Progress to date on HydEF: BGS work

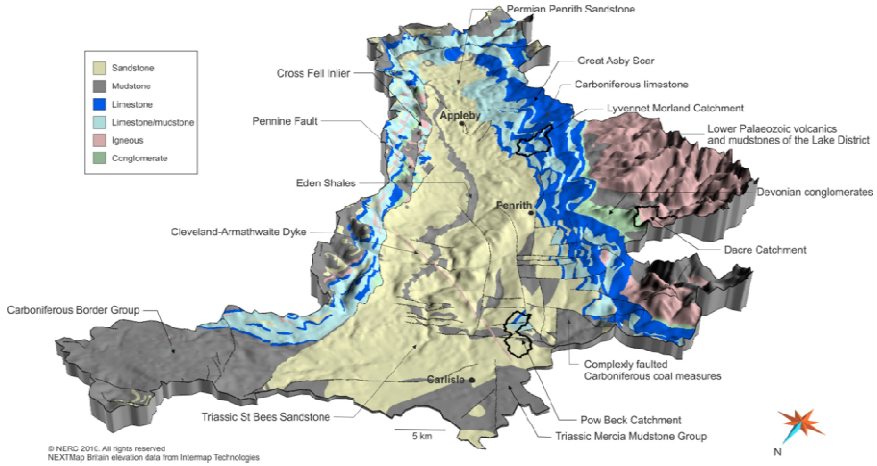
Denis Peach, Chris Jackson, Stephanie Bricker, Antoine Lafare, Andrew Hughes with help from:

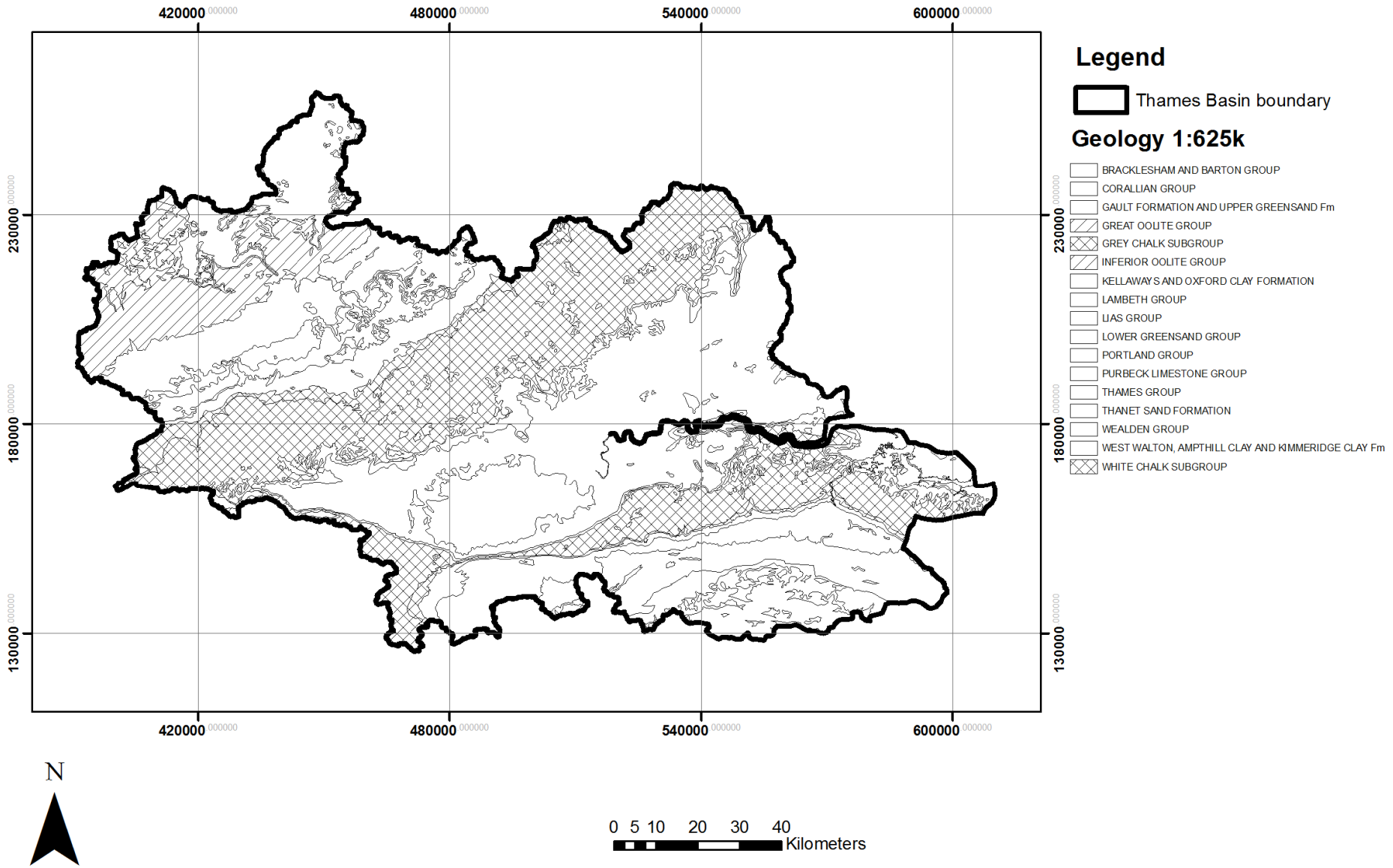
Jon Mackay, Majdi Mansour and Ann Williams.

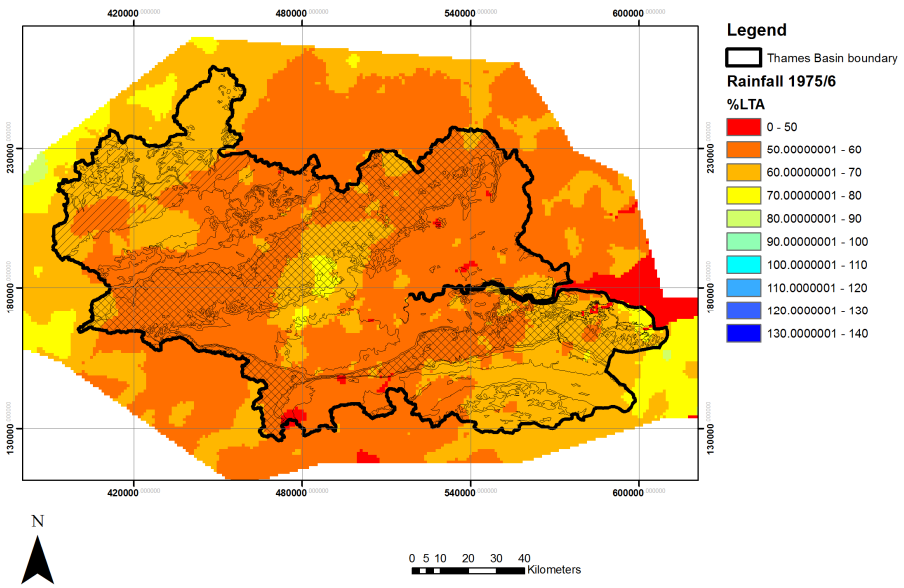
6th November 2012

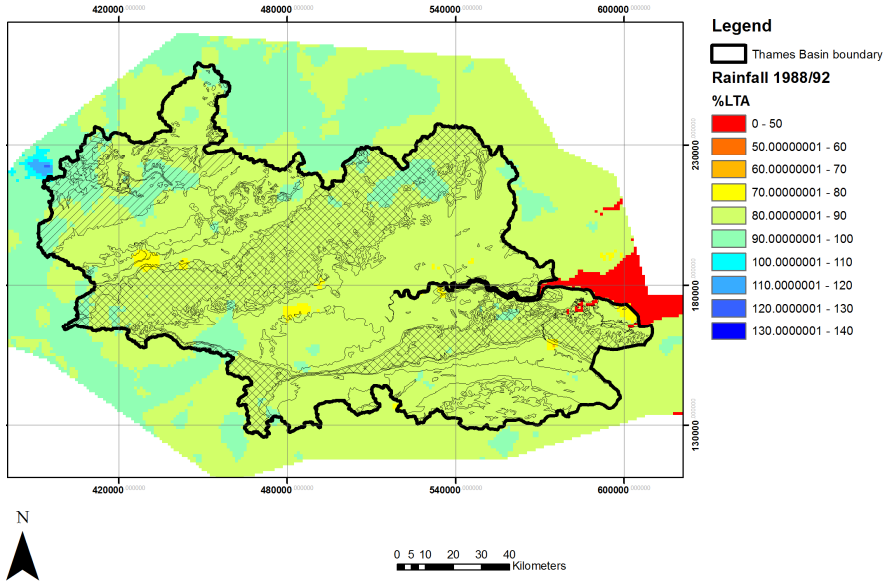
Outline of talk

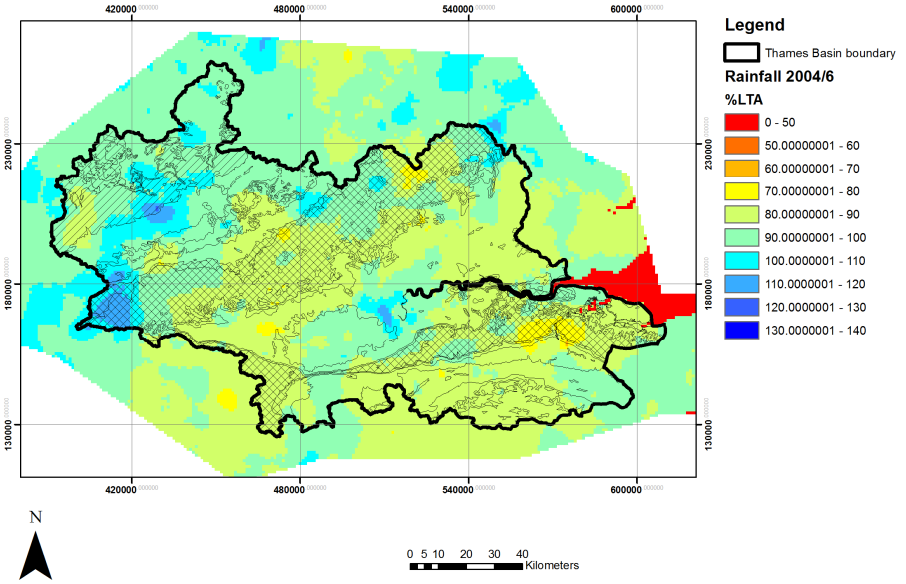
- Thames basin
  - Drought
  - Other areas:
    - Pang/Lambourn
    - Colne Valley
  - Cotswolds
  - Thames model
- Eden Valley
- Plans and schemes

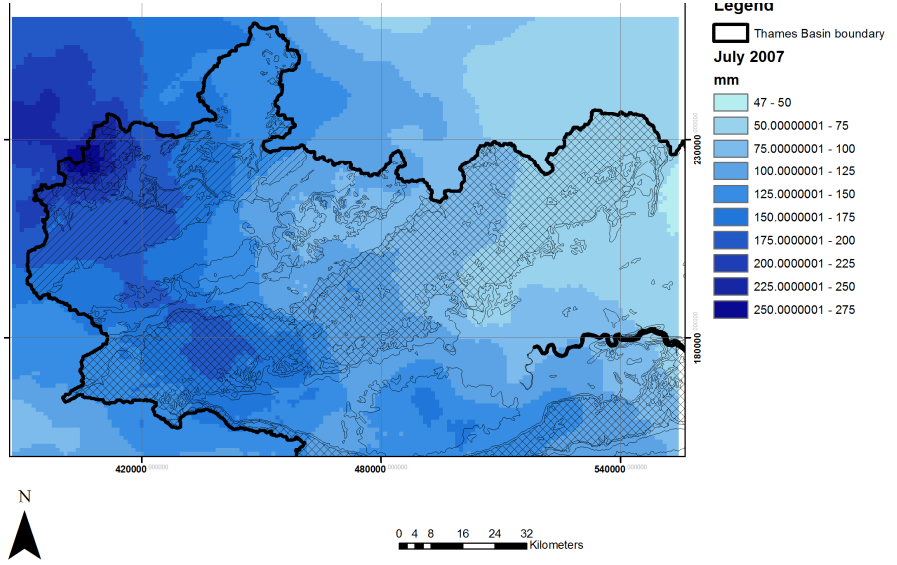


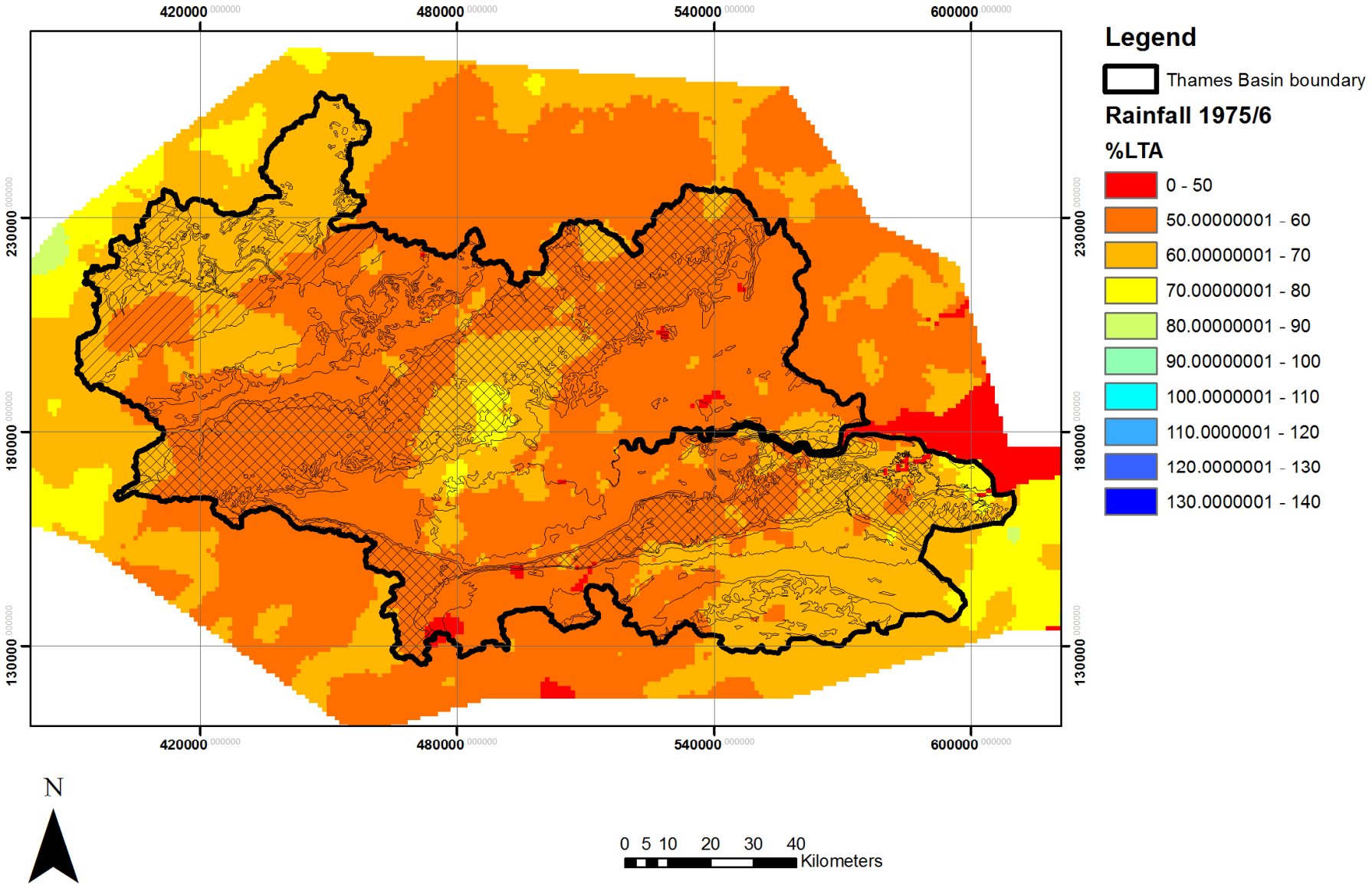

420000
480000
540000
600000
230000
180000
130000
Legend
Thames Basin boundary
Geology 1:625k
BRACKLESHAM AND BARTON GROUP
CORALLIAN GROUP
GAULT FORMATION AND UPPER GREENSAND Fm
GREAT OOLITE GROUP
GREY CHALK SUBGROUP
INFERIOR OOLITE GROUP
KELLAWAYS AND OXFORD CLAY FORMATION
LAMBETH GROUP
LIAS GROUP
LOWER GREENSAND GROUP
PORTLAND GROUP
PURBECK LIMESTONE GROUP
THAMES GROUP
THANET SAND FORMATION
WEALDEN GROUP
WEST WALTON, AMPTHILL CLAY AND KIMMERIDGE CLAY Fm
WHITE CHALK SUBGROUP
N
0 5 10 20 30 40
Kilometers

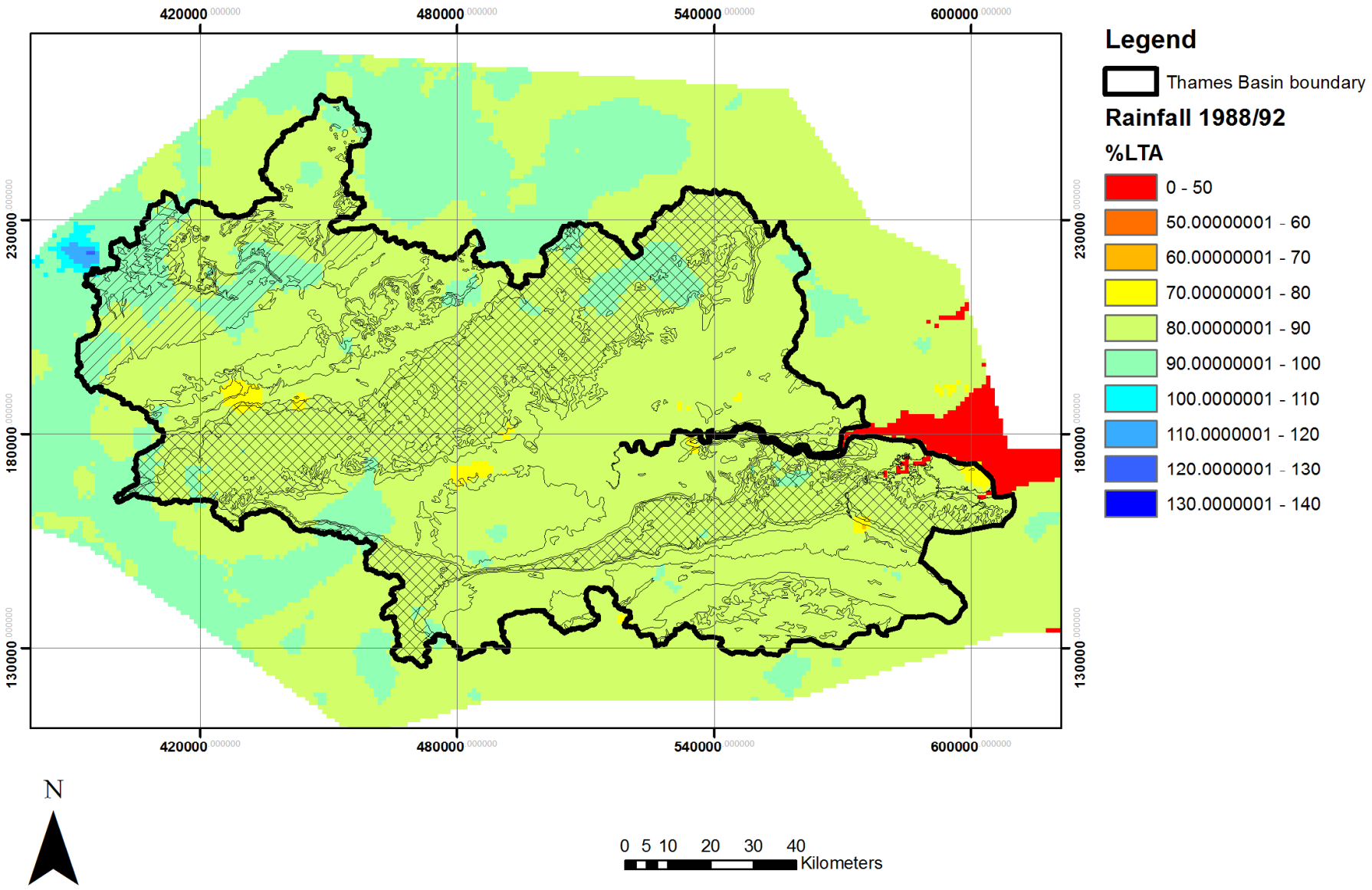


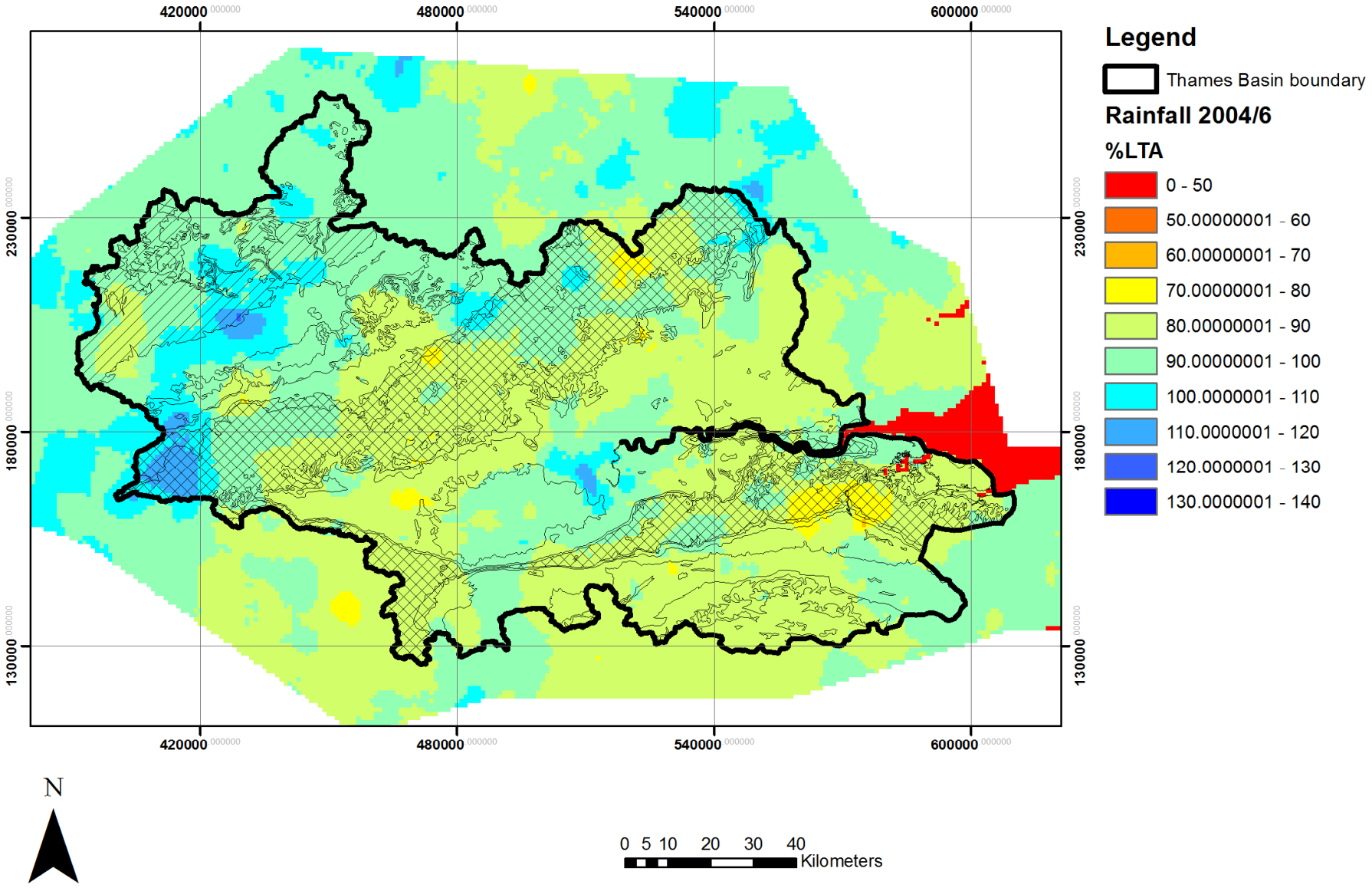


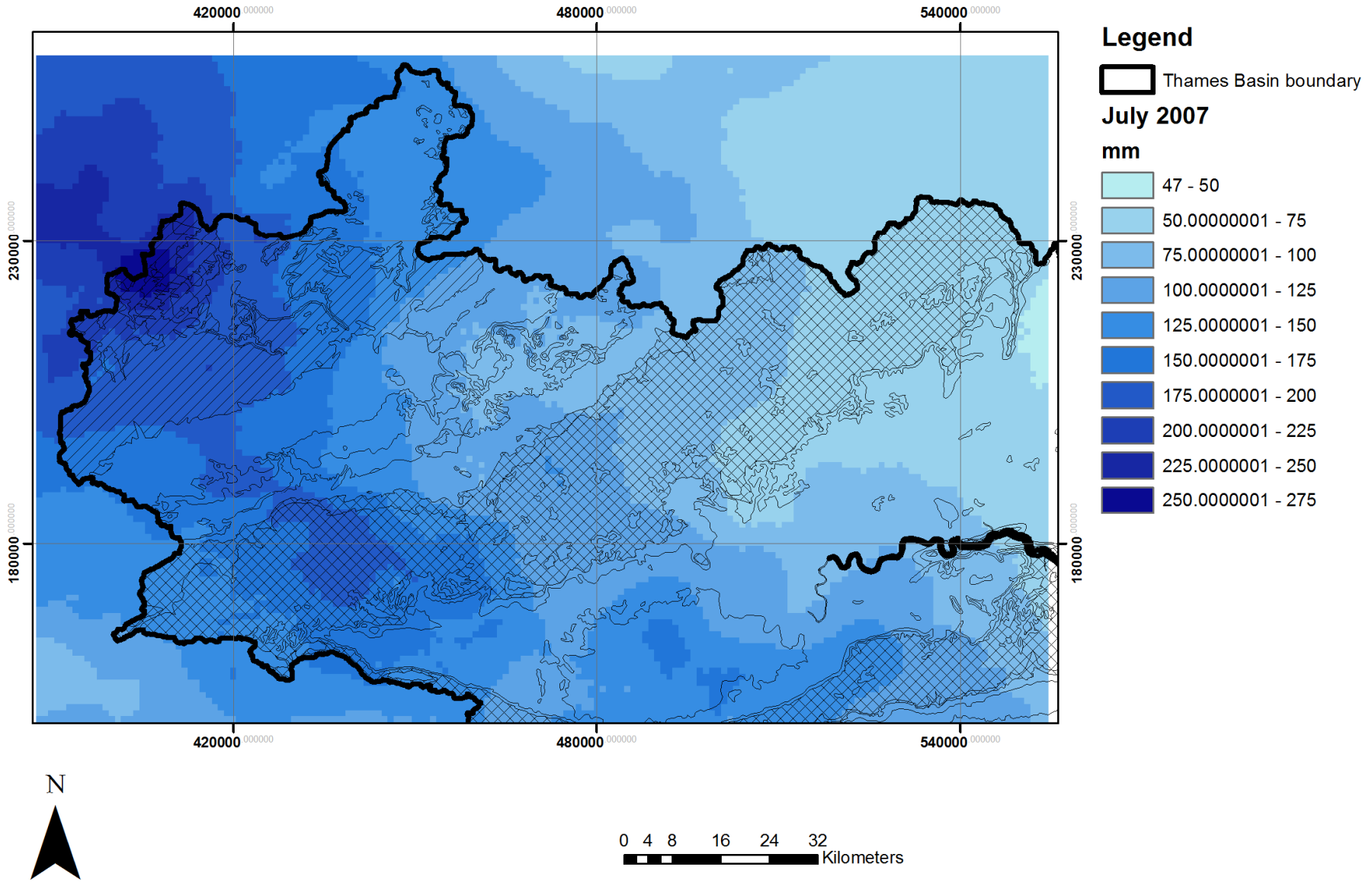




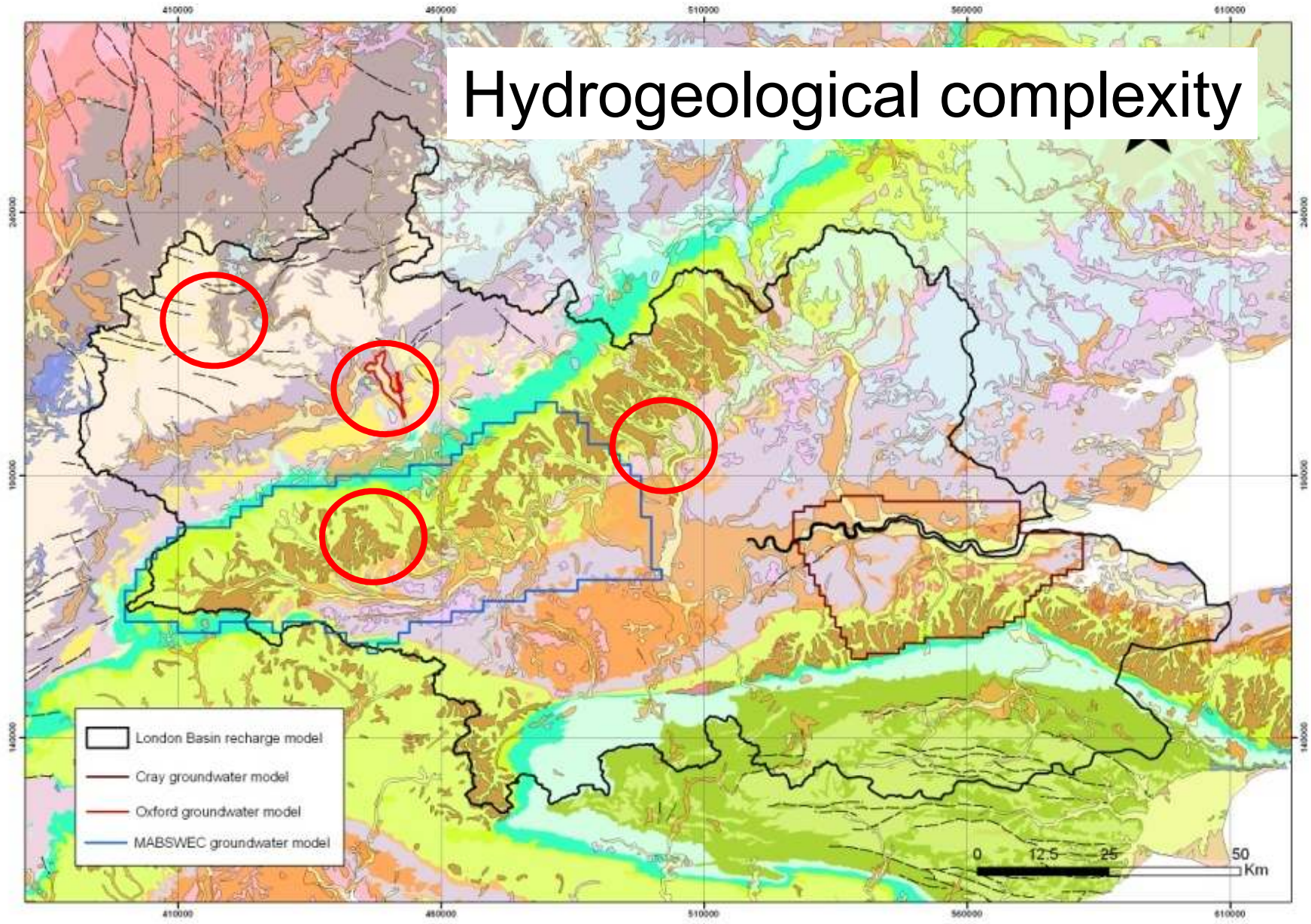

420000
480000
540000
600000
230000
180000
130000
Legend
Thames Basin boundary
Rainfall 1975/6
%LTA
0 - 50
50.00000001 - 60
60.00000001 - 70
70.00000001 - 80
80.00000001 - 90
90.00000001 - 100
100.0000001 - 110
110.0000001 - 120
120.0000001 - 130
130.0000001 - 140
N
0 5 10 20 30 40
Kilometers


420000
480000
540000
600000
230000
180000
130000
Legend
Thames Basin boundary
Rainfall 1988/92
%LTA
0 - 50
50.00000001 - 60
60.00000001 - 70
70.00000001 - 80
80.00000001 - 90
90.00000001 - 100
100.0000001 - 110
110.0000001 - 120
120.0000001 - 130
130.0000001 - 140
N
0 5 10 20 30 40
Kilometers

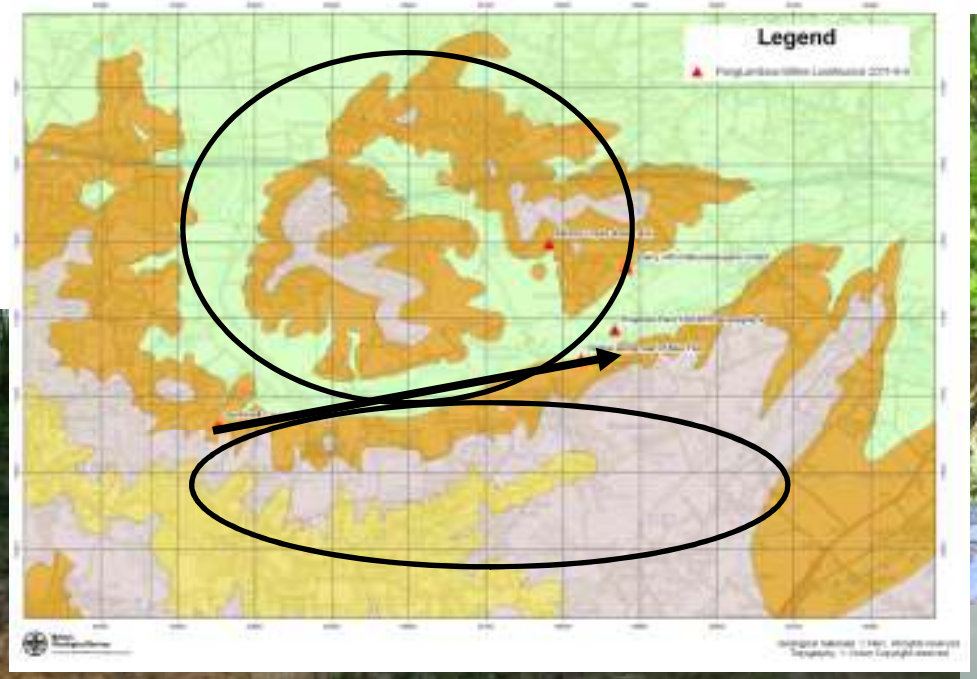

420000
480000
540000
600000
230000
180000
130000
Legend
Thames Basin boundary
Rainfall 2004/6
%LTA
0 - 50
50.00000001 - 60
60.00000001 - 70
70.00000001 - 80
80.00000001 - 90
90.00000001 - 100
100.0000001 - 110
110.0000001 - 120
120.0000001 - 130
130.0000001 - 140
N
0 5 10 20 30 40
Kilometers

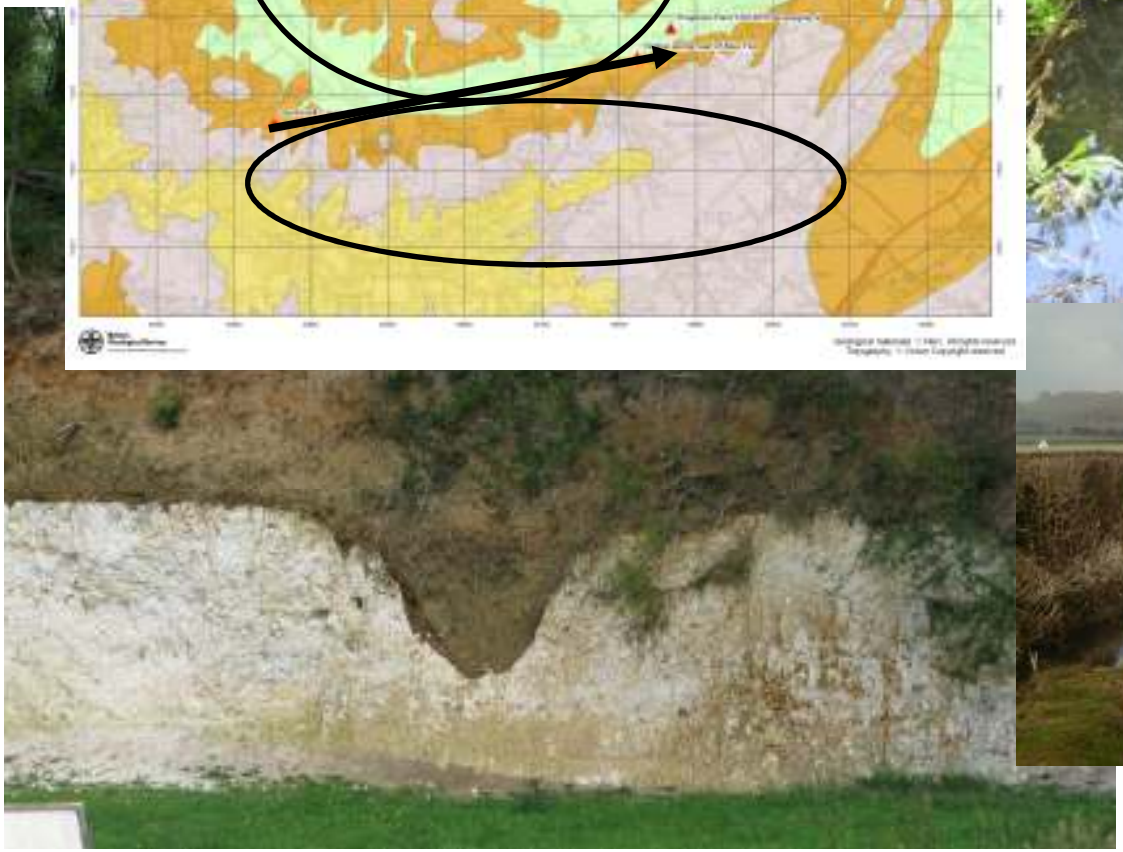

420000
480000
540000
230000
180000
Legend
Thames Basin boundary
July 2007
mm
47 - 50
50.00000001 - 75
75.00000001 - 100
100.0000001 - 125
125.0000001 - 150
150.0000001 - 175
175.0000001 - 200
200.0000001 - 225
225.0000001 - 250
250.0000001 - 275
N
0 4 8 16 24 32
Kilometers

Hydrogeological complexity

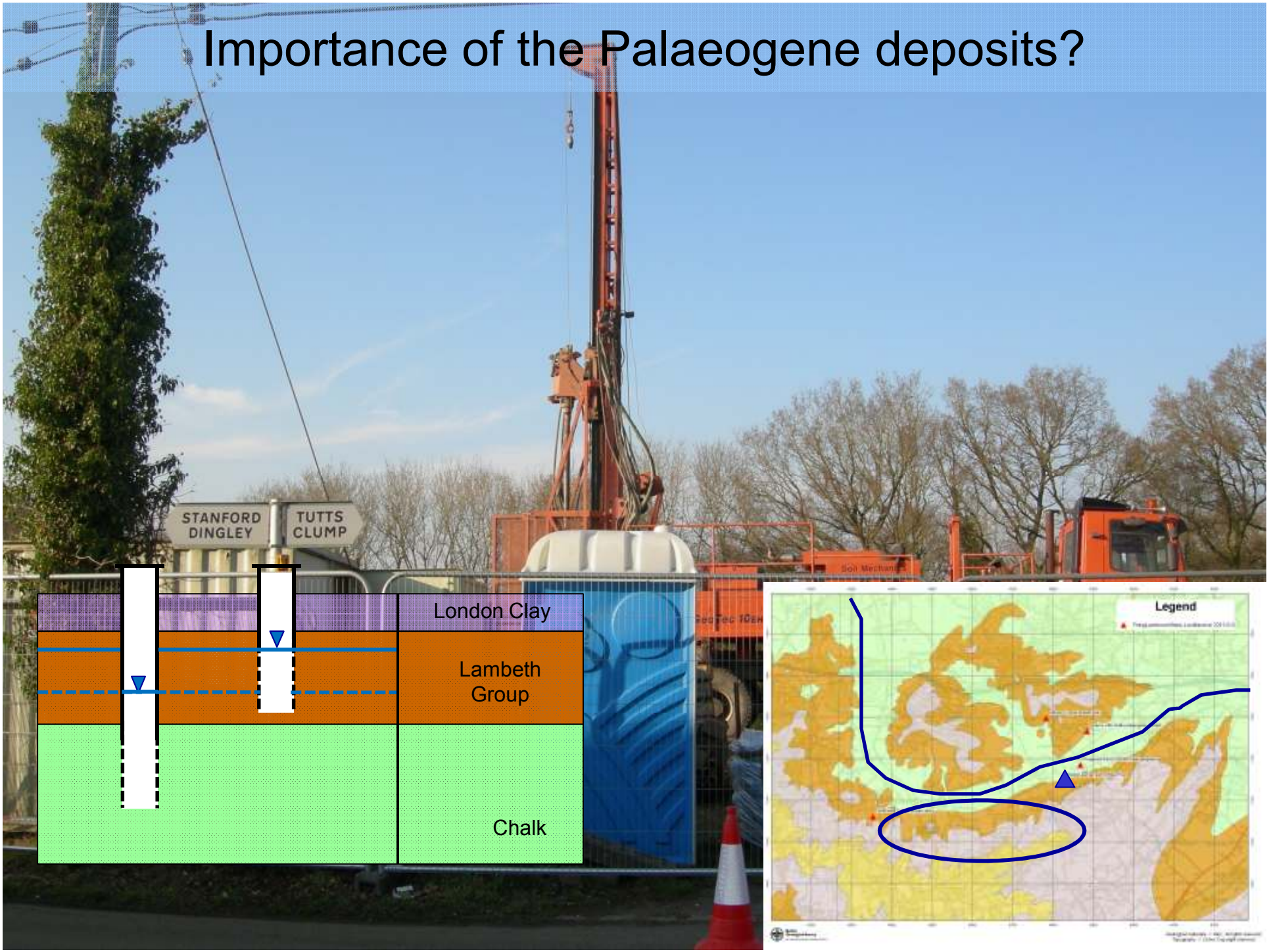


Role of the Palaeogene and karst in the Chalk groundwater system in the Pang-Lambourn

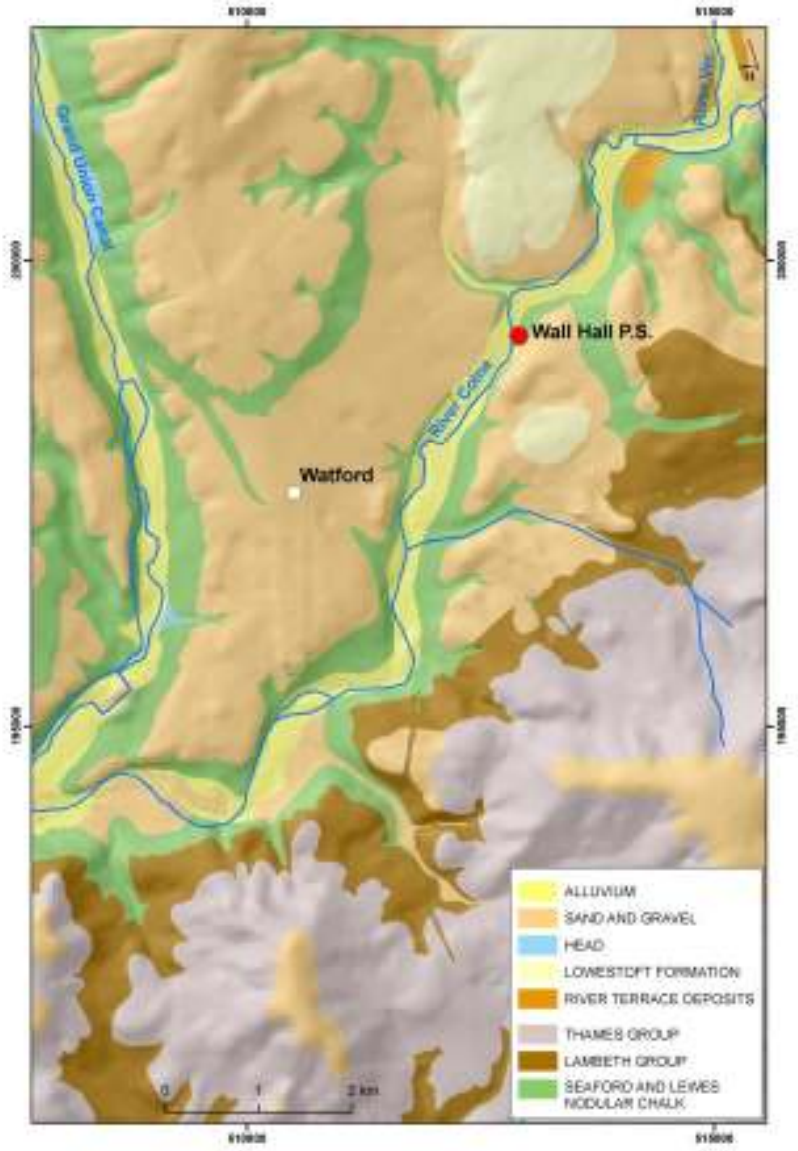


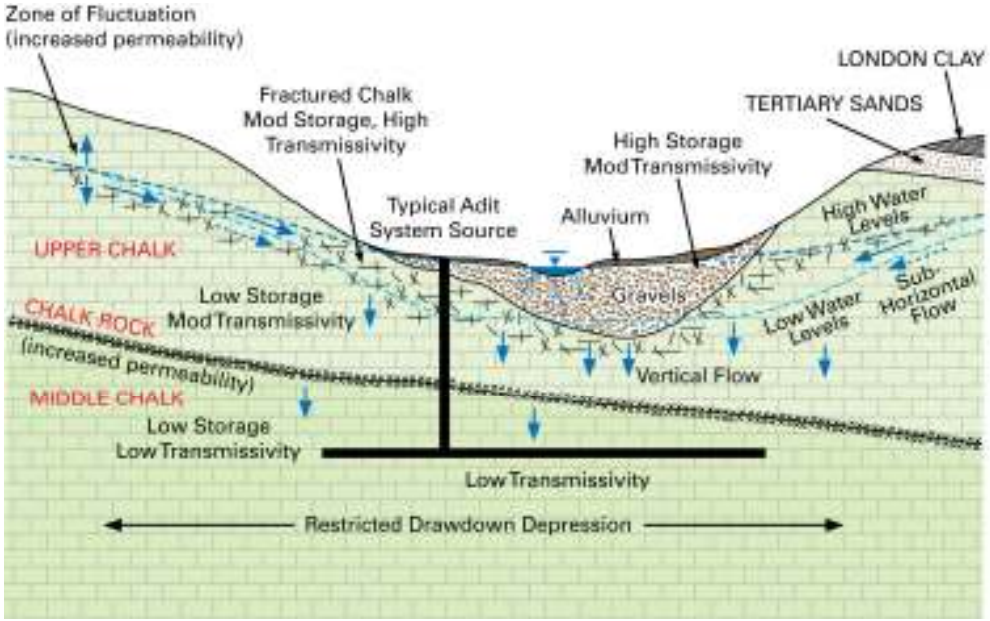


Importance of the Palaeogene deposits?



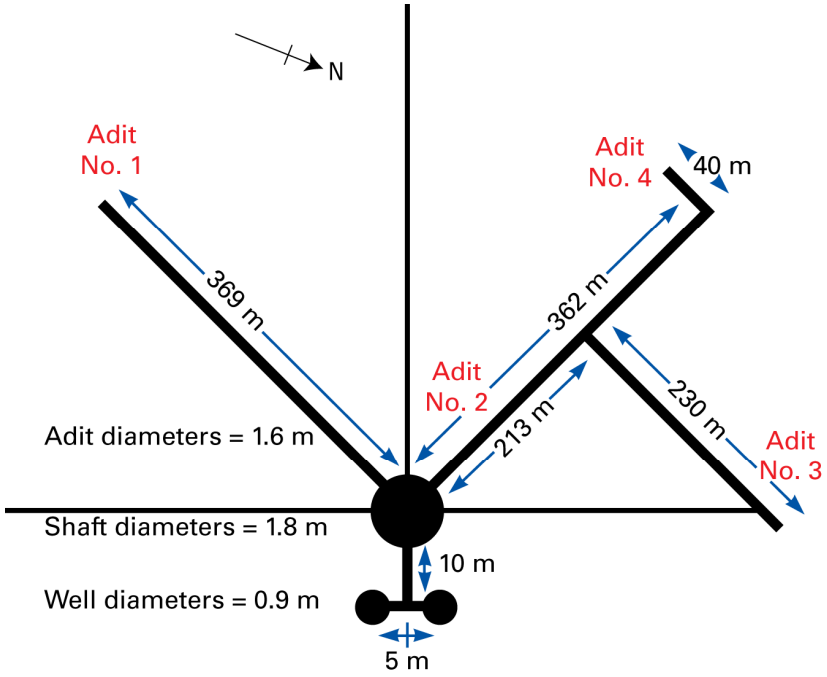
Colne Valley - Adits



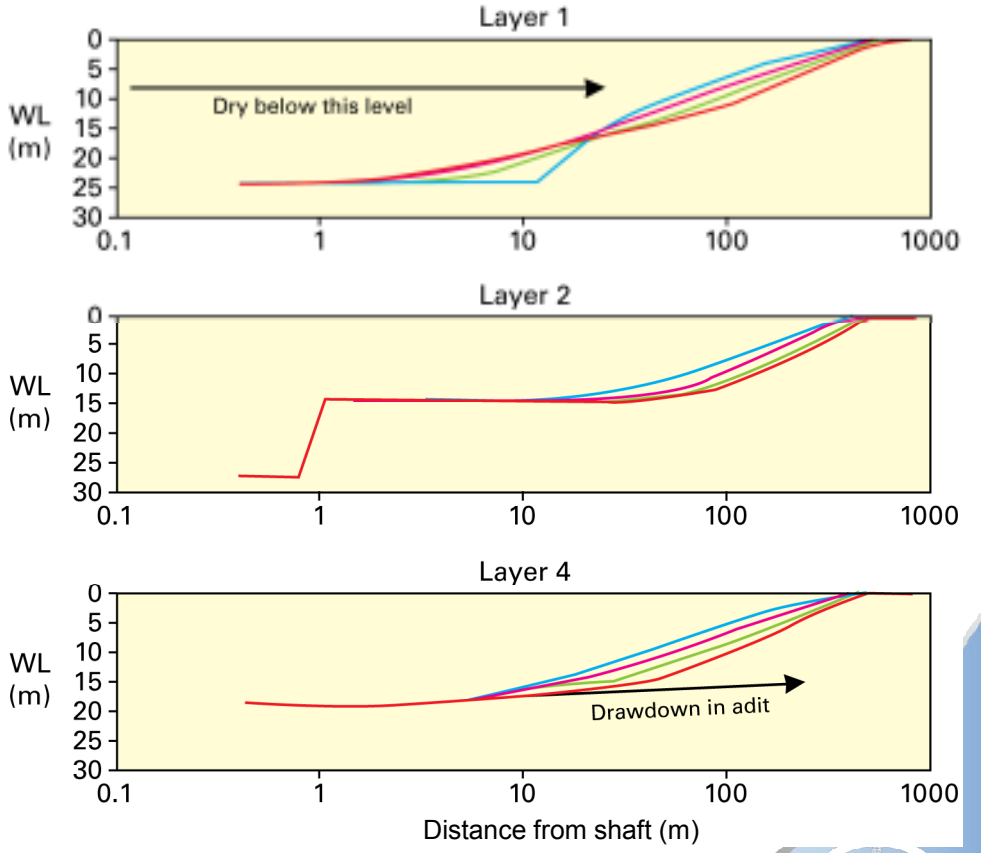


Note alluvium, sands and gravel, and river terrace deposits

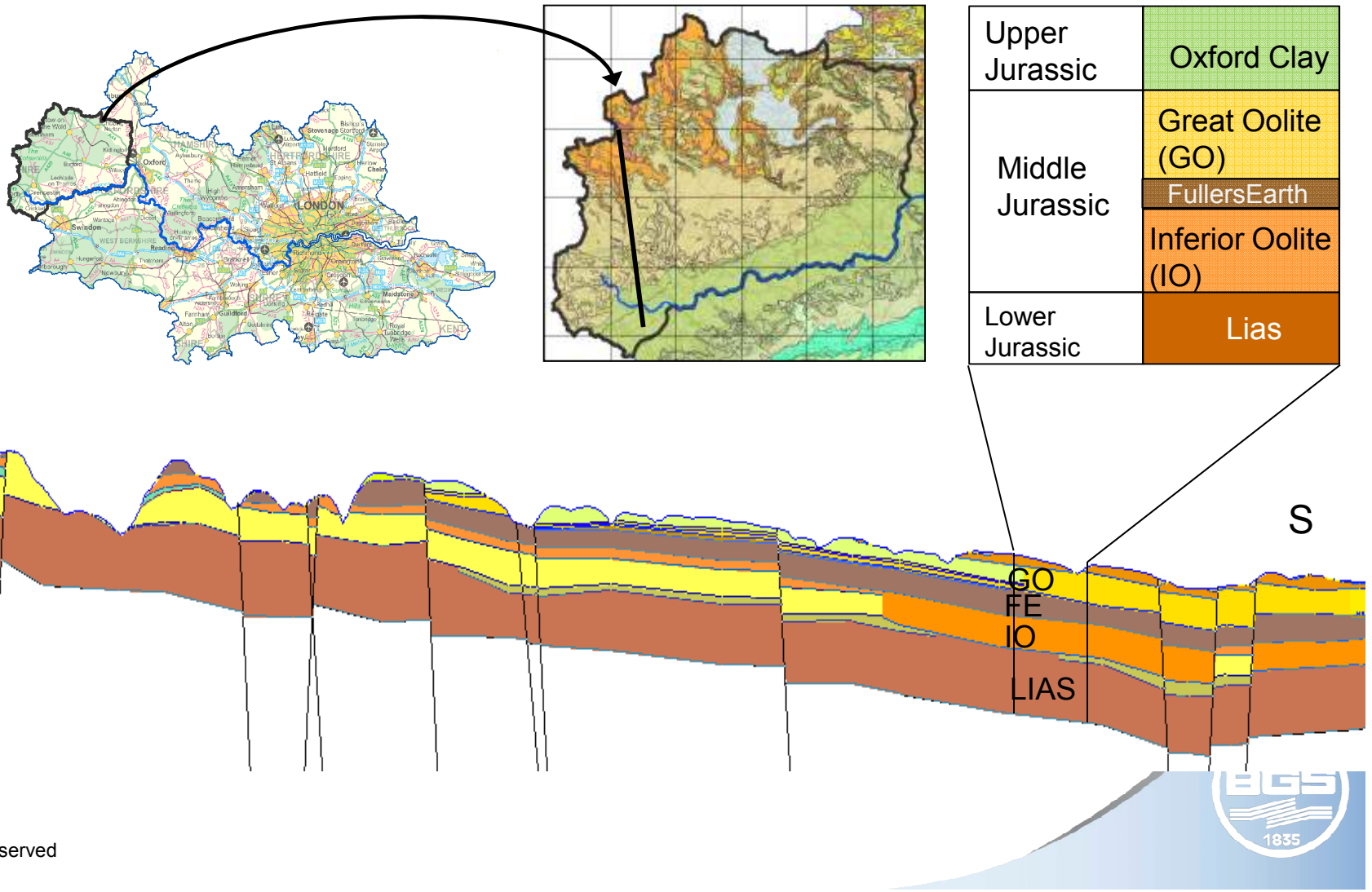
Adit Abstraction Systems
Modelling Wall Hall Pumping Test



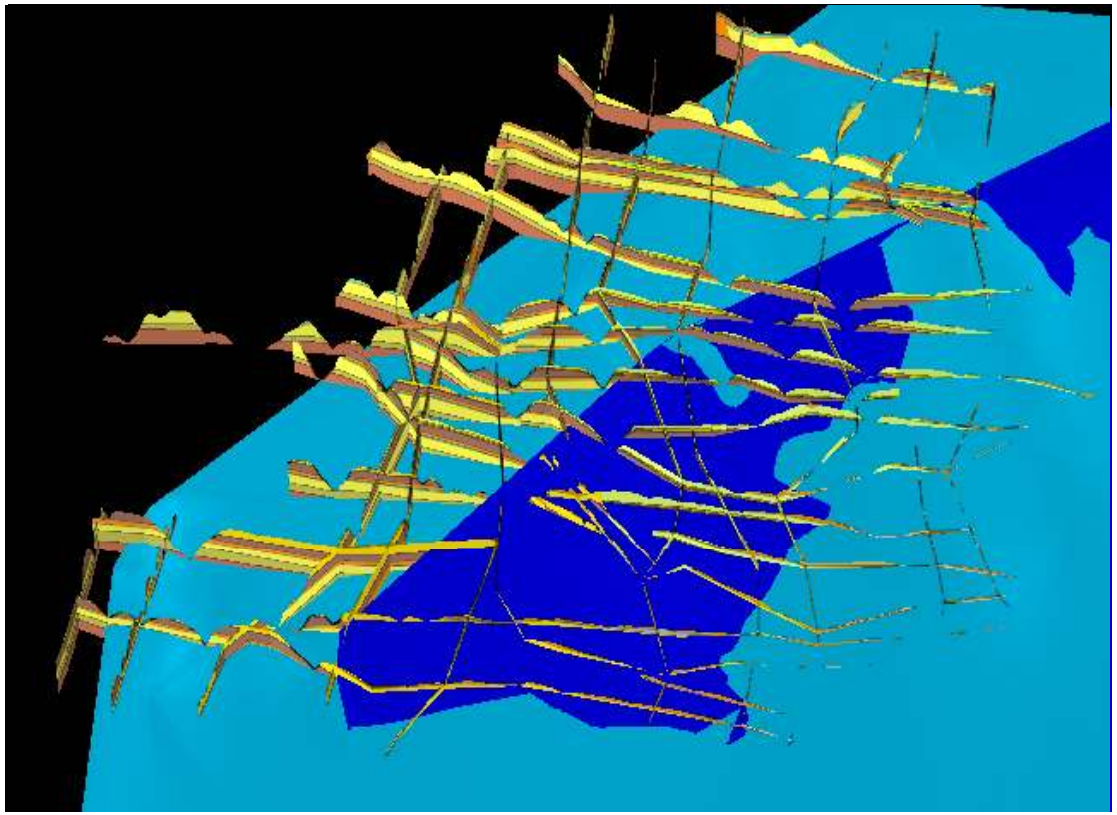
Modelled levels after 100 days pumping



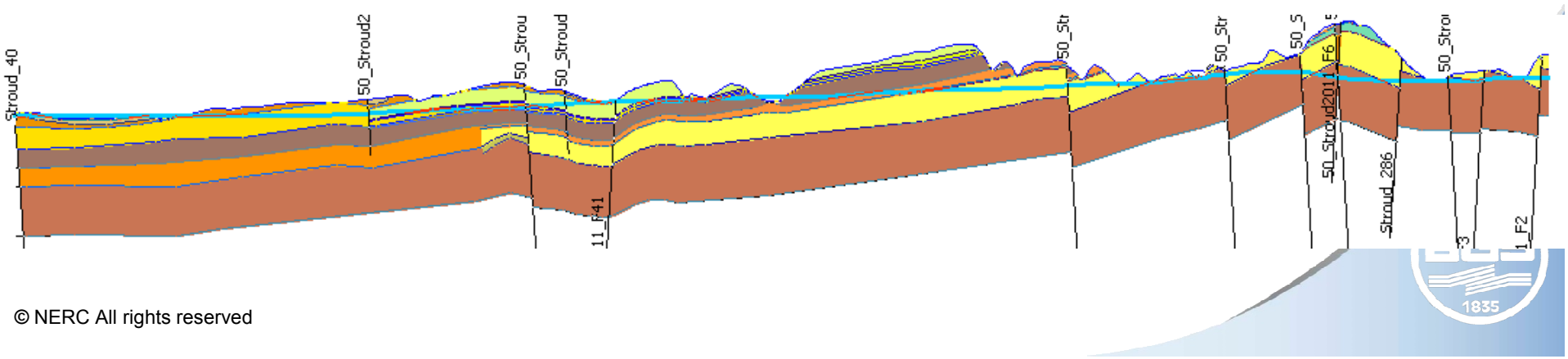
Cotswolds limestones



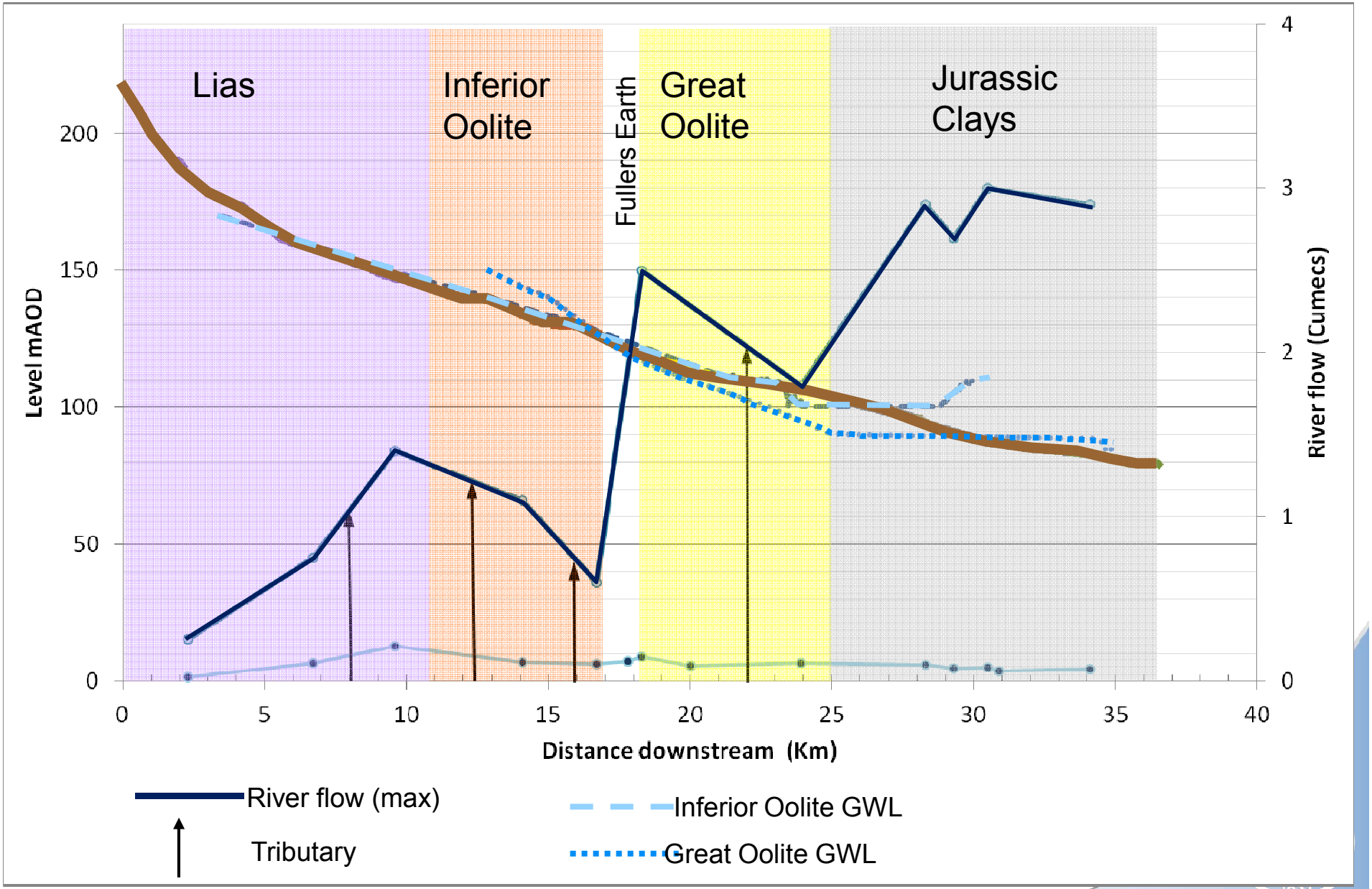
Geology in 3D using GSI3D™



Great and Inferior Oolite GW level



River Churn – Flow accretion



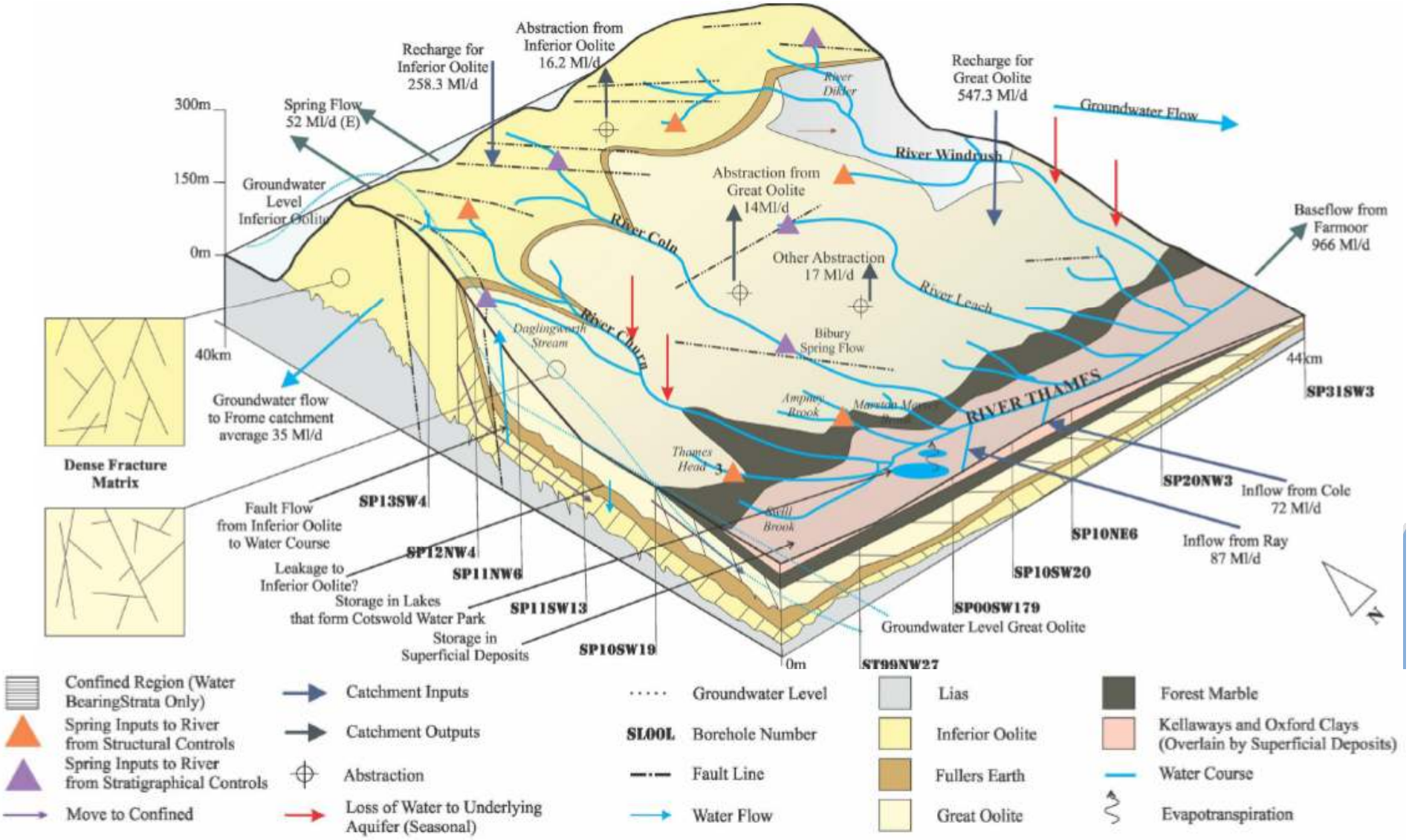
Water balance

• ~3 month delay between peak water surplus and peak river baseflow at the lowest gauging station downstream of the Cotswolds – Why ??

Extensive **terrace gravel deposits** overlying the Oxford Clay along the River Thames valley

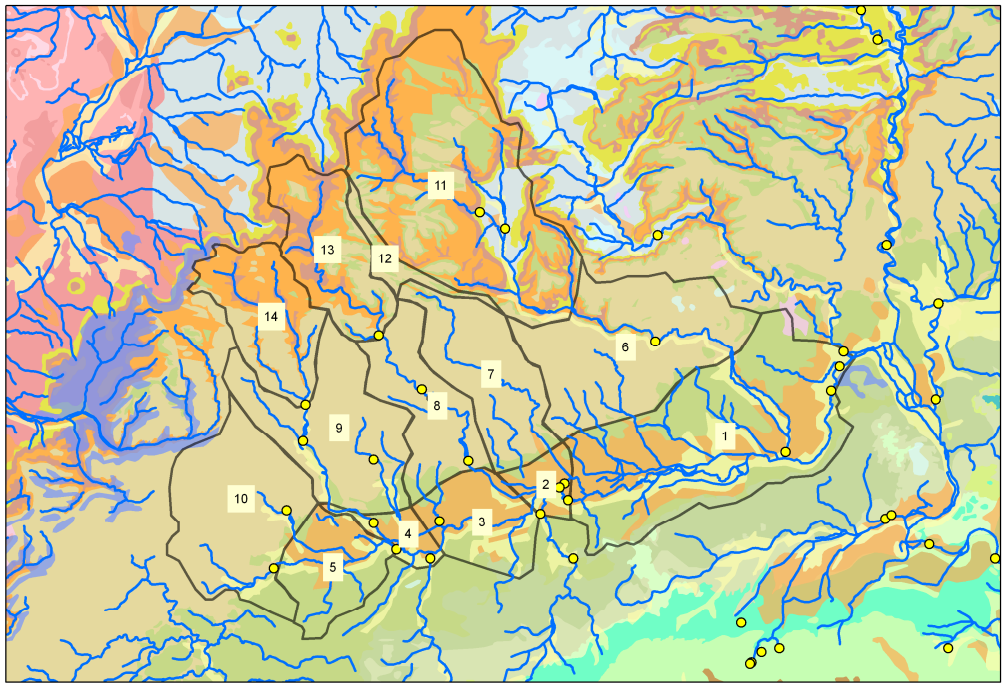
Conceptual understanding

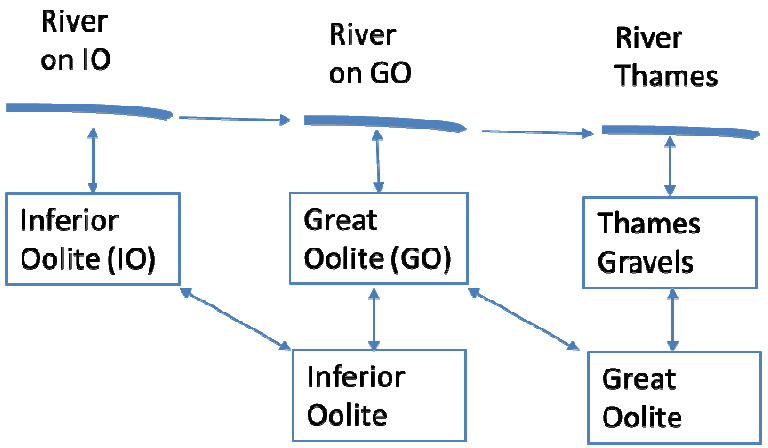
Cotswolds



Cotswolds – modelling approach

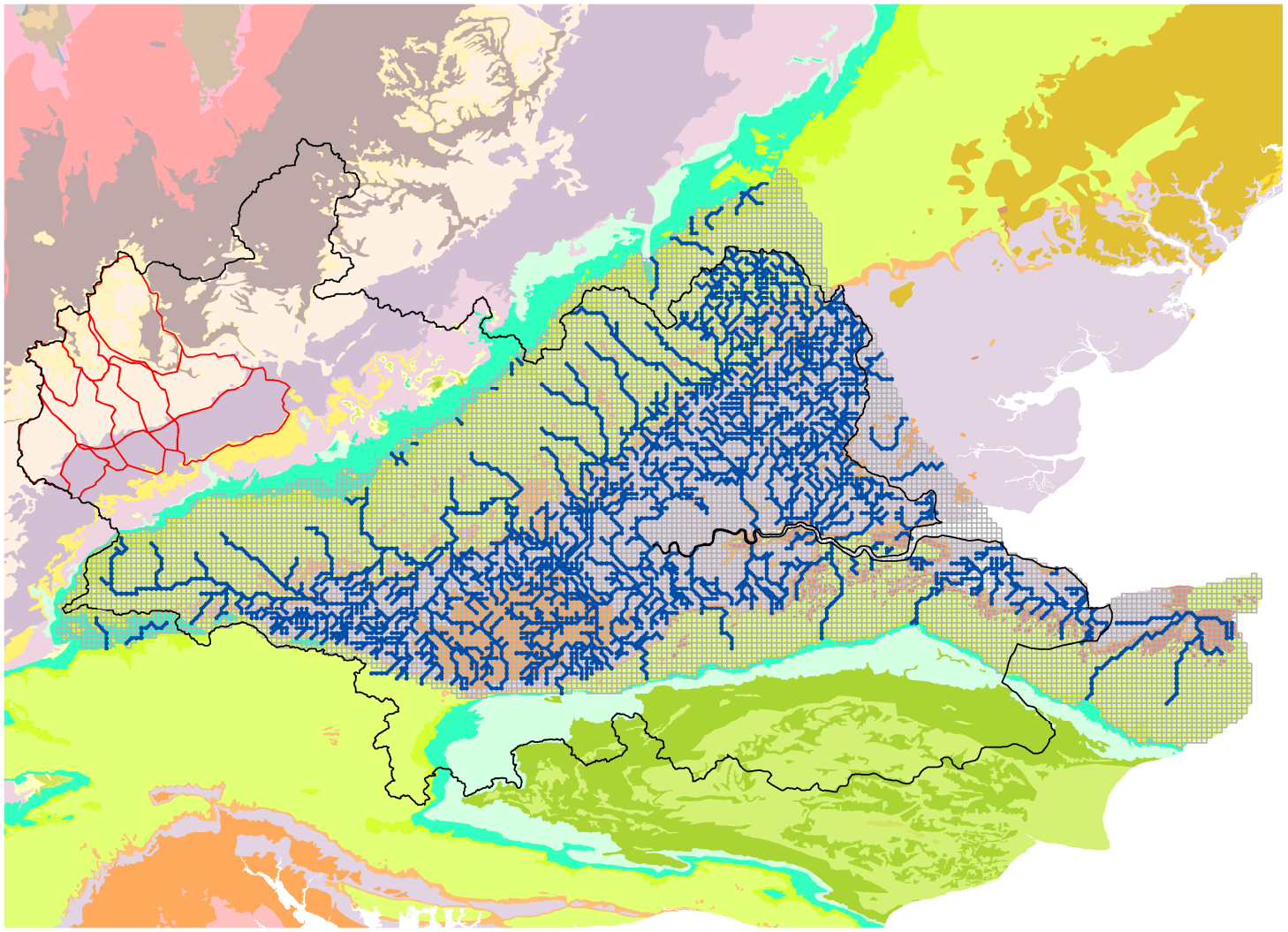
- Semi-distributed model of aquifer system: single head calculated in each "bucket".
- Designed to be incorporated into a multi-aquifer model of Thames catchment.
- Code is OpenMI compliant to link with other components.

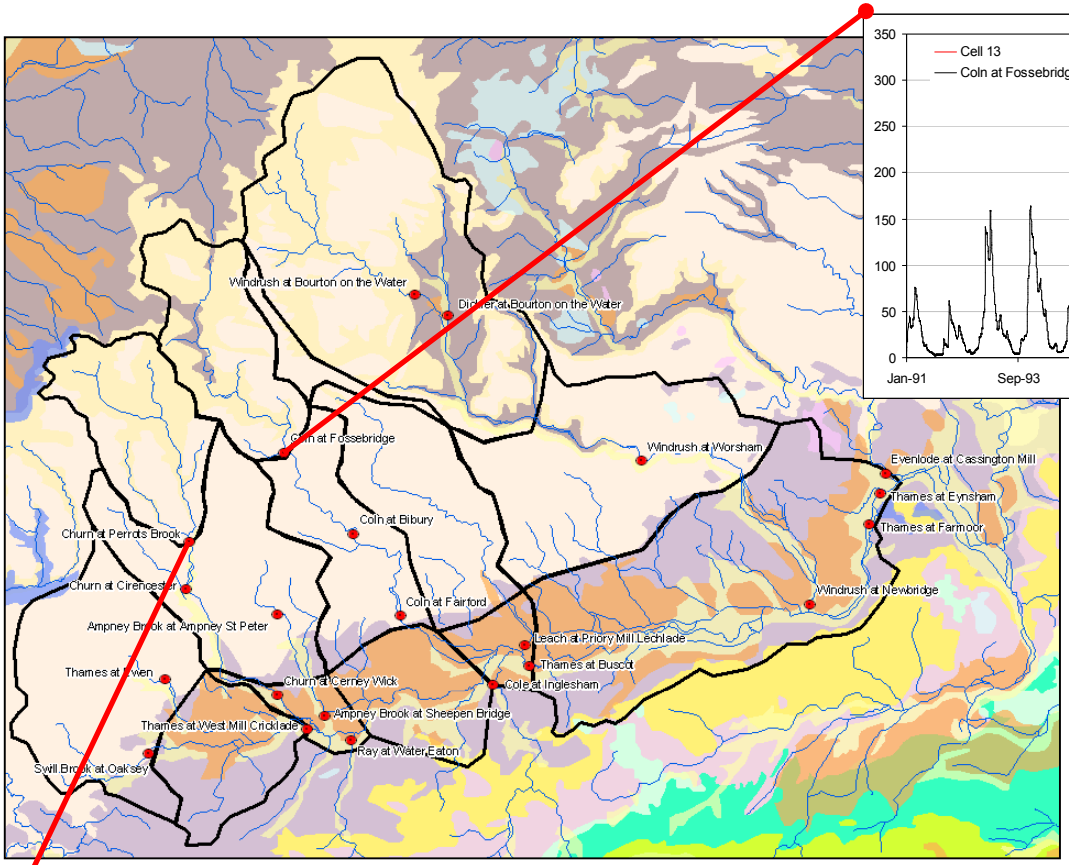


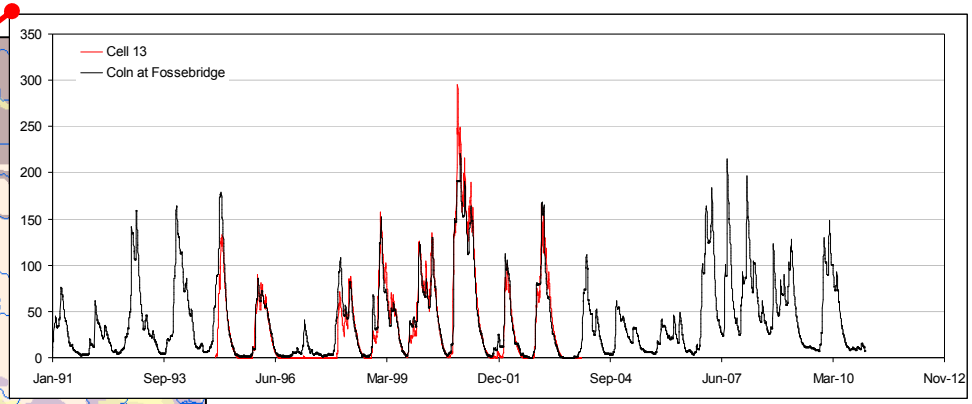


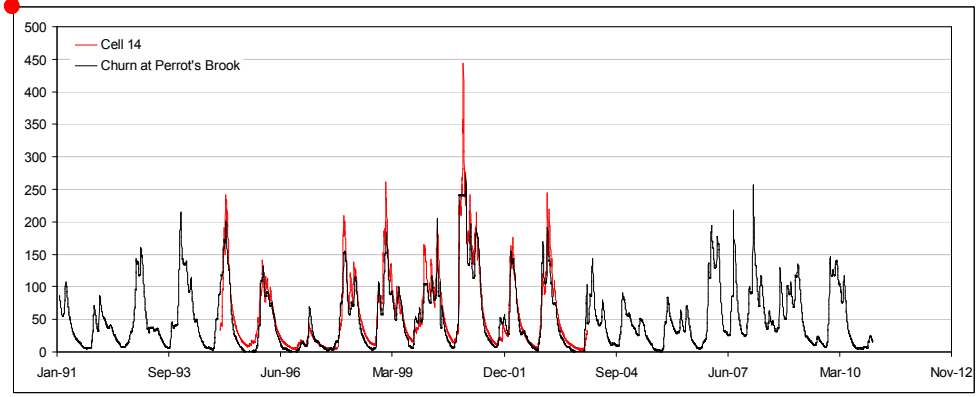
Numbering shows ID of each "bucket"
Rivers are represented as distributions of level for each "bucket"

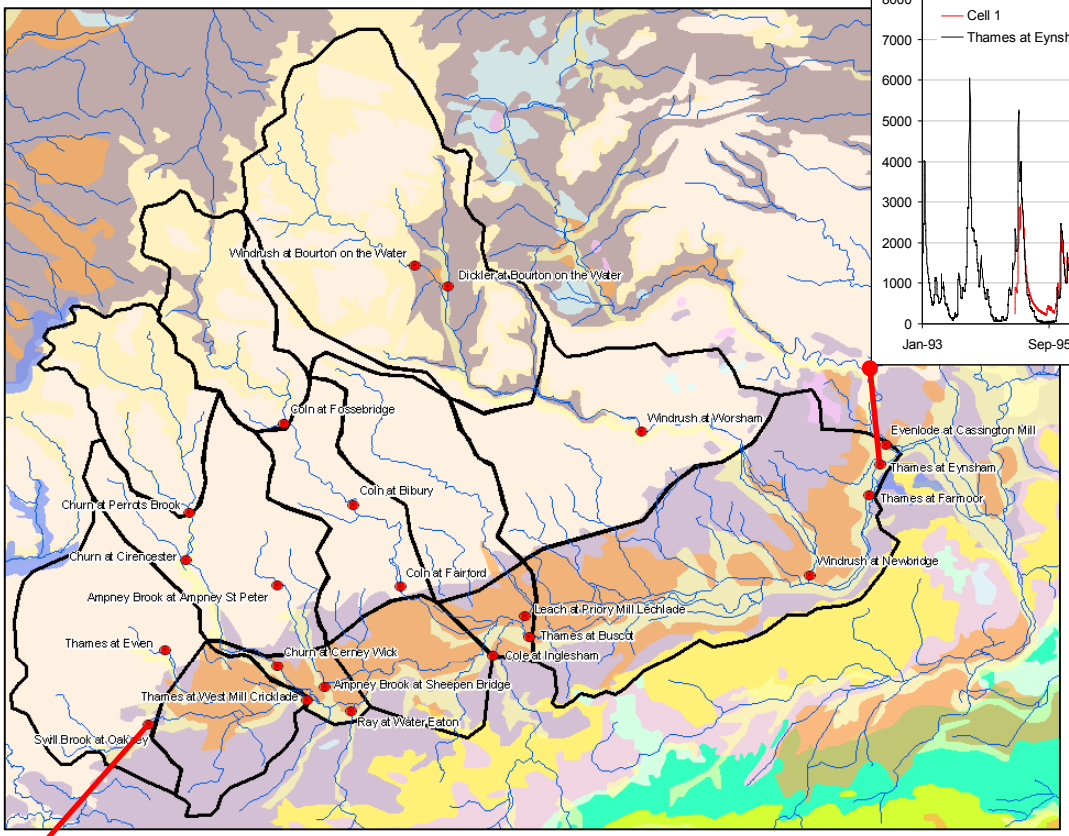
Linking multiple models in OpenMI

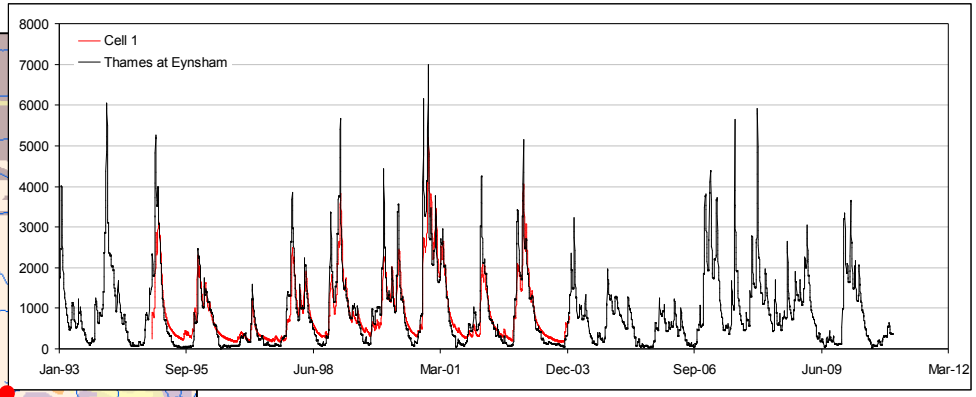


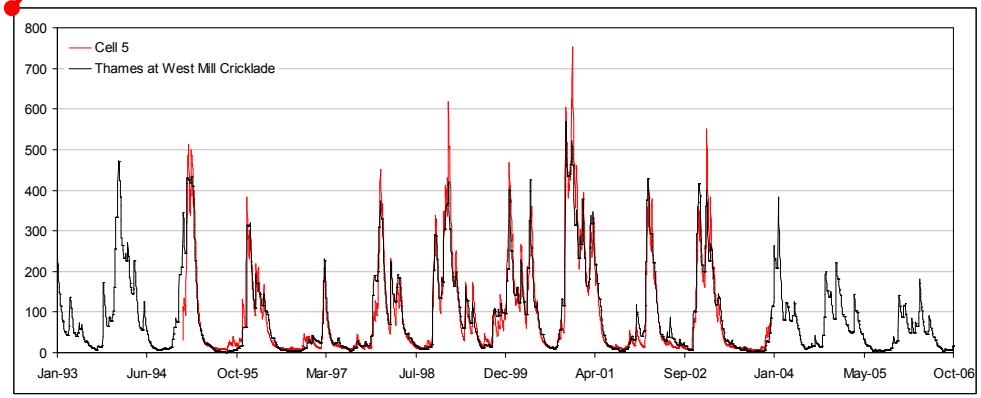


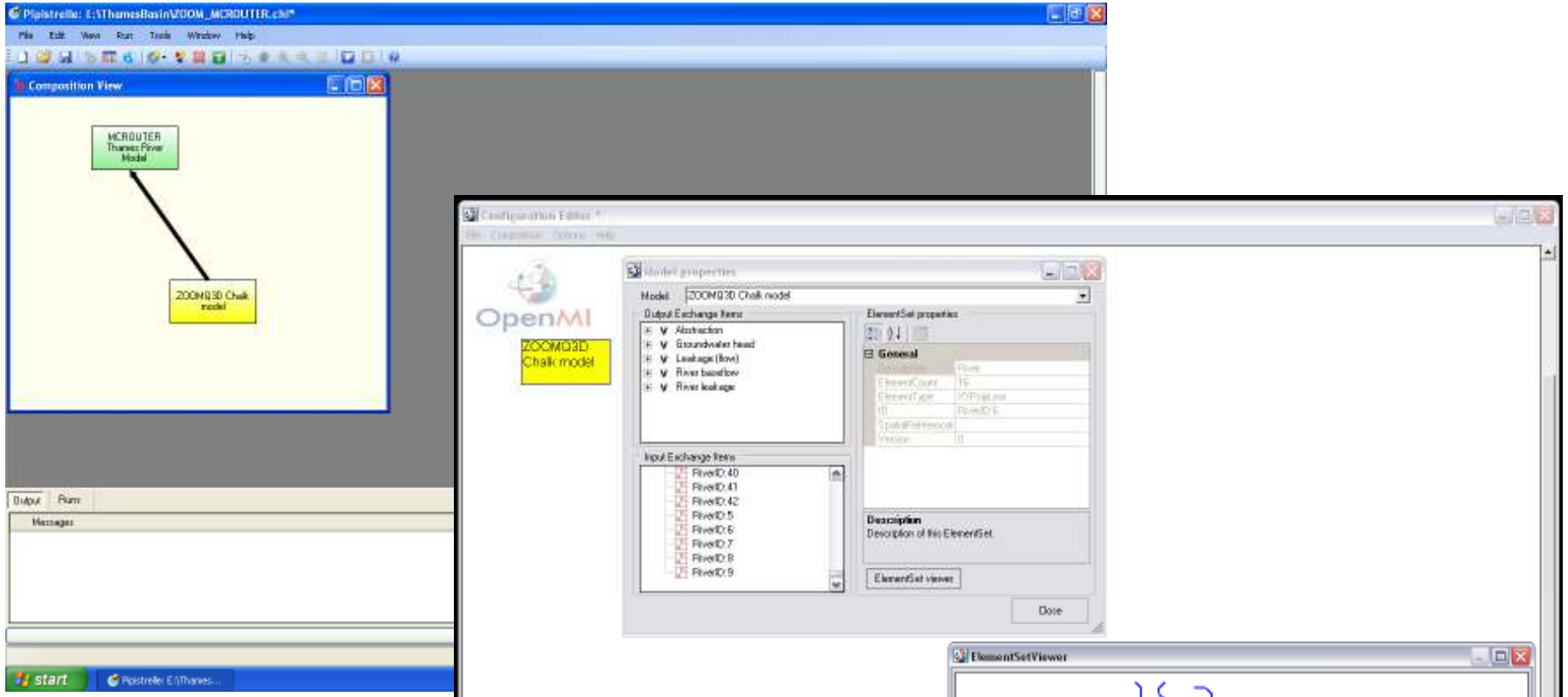


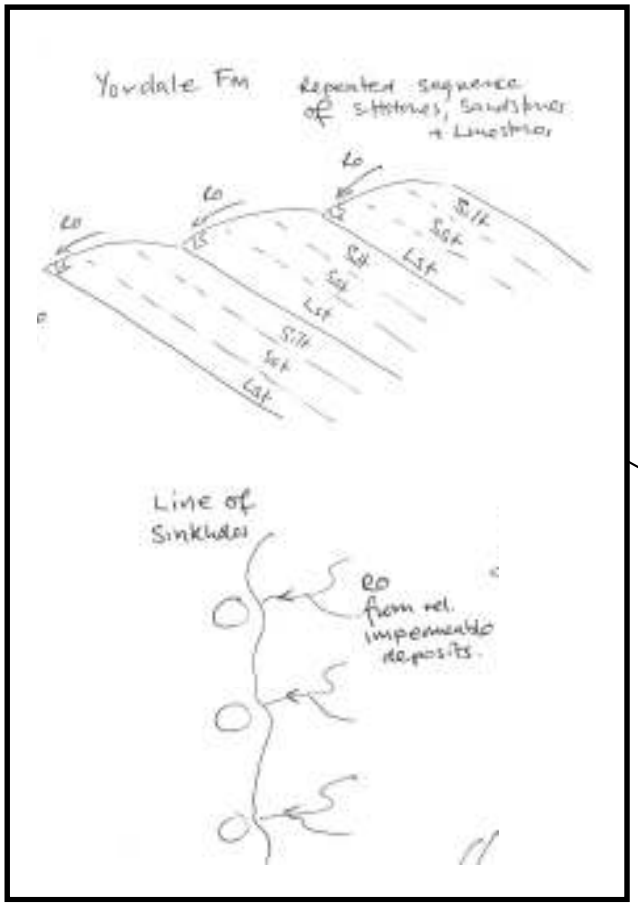


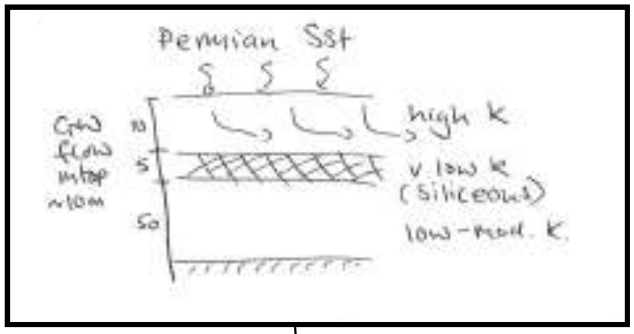


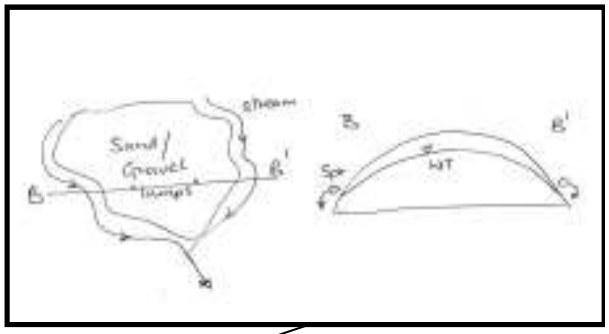


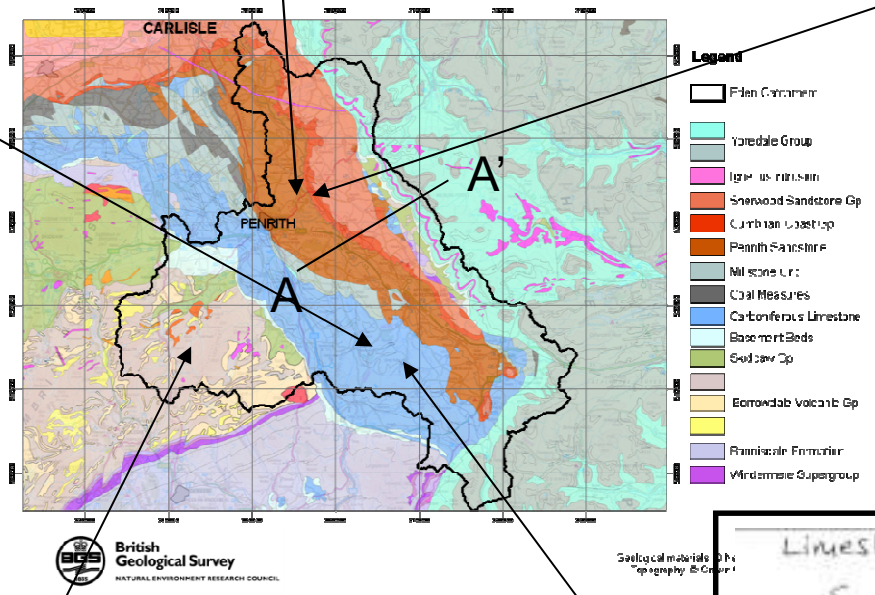






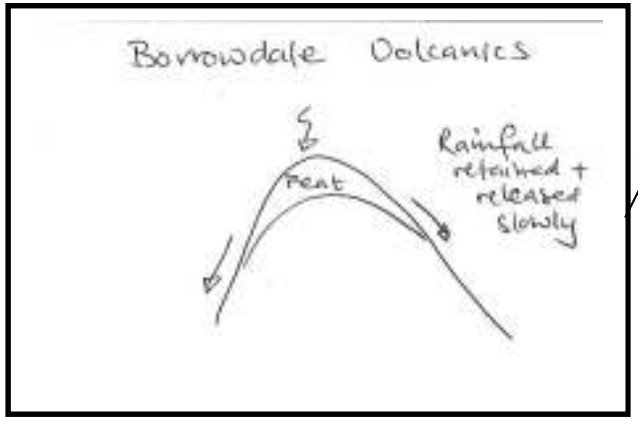


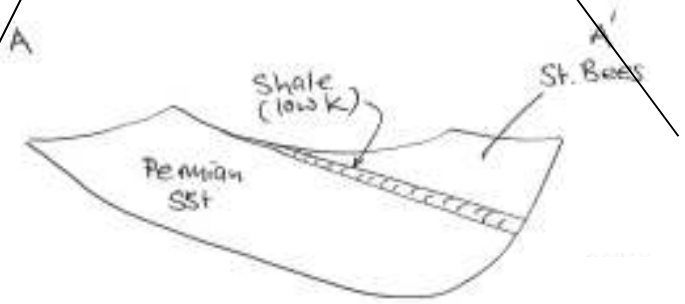


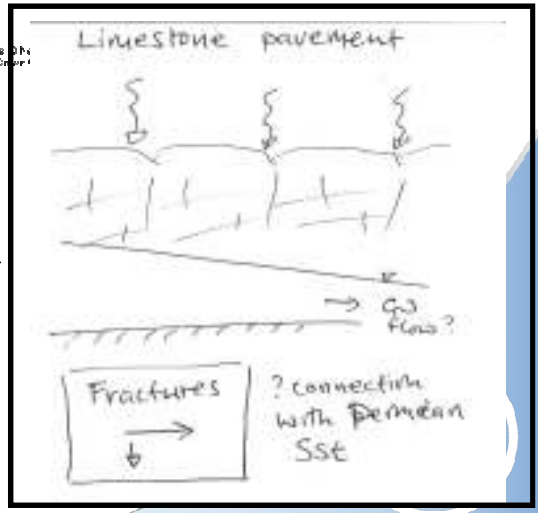


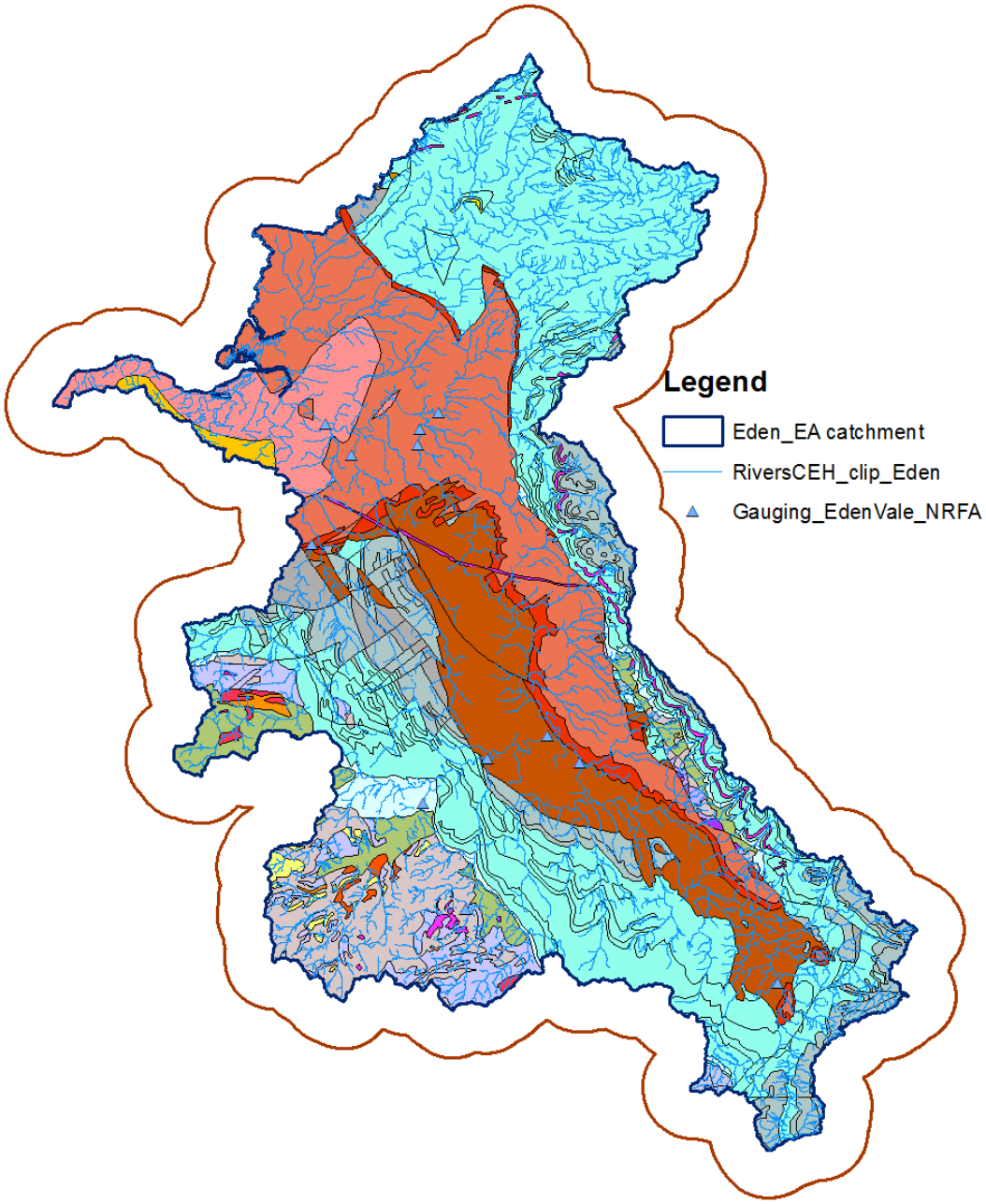
Not included:

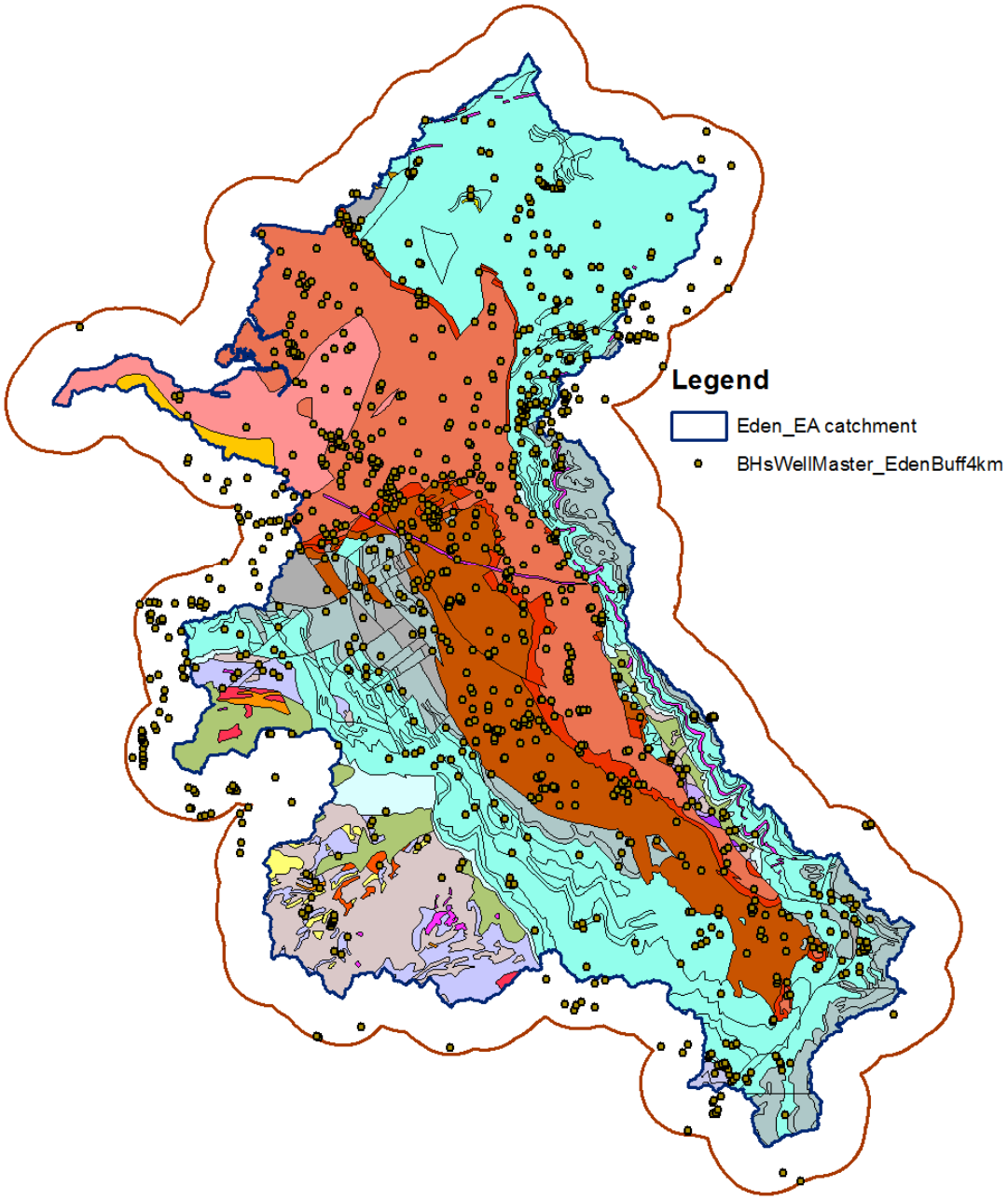
Superficials (Till – high RO), Drumlins, Sand rich alluvial floodplains

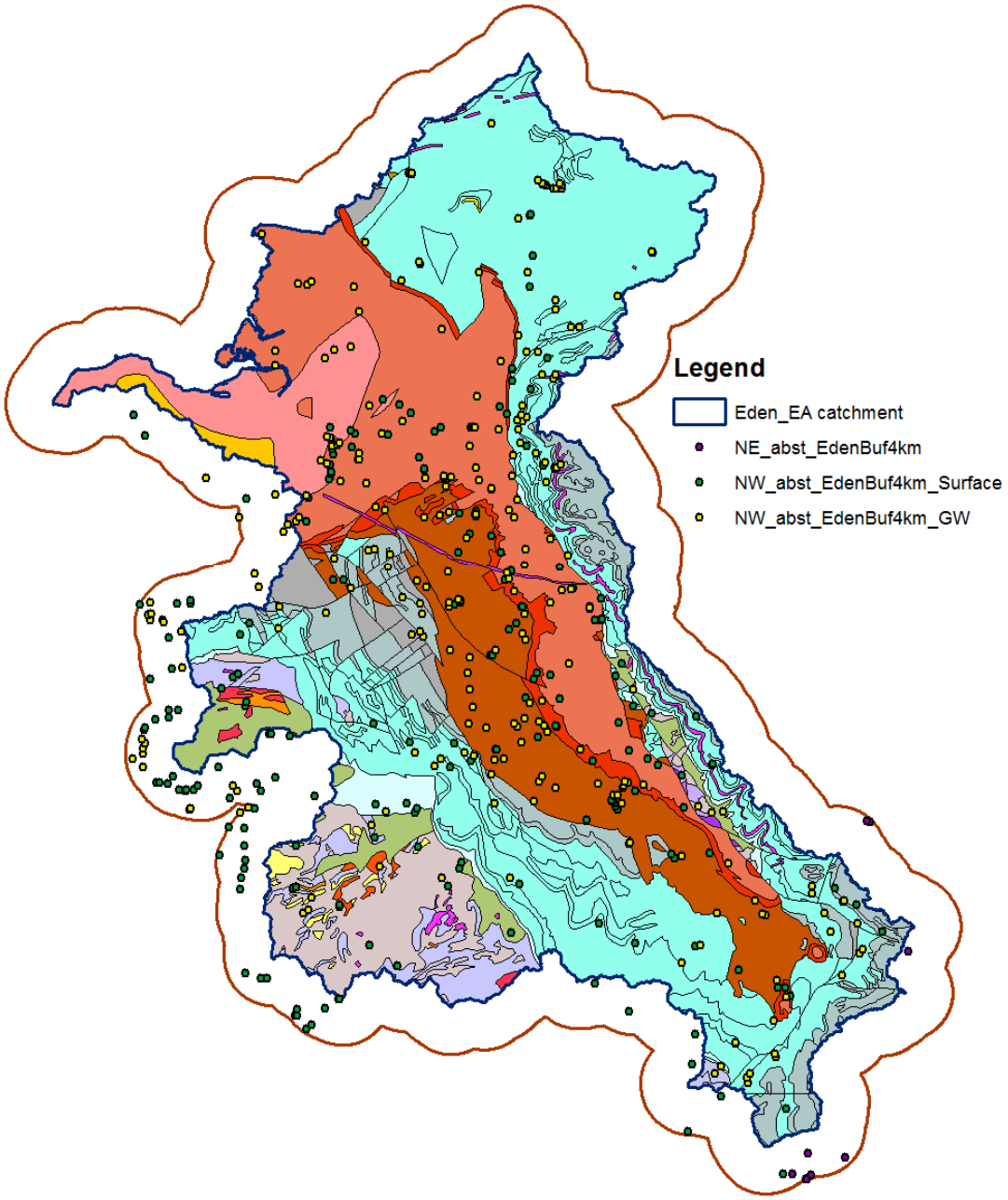







Legend
Eden_EA catchment
RiversCEH_clip_Eden
Gauging_EdenVale_NRFA




Legend
Eden_EA catchment
NE_abst_EdenBuf4km
NW_abst_EdenBuf4km_Surface
NW_abst_EdenBuf4km_GW

Type	ID	Description	Extent
Abstraction Groundwater	north_west_abstraction_point.shp +north_east	Clipped to a 4 km buffer around Eden EA catchment	NW and NE Gap: Northumbria
Boundaries	Eden Catchment		Eden
Boundaries	Eden NRFA Catchment		Carlisle
Boundaries	Eden EA catchment		Eden
Geochemistry	Nitrates, etc...	From EA	
Geochemistry	formated for GIS EA data	From EA	
Geochemistry	Nitrate trend plots		
Geological maps	Bedrock	Bedrock geology, 50000	GB
Geological maps	Superficial	Superficial Geology, 50000	GB
Geological maps	Bedrock 250 NW and SD	Bedrock geology, 250000	NW, SD
Geological models	Northumberland Solway Basin 3D Model	Gocad, Complete, 2008 Scale 250, Surface	
Groundwater Levels	OBH	Observation Bore Holes location and information	4 BHs
Groundwater Levels	Contours	Data from EA (Environment Agency)	
Groundwater Levels	Wellmaster (via GDI)		Clipped to Buffer
Groundwater Levels	ENVIRONMENT AGENCY GROUNDWATER MONITORING BOREHOLES	Locations of these boreholes	
Karst	Karst information		GB
Recharge model	Eden Recharge Model	Recharge model Monthly Potential Evaporation	
Recharge model	Rainfall	Distributed Daily Rainfall 01/1961 to 12/2007	Eden Catchment xllcorner 308100 yllcorner 490250

Plans and schemes - 1

- Thames:
  - Finished with the Cotswolds – largely
  - Pang/Lambourn – drilled them boreholes and planning a PhD
  - Colne – “not a sausage”
  - Thames – composition being developed
- Eden – just started

“I’ve had it with Oods”

Plans and schemes - 2

Papers:

- IAH – invited paper for Green Book Fractured Rock Hydrogeology (nearly) ready for submission (Steph)
- Complexity based on Thames – nearly completed final draft (AGH/Steph/Denis)
- Hydrogeology of the Cotswolds (Steph/Denis)
- Cotswolds modelling (CRJ/Others)
- Eden – Recharge/run-off (Antoine/Denis/CRJ/AGH)
- Thames basin composition (CRJ/Others)
- Imputation – Joint with UCL and CEH
- Application of Thames modelling composition (Antoine/CRJ/AGH)
- Maybe more: Gravels in the Cotswolds??

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6th November 2012