PART 3 GAP ANALYSIS – ESTUARY PLANNING DATA NEEDS

3.1 Tabulated summaries of main issues, data availability, data adequacy and knowledge gaps

The tabulated summary below (Table 6) details the linkages between the issues identified, the data currently available, the quality or adequacy of the data associated with this issue, identified knowledge gaps, and the subsequent recommendation for the Estuary Process Study and/or future phases of the estuary planning process. The issues listed were identified by Kempsey Shire Council and Department of Environment and Climate Change (formerly DIPNR) in the consultants brief and by the community during the March 2006 community meeting and subsequent creek walk and other consultations. This table has been prepared to aid future stages of the estuary management planning process.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Climate data				
None identified. (See Climate Change and Sea Level Rise below).	N/a	Adequate	nil	Update from Bureau of Meteorology as neccessary
Catchment processes				
Contribution of pollutants coming from stormwater?	No data. Kempsey Shire Urban Stormwater Management Plan 2004-2009 (KSC, 2004)	Inadequate.	No data on stormwater discharge volumes or quality is available for Korogoro Creek catchment. Water quality testing of stormwater discharge during high rainfall events and peak holiday periods.	Undertake a specific stormwater study under the Kempsey Shire Urban Stormwater Management Plan to determine issues as current water quality testing regime is unlikely to identify problems specific to stormwater.
What is the estimated nutrient budget for the estuary?	Multiattribute mapping (DIPNR, 1999) NEXSYS and CMSS modelling software. Robyn Tuff & Associates (1998) calculated a nutrient budget based upon the concentration of nutrients in the creek water.	Adequate to derive ballpark figures for Total Nitrogen Load/year and Total Phosphorous Load/year	No nutrient generation rates for landuse types specific to Korogoro Creek Catchment. No suitable information exists for the contribution of benthic sediments to nutrient levels in Korogoro Creek.	Estimate nutrient generation rates by using NEXSYS modelling and apply to CMSS modelling to get ballpark nutrient budget in the Process Study component of the report.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Geology, geomorphology, soils and sediments				
Bank erosion, its location, severity and causes.	Aerial photography available from 1942 onwards.	Adequate to derive channel planform changes over time.	Location and severity of existing bank erosion and erosion control works. Quantitative description of channel changes over time.	Undertake field survey of bank erosion locations and causes as part of the Process Study. Undertake a time series analysis of the location of the creek bank using photogrammetically derived channel locations as part of the Process Study.
Infilling of the estuary with sediment.	Aerial photography available from 1942 onwards. Estuary bathymetry completed in 2005 (DIPNR). Information on likely sedimentation processes inferred from a variety of sources.	Inadequate. Possible to qualitatively describe sediment storage patterns in the estuary over time using aerial photos, but ability to compare quantitatively restricted by the lack of historical bathymetric data.	No specific data relating to sediment infilling rates. Historical bathymetric data.	Describe evidence of change in sedimentation patterns in the process study. Use bathymetry to derive a longitudinal profile to describe current patterns of sedimentation/shoaling in the estuary for the Process Study.
Estuary hydrodynamics				
The importance of tidal flushing on water quality, amenity and ecosystem health; and, *Description of a conceptual model of circulation and flushing*	Tidal gauging survey (MHL, 2005) DIPNR Hydrographic survey (2005) University NSW Water Research Laboratory (in DPWS, 1999) estimated tidal flushing times based on a simplified representation of the creek system and some limited water level measurements.	Adequate. Tidal gauging survey and hydrographic survey provide the basic data needs for determining approximate tidal flushing times.	Detailed information on the stratification and mixing processes in the estuary.	Undertake tidal flushing analysis using available data for Process Study.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
The hydrodynamic effects of flood mitigation.	Aerial photographs showing change in estuary planform post flood mitigation.	Inadequate.	Knowledge of the hydrodynamic processes prior to flood mitigation works.	This issue cannot be resolved in the Process Study.
Describe a conceptual water balance.	Groundwater flows to creek summarised by Turner and Pell (2003, 2004)	Inadequate. Ideally, accurate information on freshwater inflows from the local catchment, flood flows, groundwater inflows, and evaporation losses would be used to determine a water balance.	Korogoro Creek is ungauged and so local catchment inflows will have to be estimated from simple rainfall-runoff relationships. No information is available on the magnitude of flood flows into the estuary. The nearest evaporation data is from the Coffs Harbour meteorological station.	Describe the conceptual balance by using the existing groundwater data and estimating the local catchment inflows (using simple rainfall-runoff relationships), estimating evaporation based on Coffs Harbour, determining flushing outflows, and ignoring the effect of high magnitude short-duration floods.
Entrance behaviour and Management				
What factors affect entrance conditions?	No specific data available but information on processes affecting entrance behaviour synthesised from a number of sources including local knowledge.	Adequate to describe processes.	Investigation of time series aerial photography could reveal more information. Size and style of boating craft using the estuary mouth for deep-water ocean access.	Further investigation not warranted as entrance conditions are rarely a significant issue in Korogoro Creek for smaller craft.
Shoaling in the vicinity of the boat ramp and at the entrance.	No specific data available.	Inadequate.	Regularity of necessary sand removal works.	Issue to be addressed in Estuary Management Study and Plan.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Water quality				
Impacts of dune disposal of treated sewerage effluent on creek water quality.	University NSW (2003,2004) monitored water quality parameters at 4 groundwater sites and 2 surface water sites. UNSW (2006) has undertaken ongoing monitoring of selected water quality parameters at 4 groundwater sites and 1 surface water site twice yearly since 2004 Robyn Tuft and Associates (1999) summarised existing water quality data and predicted the likely effects of sewage treatment and the dune disposal of effluent on the Korogoro Creek system.	Adequate	Physical and chemical testing of surface water quality currently only occurring once every six months which is probably not adequate for determining trends in surface water quality.	Impacts to be discussed in the Process Study section of report.
How does the water quality compare to ANZECC guidelines?	A large body of data collected since 1994 although some collection techniques make comparisons between years problematic for some parameters.	Adequate	Intensive sampling of water quality during drainage of the Swanpool would greatly assist in determining the effect of flood management on Korogoro Creek by quantifying the extent of reduced pH and Dissolved Oxygen and the effects of turbulence resuspending sediment.	Comparisons of existing data to ANZECC standards to be detailed in the Process Study.
What effects is stormwater having on the creek?	No available data. Kempsey Shire Urban Stormwater Management Plan 2004-2009 (KSC, 2004) Prior to sewerage scheme, contribution of faecal coliforms to creek through stormwater carrying septic overflow acknowledged by Robyn Tuff & Associates, 1998 (in DPWS, 1999). Anecdotal reports by residents of pollutants from car and caravan washing in the caravan park and from construction works in the urban area.	Inadequate.	No data on stormwater discharge volumes or quality is available for Korogoro Creek catchment.	Undertake a specific stormwater study under the Kempsey Shire Urban Stormwater Management Plan if water quality monitoring identifies potential issues.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Estuarine ecology				
Where are the major habitats and ecological communities in the estuary?	NSW DPI Fisheries (2006) Aquatic Habitats - GIS dataset. West, R. J. et al. (1985) An Estuarine Inventory for New South Wales, Australia. *Fisheries Bulletin 2*, Department of Agriculture, Sydney. NSW National Parks and Wildlife Service (NPWS) (2006) Hat Head National Park Vegetation Mapping. NSW Dept Planning: SEPP14 Wetlands - GIS dataset. Robyn Tuft and Associates (1999) Water Quality Assessment: Hat Head Sewerage Scheme. For DPWS. In DPWS (1999) Review of Environmental Factors: Hat Head Sewerage Scheme.	Inadequate data specific to Korogoro Estuary, with the exception of NSW DPI Fisheries aquatic habitat mapping dataset. Catchment fauna and flora are reasonably well described.	Data describing the fauna and flora of Korogoro Creek estuary is limited.	Undertake survey of estuarine habitats, and describe estuarine fauna and flora in the Process Study.
What rare, threatened and endangered species occur?	NSW NPWS Wildlife Atlas database Commonwealth Dept Environment: species, habitats and protected areas listed under the Environmental Protection and Biodiversity Conservation Act 1999.	Adequate. Flags potential for species of significance to occur.	Does not indicate actual locations which would need to be identified through detailed survey.	Results of searches listed in Section 2.6. Actual locations of threatened species may be able to be determined in the Estuary Management Study and Plan if resources are available.
How does the estuary rate in terms of ecological health?	No specific data on estuarine health available but information on processes affecting overall health can synthesised from a number of sources reviewed in Sections 2.5 and 2.6.	Adequate.	No definitive system exists for the quantitative assessment of estuarine health.	Assess the health of the system using available physical and biological indicators and report in Process Study.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Distribution of major environmental weeds in the estuary area.	No data available. Anecdotal reports of dumping of garden waste.	Inadequate.	Major weeds and their location and density of infestation.	Field survey of riparian areas with results described in Process Study. Issues of garden waste dumping to be addressed in Estuary Management Study and Plan.
Fish kills after flooding	Anecdotal reports of minor fish kills after flooding.	Inadequate.	Dates of fish kills and factors involved.	Issue to be addressed in Estuary Management Study and Plan. DPI Fisheries input required.
What are the impacts of bait collection from the creek during holiday periods?	No data available. Anecdotal reports of excessive collection and damage to oysters raised at the March 2007 community meeting.	Inadequate.	What species are targeted, the quantity collected and timing of collection, and the effects of collection on their distribution and population status.	Issue to be addressed in Estuary Management Study and Plan. DPI Fisheries input required.
What are the impacts of collection of subtropical fish from the estuary?	No data available. Anecdotal reports of conflicts and potential safety concerns raised during the March 2006 community meeting..	Inadequate.	What species are targeted, the quantity collected and timing of collection, and the effects of collection on their distribution and population status.	Issue to be addressed in Estuary Management Study and Plan. DPI Fisheries input required.
Recreational and cultural use				
Boating access and potential for conflict with other users at the entrance.	No data available. Anecdotal reports of conflicts and potential safety concerns raised during the March 2006 community meeting.	Inadequate.	Potential sources of conflict are apparent particularly during peak holiday seasons, however the problem as not been investigated.	Issue to be addressed in Estuary Management Study and Plan. NSW Maritime input required.

Issue/ Question	Relevant Data Availability	Adequacy to Address Issue	Knowledge Gap	Recommendation
Uncontrolled vehicular access to the southern creek bank damaging vegetation and creek banks.	No data available. Issue raised at March 2006 community meeting and evidence of damage seen on August 2006 creek walk.	Inadequate. Observations only.	No mapping of vehicular access tracks. No data detailing the impact of vehicular access on flora and fauna.	Map location of vehicular access tracks on the southern creek bank below the Hat Head Rd bridge during Process Study. Issue to be addressed in Estuary Management Study and Plan.
Climate change and sea level rise				
Impacts of sea level rise.	Guidelines of responding to the effects of Climate Change in Coastal and Ocean Engineering (Engineers Australia, 2004 update).	Inadequate. Describes potential effects based on current under-standing of science.	Impacts on local catchment and the Korogoro Creek estuary are unquantified. Detailed topographic and land elevation survey (eg. airbourne laser scanning derived elevation data such as LiDAR).	Although potentially a major influence on the catchment and estuarine environment, it is suggested that this issue is more adequately dealt with through a more directed study (for example a Climate Change/Sea Level Rise risk assessment). Potentially reviewed in the Estuary Management Study or Plan.
Community values, expectations and issues				
What are the main issues for the estuary from the community's perspective?	Issues list generated at the March 2006 community meeting. Issues raised during the August 2006 creek walk with the Korogoro Creek Estuary Planning Working Group	Inadequate.	The range of community views on the issues affecting the creek and its management has not been adequately canvassed.	Undertake a community survey as part of the Process Study to improve the understanding of the issues from the community perspective.

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