

Coastal/Foreshore Works for Remote Townships Australia Wide Specifically ONSLow, Western Australia.

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ABSTRACT: *Managing the Coastal/Foreshore Infrastructure including capital expenditure, long term programmed improvements, expansion, ongoing maintenance, new and advanced technology including materials and construction methods, specifically for Onslow within the Shire of Ashburton, North Western Australia.*

However, this could relate to many similar populated locations large and small on the coastline not just the West, such as the Gold Coast, Bundaberg, Bargara, Agnes Waters, and 1770, to name but a few within a stretch of 600km of South East Queensland. Each state could furnish numerous locations with differing degrees of complexity.

Long term forward planning closely linked to future Shire budgets set the overall parameters for the infrastructure. It will have to include for the unknown factors such as Climate Change including the rise in sea levels which can be seen worldwide, extreme weather events such as Cyclonic Activity and Storm Surges which are common in our Region, earthquakes and related Tsunami occurrences. As a resultant of this the Shire of Ashburton's Emergency Management Plans which include tropical cyclones, bush fires, flooding and the opposite end of the scale drought are constantly be reviewed and updated.

KEYWORDS: storm water infrastructure, overland flow, storm surge flood modelling, coastal protection, coastal hazard, risk management, emergency management, cost benefit analysis, flood mitigation projects, cultural and heritage considerations, local significant industry developments.

1 Introduction

It is best to start with the basics. Where is Onslow? It is approximately 1500 kilometres North of Perth in the Shire of Ashburton and it serves communities across a vast region in the Pilbara. Which includes the towns of Tom Price, Paraburdoo, Pannawonica (A closed Town) and of course Onslow This area is known for mining, oil and gas, agriculture, fishing, pearling and tourism. It is nearly half the size of Victoria at 105,647 square kilometres and is known for the rugged ancient, arid tropical landscape and some of the worlds largest open cut mines, cattle stations and pastoral leases.

The region has in excess of 10,000 residents and only 850 permanently reside in the coastal town of Onslow. It also has an interesting history as the town has literally moved or relocated back in 1925 from the original settlement close to the mouth of the Ashburton River to its present location on the shore of

North facing Beadon Bay between the Ashburton to the South and the Cane River to

the North. Onslow is a growing hub of the Coral Coast which also includes a solar salt mine, offshore oil and gas works.

Off the coast is the system of islands called the Montebello Islands made up of around 174 small islands and they are famous for their unique shape and the nuclear testing that the British undertook in the 1950's. It does sound a bit like a tourism advert for the region.

However, it is worth setting the scene to give an overview of the Onslow coast and its relevant factors that can contribute to the required coastal and foreshore works that will have to be an inclusive part of the necessary process now and in the future.

Other important factors will be briefly addressed such as the low-lying siting and topographical nature of the township, the existing coastal structures, waterways,

significant developments and of course the ever-increasing relevance of climate change impacts or influence on the overall process.

2 Site Assessment & Development Factors

Ever since this area of the Pilbara gained momentum in mining, oil and gas exploration, production, distribution on and offshore, and the subsequent development of all the associated industries that are a necessity to ensure the continuing work and future development infrastructure had to keep pace.

There have been several changes to the serving local authorities, which has had an impact, these include the Shire of East Pilbara, Pilbara Regional Council to name just two that cover what is now under the jurisdiction of the Shire of Ashburton.

Because of this massive long term and ongoing investment in the Region there has been a correspondingly large increase in infrastructure spending to satisfy all stakeholders no matter how large or small.

With this investment comes with it the need to protect and achieve the best planned outcome for asset maintenance, projected life expectancy and full utilisation of said assets.

Asset management was in its infancy when this Region developed and within the Shire of Ashburton the process is well under way to meet current essential standards.

Over the past eight to ten years surveys reports and data collection has been undertaken to accurately provide a clear and definitive assessment of the Coastal Region. Due to the Onslow Township bearing, basically Northern facing this can and does leave the coastline open to unusual events. This can include Tropical cyclones, low pressure inundation, seasonal tidal surges, wave and wind events, storm surges and even Tsunami events from the Indian Ocean.

All these issues can lead to serious coastal erosion and changes in the shoreline that have a dramatic effect on the Onslow itself and any major construction/development in the area.

Consideration must also be given to the likely impact of storm water and overland flow in and around the town. As previously mentioned, this area can have significant rainfall on occasions along with extreme temperatures, (Figure 1) is an example of the years data recorded monthly for temperature/rainfall.

Outside of these events there is very little rain recorded and combined with the normal high temperatures it would be safe to say we are in drought for a large period of the year.

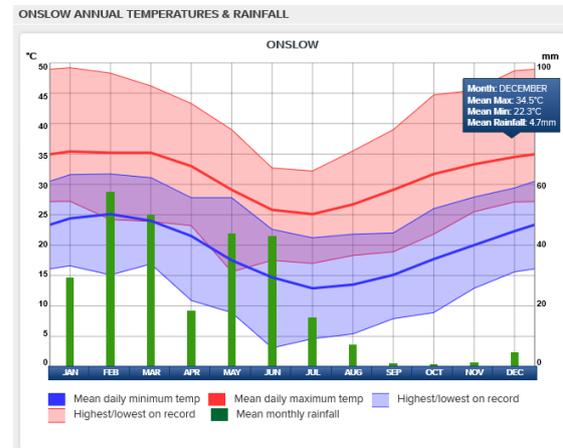


Figure 1: Temperature & rainfall data

Another consideration is of course the likely impacts of Climate Change especially in relation to increased tidal levels and the raising of overall sea levels.

WaterCorp provide potable water from the Cane River and is distributed to the town from two large reinforced concrete storage tanks on the outskirts. Also, they have a water treatment plant adjacent to the Rodeo Grounds. These are all important essential assets that are vital to the area.

Another vital utility Horizon Power undertook a project to replace all the above ground assets and install underground power to the whole town as well as offering a solar option for homes which they are planning to roll out very shortly. This came with a new power generating plant (Gas) again out of town with the required sub-stations for a vastly improved more reliable level of service.

Waste management is also a factor currently the shire has a waste transfer station close to town and this product is then transferred to a landfill site in Tom Price 490 kilometres away.

Another major project for the Shire of Ashburton is the development of a Class IV Waste Management Facility that is planned to service the region and will be located 42 kilometres from Onslow, and this will prove to be an invaluable asset to the Shire once constructed and fully operational.

To start with, the waste from offshore projects will be transported through Onslow via the Marine Supply Base and neighbouring Beadon

Creek facilities. The general waste for the region will also be processed and disposed of in this new waste management facility.

Reports that have provided information for producing a realistic Coastal and Foreshore Maintenance and Construction Program are as follows:

- Onslow Townsite Strategy Background Report January 2010
- Onslow Coastal Hazard Report 2011
- Pilbara Regional Water Plan 2010-2030
- Drainage Assessment August 2010
- Drainage Infrastructure Assessment December 2015
- Coastal Hazard Risk Management & Adaption Plan July 2017 (CHRMAP)
- Various topographical, feature and LIDAR surveys (Light imaging, detection and ranging method {3D Scanning})
- Seawall condition report July 2017
- Sand Migration Study March 2019
- Ashburton Sediment Dynamic Study
- Coastline Dynamics, Coastal Infrastructure Impacts, & Future Erosion Hotspots along the Ashburton Coast Report

All these studies and reports have and will be assessed now, and in the future to produce plans for maintenance works and major improvement programs. This includes coverage of the town's storm water network, detention basins including review and redesign, ocean outfalls, general coastal works and general access to these networks.

The actual coastal seawall and access for pedestrians and vessels have had to be upgraded over recent years, there is also more to be done.

It has now come to the point for upgrading and extending the existing seawall to protect the noted vulnerable assets including the Memorial Park incorporating the Onslow sculptured War Memorial, along with the Ocean View Caravan Park, as well as Bindi Bindi one of the local Aboriginal Community housing developments on the foreshore.

Also, further from the main town centre area is the upgraded Onslow Airport including the terminal building, fixed wing and rotary hangar, solar and fuel farms.

Significant developments such as Wheatstone (Chevron/Woodside), Macedon Gas Plant, Tubridgi Gas Plant, Onslow Salt Mining and Munderoo Station agricultural enterprises have in their own way had a significant effect on the Onslow Area.

Another project that has to be assessed is the placement of dredged material from deep water channel works in Beadon Creek to an area for land reclamation in close proximity to the Onslow Airport, some 1.1million cubic metres of material to be placed to height not exceeding 5.00m above existing ground levels.

Each of these developments have produced flood modelling and impact assessments individually, however without combing these together, it makes it extremely difficult to provide a complete an all en-compassing strategy.

During this period of assessment numerous government departments, statutory authorities, agencies and consultants have been involved some are listed here Department of Water, DMIRS, EPA Cardno WA Pty Ltd, GHD, Taylor Burrell Barnett, Land Surveys, Airborne RGB Imagery Cleanflow Environmental Solutions and the University of Western Australia.

The Shire of Ashburton is looking at a more holistic approach to obtain the best overall long-term outcome that will serve the region for decades to come.

A major issue found after a significant rain event was that the existing stormwater infrastructure was not coping the flows and was backing up within the network. Earlier this year a contractor (Cleanflow Environmental Solutions) undertook a thorough CCTV survey and in conjunction with this jetting and clearing all the pipelines, chambers and gullies and other components.

The result was extremely pleasing as it clearly showed the areas requiring attention including maintenance repairs, replacement, upgrades including re-lining and possible catastrophic failure due to parts of the aging network.

It also identified several sites where the asset, in all cases reinforced concrete pipes that have been seriously compromised by horizontal drilling/boring by contractors installing utility conduits. These locations have been identified as needing urgent repair works to ensure the

asset does not fail. All cases require the conduits to be lowered and the section of pipe affected will require lining.

3 Planned and Emergency Maintenance Ongoing

Northerly facing bays such as Beadon Bay are prone to direct impact of extreme cyclonic events. Onslow does have some limited protection from the Montebello Islands. However, it is still vulnerable especially with high tides and if you combine these with a storm surge during the season (October – April) anything could happen. I would reference the last event named Cyclone Vance in 1999.

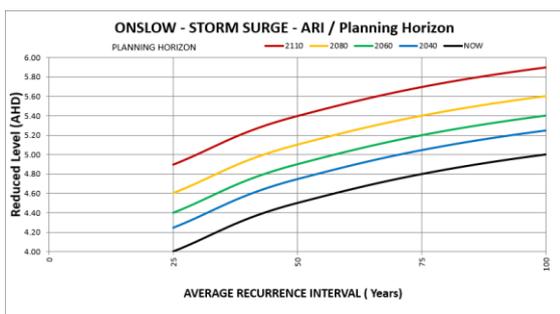


Figure 2: Average Occurrence Interval & Reduced Level (Australian Height Datum)

From this figure and looking at the statistical analysis, it identifies an expected, future event without a definitive timeframe.

Each approaching cyclone season the Shire undertakes a program of tasks that will assist in the protection of the town itself, such as clearing and removing debris from stormwater structures and open channels, tree works including the removal of overhanging branches and the removal of trees that could be hazardous in high winds. Onslow has a network of three detention basins that are inspected and any emergency remedial works are carried out such as excessive silt build up removed, vegetation removed and any waste items disposed of so as not to impede the clear and unencumbered passage of storm or floodwater to the ocean outfalls. Removal of the general build-up of detritus material on roads and footpaths and any sand blows that may have formed and are common in this area.

Because this is predicted, a comprehensive "Emergency Management Plan has been developed and is constantly being reviewed and updated. This includes an Emergency

Management Cyclone Support Group (ISG). Its aim is to ensure an informed decision as to when the first cyclone alert is initiated and which alert status is announced, when necessary using all available information from the Bureau of Meteorology (BoM) an local sources (Chevron, Onslow Salt), Department of Fire & Emergency Services (DFES) including the Police and this coordinated through the Regional Operations Centre covering the West Pilbara Coast, this location can vary, Karratha, Carnarvon and Broome depending on the Cyclone or events likely course. The use of teleconferencing is an essential tool and is regularly actioned at set agreed timetable.

Onslow prepares the normal range of measure including sandbags, all available pumps and hired pumps, barricades and warning signs. All known locations are set up as the Blue alert is raised. All assets and associated equipment will be securely tied down including shade sails and shade shelters that can be dismantled are and secured to ensure no damage can occur, caravans and cabins at the Onslow tourist parks and facilities are also made secure. This type of scrutiny would include any construction sites in progress within the Shire Boundaries.

The existing coastal seawall that protects Onslow from a direct line of impact that currently runs for 1050m from the storm water ocean outlet to the Memorial Park is checked and any areas that may be seen to be vulnerable will be protected using sandbags or shoring. Other general public assets such as the school, swimming pool, waste transfer station and Airport will be ready to close on Yellow alert.

Once Red Alert is reached this is the time no action is required. Stay indoors and be safe. All that can be done has been done in accordance with Cyclone Emergency Management Plan.

Once an event and danger has passed, all clear with caution is actioned and the Local Recovery Plan for the area starts. Ensuring the short and or long-term recovery strategies are implemented without delay.

As the town of Onslow develops, the pre-cyclone maintenance plan also expands to cover these relevant changes. The Shire adapts to meet its obligations to protect and maintain services. Some instances of

improvements have made this a lot easier as can be seen with the completion of the underground power project completed in late 2017 prior to that years' cyclone season. Resulting in the removal of the potential hazard of fallen power lines in the town area.

A truly progressive and great result for general safety, although this does not guarantee power supply will not be disrupted due to flooding from any potential cyclonic event.

Another hazard that should be of concern is an environmental health issue is Mosquito management which becomes a serious consideration in the coastal areas subject to likely inundation and any areas that will hold water which more than likely become breeding sites. Areas like this are to be treated prior to the season and on a regular basis to keep this environmental and health risk mitigated.

General public notifications are also to be implemented and site-specific signage is installed. New technology options such as blue tooth remote controlled multi-message signs are being trialled and are planned to be installed throughout the Shire in the very near future, if found to be successful.

4 Budget and Forecast Expenditure

This will be a contentious process as most projects of this nature will be costly and need considerable forward planning. It is the job of a progressive Council together with staff to make the hard choices to identify and set the standards that can be met.

Reference to asset management systems do help set the main funding parameters. In our Shire we set a standard 10-year forward program. Reporting to a full Council meeting for example, under capital expenditure this financial year \$500K has been allocated for stormwater drainage renewals and upgrades, also \$400K for the extension of the seawall. Other essential maintenance works on the existing assets will be funded from operational expenditure which currently is set between \$100 - \$200K. This will also cover related investigation works, which become essential tools to assist in this process of allocation of suitable funds. We could always say there is never enough to complete the work required. Additional funding is often on offer to assist with some of our planned projects especially in relation to coastal and foreshore works.

Each of the main townships have a set allocated budget similarly. It is often a juggling act to set the required expenditure to the needs. Flexibility is the key to achieving the best results.

5 Conclusion and the Way Forward

Due to the topographical nature of Onslow itself the Shire will have to accept a relatively pessimistic view that we can only attempt to successfully cater for a 1 in 25 flood events. Combine that with the likely and expected rise in sea levels in the coming years this may be even be less than that.

Financial constraints will have a bearing on this result. Do we try to flood proof the whole township encompassing all the existing facilities which will extend approximately 45 kms from the existing town location? This would have to be like what has been constructed as coastal protection in parts of Europe specifically the Netherlands which includes the areas of reclaimed land.

To achieve something similar here would require an enormous injection of investment capital now and in the long-term future. We can only work with what funds are available and what will likely become available in the future.

Other processes are currently in place or are being implemented and developed which include planning restrictions and standards to restrict possible flood damage by setting new acceptable build areas and design levels.

Emergency cyclone and or flood management plans which include general public safety and care firstly then all possible asset protection are constantly being fine-tuned using all available resources. This will always be a constantly improving/developing process to best serve towns like Onslow.

We endeavour to do the best we can, to protect Onslow with the finances and resources available. Planning will be critical to achieve these results and will need to be constantly assessed

Experience and knowledge local, Australia and even World-wide will be utilised to obtain the best result possible moving forward. This is a task we are all working towards and is a challenge we are keen to accept.

THANK YOU FOR LISTENING, WE HAVE TIME FOR SOME QUESTIONS.

6 PowerPoint Presentation

Slide presentation matched to paragraphs.

Acknowledgements

- Shire of Ashburton
- Cardno
- GHD
- University of Western Australia
- Cleanflow Environmental Services (Perth)
- NTC Contracting (Onslow)

References

- Onslow Town Site Strategy Background Report January 2010
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- Sand Migration Study March 2019
- Ashburton Sediment Dynamic Study (UWA)
- Coastline Dynamics, Coastal Infrastructure Impacts, & Future Erosion Hotspots along the Ashburton Coast Report (UWA)
- IPWEA Practice Notes – Infrastructure, referencing climate Change.