Coastal Flood Mapping Viewer

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Using the Coastal Flood Mapping Viewer

How do I use the tool?

On the Coastal Flood Mapping Viewer landing page you will find a link to the Quick Start Guide, which provides guidance and information on how to best use the tool. This information includes the following topics:

- Viewer layout
- Navigating around the system
- Selecting a base map (e.g., topographic, street map or imagery options are available)
- Layer list panel (where you can turn on of the various layers of information to suit your needs)
- Transparency slider
- Address and location search
- Property information

I am having problems with using the viewer

If you experience any functional problems in the use of the Coastal Flood Mapping Viewer, please refer to the Quick Start Guide provided on the site in the first instance, as this may provide the answers that you need. If your problems still persist, then email the coastal flood mapping support team at DEW.OnlineMapping@sa.gov.au who will be able to assist you.

What are the limitations of this mapping?

This coastal flood mapping has limitations which users need to be aware of. Importantly, there is no allowance in the flood mapping for:

- Existing or proposed barriers (e.g. sea walls, levees, etc.);
- Hydraulic flow restrictions, such as the width and depth of channel flow paths for flooding (i.e. can enough sea water flow through a restriction to fill the low lying area during the duration of the storm surge event);
- Coastal erosion hazard;
- Future changes to the landform, through uplifting or movement of tectonic plates or through the installation of man-made structures since the original LiDAR was captured;
- Coincident flood risk from inland (e.g. rainfall or river) sources and
- Inland coastal areas of South Australia may exist beyond the extent captured through the LiDAR, so any land further in-land will not show in the scenarios.

Development of the Coastal Flood Mapping Viewer

Why is coastal flood mapping of sea level rise important?

Sea-level rise is a major risk for many coastal areas of South Australia. Sea level rise is projected to accelerate over the next century and beyond, increasing flood risk to many coastal areas of South Australia.

The Climate Council of Australia released the *Counting the Costs: Climate Change and Coastal Flooding* (Steffen, Hunter, Hughes) report in 2014, which indicated that a sea-level rise of 1.1 metres could equate to between $22.6 to $28.2 billion damage to commercial and light industrial infrastructure in South Australia.

Decision-makers (both public and private sector), faced with the problem of adapting to sea-level rise, will need appropriate information to make informed decisions.

Governments and the private sector are also facing increasing pressure to provide evidence of sea-level rise considerations in development applications and to meet changing insurance requirements.

Individuals and communities are concerned about the impacts of climate change, including sea level rise, on their properties and local environments. The coastal flood mapping viewer provides information about sea flood risk for all interested stakeholders in the regions where data is available.

History of the Coastal Flood mapping Viewer

In August 2020, a Coastal Flood Mapping Viewer (CFMV) was developed by the Department for Environment and Water (DEW) in partnership with the Eyre Peninsula Landscape Board and the Eyre Peninsula and Limestone Coast Local Government Associations (EPLGA and LCLGA). It was developed out of a recognised need for coastal flood information to support adaptation planning for local and state government. The interactive coastal flood mapping tool aims to provide a visual representation of areas at risk of sea flood inundation.

The Coast Protection Board works closely with local governments and Landscape Boards to improve their coastal decision making and planning processes to protect and adapt their communities against coastal hazards including flooding and erosion. At the time of the initial release, the CFMV only included flood hazard data for the Limestone Coast and Eyre Peninsula coastal areas. Since the initial release of the CFMV, the Coast Protection Board has expanded the project to include new and updated data covering most of the state which has now been uploaded to the viewer. Since the initial release of the CFMV, the Coast Protection Board has expanded the project to include new and updated data covering most of the state which has now been uploaded to the viewer.

The following work has been undertaken across most of the state:

- LiDAR acquisition of the coastline (see "What is LiDAR?", below)
- Development of coastal flood mapping (six sea level scenarios);
- Interactive visualisation tool (the coastal flood mapping viewer);
- Engagement across industry, local government, and community to encourage adaptation and mitigation planning; and
- Education and awareness programs with coastal community on coastal hazard risks associated with climate change and adaptation options against sea level rise.

The updated CFMV now shows the areas of coastline across most of South Australia that are vulnerable to flooding due to sea level rise and storm surge using 'bathtub' modelling (see "What is 'bathtub' modelling?".

What is LiDAR?

LiDAR stands for Light Detection and Ranging, which is a remote sensing method used to examine the surface of the Earth, providing high resolution topographic mapping using laser reflections of ground and other surfaces. The vertical accuracy of the LiDAR used for the coastal flood mapping project was +/- 15cm. LiDAR data supports activities such as flood and storm surge modelling, hydrodynamic modelling, shoreline mapping, emergency response, hydrographic surveying, and coastal vulnerability analysis.

What is 'bathtub' modelling?

'Bathtub' modelling is a common method for identifying areas potentially at risk from coastal flooding. It is a simple method that identifies any land below a certain sea level height is at risk of flooding, like pouring water into a bathtub or bucket. Bathtub flood modelling is a relatively quick and cheap method of identifying potential flood risk at a large or regional scale and is therefore best suited to broad-scale, preliminary risk identification as a basis for further, finer-scaled investigations and modelling to support adaptation planning.

What other types of flood modelling could be used?

There are numerous different models that can predict coastal flood risk and can also include erosion risk, e.g., process based numerical models. Most of these are complex and are used at a local scale where preliminary risk assessment (e.g., bathtub modelling) has identified a particular flood risk or area of high value infrastructure. A complex hydrodynamic model is currently being developed to provide a more detailed assessment of the coastal flood risk of the Port Adelaide Enfield council area due to the high flood risk and high value infrastructure previously identified in that location. It is not practical to undertake this type of complex flood model over a large area due to the cost and data requirements.

How is Mean High Water Springs calculated?

Mean High Water Springs (MHWS) is the long-term mean of the heights of 2 successive high waters during those periods of 24 hours (approximately once a fortnight) when the range of tide is greatest, during full and new moon. MHWS levels were prepared based on analysis of tide gauge records at locations where sufficient historical tide data exists. This data is collected and managed by the Bureau of Meteorology, who have established tide data records and statistics for ports across South Australia. These values change along the coast, so the study area has been divided into 62 coastal cells, and values for MHWS have been interpolated for the sections between recording stations.

How is storm surge height calculated?

In our coastal flood mapping, storm surge height is calculated by combining components that contribute to the rise in water levels during storm events. These may include:

1. Tide Height (Astronomical Tide): This is the baseline water level, influenced by the gravitational effects of the moon and sun.

2. Wave Setup: This component refers to the water level rise under the influence of storm winds. Wind-driven waves pile water against the shore, increasing the water level above the normal tide. This phenomenon is crucial in understanding the total water level during storms.

3. Wave Runup: Not included in our standard model, wave runup represents the maximum excursion of the water up the beach or structure as waves break. It includes the additional height over the still-water level that a wave reaches as it runs up the beach.

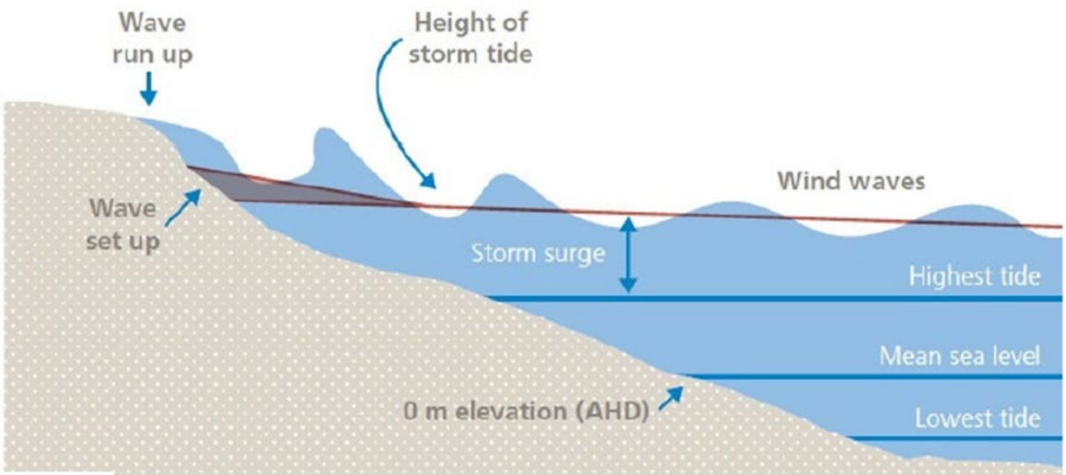

Figure 1 The components of storm surge which use the highest astronomical tide as the starting point for calculating storm surge heights and impacts (Source: CoastAdapt.com.au)

Understanding how storm surge height is calculated can gauge the potential flood risks during storm events more accurately. It also provides insight into why different mapping outputs may show varying extents of flood risk, depending on the components included in their storm surge calculations.

What is a 1% AEP storm surge event?

For long term planning, development, and engineering projects, it is normal to consider the likelihood of extreme events, expressed in terms of AEP (i.e., the probability of an event of a certain size occurring in any one year). AEP or Annual Exceedance Probability is the probability of a certain sized storm surge event occurring.

A 1% AEP storm surge event has a one in one hundred chance of occurring in any given year and has the same chance of occurring each year. While the likelihood of an event occurring in any one year is low, the risk increases over time. For example, while a 1% AEP event has a 1% chance of occurring in any one year, it has a 10% chance of occurring in any 10-year period. The one percent AEP levels used in the project include the storm surge and wave setup estimates but do not include wave runup.

What is meant by the term 'no flow path'?

The coastal flood mapping differentiates between low lying areas that are connected to the sea or coastal waters and are therefore at present risk of coastal flooding, and low-lying areas that have a barrier (e.g. levee bank, sand dune, etc) blocking the flow path of the coastal waters and preventing coastal flooding. If these barriers were removed or modified, for example by coastal erosion or manual earthworks, the low-lying areas may be at risk of coastal flooding.

What coastal flood models have been completed and included in the coastal mapping viewer?

Bathtub modelling has been undertaken over most of the coastal areas of the state. There is currently no coastal flood mapping for the area west of Fowlers Bay or between Victor Harbour and Kingston SE. The coastal flood hazard for the

Port Adelaide area is currently being investigated through a separate project using a different model and will be added in the coming months.
The bathtub modelling utilised the recently acquired LiDAR DEMs, to map areas vulnerable to flooding for six sea level scenarios:

1. 2020: 2020 mean high water spring tide level.
2. 2050: 2020 mean high water spring tide level + 30 cm sea level rise allowance.
3. 2100: 2020 mean high water spring tide level + 1 m sea level rise allowance.
4. 2020: 2020 1% AEP storm surge.
5. 2050: 2020 1% AEP storm surge + 30 cm sea level rise allowance.
6. 2100: 2020 1% AEP storm surge + 1 m sea level rise allowance.

Scenarios 1, 2, and 3 represent water levels that would regularly occur at high tides for the current (2020 baseline) level as well as the two sea level rise projections (2050 and 2100 respectively). The data for the mean highwater spring (MHWS), was derived from the Tide Tables for South Australian Ports.

Scenarios 4, 5 and 6 represent a one percent annual exceedance probability (AEP) storm surge event with the current (baseline) level including wave setup (but not wave runup) as well as two sea level rise projections. The 1% AEP water level heights were obtained from a database of storm surge estimates for all coastal locations in the state held by the department.

How was the Mean High Water Springs and storm surge information prepared?

The Mean High Water Spring (MHWS) levels were prepared based on analysis of tide gauge records at locations where sufficient historical tide data exists. This data is collected and managed by the Bureau of Meteorology, who have established tide data records and statistics for ports across South Australia.

MHWS levels were then interpolated for sections of coastline between the SA port recording stations. These values change along the coast and the study area has been divided into 62 sub-areas across the state, each representing particular MHWS and one percent AEP storm surge/set up values.

For long term planning, development and engineering projects, it is normal to consider the likelihood of extreme events, expressed in terms of AEP (i.e. the probability of an event of a certain size occurring in any one year). The one percent AEP storm surge event used for this project has a one percent chance of occurring in any one year. The one percent AEP levels used in the project include the storm surge and wave setup estimates but do not include wave runup.

Further information

How do I access the LiDAR, if I want someone to do more in-depth modelling and hazard mapping?

The LiDAR data is stored and available publicly for download on the Geoscience Australia ELVIS Platform.

Where can I find more information in regard to coastal management and developments in SA?

If you are interested in finding out more regarding coastal management in SA, there are a range of resources, information and tools freely available on the internet.

The Coasts section on the Department for Environment and Water website has a range of coastal management information including:

- Protecting our coastal environment
- The role of the Coast Protection Board
- How sea level rise impacts coastal development.
- Coastal development applications
- Grants and opportunities
- The site also has a huge array of links to research, reports journals and policies.

You can contact the Coast Unit at DEWcoasts@sa.gov.au to discuss these matters further.

If you are after more localised coastal management information the best source of information is your local Landscape SA Board – visit the Landscape SA website for a link to the Landscape Board for your region.

Where can I go to find out more about climate change and its impacts on the coast?

If you are interested in finding out more in regard to climate change and its effects on the coastal environment, there are a range of resources, information and tools freely available on the internet. Here are just a few that you could take a look at:

- Climate Change SA on the Department for Environment and Water website has a range of climate change information, including:
    - Directions for a climate smart South Australia
    - Details of how climate change is affecting SA
    - Programs and initiatives
    - SA's greenhouse gas emissions
    - Climate change legislation, and the
    - Premiers Climate Change Council.

- Check out an array of tools and checklists on the CoastAdapt website, National Climate Change Adaptation Research Facility.
- The Intergovernmental Panel on Climate change, is the world's leading body that assesses the impact of climate change on a global scale. Information on the latest climate change science is available on the IPCC website.

Other links include:

- CSIRO – Climate Science Centre
- Bureau of Meteorology – Long range weather and climate
- World Meteorological organisation
- United Nations Climate Change – Climate Action
- Australian Academy of Science – Climate Change
- NASA – Global Climate Change

Where can I find information on other types of flood risk information such as riverine or stormwater?

The Flood Awareness Map on the Water Connect website is a South Australian portal for land-based flood risk information. Most of the studies included in the portal cover riverine and stormwater flooding. Some investigate flood risk from rainfall events, others examine flood mitigation options, and some are coastal flood studies. Some flood maps consider impacts of climate change, others do not.