, it lies at the end of a major road being constructed through the Fitzgerald National Park and UNESCO biosphere reserve. The plan is currently out for public comment.

- **Other waterways activities**

Through the review process of waterways activities, the Region has reduced involvement with the Stokes Inlet and Culham Inlet catchment groups. The DoW written plans are owned and managed by the community groups, and works continue in implementing DoW objectives to protect water quality in these estuaries. Involvement now takes the form of strategic strategic guidance through attendance at selected meetings and provision of briefing papers.

As part of the South Coast regions strategy to reduce involvement in waterways activities, and to align ongoing activities with current DoW priorities, closure of the Wilson Inlet Management Advisory Group has been jointly negotiated with the Shire of Denmark.

7. Update – Estuary Research

- **Dolphin health and ecology investigations**

In response to a series of dolphin deaths in the Swan-Canning Riverpark in 2009, additional funds were made available for investigations into dolphin health and ecology. Work to date has identified the presence of morbillivirus in two of the dolphins that died and its presence in the other deceased dolphins cannot be ruled out. Morbillivirus affects dolphins immune system and makes them vulnerable to a range of other stressors including water quality changes, contaminants and entanglements. Investigations are continuing.

- **Development of Indicators of ecological health**

  Fish communities: The Swan River Trust is currently concluding a project with Murdoch University to validate the sensitivity of a fish-assemblage based index of ecosystem health and to develop monitoring protocols.

  Seagrass: Department of Water and the Swan River Trust have established a collaborative project aimed at the development of seagrass health indices. Measurements of leaf metrics, sediment condition, epiphyte characteristics (over 12 months) will be examined as part of its development. Field work is currently underway.

- **Estuarine Modelling**

The Department of Water and the Swan River Trust are collaborating with modellers from the at the University of Western Australia to develop a coupled hydrodynamic-biogeochemical model that can simulate oxygenation dynamics at key locations in the Swan-Canning estuary. This project is just getting underway, but it expected that the model will enable the testing of optimal operational approaches to oxygenation plants in order to achieve desired ecological outcomes

- **Wake research**

The Swan River Trust in collaboration with the Department of Transport Marine Safety undertook a collaborative project to investigate the effects of boat wake versus wind waves on shoreline erosion on the Swan River. This was in line with one of the recommendations in the Boating Management Strategy for the Swan Canning Riverpark. (Copies available on Trust website http://www.swanrivertrust.wa.gov.au). Research was undertaken by the Australian Maritime College (AMC) and Curtin University Centre for Marine Science and Technology (CMST) in two stages. The initial stage was based on modeled wake data obtained from wave tanks at AMC and modeled wind wave data through Curtin. Modelling focused on two sites on the Swan River characteristic of open water and sheltered upstream sections.

Modeled results indicated that in the upstream sheltered areas a reduction in the speed limit from the 8 knots (which corresponds to most vessels hump speed) to 5 knots would see a reduction in wake (height, energy and power) produced by most vessels which would see a reduction in shoreline erosion. In the open water areas the wind generated waves were often as powerful as vessel generated waves and therefore a reduction in speed limit would not see a noticeable reduction in shoreline erosion. These results were ground-truthed against a broad range of recreational and commercial vessels and results confirmed. The Trust and Department of Transport have used these results in a recent review of speed limits and activities within the Swan and Canning Rivers and a reduction in speed limit to 5 knots has already been put in place in the upstream sections of the Swan River. It is likely a reduction from 8 knots to 5 knots will be used in a number of other areas as well. Based on this research, the Department of Transport are considering reducing all 8 knot areas in shelter waters to 5 knots, throughout the state.

- **Algal monitoring approaches**

The Trust is involved in a collaborative project with researchers at Curtin University aimed at the development of an autonomous monitoring system capable of detecting the density of algae present in the Swan and Canning Rivers and to discriminate between the represented taxonomic groups using an above water hyperspectral radiometer (DALEC). The project involves multiple modelling steps and the collection of data to populate a library of total pigment absorption from suspended algal particles (from *in-situ* water samples using a laboratory dual beam spectrophotometer). Current results indicate Chl concentrations produced by the model from hyperspectral data correlate well with weekly sampling data.
Work will also be done to develop a model capable of accounting for multiple scattering and self shading. This will lead to an improved understanding of the relationship between cellular pigment density and cell counts. All going well – this project will develop a method of producing detailed maps of phytoplankton density from boat-based remote sensing reflectance data.

National Estuaries Network	Meeting No. 21 Townsville, Queensland 15 Nov, 2011
AGENDA PAPER	State / Territory: CSIRO

Prepared by: Andy Steven
Position: Research Theme Leader
Organisation: CSIRO

BIOGEOCHEMICAL ACTIVITIES

WESTERN AUSTRALIA

A hydrodynamic model of the Leschenault Estuary (Hertzfeld)

This model has been recently implemented running in near-real-time and using fully operational data streams for all boundary conditions and forcing data. The coastal model uses operational model products OceanMaps and ACCESS from the Bureau of Meteorology to provide ocean and meteorological forcing but, for the first time, these products are complemented by telemetered temperature, salinity and flow data for all the significant rivers flowing into the estuary. An on-going field programme is collecting observations of water temperature and salinity in the rivers and estuary. These data are being compiled into a comprehensive dataset that will be used to first calibrate, and then validate, the model. As of early November 2011, a formal calibration process has not been undertaken, but is expected to be completed by the end of 2011. The fully operational supply of all required data streams marks, to the best of our knowledge, a first for coastal hydrodynamic modelling in Australia. The project is funded by the Department of Water in Western Australia. Contact Mike Herzfeld (mike.herzfeld.csiro.au)

Source and biogeochemical cycling of dissolved organic matter, Swan-Canning estuary and catchments

Dissolved organic matter (DOM), observed as tannin or tea coloration, is ubiquitous in estuaries of South-western Australia, yet its role in river and estuary ecosystem function is not well understood. In recent studies funded by the CSIRO and Swan River Trust, we examined the source and function of dissolved organic carbon (DOC) and associated nitrogen compounds in streams draining agricultural and urban sub-catchments as well as the Swan-Canning estuary using fluorescence spectroscopy and laboratory bioassays. We make a quantitative link between organic matter composition and function in aquatic ecosystems. In streams we found that bioavailable DOC was negatively related to humic-like fluorescence, but positively related to protein like fluorescence. In the estuary, fluorescence spectroscopy fingerprinted distinct estuarine DOM sources: (1) riverine DOM derived mainly from vascular plant material, (2) autochthonous DOM recently produced within the estuary and (3) autochthonous DOM originating from within the lower estuary or coastal marine environment. These studies provide a quantitative link between organic matter composition and function in aquatic ecosystems. Importantly, our findings demonstrate that fluorescence characteristics can be used better understand the flow of carbon and nutrients in aquatic food webs

for improved monitoring and management of coastal ecosystems. The ecological process understanding gained from this research may be particularly useful to guide catchment rehabilitation efforts such as constructed wetlands and address the source of organic matter that contributes to anoxia in the upper Swan. Lastly, understanding of the source of dissolved organic nitrogen (DON) can be used to better inform water quality targets (TN = 1.0 mg/L) that are often exceeded by DON alone. Contact Kevin Petrone (kevin.petrone@csiro.au)

QUEENSLAND

eReefs

The vision for eReefs is to develop an "operational system" which enables accounting and forecasting of hydrodynamics and water quality from the catchment to the reef.
In order to operationalise eReefs, four R&D work packages will be undertaken over the next 5 years: (1) Enhanced Monitoring, (2) Interoperable data and information systems, (3) Operational Catchment and Marine Modelling and (4) Reporting and Visualisation Services.
The most substantial of these work packages is WP 3- Operational Catchment and Marine Modelling, which will develop an integrated suite of marine receiving water models to represent the circulation, transport and fate of water and dissolved and suspended constituents from the estuaries to the Great Barrier Reef (GBR) shelf-break. Funding is provided by federal and Queensland governments, and philanthropic partners. CSIRO AIMS and BoM are the key research providers
Contact Andy Steven (andy.steven@csiro.au)

TERN Supersite

The Logan estuary in SEQ is apart of the TERN Periurban supersite. Four stations located at the head to the mouth of estuary provide high-frequency data of flow, turbidity, CDOM, nitrate, pCO2 and meteorological data. Data can be seen at : ftp://ftp.csiro.au/LoganRiver/index.htm

Fish biomass and fish movements are also measured using acoustic methods. Associated studies in include studies of trophodynamics in association with Griffith University and the use of high resolution cameras to monitor bird distributions.

Contact Andy Steven (andy.steven@csiro.au)

SEQ 2011 Post flood Responses

The January 2011 flood delivered well over 1.2 million tonnes of sediment to Moreton Bay, At the peak of the flood, water carrying sediment from the Brisbane, Lockyer and Bremer Rivers extended to the middle of Moreton Bay and totally filled Bramble Bay and Deception Bay, with layers of find sediment from 10cm to >30cm being recorded across this area. A number of institutions have responded to post-flood monitoring of the impacts and recovery of Moreton Bay to the January flood. CSIRO has undertaken biogeochemical and bio-optical surveys on 4 occasions at 17 stations, and conducted seagrass surveys and collected samples to assess recovery. Similarly, Griffith University has made assessments of a benthic biota including seagrass, coral and macro-algae. The University of Queensland has made measurements of sediment distribution. Further surveys to consider longer term ecological implications are planned for December. A data exposure workshop has been held, revised conceptual models developed and a report releases. Further write-up workshops are being organised. Contact Andy Steven (andy.steven@csiro.au)

High frequency nutrient monitoring on GBR

This project examines the use of high frequency nutrient monitoring data to inform water quality improvement and catchment management. High-frequency monitoring of nutrients in rivers and streams has only recently become possible with the development of portable nutrient analysers. With an increased emphasis on the use of sensors and real-time monitoring, these analysers have tremendous appeal although interpretation of their data is still in its infancy. This project will (i) Provide an inventory of in-situ projects in HWE and WfHC that perform high-frequency nutrient monitoring (Swan, Tasmania, SE Qld), (ii) Review the improved understanding of hydrological and

ecological processes derived from such monitoring, (iii) Review the integration of high-frequency nutrient monitoring with catchment water quality modelling, and (iv) Evaluate (cost-) effectiveness of high-frequency nutrient monitoring and appropriate niches for this monitoring identified. This project has subsequently been funded to apply its findings in a sugarcane catchment in the Mackay-Whitsundays region. Contact Kirsten Verburg (Kirsten.verburg@csiro.au)

River loads of suspended solids, nitrogen, phosphorus and herbicides delivered to the GBR Reef
Degradation of coastal ecosystems in the Great Barrier Reef (GBR) lagoon, Australia, has been linked with increased land-based runoff of suspended solids, nutrients and pesticides since European settlement. This study estimated the increase in river loads for all 35 GBR basins, using the best available estimates of pre-European and current loads derived from catchment modelling and monitoring. The mean annual load to the GBR lagoon for (i) total suspended solid sediment has increased by 5.5 times to 17,000 ktonnes/yr, (ii) total nitrogen by 5.7 times to 80,000 tonnes/yr, (iii) total phosphorus by 8.9 times to 16,000 tonnes/yr, and (iv) PSII herbicides is 30,000 kg/yr. The increases in river loads differ across the ten constituents and 35 basins examined, reflecting differences in surface runoff, urbanisation, deforestation, agricultural practices, mining and retention by reservoirs. These estimates will facilitate target setting for water quality and desired ecosystem states, and enable prioritisation of critical sources for management.
Contact Frederieke Kroon (frederieke.kroon@csiro.au)

Overbank flood loads to the Great Barrier Reef lagoon
This project builds on the flood load estimation work carried out in the Tully-Murray catchments under the MTSRF program and subsequent HWE investments in the assessment of the need for flood load corrections in other GBR rivers. To estimate flood discharge correctly further stream channel and topographic information is needed to determine when and where water leaves the main channel and how much of this reaches the ocean as ungauged bypass flow. Static assessments of this could be made using Digital Elevation Models (DEM's) where flow pathways along low lying land can be identified. The high resolution DEM's that can be derived from Laser altimetry data (LiDAR) are ideal for this purpose and they can also be used to derive natural and man-made drainage channel networks (e.g. see Karim et al., 2011). Satellite remote sensing data can also be used to identify inundated areas and flow pathways and this could be combined with topography data to estimate flood discharge volumes. The most definitive estimates of flood discharge are made with calibrated 2-D hydrodynamic models, however, such models have only been applied in a few catchments (e.g. Tully, Murray and Fitzroy, WA), but where they have they provide an excellent basis for evaluating the above static flood discharge methods

Towards ecologically relevant targets for river pollutant loads to the Great Barrier Reef
Degradation of coastal ecosystems in the Great Barrier Reef (GBR), Australia, has been linked with a decline in water quality from land-based runoff. This paper examines the reduction in current end-of-catchment loads required for total suspended sediment (TSS) and dissolved inorganic nitrogen (DIN) to achieve GBR water quality guidelines. Based on first-order estimates of sustainable pollutant loads, current TSS and DIN loads would need to be reduced by approximately 7,000 ktonnes/yr (41%) and 6,000 tonnes/yr (38%), respectively. Next, these estimated reductions for TSS and DIN are compared with Reef Plan targets for anthropogenic sediment (-20% by 2020) and nitrogen (-50% by 2013) loads. If successful, these targets will accomplish approximately 40% of TSS and 92% of DIN load reductions required to achieve sustainable loads to the GBR lagoon. These first-order estimates elucidate the need to establish ecologically relevant targets for river pollutant loads to the GBR for management and policy. Contact Frederieke Kroon (frederieke.kroon@csiro.au)

Endocrine disruption in freshwater and marine fishes in the GBR region (Kroon et al.)
This project provides a first assessment of the potential impacts of endocrine disruptors, including triazine herbicides, on wild fisheries populations in the GBR region. The potential for endocrine disruption in wild fish populations in GBR coastal waters is likely to be high, given that (i) low

chronic levels of herbicide residues are present in the GBR throughout the year (Shaw and Muller 2005) (ii) triazine concentrations exceed GBR and national water quality guidelines in some freshwater and marine locations (Lewis et al. 2009), and (iii) labile sex determination is common amongst tropical fish (Sadovy de Mitcheson and Liu 2008). Hence, continuous exposure at low levels of triazines has the potential to cause reproductive failure and population collapse in hermaphroditic fish species of ecological and commercial importance, such as barramundi (*Lates calcarifer*) and coral trout (*Plectropomus leopardus*). Contact Frederieke Kroon (frederieke.kroon@csiro.au)

NORTHERN TERRITORY

Estuarine-coastal Research on Kakadu National Park through the Northern NERP Hub: Estuaries and the coast are key features of northern Australian rivers because they support high value fisheries and encompass habitats high in biodiversity. However, we have limited understanding of the factors that influence the patterns of estuarine and coastal habitat diversity, and the processes that sustain high productivity, even in high conservation value and pristine areas such as Kakadu National Park. Additionally, climate change seriously threatens the resilience of communities that rely on ecosystems for their well-being. Indigenous coastal communities in northern Australia, for example, are particularly vulnerable because such impacts will exacerbate existing threats to natural and cultural values that are inextricably connected. These cumulative impacts will substantially reduce opportunities for sustaining and developing future ecosystem-based livelihoods such as ecotourism. Hence, the socio-economic and ecological impacts of a range of climate change scenarios along the northern coastline need to be examined in combination with other existing pressures including multiple use, and adaptation options developed and implemented.

The CSIRO WfO Flagship is one of 16 consortium partners in the Northern NERP hub that has commenced critical research on Kakadu National Park to help close key knowledge gaps on tropical estuaries, and to help develop and assess adaptation options for climate change in partnership with Indigenous communities and other stakeholders. Areas of research include: ecohydrological modelling including sea level rise prediction (AIMS); an assessment of the biodiversity of estuarine fish in the Alligator Rivers Region/Kakadu (Griffith University); developing remote-sensing tools to map, monitor and asses the condition of catchment, coastal and near-offshore habitats as surrogates of biodiversity (CSIRO); developing ecogenomic approaches to monitor and assess biodiversity in estuaries (CSIRO); developing monitoring and assessment tools (e.g. I-Tracker) with Indigenous land and sea rangers in order to better manage dugongs, turtles and sea grass (NAILSMA-CSIRO); developing a Management Strategy Evaluation (MSE) for Kakadu's coastal floodplains and estuaries, in partnership with Indigenous land owners and park rangers, to help manage current and future threats such as invasive species and sea level rise (CSIRO, Charles Darwin University). Contact Peter Bayliss (peter.bayliss@csiro.au)

NATIONAL

Ecogenomic methods for measuring estuarine infauna and nitrifying microbial communities Human activities are altering biodiversity at an unprecedented rate. Current assessment methods only examine a minute fraction of the true biodiversity of an ecosystem. To address this, CSIRO researchers have developed two approaches which enable thousands of organisms to be examined simultaneously. Firstly, a DNA microarray chip which contains the genetic information for thousands of animals, plants and micro-organisms, is used to identify the DNA signatures extracted from an environmental sample, such as a sediment core or a volume of water. This information can then be used to compare reference and impacted locations. Extending from this development has been the application of high-throughput sequencing as an ecological monitoring tool. In this approach, the DNA of environmental samples are sequenced and compared using a new approach

called pyrosequencing. This method can potentially provide information on all organisms present within a sample.

Presently, we are examining how these approaches can be adopted to monitor and assess the health of coastal ecosystems. This includes refining the way we collect, process and analyse the samples, and the ecological relevance of the data. Trial projects utilising ecogenomics are currently being performed in Kakadu National Park and along SE Queensland. In conjunction with CSIRO, the USPEPA is trialling this approach to assess the ecological impacts of a number of emerging contaminants, e.g. Triclosan, an antibacterial agent commonly found in health care products. We envisage that the inclusion of ecogenomic tools will greatly advance the way we examine estuarine and other environments.

Another focus is microbial ecogenomics to qualitative identify the presence and diversity of nitrogen cycling bacteria and archea. The aim of this work is to develop a nitrifier array. Field studies are currently being deployed in SEQ and Fitzroy estuary, Derwent and potentially Darwin Harbour

Contact Anthony Chariton (Anthony.chariton@csiro.au) for estuarine infauna and Lev Bodrossy (Lev.bodrossy@csiro.au) for nitrogenenous cycling genomics.

Metal concentrations

Soft metalliferous ores, increasing use of copper-based paints to reduce biofouling (including aquaculture), are expanding the footprint metal contamination within estuaries. Measurement of total metal concentrations are not suitable for assessing potential impacts to aquatic biota. The potential impacts of increased metal contaminant loadings in estuaries needs to be evaluated in relation to the bioavailability of the metals to aquatic organisms. However, while our current regulatory frameworks for sediment quality assessment include consideration of contaminant bioavailability, the tools presently available are frequently inadequate. The use of inappropriate or inadequate information for environmental impact assessment (EIA) impedes both the management and approval processes for development within our coastal marine environment. We have a range of projects aimed at improving the suite of tools available for EIA and assisting industries (e.g. aquaculture and mineral export industries) with improving the procedures for assessing and managing the risks their practices pose to the environment. Contact Stuart Simpson (stuart.simpson@csiro.au).

Satellite Remote Sensing

- SOE funding CSIRO to report on algal growth and algal bloom trends as perceived from SRS products.
- More than 8 years of Tasmanian Ocean colour data now available using CSIRO developed algorithms. http://www.marine.csiro.au/remotesensing/imos.test/aggregator.html
- SRS scientists and modellers are working on developing a common interface between their domains using surface spectral absorption and surface spectral backscatter. To this end a commons bio-optical model has been developed and is being implemented in the CSIRO EMS biogeochemical model.
- Contact Arnold Dekker (arnold.dekker@csiro.au)

Visualisation and Data Access:

CSIRO is developing a combined bid with IMOS/AODN to create a virtual laboratory for the initiation of modelling projects as part of a relocatable framework, and the delivery of the data in a common format for visualisation and synthesis. This is part of the NECTAR call for proposals. The CSIRO Ocean currents web pages have transitioned to IMOS as part of a long-term delivery strategy. http://imos.aodn.org.au/oceancurrent/index.htm

Carbon Cluster

Wfo has recently been successfully in getting a new CSIRO Collaborative cluster up on Marine and Coastal Carbon Biogeochemistry. The focus of this proposed cluster is the research and delivery of carbon inventory information on sources, speciation, stocks and flows of carbon in Australian marine and coastal environments, and process understanding of changes in carbon cycling resulting from natural and anthropogenic change that can be used to underpin assessment of sequestration potential, ecosystem status and vulnerability.

This collaboration is necessary to assist CSIRO accelerate the development and delivery of marine, climate and ecological information streams based on models that can (i) better evaluate and predict primary productivity1 and its importance to environmental and economic services, (ii) assess the implication of climate induced changes on biogeochemical cycles, including ocean acidification2, and (iii) sequestration options including the application of Blue Carbon3 and other strategies for carbon burial.

This proposed cluster would deliver important inventory and baseline information of carbon cycling in marine ecosystems, and process understanding that would assist WfO to develop and deliver marine coastal modelling services. The Cluster will also assist CSIRO in developing its Earth System Modelling capability and in the development and evaluation of marine and coastal climate adaptations strategies, and the CSIRO Carbon strategy in delivering key inventory information and sequestration options to underpin an Australian Carbon economy.

Details at: http://www.csiro.au/org/Flagship-Cluster-Applications.html

Contact Andy Steven (andy.steven@csiro.au)

Estuarine and nearshore ecosystems – Assessing alternative adaptive management strategies for the management of estuarine and coastal ecosystems

With NARFP funding and a number of collaborators will be developing a guideline of National adaptation strategies for the estuarine environment by drawing together existing information and tools. These will be tested with a few case studies that are selected to represent different estuarine types. Objectives are to:

- Synthesize and integrate all current knowledge, data, tools and processes for the development of a national assessment of impacts and adaptation strategies for management of estuarine and coastal marine ecosystem under climate change.
- Evaluate the key adaptation strategies recognising that there needs to be a process to harmonise adaptation strategies for the public benefit.
- Develop a guideline on developing National adaptation strategies for the estuarine environment.

Contact Cathy Dichmont (cathy.dichmont@csiro.au)

National Estuaries Network	Meeting No. 21 Townsville Australia
	15 Nov, 2011
AGENDA PAPER	National: Geoscience Australia

Compiled by Lynda Radke (NEN Coordinator); Environmental Geoscience Division, Geoscience Australia:

Seabed Mapping and Coastal Management Section

Web address and branding: Minor changes have been made to OzCoasts including more prominent Geoscience Australia branding and changing the web address to a government URL (www.ozcoasts.gov.au).

Victoria Mangrove and Coastal Saltmarsh document: Professor Paul Boon from Victoria University led a large team of researchers from other institutions to just complete the first State-wide assessment of the wetlands that fringe the coast of Victoria. The project was funded by the Strategic Reserve of the National Heritage Trust and ran from 2008 to 2011. The 514 page report examines the diversity of wetland types and plant communities along the Victorian coast and provides analysis of the ecological condition and major threats to coastal wetlands in Victoria. Recommendations in the report include the reservation or purchase of environmental land to support the inland retreat of mangroves and saltmarshes. It also includes the first fine-scale mapping of all current mangrove and saltmarsh wetlands in Victoria. You can now download the report (http://www.ozcoasts.gov.au:/geom_geol/vic/index.jsp). Contact Professor Paul Boon (paul.boon@vu.edu.au).

QLD Conceptual Models. OzCoasts now delivers conceptual models of Mangrove community dynamics, man-made causes of defoliation, dieback and death, natural causes of defoliation, dieback and death for QLD DEEDI (http://www.ozcoasts.gov.au/conceptual_mods/processes/mangrove.jsp). The models were presented by the state representative at the 20th NEN. Contact: Dawn Couchman (dawn.couchman@deedi.qld.gov.au)

NSW products: We are making good progress with the web-development of the Coastal Eutrophication Risk Assessment Tool (CERAT) for the NSW Office of Environment and Heritage, Department of Premier and Cabinet. It is anticipated that the tool will be released in mid-November through the OzCoasts Natural Resource Management module. Updated NSW estuary reports and water and sediment data will also soon be available on line.

TRaCK: Development of the TRaCK-sponsored of the Australian Riverscape Classification Service (AURICL) module is nearly complete. AURICL is a dynamic and flexible system for classifying northern catchments and their rivers based on the similarity, or dissimilarity, of a wide range of parameters.

Contact: Lynda Radke | Lynda.Radke@ga.gov.au | 02 6249 9237

GA has been involved in a mapping project in Darwin Harbour with NRETAS/AIMS using multibeam sonar (GA Simrad EM3002 system). The major aim is to produce a full coverage habitat map for Darwin Harbour (Delivery date is July 2013). The mapping included all of the inner harbour and major arms (~200 km^2). The bathymetry IP is Creative Commons and is available at GA.

Contact: Brendan Brooke | Brendan. Brooke@ga.gov.au | 02 6249 9434

Climate Hazard and Risk Section

In collaboration with the Department of Climate Change and Energy Efficiency, Geoscience Australia has developed a national geomorphic classification scheme for the Australian coastal zone. This has been used to develop a nationally consistent coastal geomorphic dataset by collating and re-classifying more than 60 existing coastal data geomorphic datasets. This dataset will compliment the Smartline (polyline map) of coastal geomorphology for use in coastal vulnerability assessments. The data will be publicly available through the Geoscience Australia portal in 2012.

Following the first pass national coastal vulnerability assessment, Geoscience Australia is conducting detailed vulnerability assessments in south west Western Australia at Mandurah, Bunbury and Busselton. These involve impact assessments of future climate sea level and coastal response, specifically looking at the impact of inundation from storm surge. The studies aim to combine the results of the University of Sydney's Shoreface Translation Model (providing estimates of the potential coastal response to sea level rise) with detailed hydrodynamic storm surge modelling (utilising both ANUGA and GCOM2) to determine the potential areas of inundation.

Contact: Martine Woolf | Martine.Woolf@ga.gov.au | 02 6249 9075 | hazards@ga.gov.au

A National Scale Vulnerability Assessment of Seawater Intrusion Project

The principle aim of the project is to conduct a national-scale coastal aquifer vulnerability assessment and to identify the coastal groundwater resources currently vulnerable to SWI and potentially at risk in the future as a consequence of over-extraction, sea-level rise and/or recharge-discharge variations associated with climate change.

The project has been conducted in three phases: 1. Literature review and baseline assessment; 2. Conceptualisation and vulnerability methodology design; 3. Vulnerability assessment and mapping. The milestone reports for Phases 1 and 2 (described in greater detail in the notes from the 20th NEN meeting) have been delivered for internal purposes, but are not yet publically available

The project team is currently working on Phase 3 of the project, which will offer insight into SWI under various scenarios of groundwater extraction and climate change. The project finishes in May 2012 and the final reports and outputs will be available then

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National Earth Observation Group: Science and Strategy Project

The inaugural meeting of the National Satellite Calibration Working Group being co-chaired by GA and CSIRO is being held on 3 November in Canberra; the meeting will take stock of current

Australian satellite calibration / validation activities, including field instruments, review past experience, and explore synergies with a view to establish a coordinated national plan for satellite calibration / validation in Australia.

Field spectroradiometers: GA maintains two field spectroradiometers that were purchased by the NLWRA. These instruments can be made available for loan subject to a few provisos. One of these provisos is that the data you collect is incorporated into the National Spectral Library. A preliminary page on the National Spectral Library has been set up (http://www.ozcoasts.org.au/nrm_rpt/library.jsp). There were no requests for these instruments since February 2011.

Coastal QUICKBIRD scenes: The NLWRA purchased 83 Coastal QUICKBIRD scenes (covering ~50,000 km^2 of coastal Australia). Chris Auricht has set up a web page to view degraded versions of these images and to provide access to KML files for Google-Earth (http://www.auricht-projects.com/Coasts/index.html) and then follow links to the HTML Quickbird results; or use the direct link as follows: http://www.auricht.servebbs.com/maps/quickbird/?basemap=Google+Hybrid&layers=0TBT. Please let GA/Chris know if your security settings prevent you from viewing these images, or else ask your IT people to clear the site from its suspicious status. The complete images are also now available on a 43GB memory stick at a cost of $280 from the GA sales centre. For more information on acquiring the images (or adding your name to the list) follow this link: http://www.ga.gov.au/earth-observation/accessing-satellite-imagery/ordering/pricing/quickbird-processed-products.html

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