



## Flood Risk Management in Heavily Urbanised Floodplains.

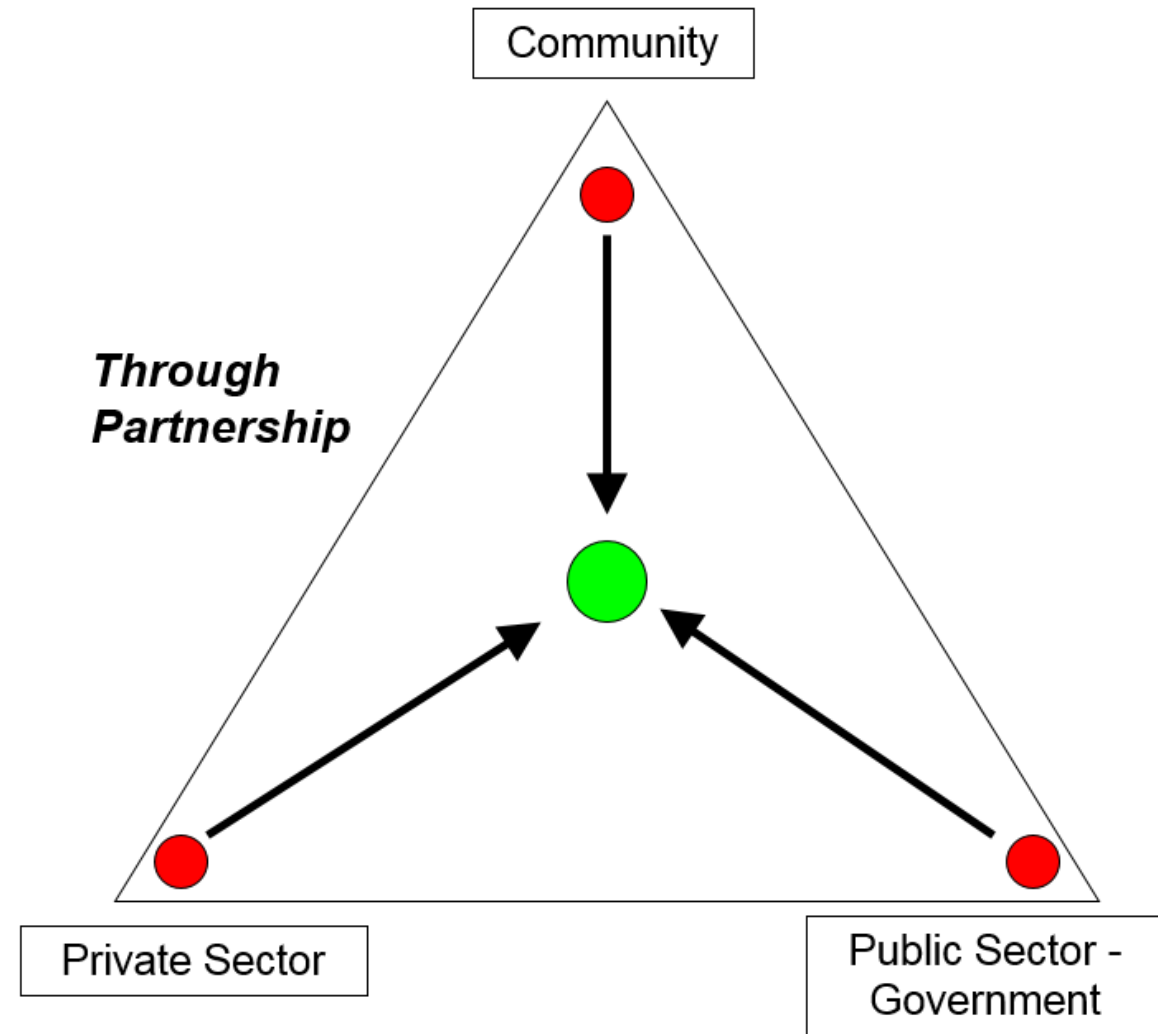
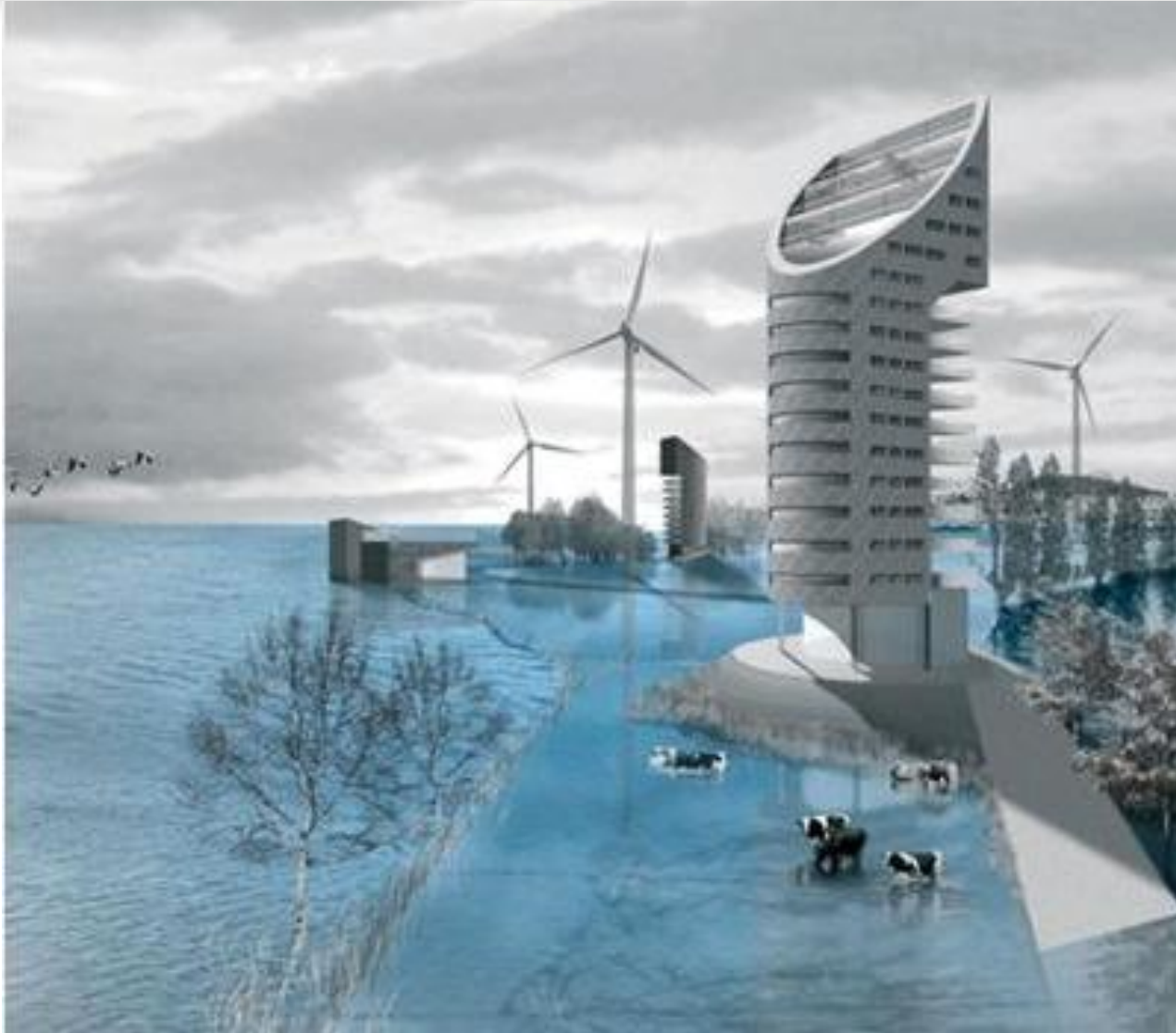
**Bryan Harvey**, *MEng, MBA, MICE, CEng*

Vice President & Global Operations Director,

CH2M HILL Water Market



# What will flood risk management (FRM) look like in 20 years?





**More Defences**



**More Coastal Erosion**



**More River Flooding**



**More Coastal Flooding**

# Presentation Outline

- Introduction to CH2M HILL
- The Challenge of Flood Risk Management in Heavily Urbanised Areas
- The Tools we use to develop trusted and transparent solutions



# CH2M HILL - Founded on Values

Established in 1946, CH2M HILL operated from its very beginning on **four simple values:** take care of clients, deliver high-quality work, do right by employees, and stay true to our culture of integrity and honesty.

Holly Cornell



Jim Howland



Burke Hayes



Fred Merryfield



Clair Hill



**CH2MHILL**



# Global Reach & Diverse Business Portfolio



**A global leader in full-service consulting, design, design-build, operations and program management services**

**The Challenge of Flood Risk Management in Urban Areas.**



# Challenge of Flood Risk in the Urban Area<sup>(1 of 2)</sup>

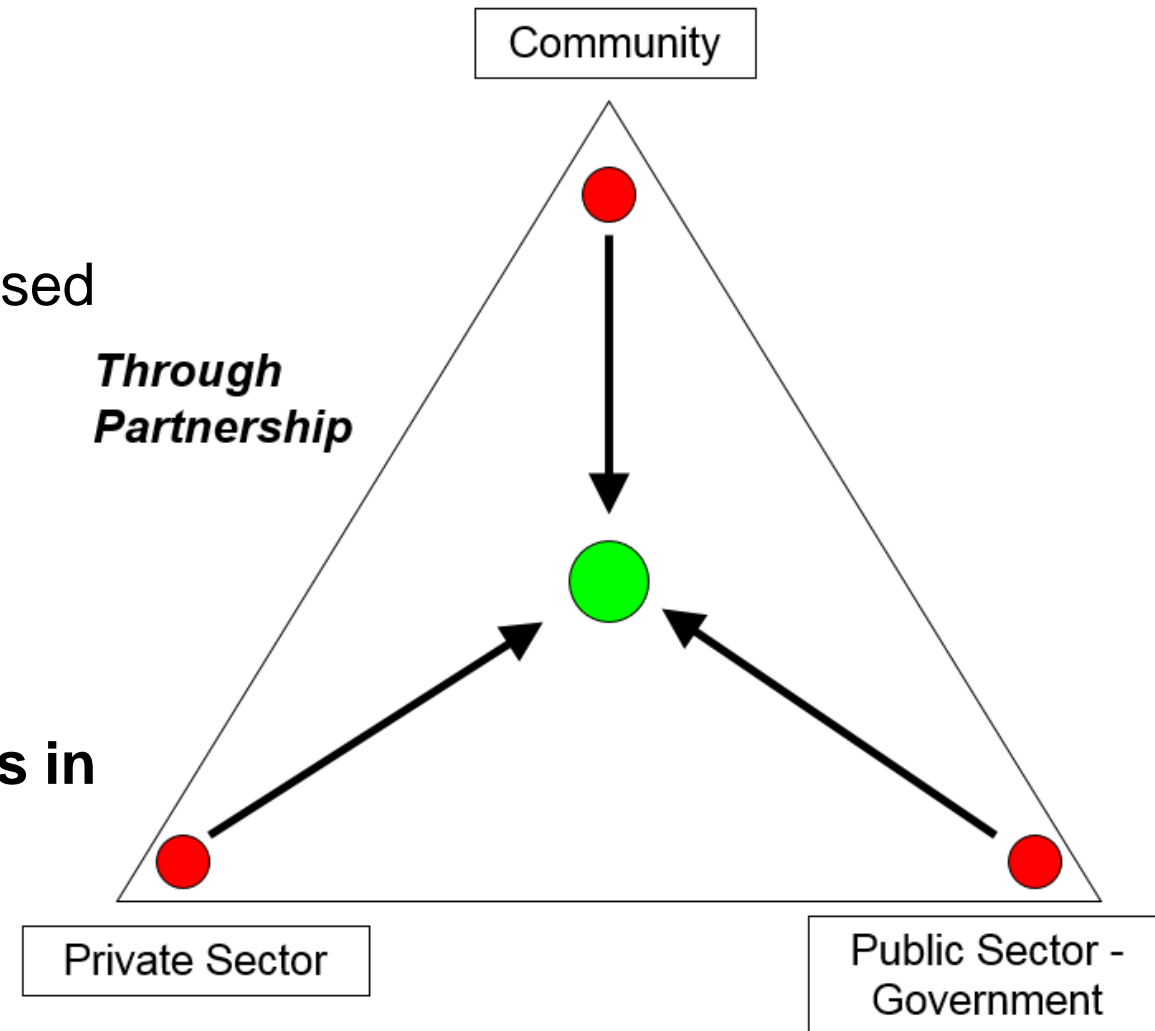
- We know that there is **risk to people, property and the environment**;
- We know that **critical infrastructure is often close to rivers** and recent events have shown us how the impact of critical infrastructure flooding can have far reaching impacts (*transport infrastructure, utilities, fuel storage, power stations etc.*);
- Such impacts are not new, but **the scale is changing** and we now have a much better understanding of the cause, impact and true cost;
- Heightened **perception of flood** risk (*public and political*);
- Recognition of the **range of potential flood impacts** and their severity.





# Challenge of Flood Risk in the Urban Area<sup>(2 of 2)</sup>

- **Heightened perception of climate change** impacts (scale, frequency and nature)
- **Changes in policy**, towards long-term risk-based (catchment-scale) approaches
- The only **potential solution therefore is a partnership** of \$, people, energy and ideas
- The **tools we use are critical building blocks in the development of partnerships**



**CH2MHILL®**

**Introducing ISIS**

**Introducing  
ISIS**

**What is ISIS being  
used for**

**The ISIS  
Suite**

**ISIS**



# ISIS - 1970s to 2014 Today – a trusted tool for the Industry

- Roots of ISIS (1D) date back to 1970s, ONDA (*developed by Halcrow*);
- 2008/09 - ISIS FAST and ISIS 2D engines;
- Nov 2011 – become part of CH2M HILL;
  
- Designed for flood modeling (*with sediment transport and water quality*);
- Robust and proven solvers (*benchmarked*);
- Dedicated development/ customer support team;
- Extensive online training and support;
- Large and active global user community.



Source: [en.wikipedia.org/wiki/The\\_Isis](http://en.wikipedia.org/wiki/The_Isis)

ISIS name comes from the part of the River Thames which flows through Oxford, England

# Who is using ISIS

- Used in more than 150 countries
- Used by over 10,000 people
  - Government bodies/agencies (>400 worldwide),
  - Utilities (Water, Power etc.),
  - Engineering consultants,
  - Insurance companies, and
  - Academia and research
- More than 2,000 new ISIS users every year

**ISIS FREE – it really is completely free to use, the only restriction is the size of model that can be run.**

With unrestricted access to manuals, support forums, videos, knowledge bases, downloads and other productivity tools.

1D - limited to 250 nodes

2D - limited to 2,500 cells/DEM grid size

WQ and ST – limited to 50 nodes

**CH2MHILL®**

**ISIS**

What is ISIS being used for

**Introducing  
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# What is ISIS being used for

## Flood scale



Global

National

Regional



Local

## Flood peril

Pluvial

Fluvial

Coastal

Culvert blockage

Levee breach

Dam break

Urban drainage

Groundwater

Tsunami

## Flood application



Identify risk



Profile hazards



Estimate losses



Evaluate and design



Forecasting and warning

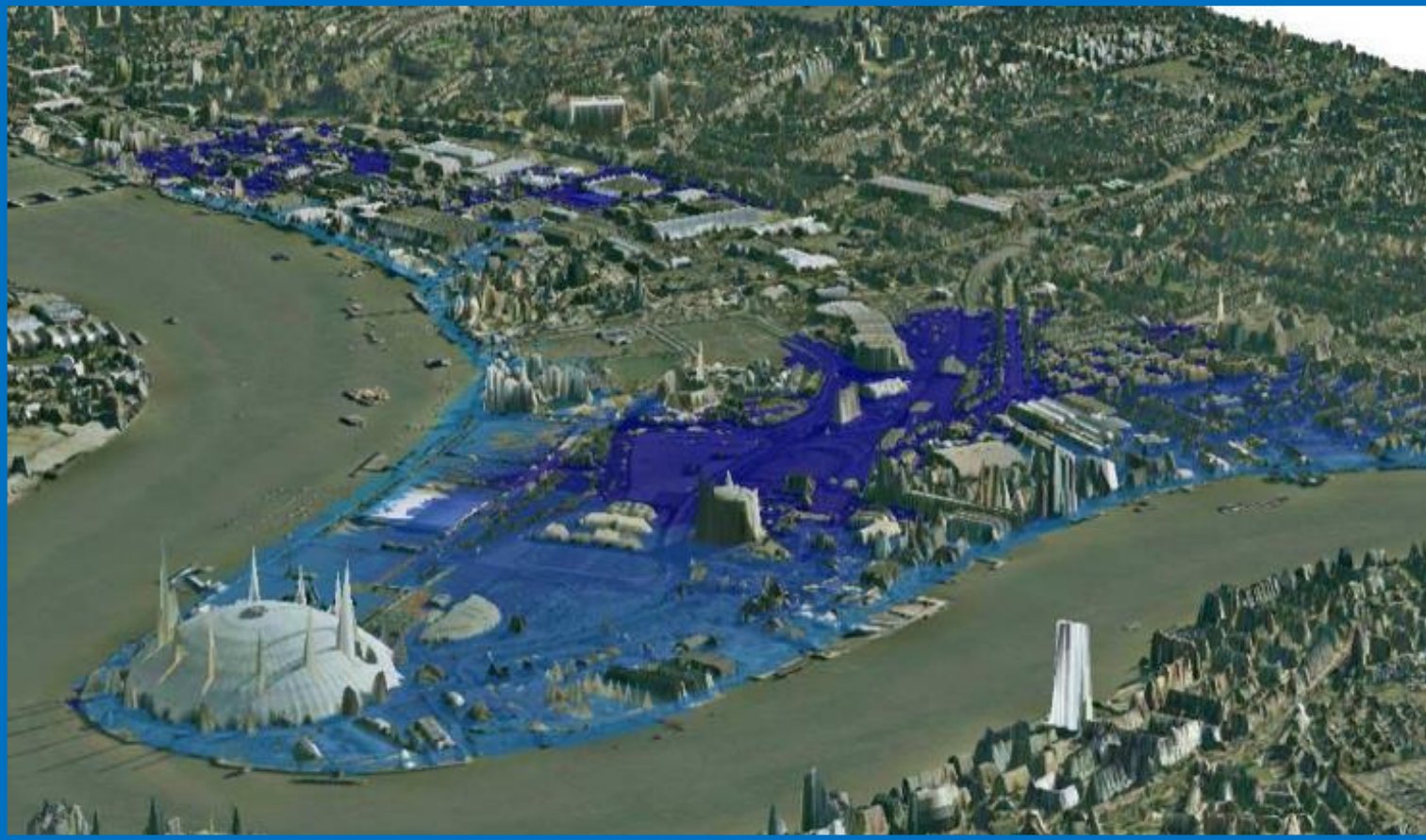


Operational control



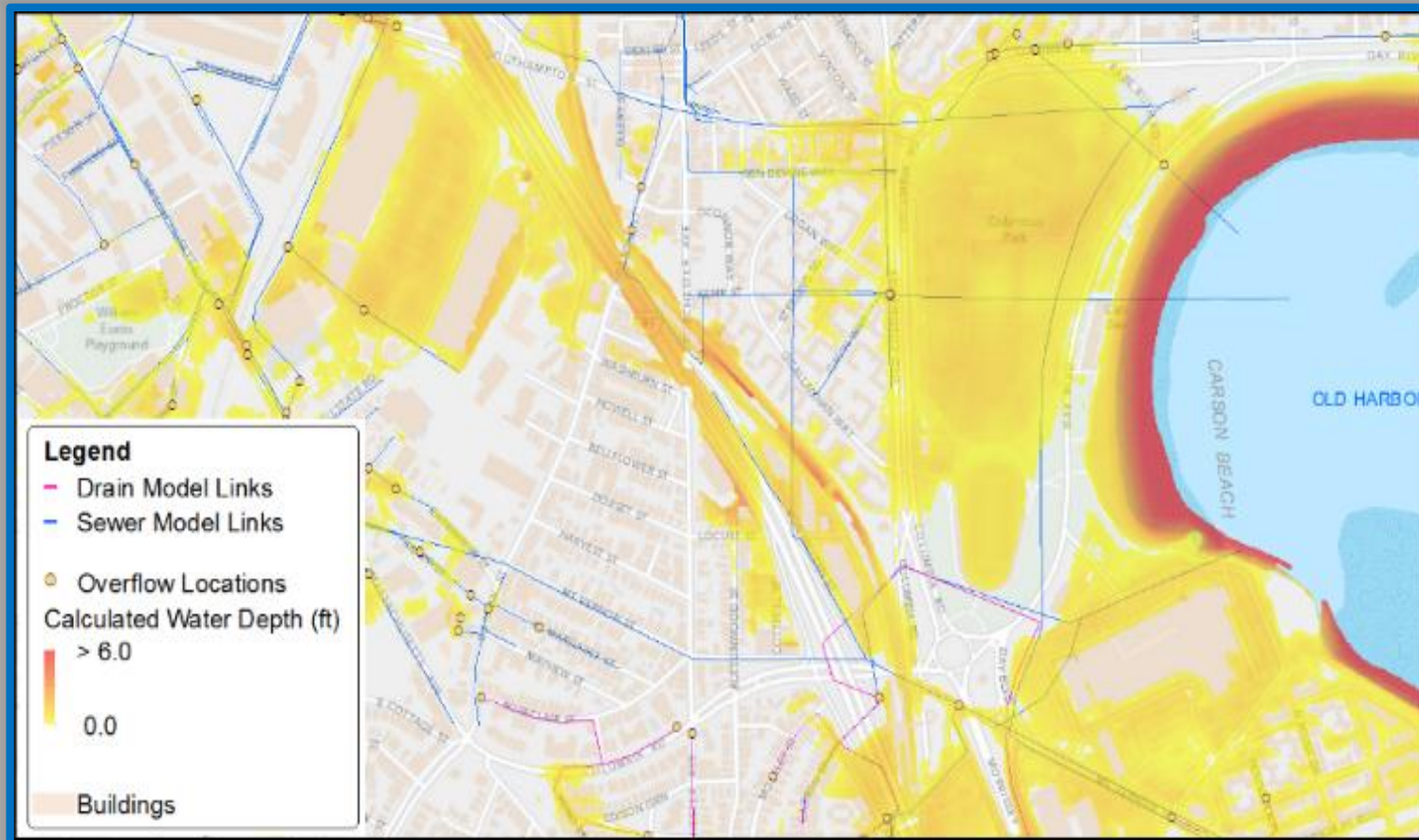
Incident management

# London, England



ISIS is trusted by the city of London for flood mapping, strategic planning, flood forecasting and real-time operational management at the Thames Barrier.

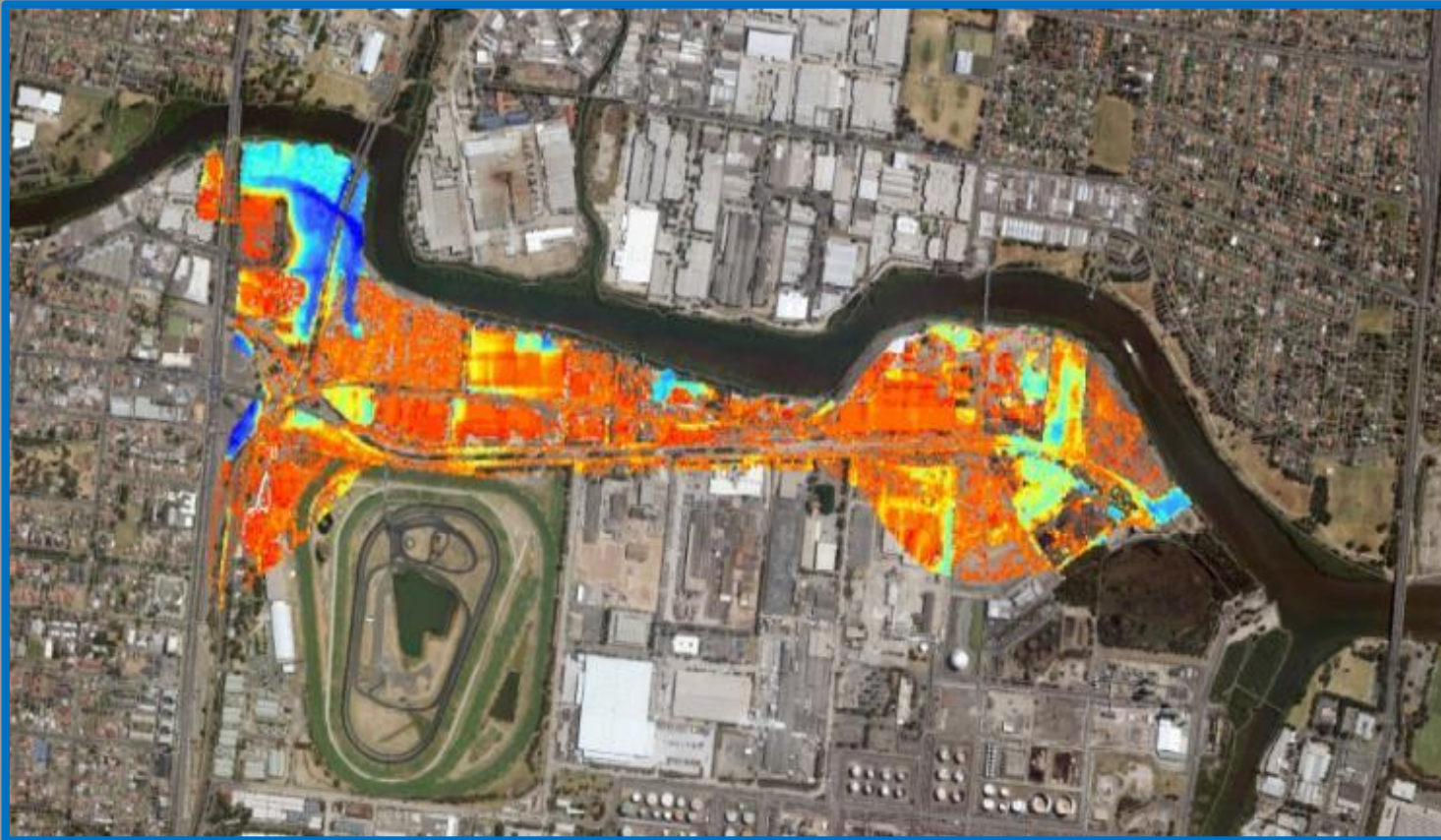
# Boston, USA



The ISIS FAST solver (up to 1,000 times faster than traditional solvers) is trusted in the city of Boston to help identify areas that will be prone to flooding at future year milestones due to sea level rise, storm surge, combined and storm sewer systems surcharging.

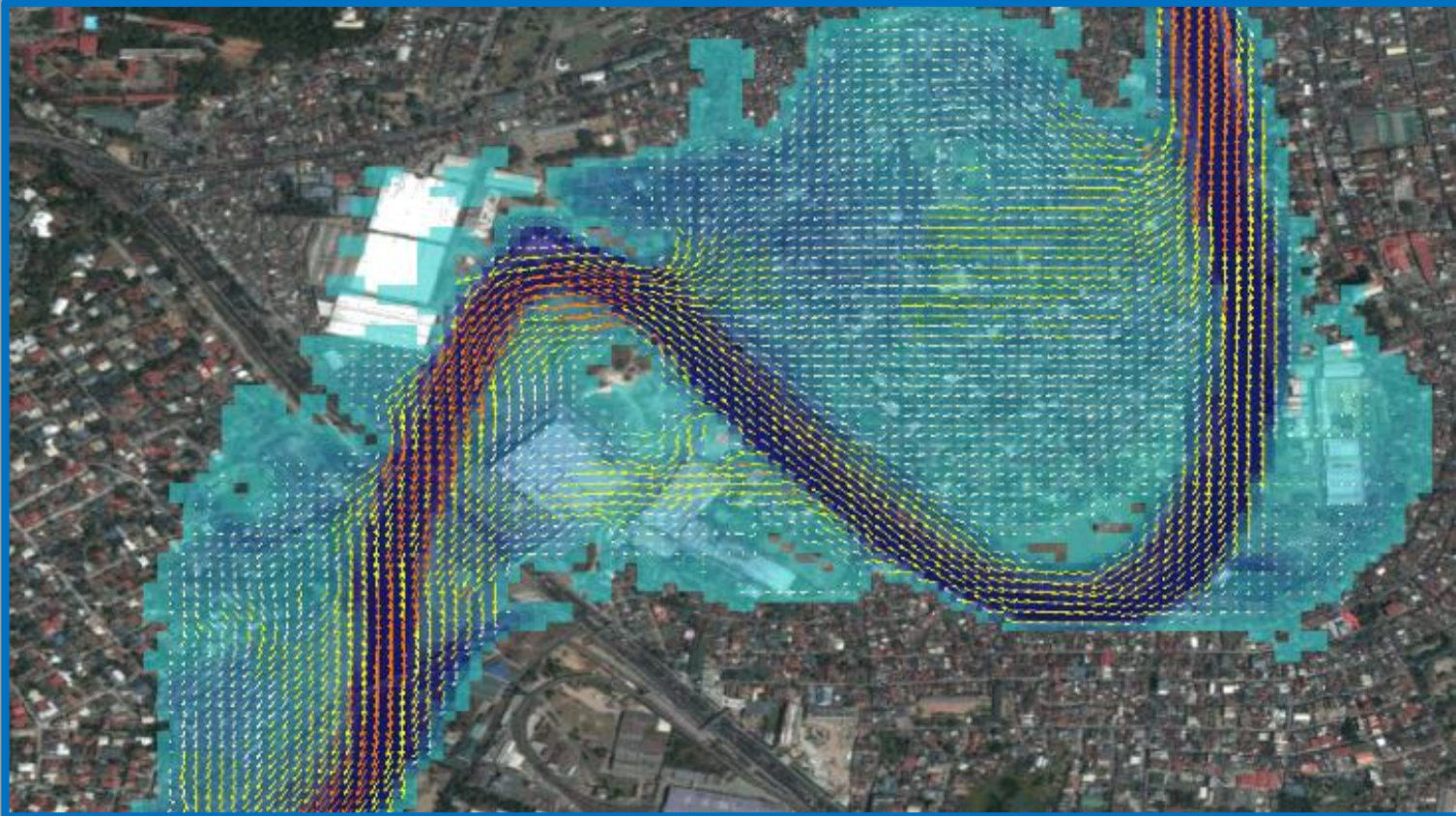


# Sydney, Australia



ISIS is trusted in the city of Sydney for flood mapping, strategic planning, and assessing the impacts of climate change on critical infrastructure.

# Philippines, Asia



ISIS is trusted by the Philippine government to map and manage flood risk scenarios for the entire country. This includes flood risk mapping, flood hazard modelling and flood forecasting.

**CH2MHILL®**

## The ISIS Suite

**Introducing  
ISIS**

**What is ISIS being  
used for**

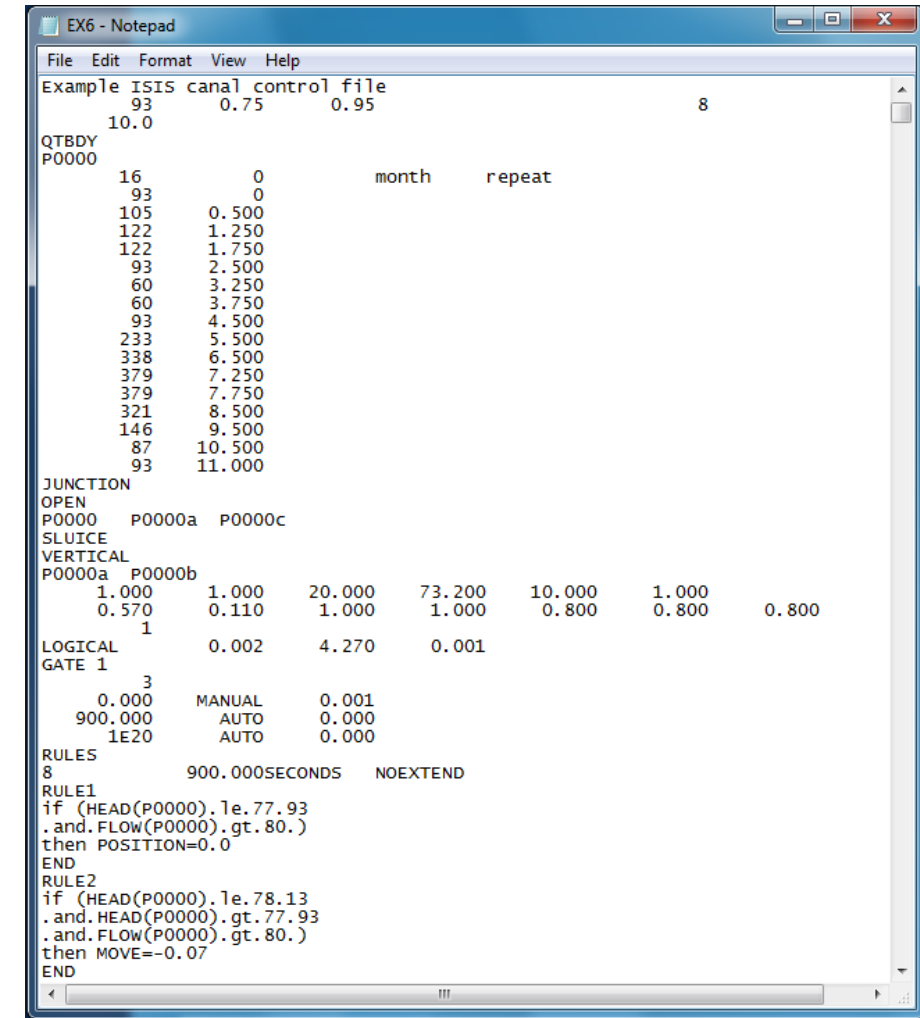
**The ISIS  
Suite**

**ISIS**



# Built on “Open Data” file formats

- **Built on an open file system**
  - quickly and conveniently see and alter model data files
  - integrate custom modeling tools and processes
- **Compatible with various data standards, incl:**
  - ESRI
  - MapInfo
  - AutoCAD
  - EACSD (for cross-section survey data)
- **ISIS provides tools to build and run models, analyse results and convert other data types**
  - Convert HEC-RAS data to ISIS data format



```
EX6 - Notepad
File Edit Format View Help
Example ISIS canal control file
93 0.75 0.95 8
10.0
QTBDY
P0000
16 0 month repeat
93 0
105 0.500
122 1.250
122 1.750
93 2.500
60 3.250
60 3.750
93 4.500
233 5.500
338 6.500
379 7.250
379 7.750
321 8.500
146 9.500
87 10.500
93 11.000
JUNCTION
OPEN
P0000 P0000a P0000c
SLUICE
VERTICAL
P0000a P0000b
1.000 1.000 1.000 20.000 73.200 10.000 1.000
0.570 0.110 1.000 1.000 0.800 0.800 0.800
1
LOGICAL
GATE 1 0.002 4.270 0.001
3
0.000 MANUAL 0.001
900.000 AUTO 0.000
1E20 AUTO 0.000
RULES
8 900.000SECONDS NOEXTEND
RULE1
if (HEAD(P0000).1e.77.93
.and.FLOW(P0000).gt.80.)
then POSITION=0.0
END
RULE2
if (HEAD(P0000).1e.78.13
.and.HEAD(P0000).gt.77.93
.and.FLOW(P0000).gt.80.)
then MOVE=-0.07
END
```

# The ISIS flood modeling suite



**ISIS MAPPER – a GIS based model building 2D and FAST models, data analysis and visualization tool.**

Interactively view model results alongside other GIS data in two or three dimensions

# The ISIS flood modeling suite



**ISIS 1D - a full solution solver for modeling of open channels, floodplains, levees, and hydraulic structures.**

Any hydrological method can be used and rainfall-runoff simulation enables both event based and conceptual hydrological methods.

# The ISIS flood modeling suite



**ISIS 2D has fully hydrodynamic computational engine designed to work alone or with ISIS 1D, enabling dynamic interaction between 1D and 2D models.**

Multiple 2D domains, with different cell sizes, time steps, simulation times can be coupled to a single 1D model to represent the floodplain at different resolutions.

# The ISIS flood modeling suite



**ISIS FAST - rapid flood inundation modeling, providing results up to 1,000 times faster than traditional 2D models.**

ISIS FAST links dynamically to ISIS 1D, enabling large and complex studies to be undertaken much quicker than previously possible.

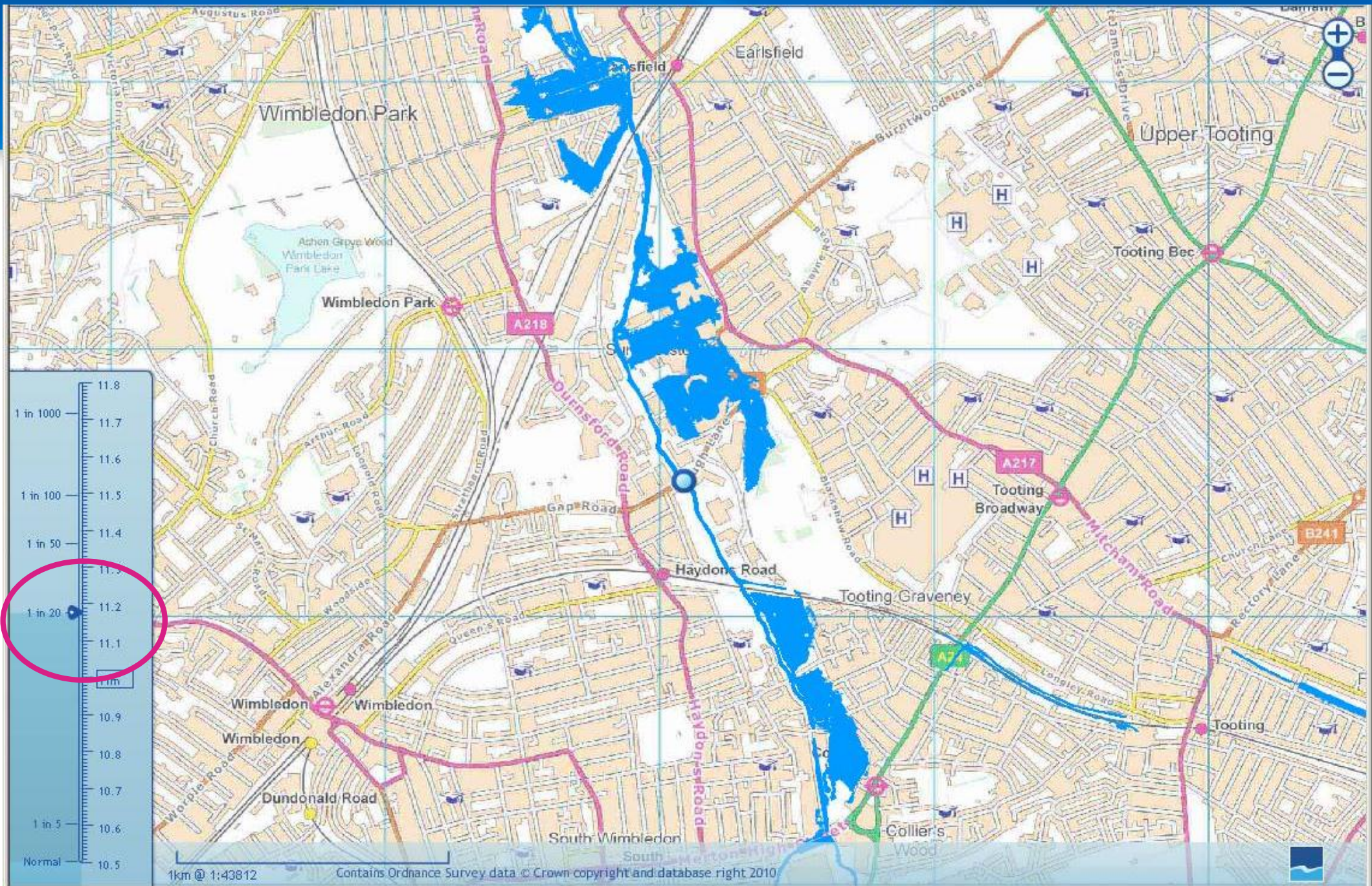


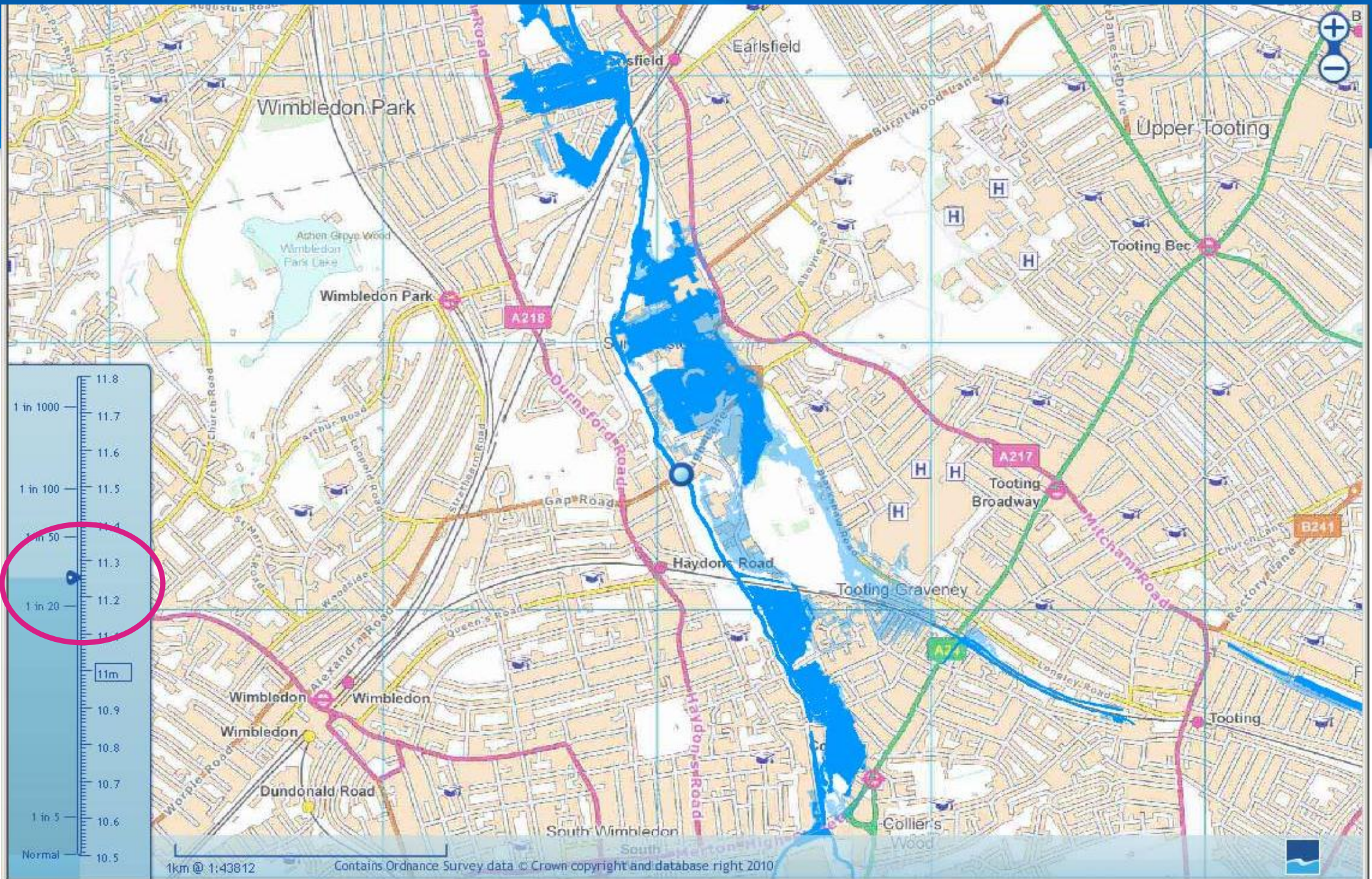
# The ISIS flood modeling suite



**ISIS VIEWER – an intuitive way for the non-technical user to effortlessly view and interrogate model results without the need to purchase any software.**

Helping technical users to quickly and effectively visualize data and share project outputs with colleagues, clients and third parties.







# Flood Forecasting (and Flood Early Warning Systems)

- ISIS VIEWER is used in flood incident management;
- ISIS 1D is the principle flood model within National Flood Forecasting Systems across the world (within Delft FEWS);
- Flood Alert provides real-time flood forecast information



David Cameron, being briefed using CH2M HILL's Flood Viewer, Gloucestershire Gold Command, November 2012 Floods  
Source: Press Association

# Summary

- Long history of development and widely used across the world;
- Robust and proven 1D and 2D solvers - designed for flood modelling at any scale
- Dedicated development team, support and training teams;
- Extensive online training and support, and a 13,000 strong user community;
- Versions available for free.

**Major new release  
coming in Q4, 2014**

**Life simplified**

**Better than ever**

**Visually stunning**

**CH2MHILL**

Thank you

