Catchment Modelling of Pesticide Contamination Risk in East Anglia, UK

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Overview

- The water quality challenge
- Modelling approach
- Case study
- How are Anglian Water using the results?

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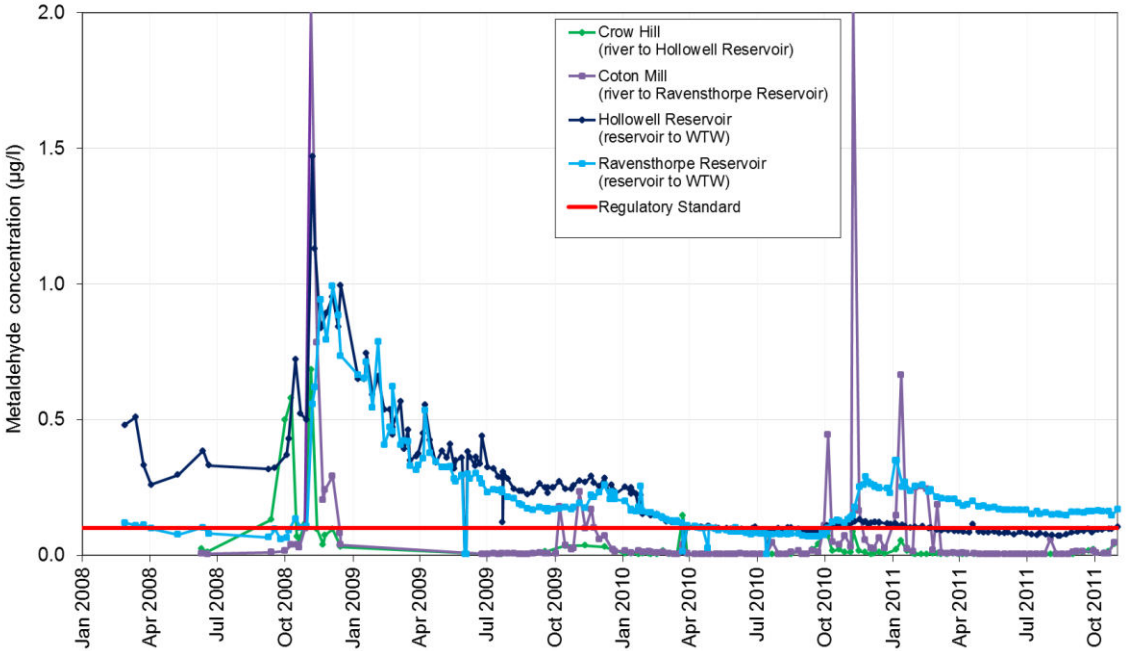
The water quality challenge

- Metaldehyde
  - Active ingredient in slug pellets
  - Applied to protect wheat and oil seed rape in late summer/autumn
  - Carried into water courses by field runoff and field drains
- EU legislation requires 0.1µg/l limit on all pesticides

The water quality challenge



- Drivers for improvement:
  - DWI Undertakings
  - Water Framework Directive

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Potential solutions

- Additional treatment
- Operational control
- Catchment management
  - Promotion of alternative product
  - Change in farming practices
  - Change in land use

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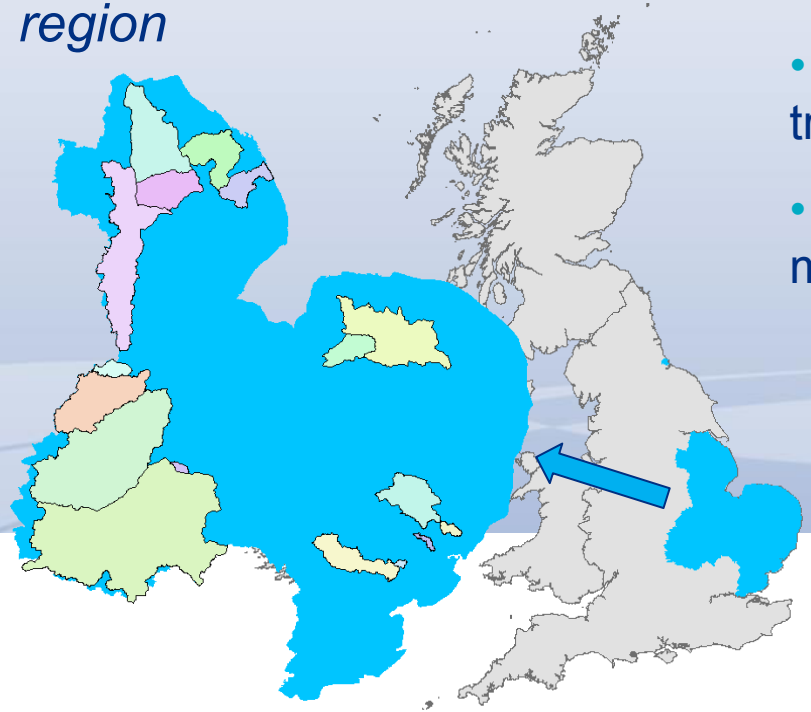
Our project – an overview

Overall aim: Assess the feasibility of using catchment management solutions to improve raw water quality in surface water sources in Anglian region



- Increase our understanding of metaldehyde transport and the catchments
- Identify and assess potential catchment management solutions:
  - Will the measures work?
  - If so, **where** will measures be most cost-effective?

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Modelling approach

Collect information on catchment

Develop conceptual model

Build catchment SWAT model

Calibrate and validate model against real data

Assess catchment management scenarios

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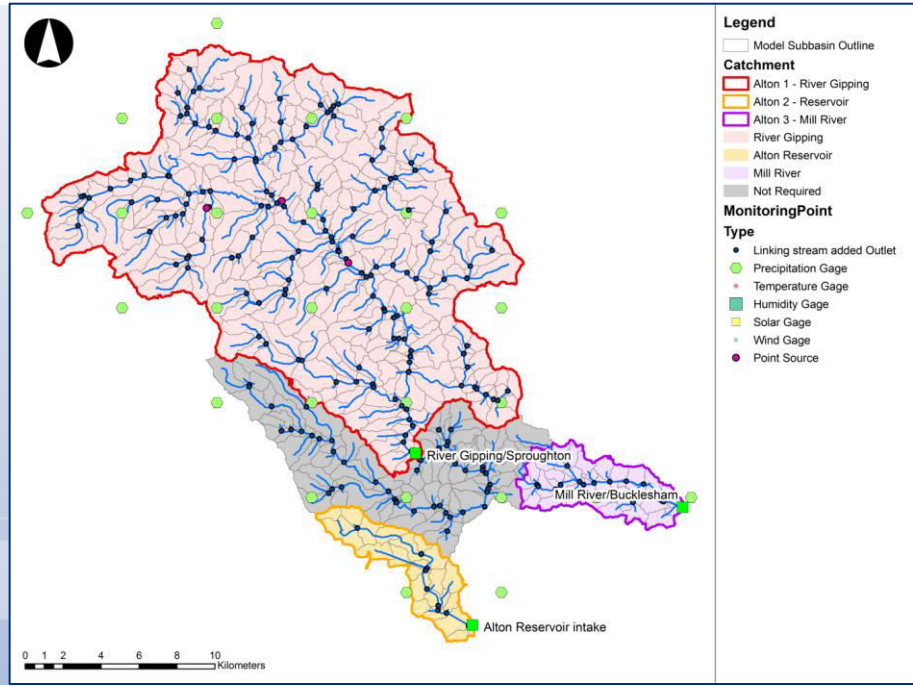
SWAT model overview

- SWAT: Soil & Water Assessment Tool
- SWAT simulates:
  - Catchment and soil hydrology
  - Crop growth
  - Pesticide transport and degradation
  - Abstractions/discharges/transfers
  - Simplified reservoir processes



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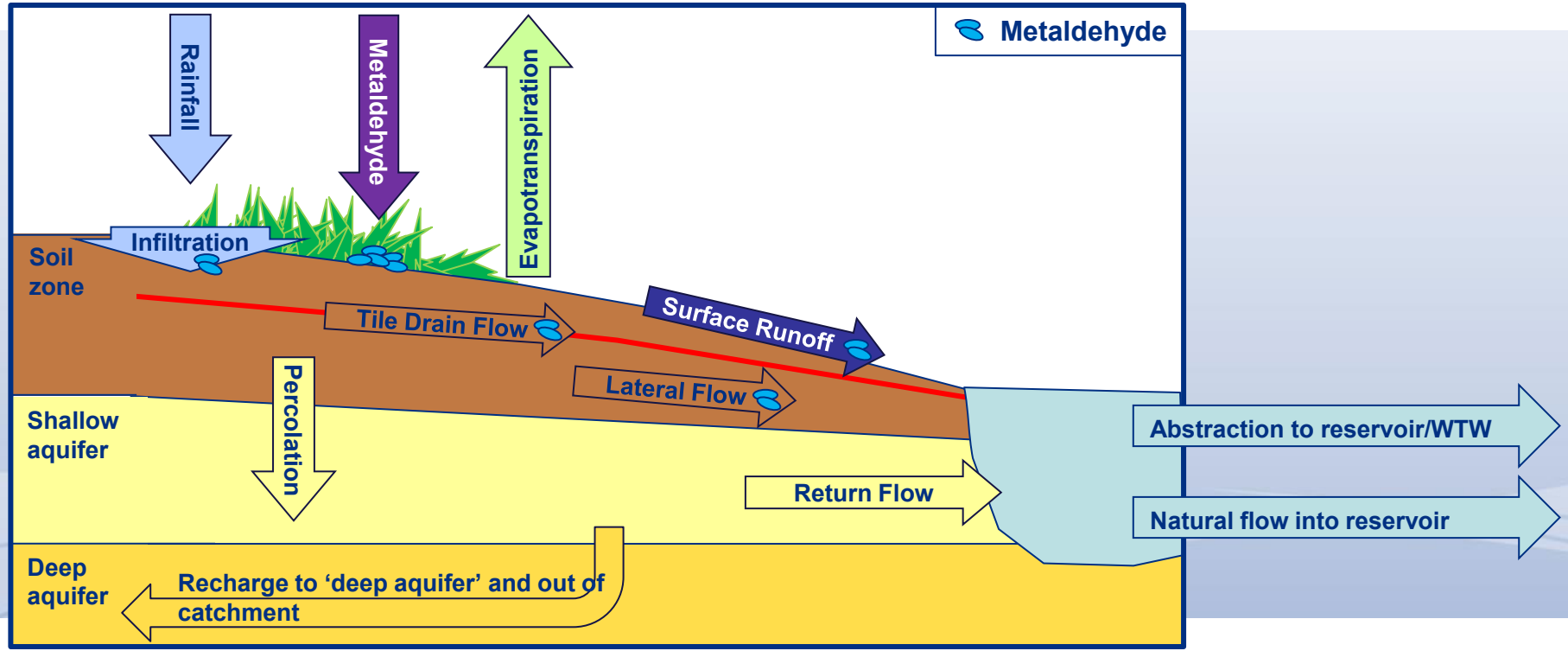
SWAT conceptual model



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Model build and calibration

- Model build data
  - Topography
  - Rainfall and climate
  - Soils and geology
  - Land cover
  - Agricultural data
  - Anglian Water operational data
- Calibration data
  - Recorded daily flow
  - Recorded metaldehyde concentrations
  - Reservoir water levels

Catchment management scenarios

Scenario		
1	No metaldehyde application across percentage of arable land	
2	No metaldehyde application on clayey soils	**High risk areas**
3	No metaldehyde application in steeper areas (>3 degree slope)	
4	No metaldehyde application within 200/500m of watercourses	
5	Reduced metaldehyde through guideline dose rate	
6	Combination of the most effective scenarios	

- Contribution of each catchment considered individually

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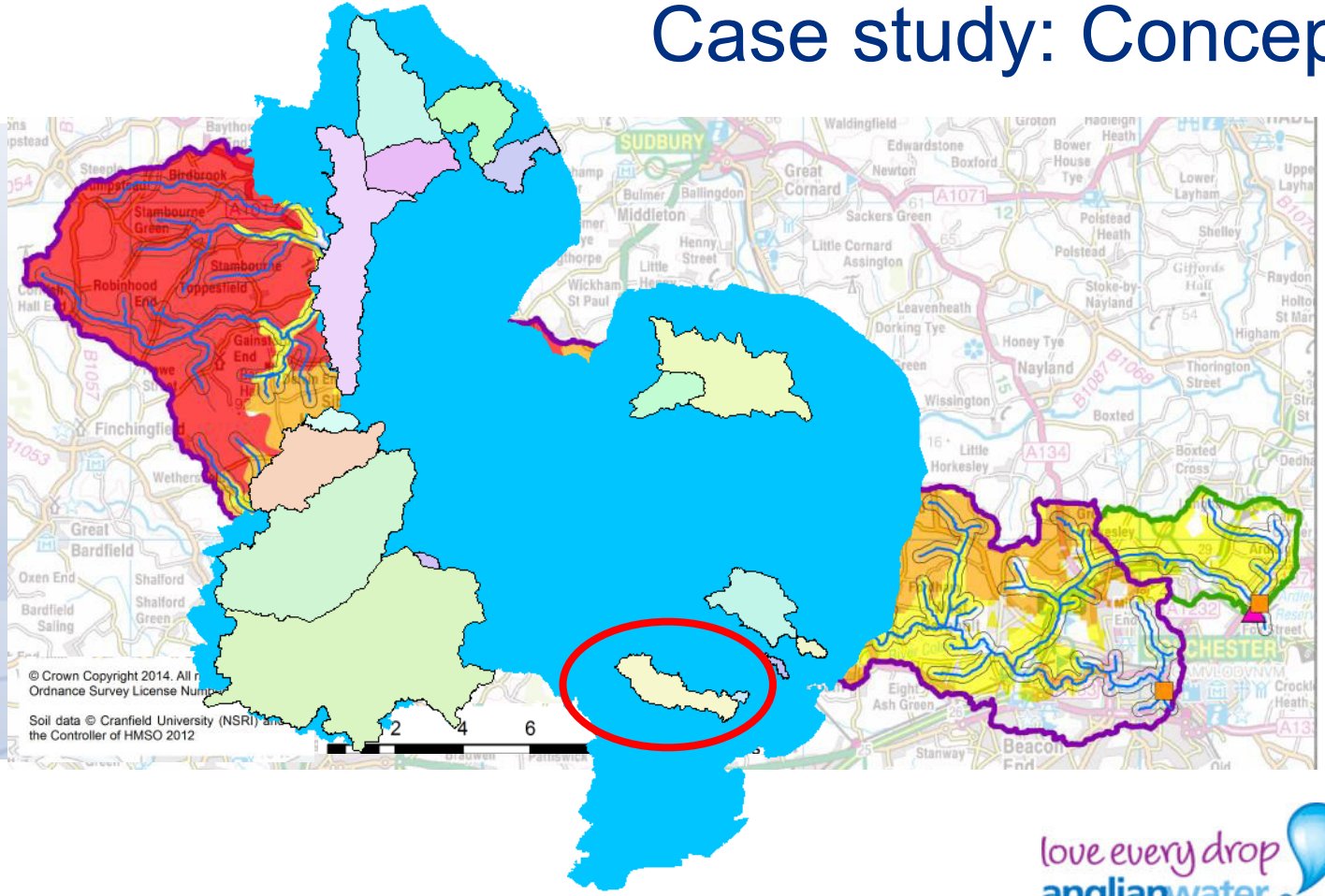
Case study: Conceptualisation



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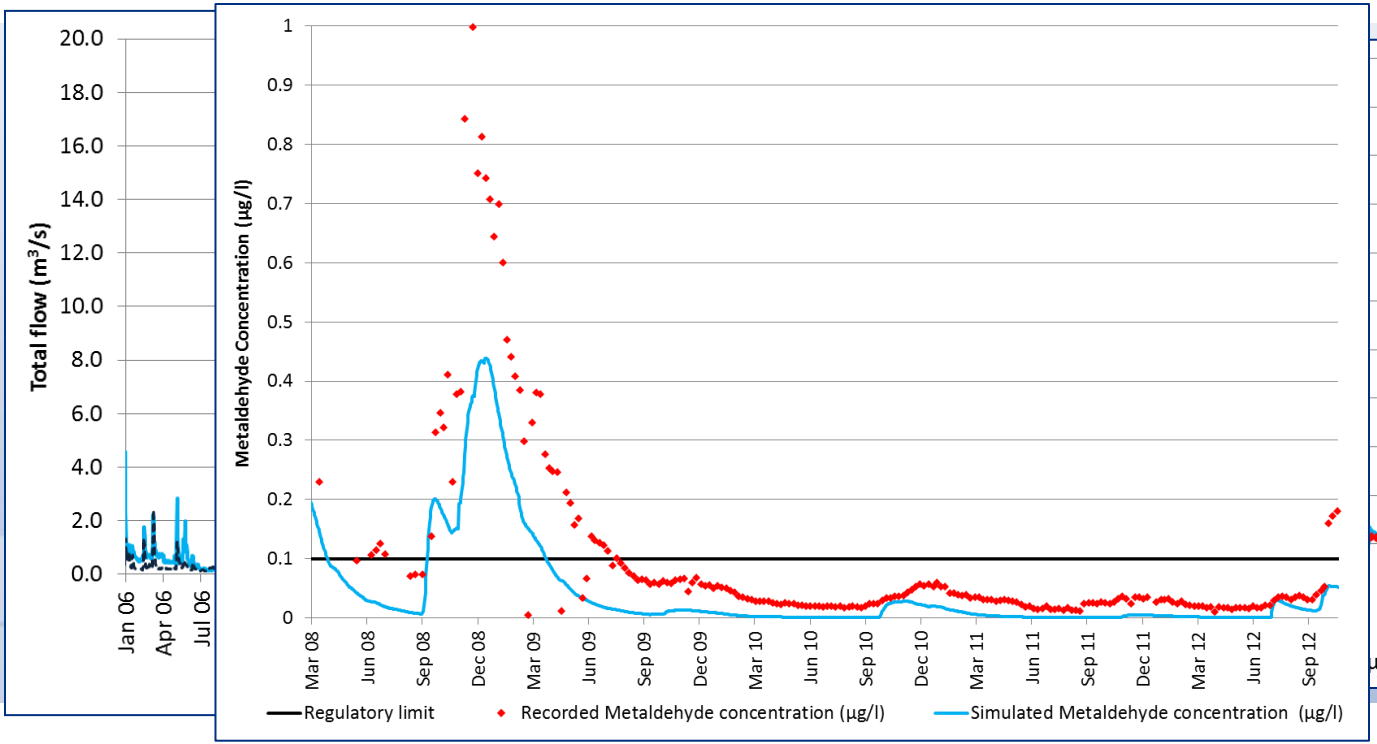
Case study: Calibration



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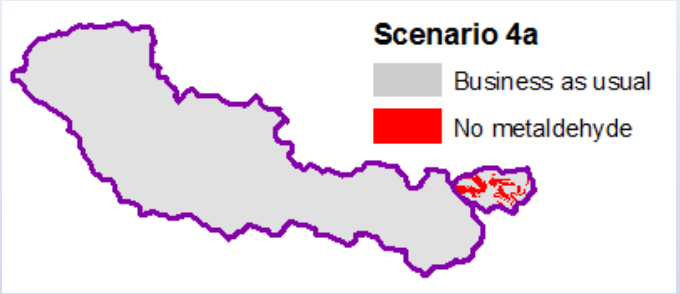
Case study: Scenario modelling results

- Most effective scenario by area: No metaldehyde applied within 200m of watercourses in natural reservoir catchment



- BUT total area too small for significant impact on overall concentration in reservoir
- To reduce concentrations to below 0.1µg/l in Ardleigh Reservoir…

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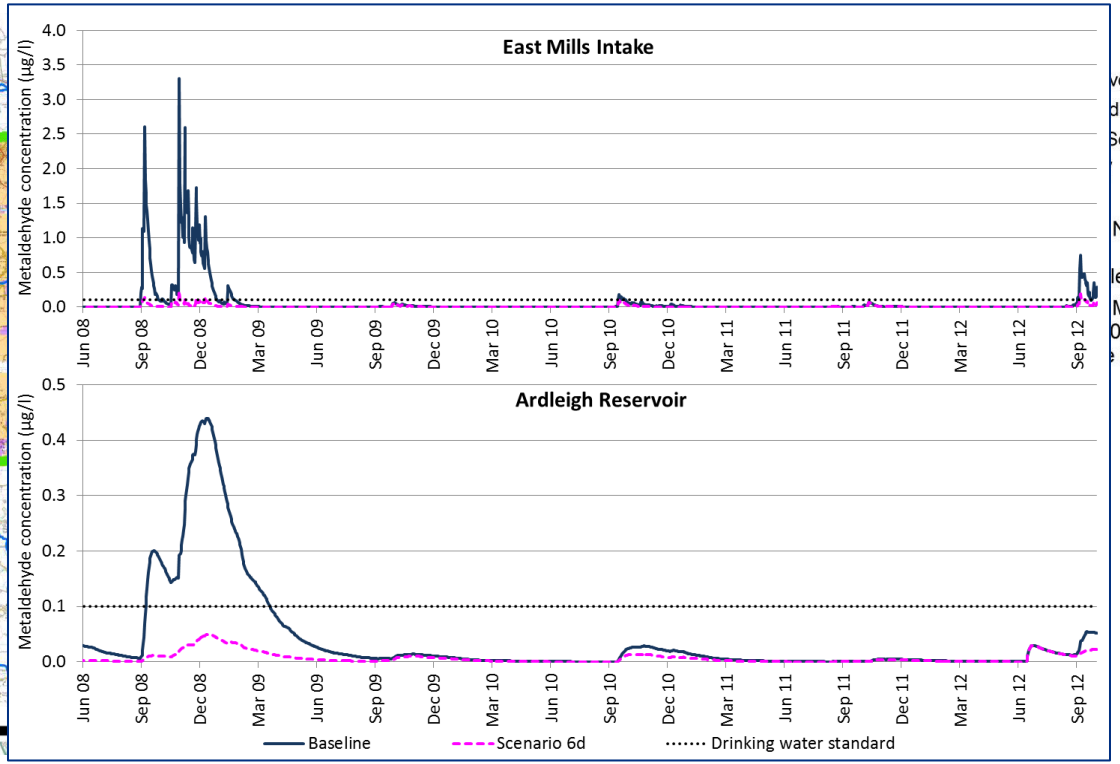
Case study: Scenario modelling results



ver Colne
dleigh Reservoir
Sources

No metaldehyde

le land

Max metaldehyde
0g/ha
e land

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How are Anglian Water using the results?

- Results informed business plan for 2015-2020 (AMP6)
  - Catchment advisers
  - CFD modelling of reservoirs
  - Using remote sensing data to refine models
  - Use of models as planning tools

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