



The  
Geological  
Society

*-serving science & profession*

**Speakers:**

Dr Clive Edmonds,  
PBA  
James Dyke, Atkins  
Simon Holt, Atkins

**Date:**

**Wednesday 6<sup>th</sup>  
July 2016**

**Details:**

**Tea / coffee:  
17:30**

**Meeting**

**Commences:**

**18:00**

**Location:**

**Burlington House**

**Free to attend.**

**Registration not  
required.**

For further information  
and registration, please  
contact:

Event Convenor: Dave  
Giles

email:

[dave.giles@port.ac.uk](mailto:dave.giles@port.ac.uk)

## Year of Water: Case Studies in Engineering Geology

**An evening meeting organised by the Engineering Group of the  
Geological Society (EGGS)**

### **Too much H<sub>2</sub>O isn't always good for you! Dr Clive Edmonds, PBA**

In recent times there has been an apparent increase in the number of "sinkholes" occurring (e.g. St Albans – October 2015 being the latest) in response to heavy rainfall or leaking water utility services. Evaluation of rainfall data shows an increasing trend towards higher rainfall since 2000. This coincides with the appearance of ever larger numbers and sizes of collapses being recorded. A review of the reported "sinkhole" case studies shows that much of the land instability is actually caused by man-made voids rather than naturally occurring voids in southern England and therefore the collapses should be termed "crown holes". The collapse mechanism that operates over collapsing old chalk mines in the presence of large volumes of water can be used to explain why many of the collapses are so large. Attention is drawn to particular engineering geological and historical characteristics that are relevant to predicting future "sinkhole" or more correctly "crown hole" locations in southern England.

### **Pontarddulais Flood Risk Management Scheme, James Dyke, Atkins**

An in-line flood storage scheme by Natural Resources Wales (NRW) has been designed to manage the risk of flooding at Pontarddulais, near Swansea. The scheme comprises a 9m high embankment dam, located on the River Dulais, approximately 1km upstream from the town. Three phases of ground investigation were used to understand geotechnical risks and provide information for outline and detailed design. The proposed dam is positioned at the site of an artificial pond associated with the former Graig Merthyr Colliery. Recent alluvial pond sediments overlie a thick and variable glacial sequence, underlain by Coal Measures bedrock. Investigations enabled assessment of founding conditions for detailed settlement analysis of the dam and culvert; investigation of groundwater conditions and permeability characteristics for seepage flow analysis; and investigation of colliery spoil at the former colliery site to assess its suitability for re-use in dam construction. Investigations were designed by Atkins Limited and carried out by NRW National Site Investigation Framework (NSIF) Contractors, WYG and Fugro. A combination of techniques was used, including sonic and rotary core drilling, cone penetration testing (CPT), percussive boring, windowless sampling, dynamic probing, trial pitting, as well as various geophysical techniques used for investigation of the former colliery site. Key to the settlement and seepage flow analysis was a good understanding of the glacial sequence, particularly the lateral extent and thickness of compressible glaciolacustrine silts in the upper part of the sequence. Understanding the historic development of the former colliery and associated pond was also important to the development of the overall ground model as well as for identifying sources of colliery spoil for re-use as general fill.





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### Swansea Bay Tidal Lagoon, Simon Holt, Atkins

The proposed scheme by Tidal Lagoon (Swansea) plc comprises a 9.5km breakwater embankment up to 20m high, enclosing an 11.5km<sup>2</sup> lagoon. The average Spring tide range is 8.5m and this will be harnessed to provide 320MW of electricity to 155,000 homes. In order to provide sufficient information for Front End Engineering Design (FEED) and the planning application, a Phase 1 preliminary ground investigation ensured a good understanding of the potential geological and geotechnical risks and provided greater certainty on proposed construction costs. One of the objectives was to determine properties of shallow sediments and assess suitability for hydraulic fill from in-situ and laboratory tests.

Following a desk study phase and initial geophysical survey, the ground investigation was designed by Atkins Limited; Environmental Scientifics Group was the Principal Contractor for the £0.5M works. A variety of techniques were required, including dynamic sampling in intertidal areas, overwater boreholes from a jackup platform and CPT and vibrocoring from a survey vessel. Geological units were derived based on their origin and geotechnical properties from geotechnical laboratory and in-situ testing. The spatial distribution of marine and glacial deposits together with geophysical profiles led to the development of a preliminary geological model. A central ridge of fluvio-glacial sands and gravels divides different marine deposits and large variations in rockhead level are present as a result of glacially incised rock basins.

