

THE NSW COASTAL INFORMATION SYSTEM – BUILDING A SYSTEM TO DELIVER COASTAL INFORMATION TO USERS

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Abstract

The Coastal Information System was conceived as a project in late 2010. It was originally devised as a knowledge management tool to provide easier access to coastal data, reports and information and to assist in succession planning in anticipation of retirement of key staff. The NSW Office of Environment and Heritage (OEH) holds in excess of 30 years of coastal data and knowledge that has been accumulated over time. This data is made available on request, but it is has been recognised that a large amount of valuable information is held as non-digital assets and much of this material is not easily accessible. With the emergence of spatially enabled web-based technology, the potential for making this data available to the public to assist and inform decision making was recognised.

With increasing emphasis on availability of information and data through open government initiatives, the Coastal Information System aims to provide coastal communities, local councils and government agencies with easier access to OEH's coastal information and provide a better understanding of the coastal environment. A key aspect of the project is the development of a standalone web portal showcasing OEH information, datasets, reports and photos, to be called the NSW Coastal Explorer. The Coastal Explorer will include an intuitive web-map interface that will allow easy public access to coastal hazard data and other coastal information. This is intended to provide easy public access to information and documents that will be drawn from larger, more comprehensive data sets that are held in the Coastal Information System. It will make key data and information available to local government and the broader community to help inform decision making and ensure that OEH is transparent and accountable about the information it holds.

Introduction

Conceived in 2010, the NSW Coastal Information System (CIS) was originally designed as a project that aimed to integrate and consolidate the extensive range of information that exists for the NSW coast, including most of the historic information that the NSW Office of Environment and Heritage (OEH) currently holds. Its primary purpose was to provide a knowledge management tool for this information, and in turn allow OEH staff and customers (e.g. local councils, coastal communities, interested parties and other government agencies) with easier access to OEH's coastal data and information.

A key component of the greater CIS project is the delivery of a standalone web portal, to be called *The NSW Coastal Explorer*, designed to operate as the interface to allow for public access to OEH's coastal information, reports, photos, and eventually both small and large coastal and estuary datasets. The NSW Coastal Explorer would essentially draw from the larger, more comprehensive data sets held within the CIS in providing access to coastal hazard assessments, coastal zone management plans, reports, studies and images, coastal habitat information and shoreline characters, aimed to facilitate better decision making in the coastal zone.

This paper focuses on the development of the NSW Coastal Explorer, the specifics behind its operation, and the expected benefits it will provide to both OEH and its customers.

The Coastal Explorer Project

In envisioning the NSW Coastal Explorer the main objective was to provide an intuitive, map-based interface to be used as the discovery mechanism for OEH's documents relating to the NSW coast. It was also expected the Coastal Explorer would display traditional GIS datasets including the locations of beaches, estuaries and elevation datasets, along with live feeds from the department's supported tidal- and rainfall-gauges network.

OEH commissioned Full Extent, an Australian software engineering company specialising in semantic analysis and geo-spatial technologies, to help build and deliver the NSW Coastal Explorer. The first step was to develop a prototype application to demonstrate its practicality, which following its success would be migrated to OEH and integrated with the full document library. To support the development of the prototype, this required OEH to arrange for a number of historic reports and information from the OEH library to be supplied to Full Extent.

Some challenges which Full Extent needed to consider when developing the software included:

- The majority of the documents relate to either a specific area(s) or region(s) along the NSW coastline.
- Each report tends to contain references to numerous beaches and place-names.
- Many of the historical reports pre-date the more recent era of desktop publishing, which provided further challenges in making documents machine readable
- The need to geocode thousands of documents using minimal resources.

The aim was to determine the location of each place-name contained in the documents, and marks these as a pin of a map, therefore allowing users to find and discover reports utilising a native map based interface.

Developing the Coastal Explore – From Concept to Proof

Text-to-Map an Intelligent Geocoding Solution

In developing the Coastal Explorer, Full Extent's **Text-to-map** solution was applied to OEH's scanned documents, semantically searching and reading the place-name information contained in each report. The Text-to-map semantic engine is an automated process, which using a semantic search function searches document text looking for place-names, for examples any text which reference to a country, region, city, suburb, or in the case of the coastal explorer a beach or estuary name. However, rather than testing every word as a potential place-name, the Text-to-map search recognises place-names by their context *within a sentence*. This allows it to very quickly analyse a large array of documents and extract the place-names each contains. The semantic analysis approach also helps to avoid ambiguity - for example,

evaluating Orange, the NSW town or county in California, verses orange the fruit or colour.

After the semantic analysis was complete, text-to-map worked to geocode the placenames contained in the documents, therefore allowing them to be spatially enabled. The output of this process was the production of a KML layer. This contained markers for each place-name reference, and provided a link back to the report page, thereby allowing each report to be spatially represented on the map.

Building the mapping interface

At the front-end the mapping interface of NSW Coastal Explorer was built on Full Extent's **Mapping-Viewer**. This provided quick deployment with minimal coding. The mapping-viewer is principally based on Esri's ArcGIS Server JavaScript API. This meant OEH's existing ArcGIS data layers could also be easily integrated within the Coastal Explorer.

In developing the explorer interface, OEH required that the portal must be both simple and intuitive, designed for both novice and experienced users, and with no prior GIS experience assumed in the user. Therefore, a traditional GIS Table of Contents Interface was not included, as this could easily confuse novice users. Instead the concept of "maps" was applied, whereby a specific map is configured to include pre-set layers. For example, the *coastline map* holds beach, erosion, and tide gauge layers, along with any of the spatially referenced reports relating to the coastline (Figure 1). While the *estuaries map* holds layers relating to estuary monitoring stations, rainfall gauges, plus any referenced reports relating to the estuary locations.

The user can switch between the coastal and estuary maps, using the map viewer, controlled by a simple *Coastal* and *Estuary* button on the map screen. Switching between the maps automatically adds and removes the associated map layers, while retaining the current map scale. This allows for a large number of layers and complex functionality to be abstracted behind a relatively simple, user friendly map switching mechanism.

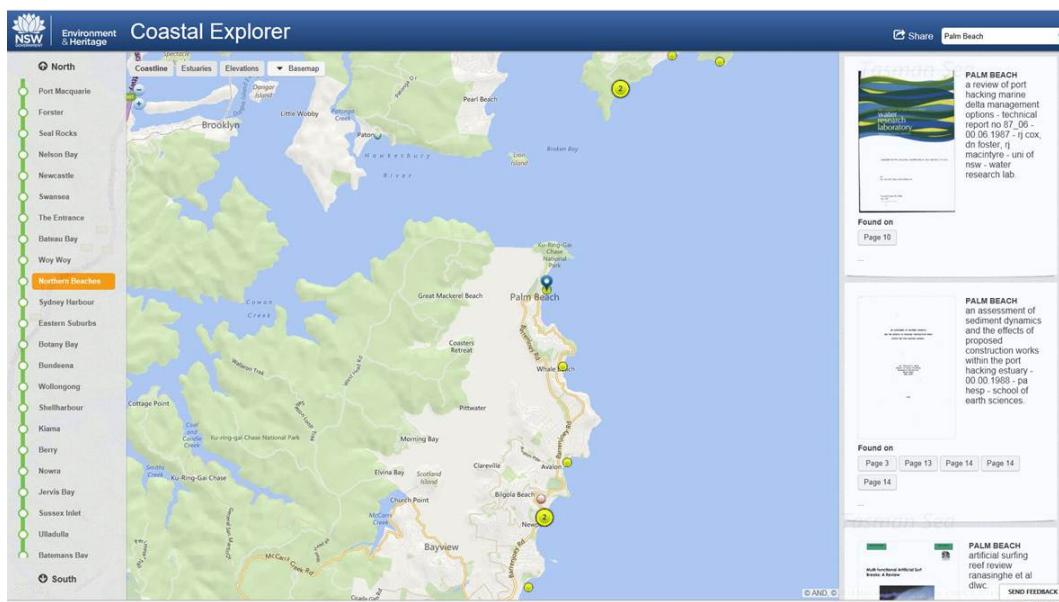


Figure 1 – The NSW Coastal Explorer Interface

Navigating the Explorer

An innovative custom navigation widget was designed, to assist in navigating the Coastal Explorer and help guide users to relevant locations. The widget is located on the left of the mapping interface (Figure 2). The widget is used to highlight the current map extent, whilst also allowing the user to instantly navigate to other key locations along the coast by clicking on a location name within the widget. For example, the user can navigate from Moruya (on the southern NSW Coast) to Byron Bay (on the north coast), within seconds and without needing to search or pan. The widget is continually updated as the user navigates the map window manually, ensuring it always shows the user's current location.

Integrating the reports

Following the application of Full Extent's **Text-to-map** semantic search, the output KML layer was added to the map, allowing for the spatial registration of the scanned reports. These reports are displayed in a panel on the right-hand side of the mapping interface (Figure 2). Only reports that relate to areas located within the current onscreen map extent are displayed as any one time. Therefore, as a user navigates the map, documents are automatically added or removed from the panel depending on the mapped area being displayed.

If a user wishes to open a report, they simply click the "Found on" button in the right-hand panel and the explorer will open the document, navigating directly to the page where the referenced place-name is found. Users also have the option to download each report in its entirety for offline reading.



Figure 2 - Integration of Images and Reports within the Explorer

Benefits of delivering the NSW Coastal Explorer

The key benefit in delivering the NSW Coastal Explorer is that vast quantities of valuable information, previously locked in historical reports and often difficult to access, (even for OEH staff) will be made available to OEH and to OEH customers.

These reports will be easily discoverable using the intuitive mapping interface, with a focus on representing the spatial relationships between documents, rather than traditional text-based searches. For example, *Cronulla* would return a list of documents that reference ‘Cronulla’, but would not identify documents relating to nearby locations, such as Bundenna or Garie Beach.

A searchable map-based interface allows users to consider nearby areas by simply scanning or panning, with the document panel automatically updating on the fly. Putting the documents on the map also allows the user to discover additional information about the area they are researching, through the integration and display of live feeds from the departments extensive tidal and rainfall gauge networks (Figure 3).

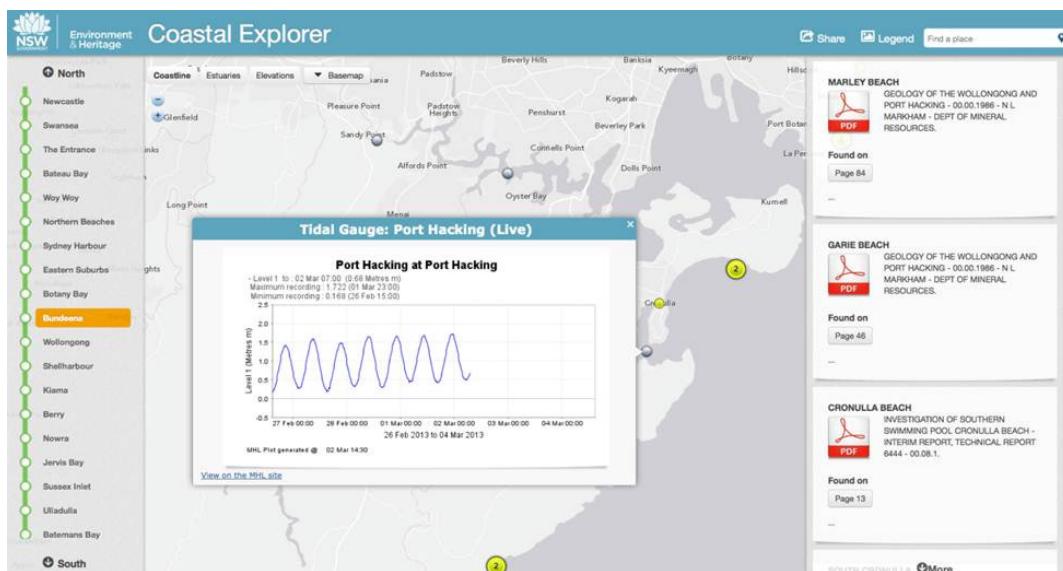


Figure 3 – Example of the live feed tidal gauge data

Conclusion

The NSW Coastal Explorer represents an exciting project for OEH, aimed at building on OEH’s traditional role as a key provider of coastal expertise and information relating to the coastal zone. In particular, it will make key data and information available to local governments, consultants, and the broader community to help inform decision making and ensure that OEH is transparent and accountable about the information it holds.

Full Extent’s text-to-map unique semantic search has allowed OEH to unlock value from existing content and data by geocoding hundreds of reports with very little effort. This avoids countless hours of tedious manual data entry and makes feasible a project which would have otherwise been too time-consuming to undertake. Similarly the intuitive map based interface allows users to quickly and easily search for and find documents in a spatial context.

OEH and Full Extent are expecting to launch the NSW Coastal Explorer in 2015.