

Smart Coasts

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Sustainable Communities

Swansea 16th June 2011



Ireland's EU Structural Funds Programmes 2007 - 2013

Co-funded by the Irish Government and the European Union



EUROPEAN REGIONAL DEVELOPMENT FUND

The Partnership



CREH

Swansea Bay



Asiantaeth yr
Amgylchedd Cymru
Environment
Agency Wales

Priority

Maintain and improve bathing and drinking water quality

INDICATOR:

- percentage of coastal waters at guideline standard for bathing water



Why is it needed?

1. New EU standards for bathing waters will be in force by 2015 with the first sampling 2012.
2. These standards are tighter and will result in fewer Blue Flag beaches throughout the EU without the SC=SC approach.

What is the new approach?

3. The WHO have called for real-time prediction of bathing water quality

AND

4. Provision of real-time information to the public as a foundation for public health protection

This underpins ‘discounting’



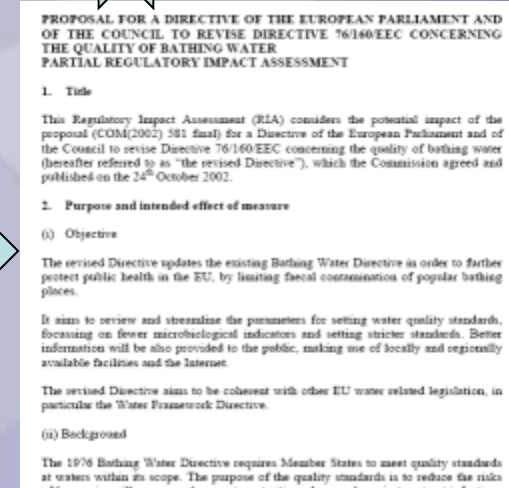
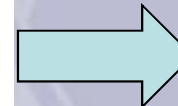
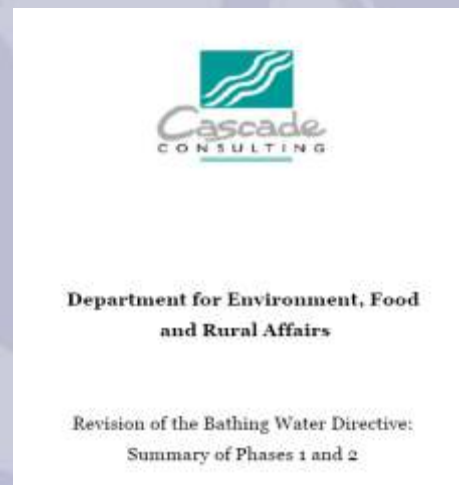
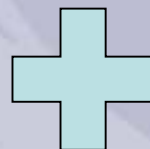
UK Policy Costs and SCSC Benefits

Defra 2002

COSTS £m	From	To
Good	3163	4858
Excellent	4999	7818
Three Events	1621	2443
SAVINGS £m		
Good	1542	2415
Excellent	3378	5375

	NPV of total benefits	NPV of total costs	
Option 1	0	9-14	
Option 2a	1104-1923	3163-4858	~Good
Option 2b	1638 -3497	4999-7818	Excellent
Option 3a	2215	2530-3846	One event
Option 3b	2215	1621-2443	Three events

NB
Does not include CSOs improved to one spill/season



What is the result?

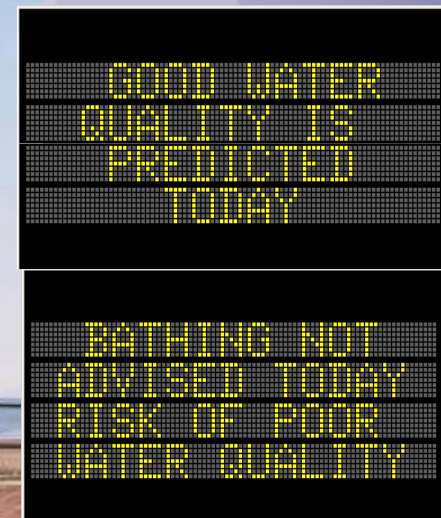
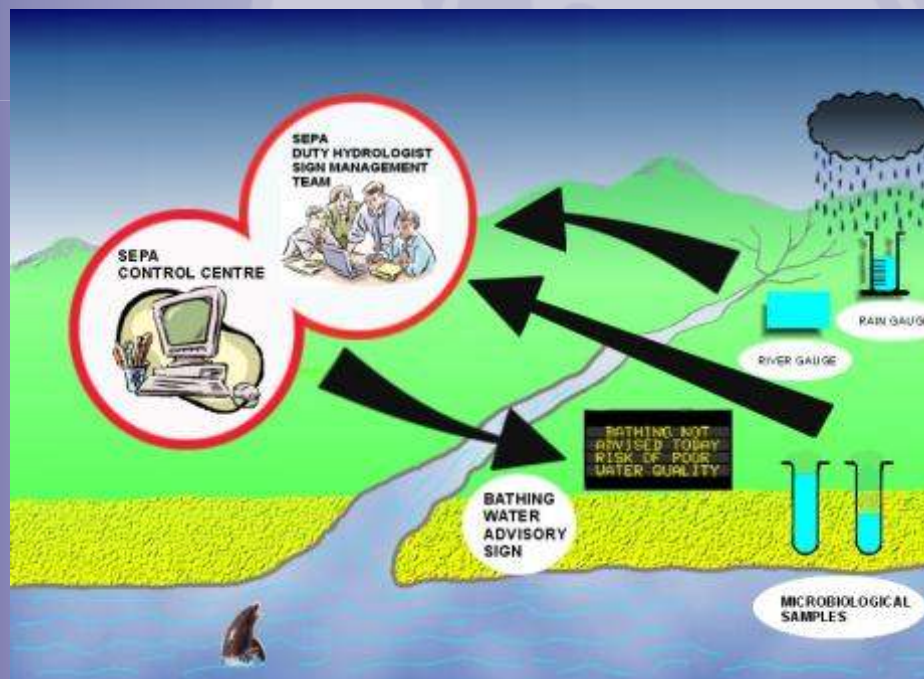
5. With 'real time prediction' we can protect the health of bathers and ensure we maintain present levels of blue flag beaches
6. The approach is an 'option' not a regulatory requirement and is outlined in the EU Bathing Water Directive (2006)

The Policy Requirement

7. Provide the science-base and modelling for real time bathing water prediction.
8. Development sites
 - Swansea Bay
 - Dargle Bathing Waters
9. Roll-out to other convergence area beaches
10. Roll-out to EU and international sites

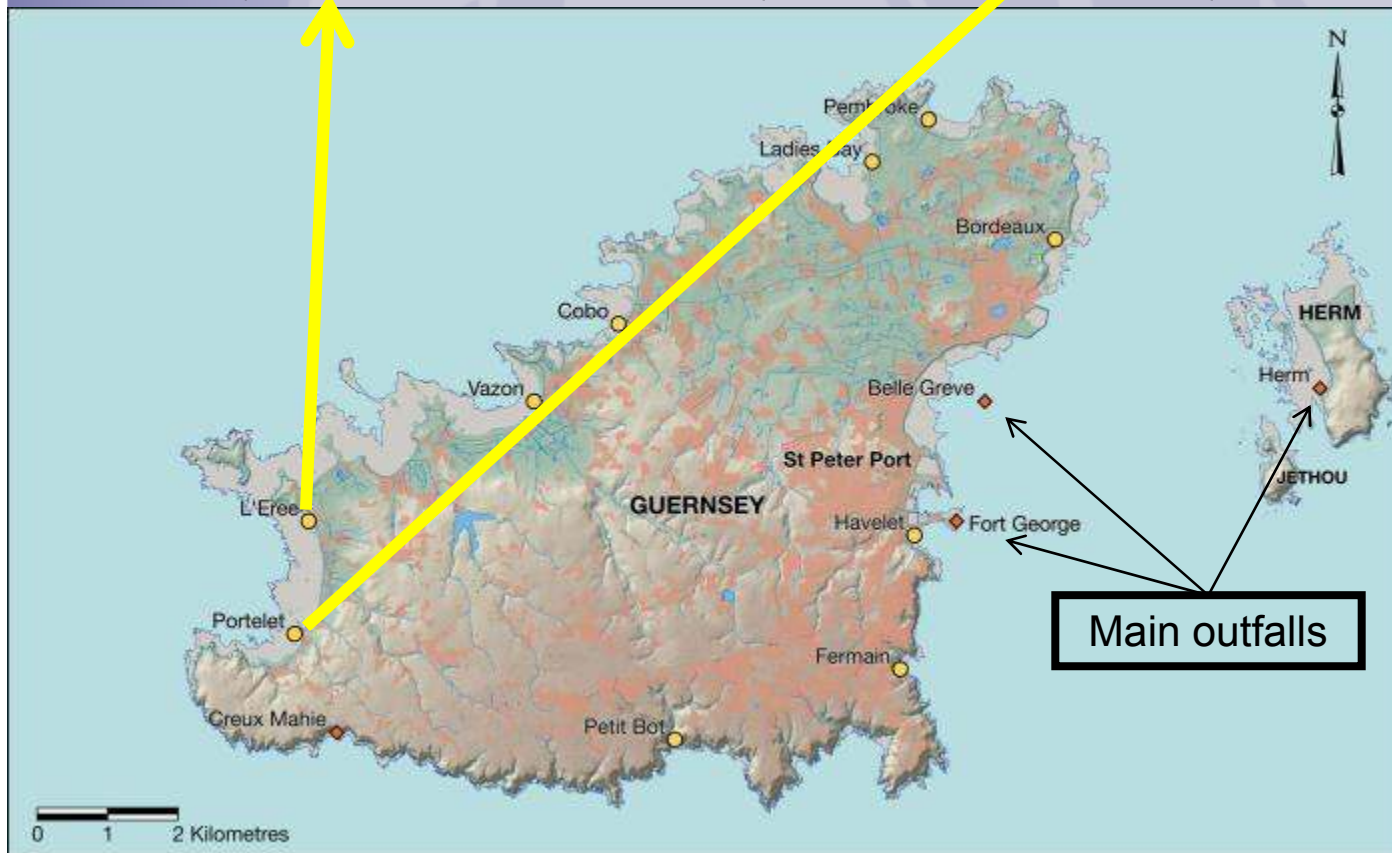
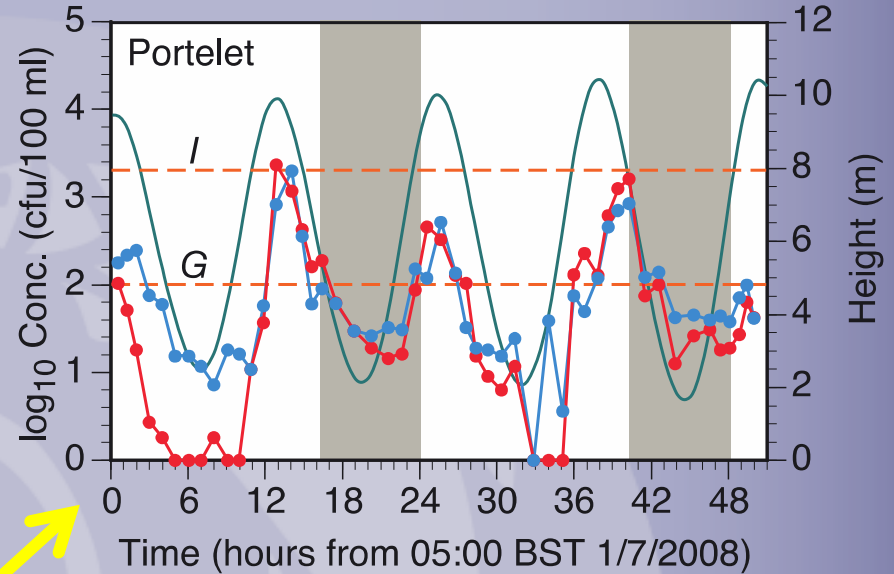
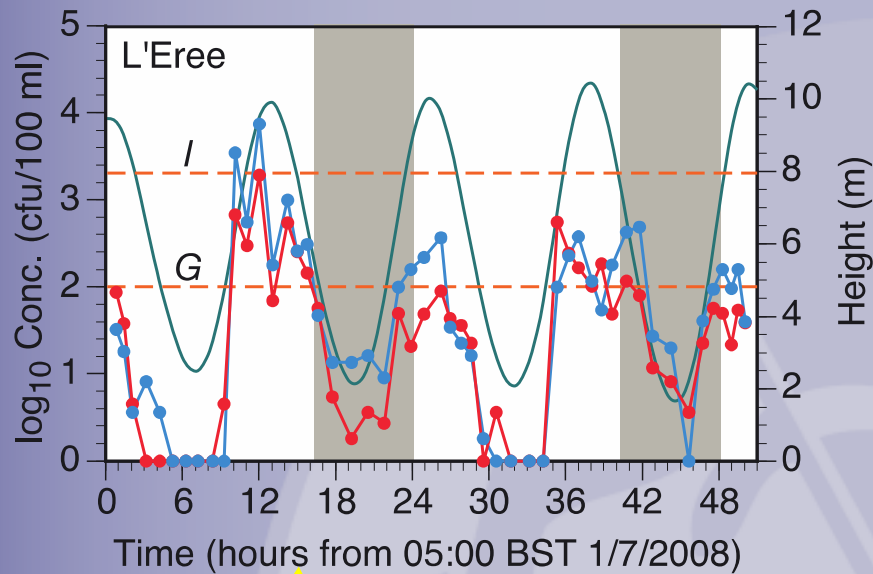
Approach 1

Develop simple black-box models



Problems

- **Model calibration data**
 - ‘**Bathing Day**’ is the modelling unit
 - Spot compliance samples provide the calibration data
 - **Diurnality** introduces random variation and increase model error reducing explained variance
 - **Censored data** (< and >) and measurement imprecision in cfu and/or MPN counts would further reduce model utility



- Faecal coliforms
- Enterococci
- Tide height
- Night time

G *Guideline:*
100 cfu/100 ml*

I *Imperative:*
2000 cfu/100 ml†

* both parameters
† Faecal coliforms

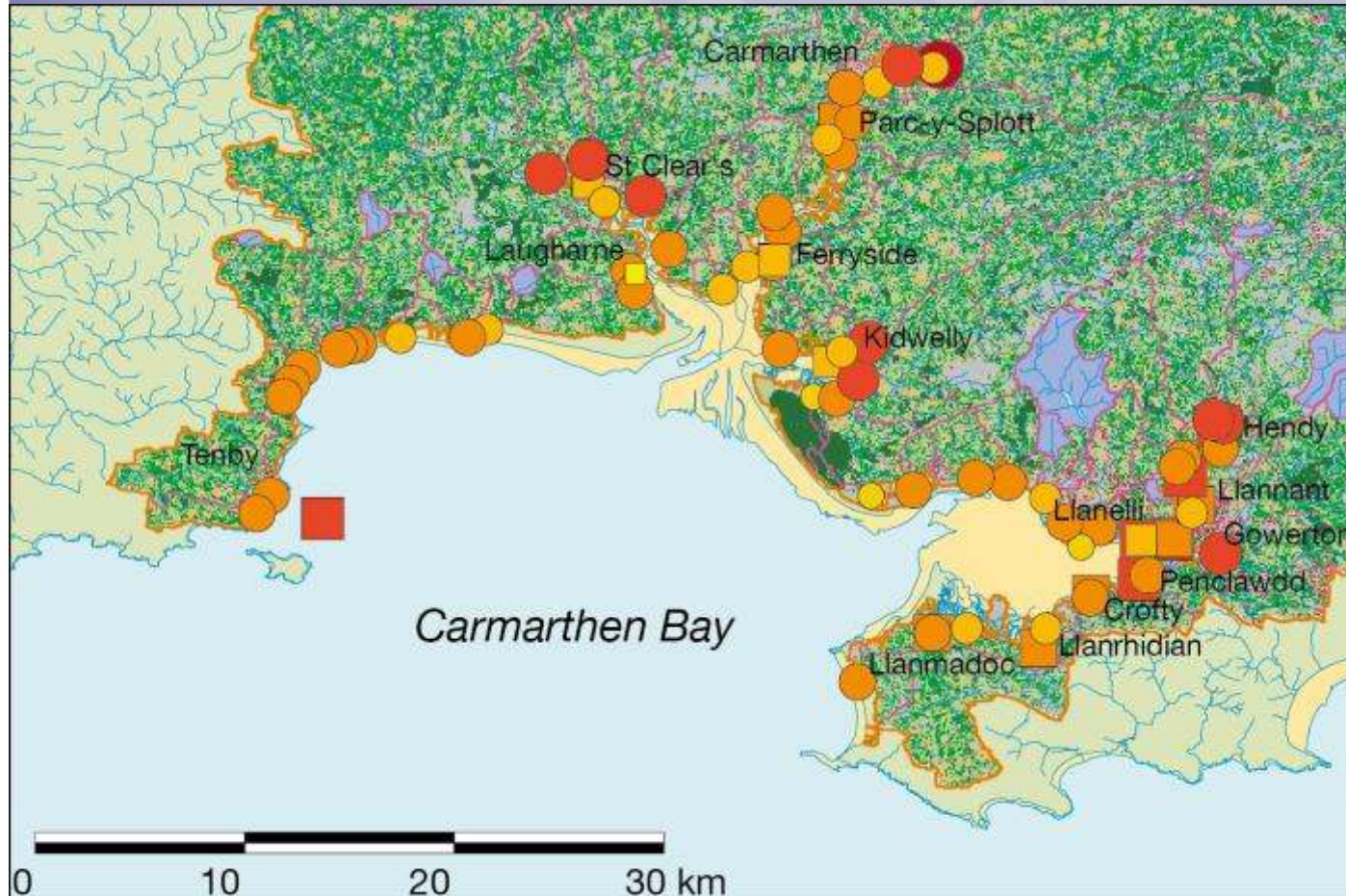
Solutions

- Characterise the '**bathing day**' water quality for model building
 - **multiple sampling events** during daylight
 - 07:00 to 19:00
 - Measure FIOs with **enhanced accuracy** through the bathing day
 - Triplicate enumeration / >100+ml filtered

What if it does not work?

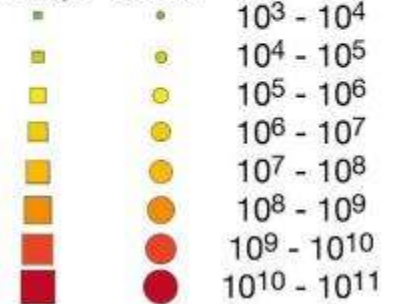
- The back-up plan
 - ‘**predictive**’ not ‘**protective**’ hydrodynamic and water quality modelling
 - ‘**real-time**’ not ‘**constant**’ T_{90} microbial decay coefficients

Carmarthen Bay example

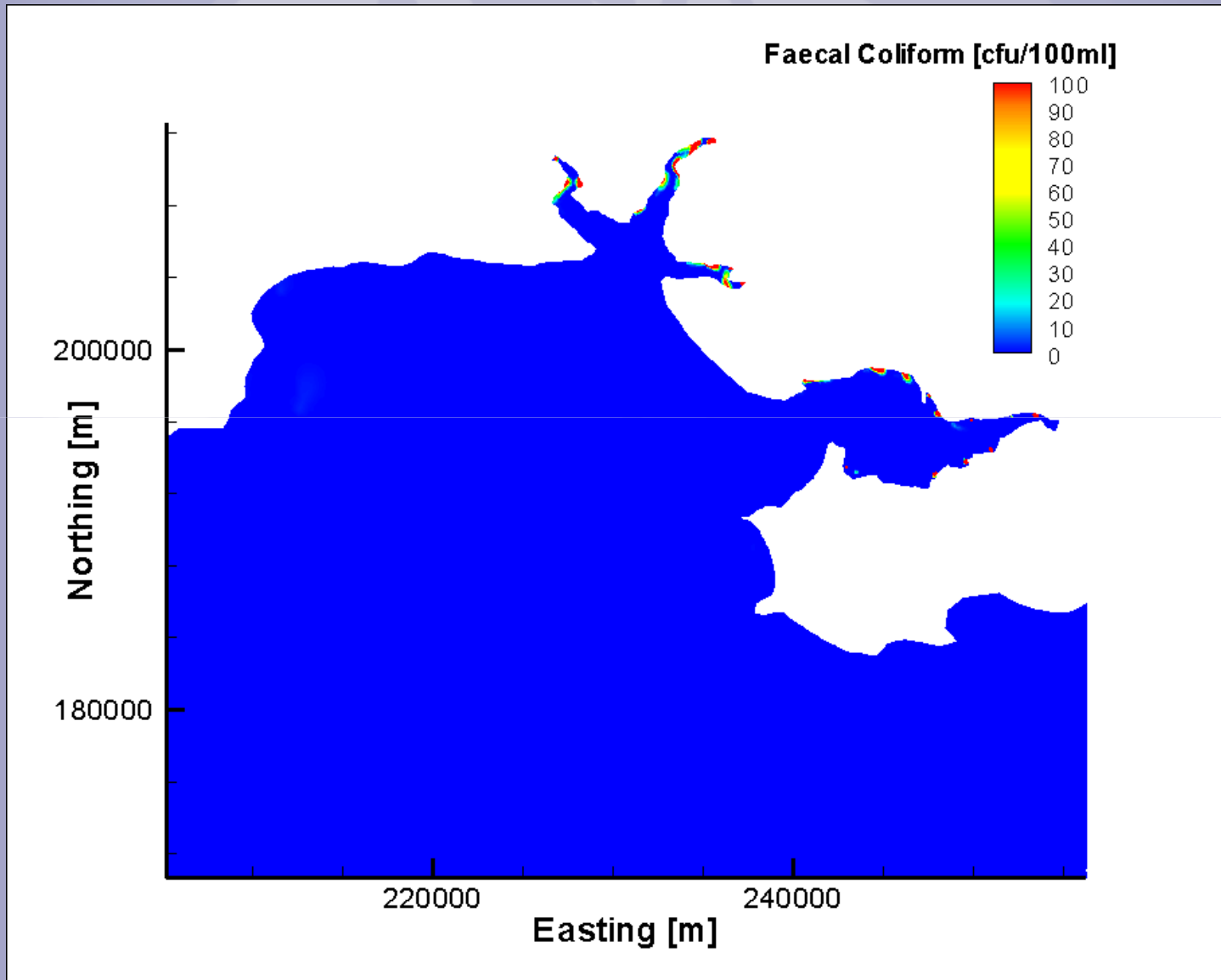


High flow Presumptive
Escherichia coli load
(per second):

Sewage Rivers



Carmarthen Bay example



How will we do it

Programme of new field investigations to drive model development



CREH



CREH



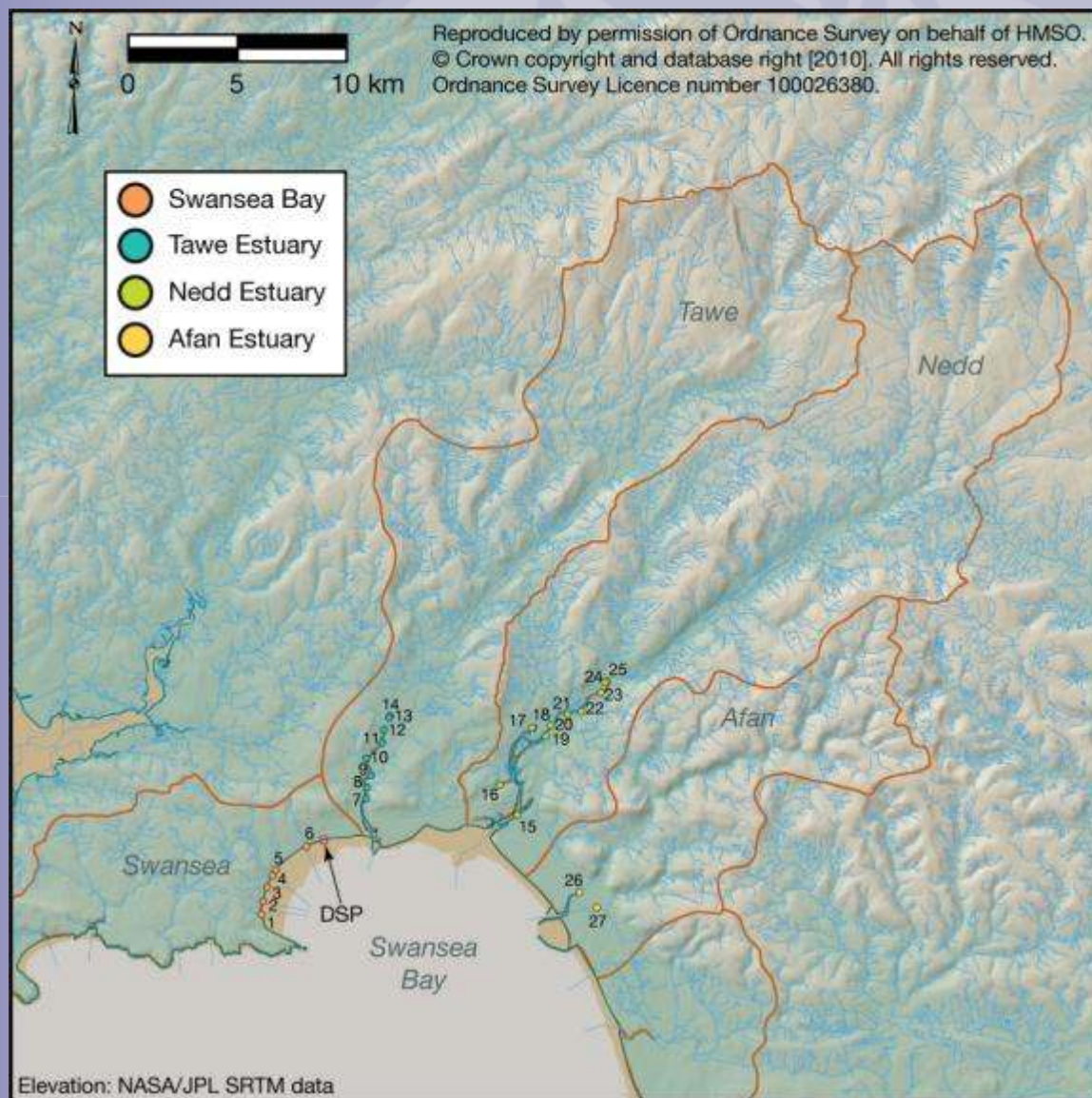
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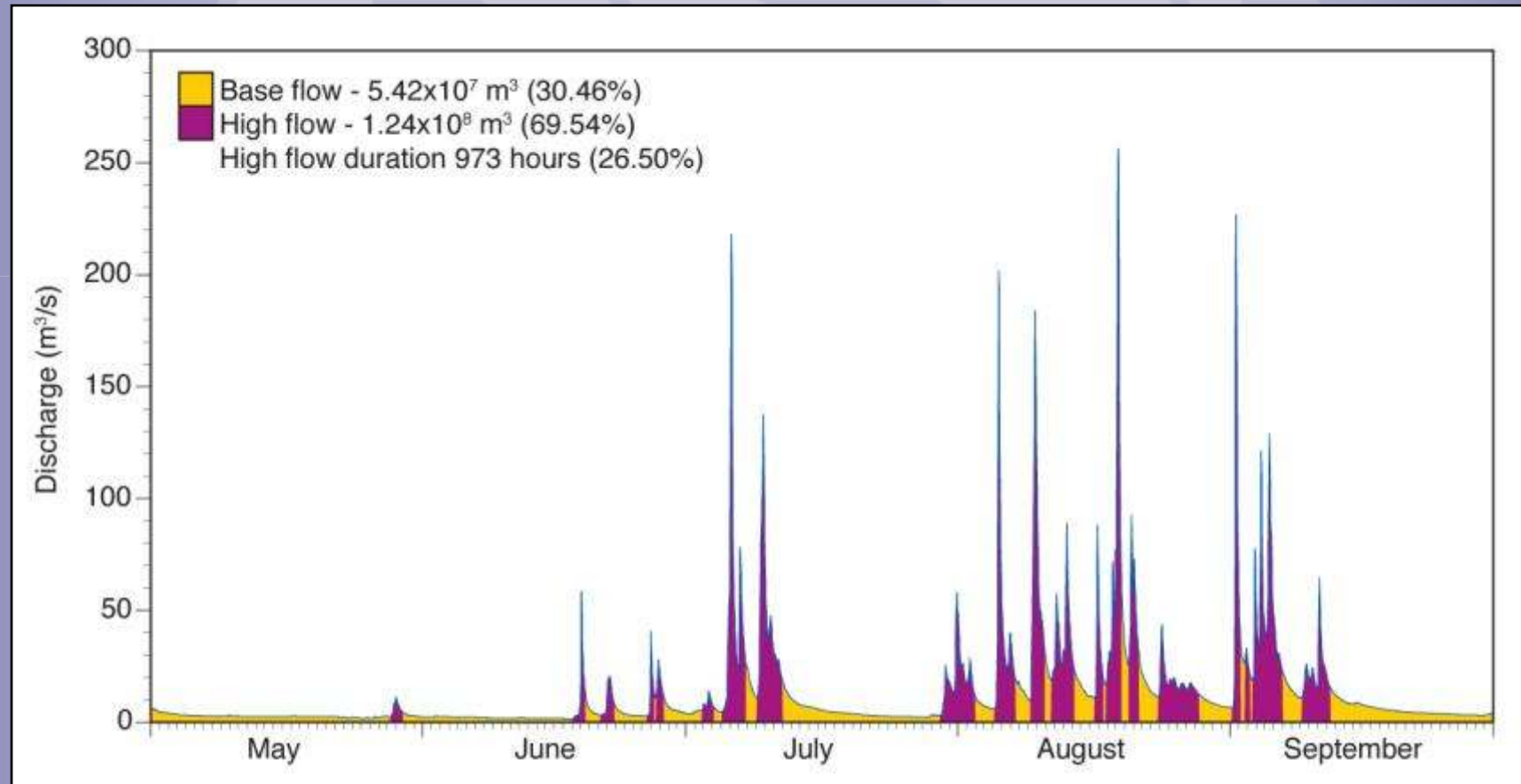


River and stream inputs



27 inputs along
the coastline

Afan Tawe - Ynystanglws



Why Swansea Bay

- The ideal test-site
 - Large investments made and planned
 - A complex site with a range of pollutant sources
 - Urban drainage
 - Sewage infrastructure
 - Upstream agriculture

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Black box statistical modelling of faecal indicator organism concentrations at the Swansea Bay designated sample point :-



Sampling programme and logistics

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Source apportionment of faecal indicator organism inputs to Swansea Bay :-



River and stream sampling sites

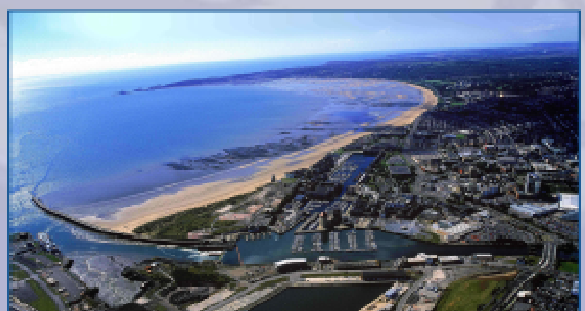
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Analysis of long-term rainfall records from Victoria Park, Swansea



Further Information Swansea

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