

KARRATHA COASTAL VULNERABILITY STUDY

AUGUST 2012

SUMMARY OF FINDINGS

The Karratha Coastal Vulnerability Study, August 2012 was commissioned by LandCorp to determine the areas that are prone to inundation in Karratha to assist with land use planning.

The Study was undertaken by a team of consultants comprising JDA Consultant Hydrologists, Global Environmental Modelling Systems, Damara WA Pty Ltd, Coastal Zone Management and DHI Water & Environment and received technical guidance from the Departments of Water and Transport.

The Study is not a statutory document. However, its findings will be considered by statutory agencies in assessing future development proposals under the Shire of Roebourne's Town Planning Scheme and the Western Australian Planning Commission's State Planning Policy 2.6.

The Study is presently going through final stages of approval for public release. Data from the Karratha Coastal Vulnerability Study is already being used by the Department of Water in its Advisory Notices.

The Karratha Coastal Vulnerability Study looked at three time periods – current (2010), and then 50 years (2060) and 100 years (2110) from present. The Study involved five components:

- I. Climate Change Drivers and Projections (Coastal Zone Management)
- II. Hydrological Assessment (JDA Consultant Hydrologists)
- III. Coastal Movement Study (Damara WA)
- IV. Storm Surge and Coastal Inundation (GEMS)
- V. Hydraulic Modelling (JDA Consultant Hydrologists)

These components have been integrated to provide a comprehensive assessment of the flooding and shoreline stability in the Karratha Study Area.

The Climate Change component was used to identify projected changes in climate for the 2060 and 2110 scenarios. The impact of these changes would then be assessed by the other study components.

The Coastal Movement component utilises the storm surge and coastal conditions to assess movement of the coastline, and how this will change with the change in climate. This component feeds into the Storm Surge component.

The Storm Surge and Hydraulic Modelling components model flooding behaviour as result of cyclonic activity and terrestrial rain runoff respectively, with the Hydraulic Modelling being informed by the Hydrological Assessment for catchments outside of the Study Area.

The Study draws the following conclusions:

Climate Change

- The projected climate conditions for 2060 included a 0.3m rise in sea level, 10% increase in intensity and frequency of cyclones and a 0 to 20% increase in rainfall intensity for events great than 20yr ARI.
- The projected climate conditions for 2110 included a 0.9m rise in sea level, 10% increase in intensity and frequency of cyclones and a 10 to 30% increase in rainfall intensity for events great than 20yr ARI.

Coastal Movement

- Shoreline projections indicated that tidal creeks west of the Karratha townsite will continue to expand, with acceleration of the process as a result of sea level change. Sea level change will also result in increased sediment transport and destabilisation of the fringing mangroves. With the destabilisation of the mangroves and increased sediment transport, there is insufficient material storage within the dune adjacent to the airport, resulting in a risk that the dune will be breached by overtopping during a storm surge event.
- The Karratha townsite is landward of a high, largely continuous coastal dune that provides some protection to inundation. With sea level rise, the tidal flat fronting the dune system will progressively experience inundation, with formation of a tidal creek network and then formation of a coastal lagoon behind the coastal dune. As sea level increases, erosion of the coastal dune will occur, decreasing the level of protection provided by the dune.
- The eastern Karratha area (east of the golf course) has a narrow fringe of mangroves, fronting a thin sandy foreshore and backed by a rocky hinterland. The change in sea level will result in the loss of the mangroves however the rocky structure provides a significant constraint to potential shoreline movement, and this stable configuration results in minimal coastline changes through this area.
- The Nickol River Delta east of the townsite will be subjected to increased inundation under rising sea level conditions.
- Wave run-up has been estimated to be between 0.1 and 0.3 m adjacent to Karratha Townsite, occurring within the floodplain areas under existing conditions, based on application of site specific factors using standard empirical methods. Wave run-up levels are likely to increase if development of the floodplain areas are filled and incorporate steep batter slopes.

Flood Mapping 2010

- Flood mapping was produced by combining the 100yr ARI storm surge modelling results with the 100yr ARI terrestrial runoff hydraulic modelling.
- The flood modelling shows that almost all existing development in Karratha is protected from the 100yr ARI flood event. The only areas which will be affected are properties along Balmoral Rd between Gawthorne Drive and Warambie Rd, which are subject to some inundation as a result of storm surge.
- Within the Karratha townsite, flood flows are generally kept within the drainage channels and on roads.
- All of the creek crossings on North West Coastal Highway are subject to inundation. Many of these crossings are floodways, and so some inundation is expected after any significant rainfall event.
- The four NWCH crossings with bridge structures (Turnoff Creek, Lulu Creek, Hilux Creek and Nickol River) convey flow in the 2yr and 10yr events without overtopping of the roadway, however in the 100yr ARI and greater events, these structures are breached, with greater than 400 m of roadway inundation occurring at each creek crossing.
- The NWCH crossings which have culverts at creek lines as well as floodways have a low level of service, with some overtopping even in the 2yr ARI event.
- The Dampier Rd crossing of 7 Mile Creek can convey the 2yr and 10yr ARI flow with no overtopping. In the 100yr ARI event, some overtopping of the western approach

occurs to a shallow depth (<0.2 m) for a short length (<100 m). In the 200yr ARI, greater overtopping of the bridge and approaches occurs.

- The Dampier Rd crossing of Madigan Creek shows overtopping of the floodway to the immediate west of the creek line. The mapping also shows some flow westward along Dampier Rd to 7 Mile Creek.
- The eastern tributaries of 7 Mile Creek show a wide extent of flooding (up to 1 km in places) however most of this flooding is less than 0.25 m depth.
- The developments on the eastern and western banks of 7 Mile Creek upstream of Dampier Rd are both above the 100yr ARI flood level.
- The Karratha LIA area is protected from flooding for the 100yr ARI event, although Coolawanyah Rd is inundated for several hundred metres at the creek crossing.
- West of Karratha Rd, the Nickol River tributary has a flow width of up to 500 m and depths of up to 1 m. Significant areas of the upper catchment for this tributary are subject to inundation, although flood depth is generally less than 0.25 m.

The Storm Surge and Hydraulic Modelling components model flooding behaviour as result of cyclonic activity and terrestrial rain runoff respectively, with the Hydraulic Modelling being informed by the Hydrological Assessment for catchments outside of the Study Area.

Flood Mapping 2060

- Over the next 50 years, it is estimated that rainfall intensities may increase by up to 20%, that sea level will rise by 0.3 m and that cyclone intensity and frequency will increase by 10%. As this will increase the volume of water impacting on the Study Area, it is not unexpected that flood levels will rise.
- Flood modelling indicates that flood levels will rise by up to 0.5 m, with an average of 0.2 m rise across all tag points. However there is only a small increase in areas affected by flooding, with these mainly along the coast.
- The increased storm surge levels result in a small increase in the townsite subjected to inundation. An area of land between Searipple Rd and the golf course that was previously dry in the 100yr ARI is now inundated.
- Within the riverine catchments, the increase in flood levels is generally less than 0.2 m, with increases of 0.3 m in the larger catchments at downstream locations.
- Increased flood levels result in a greater degree of inundation at floodways and other channel crossings. The Dampier Rd crossing of 7 Mile Creek now has overtopping of a long section of bridge and approaches due to an upstream increase of 0.3 m in 100yr ARI level.

Flood Mapping 2110

- Over the next 100 years, it is estimated that rainfall intensities may increase by up to 30%, that sea level will rise by 0.9 m and that cyclone intensity and frequency will increase by 10%. This further increase in the volume of water will have a greater impact than the 2060 climate scenario.
- Flood modelling indicates that 100yr ARI flood levels will rise by up to 1.9 m compared to 2010 in some locations, with an average of 0.5 m rise across all tag points. Again, coastal locations show the greatest increases in levels.
- Within the townsite, more properties adjacent to Balmoral Rd will be affected by storm surge, with properties along Searipple Rd also affected.
- Developments at the western end of Karratha will not be affected by flooding from 7 Mile or Madigan Creeks.
- The Karratha LIA is also not affected by flooding from the adjacent creek networks.
- The western bank of 7 Mile Creek is subject to increased inundation, particularly downstream of Dampier Rd, where a further width of approximately 1 km is inundated compared to the 2010 scenario.

- Within the riverine catchments, the increase in flood levels from 2010 is generally less than 0.4 m, with increases of 0.5 m in the larger catchments at downstream locations.
- Increased flood levels result in a greater degree of inundation at floodways and other channel crossings. The Dampier Rd crossing of 7 Mile Creek has increased overtopping of a long section of bridge and approaches due to an upstream increase of 0.4 m in 100yr ARI level compared to 2010.

Karratha residents may obtain information about whether or not their property may be affected by storm surge or overland flooding, based on information from the study, from the Department of Water.

This detail may be provided by the Department of Water or certified by a qualified and suitably indemnified engineer to the satisfaction of the Shire of Roebourne. For access to this localized assessment, contact the Department of Water, Engineer, Floodplain Management on Telephone: (08) 6364 7413

Extracts from KCVS
Manager Planning Services
Shire of Roebourne
15 October 2012