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# South Downs Groundwater Case Study

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Portsmouth Water



# Summary

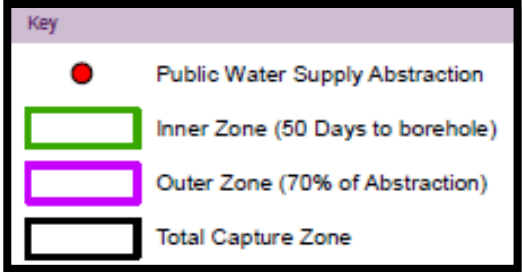
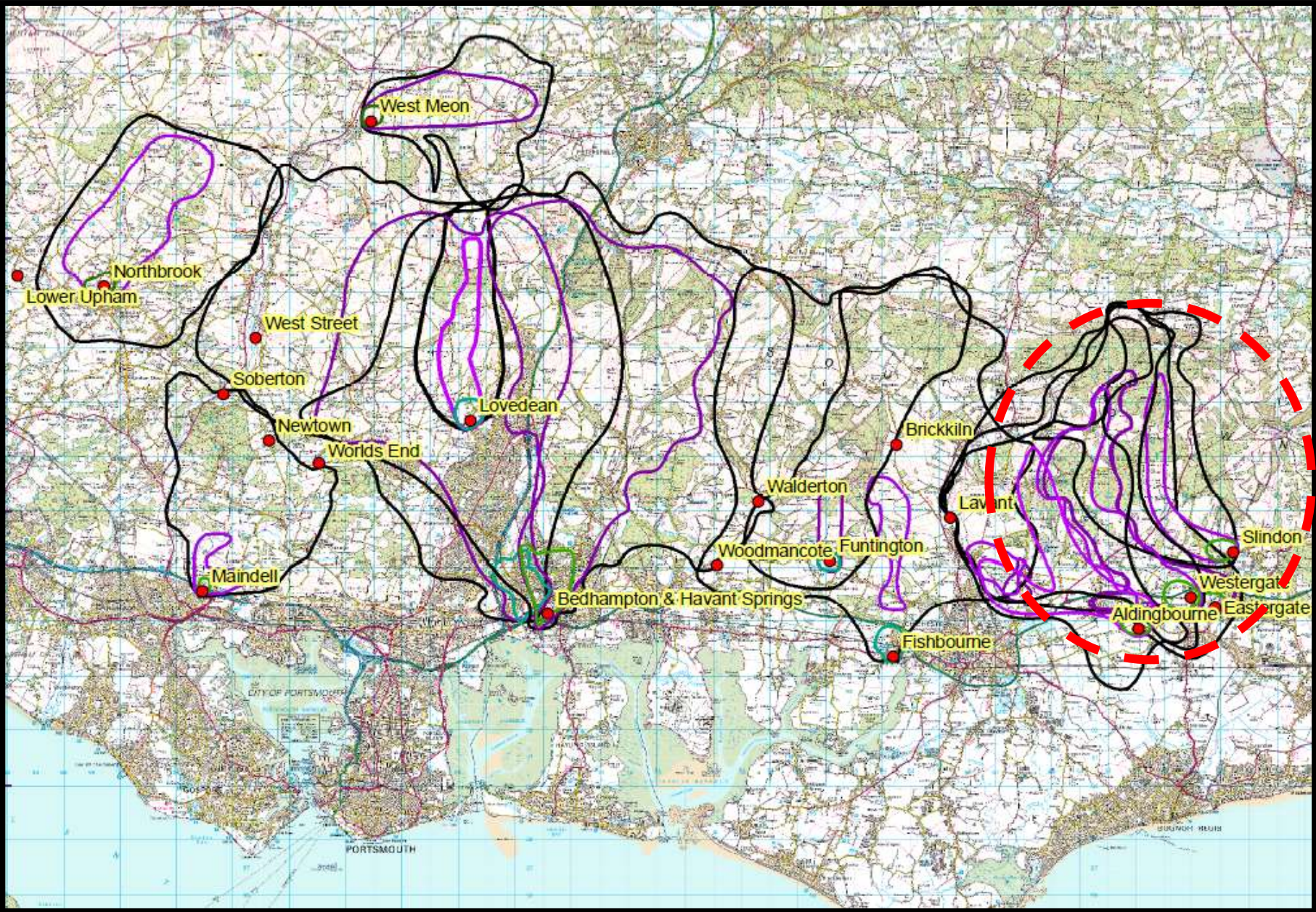
- The issue: nitrate contamination of groundwater
- ‘Geographic scope’ of the study area
- ‘State of the environment’ of the study area
- Progress on PES scheme development...



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GEOGRAPHIC  
SCOPE

# Study Area



# Stakeholder Analysis

- Undertaken through the ‘West Sussex Pilots Group’
- Excellent knowledge/relationship with local farmers through Downs & Harbours Clean Water Partnership
- This is furthered by the South Downs Farmers Group



# Cost of Inaction

- Shutdown of Eastergate pumping station
- Impact on resilience of public water supply
- Continued nitrate trend, Littleheath blending reservoir fails in 2040

## Bognor WSP

Catchment	Treatment	Distribution			Customer
		Reservoir Transfers	Service Reservoirs	Zone	
Aldingbourne (RWALD)	Aldingbourne WTW (TALD)		Littleheath SR (RLH 1+2) Whiteways Lodge SR (RWWL)	BOGNOR WSZ (ZZBOG)	BOGNOR WSZ (ZZBOG)
Eastergate (RWEGT)	Eastergate WTW (TEGT)				
Westergate (RWWGT)	Westergate WTW (TWGT)				
Slindon (RWSLN)	Slindon WTW (TSLN)				
		Lavant SR (RLV) (WSP-CH)			

# Economic Impact of Intervention

- Catchment management in the Eastergate and Slindon catchments until 2075 estimated at £3.3M (to sustain blending at Littleheath)
- The alternative is 1 nitrate removal plant estimated at **£2M capex**, and **£110,000/a opex** – therefore ~£8M until 2075
- Economic analysis identifies woodland creation (including biomass cropping) and soil management measures (including cover crops) as the most cost effective mitigation measures – therefore will develop associated trials through CPES

# Economic Impact of Intervention

- Analysis includes a qualitative assessment of wider ecosystem services benefits associated with woodland creation and improved soil management.
- These benefits relate to:
  - Provisioning services** – benefits in the form of goods or products (e.g. crops, timber etc);
  - Regulating services** – benefits through the control of natural processes such as water quality and flows, pollination, climate regulation and erosion control;
  - Cultural services** – non-material benefits such as recreation, spiritual values and aesthetic enjoyment; and,
  - Supporting services** – natural processes that maintain the production of all other ecosystem services such as habitat provision, nutrient cycling, soil formation etc.





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## STATE OF THE ENVIRONMENT

# Basic Map

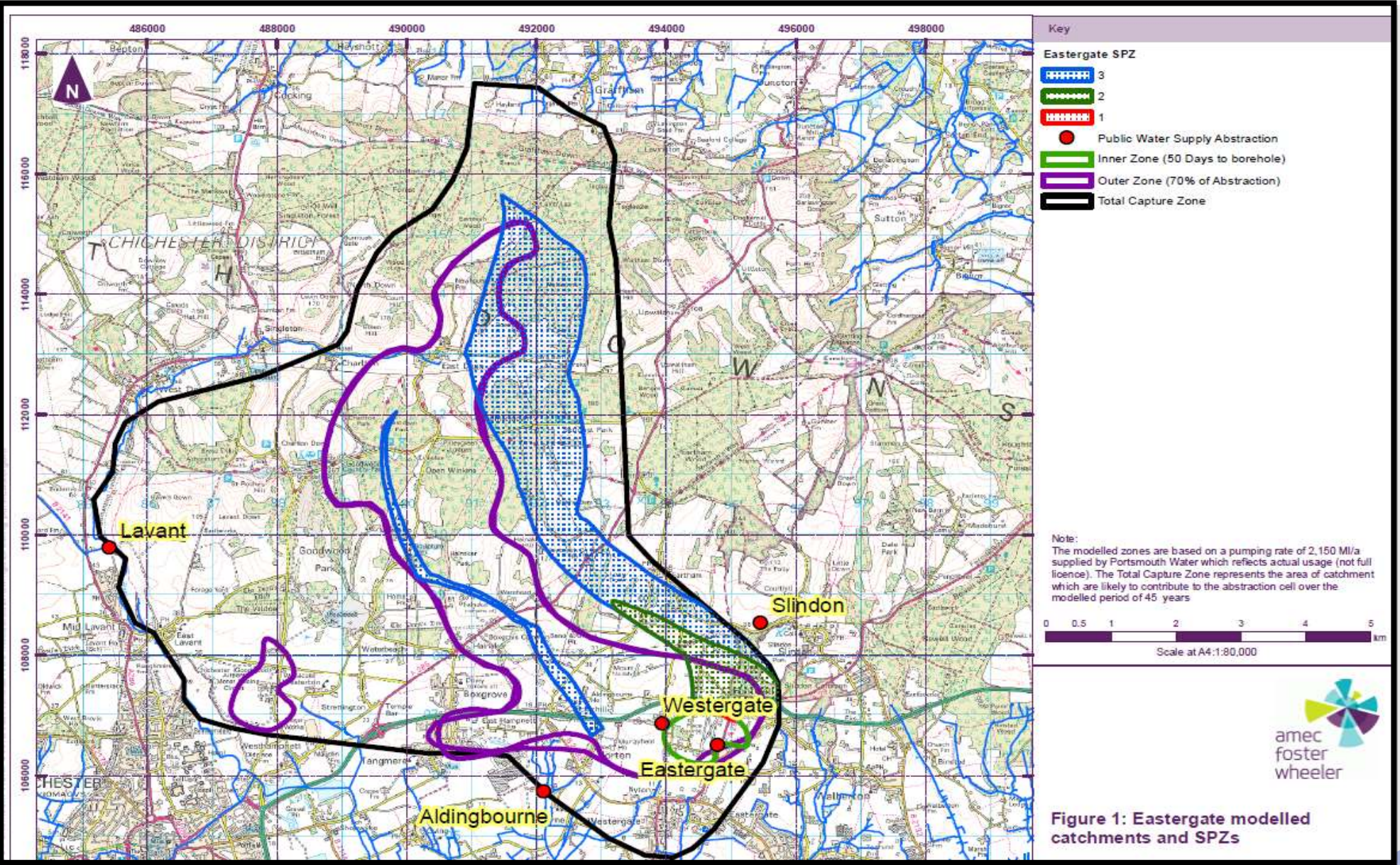
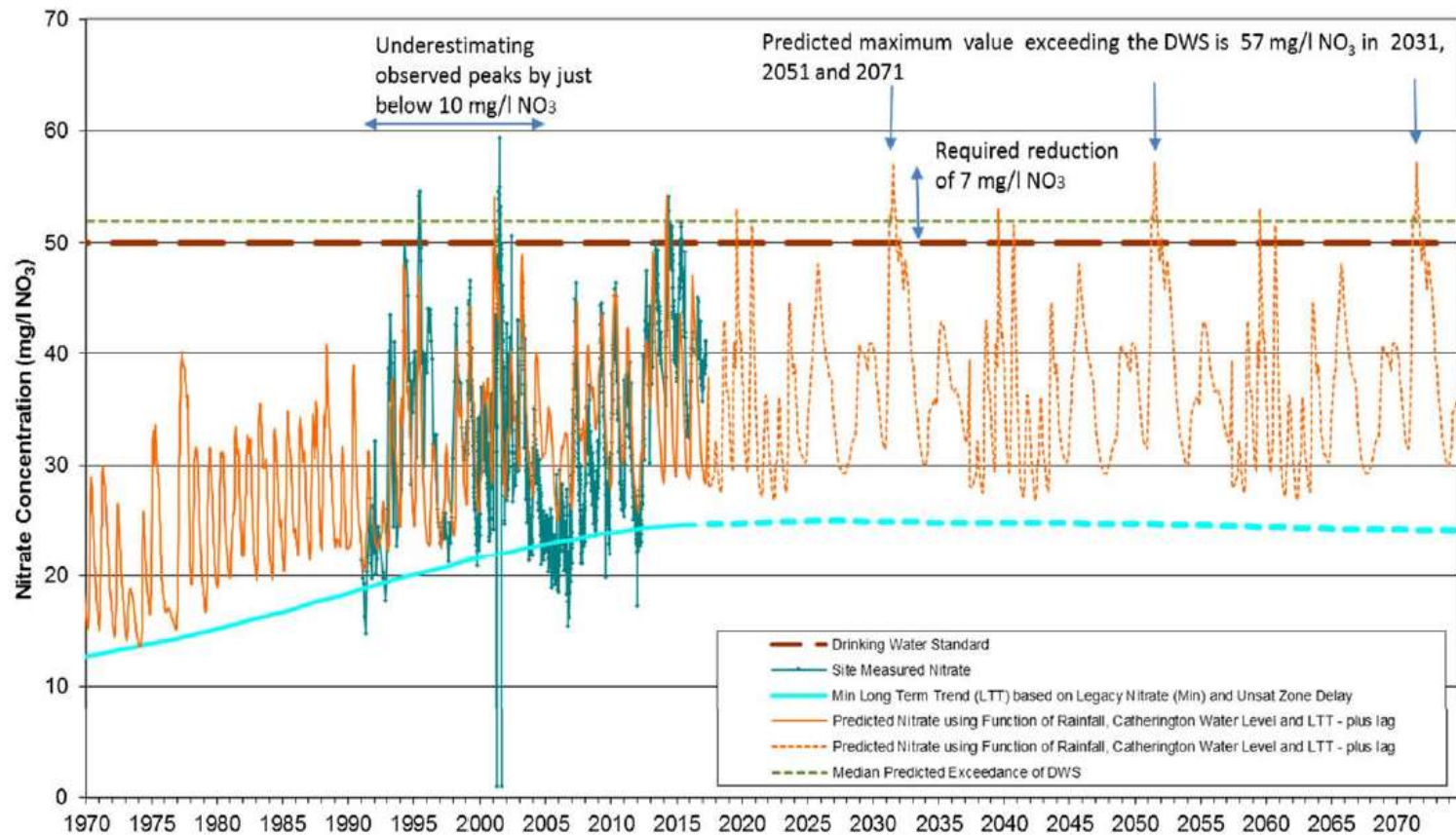


Figure 1: Eastergate modelled catchments and SPZs

# Problem

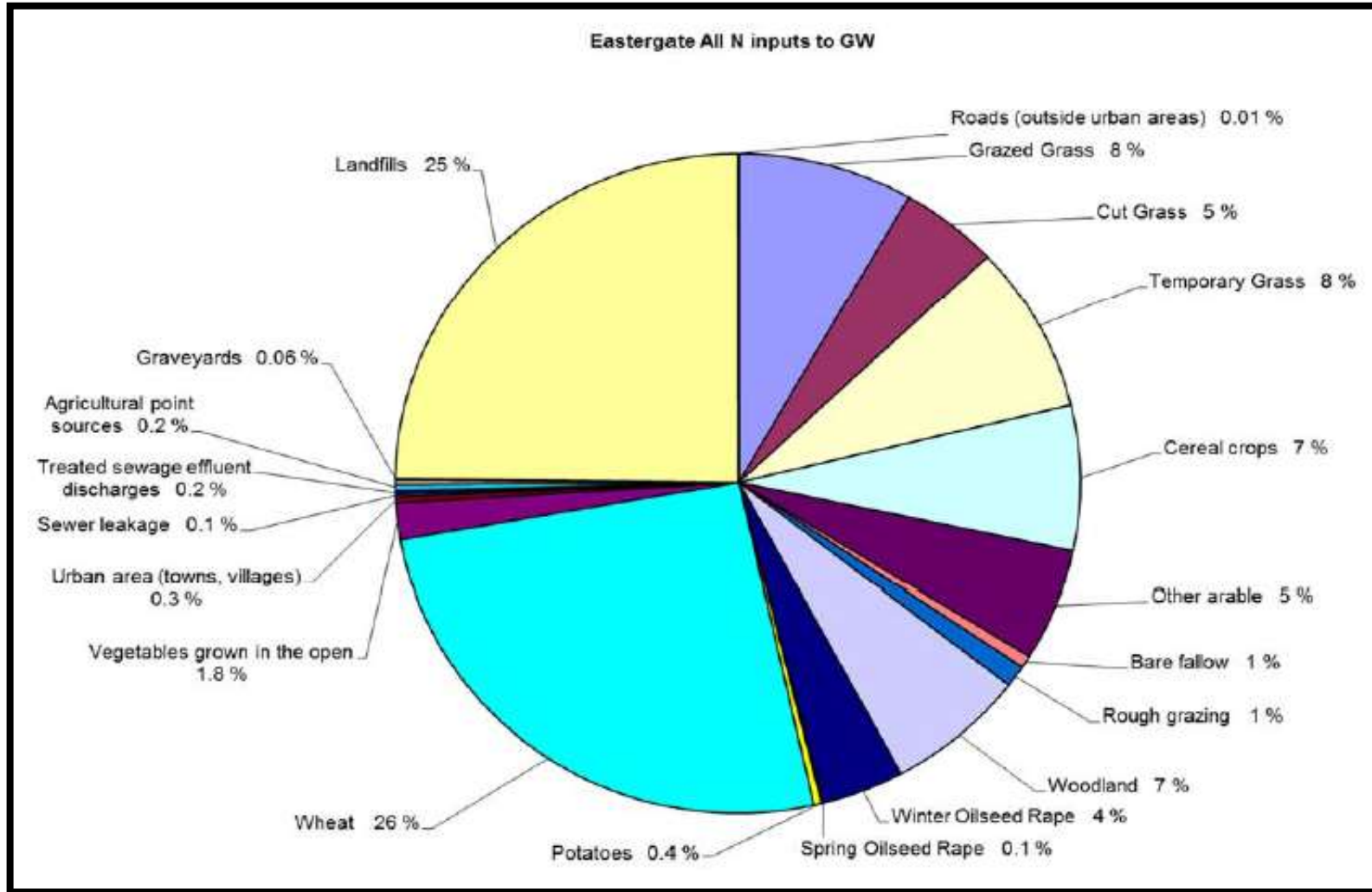
- Eastergate breached drinking water standard for nitrate - 50 mg/l NO<sub>3</sub>



# Problem

- Nitrate concentrations rising – predicted to peak 2028-2033
- The reduction needed in concentration is 7 mg/l NO<sub>3</sub> - 17% of the average concentration calculated over the past 3 years of 42.4 mg/l NO<sub>3</sub>.
- Amount of N which needs to be removed from the catchment through measures is 34,683 kg N/yr
- Reductions in nitrate leaching from soils could help to reduce size of peaks by providing lower nitrate in fast fissure flow pathways
- Such reductions in nitrate flowing rapidly to the borehole could help to reduce the frequency of predicted exceedances of the DWS

# Source



# Source

- Majority of the nitrate reaching the water table from agricultural land
- 21% from improved grassland
- Over 40% from cropping of arable land, principally wheat, other cereal crops and oilseed rape
- This sector/land use is where we need to target PES

# Source

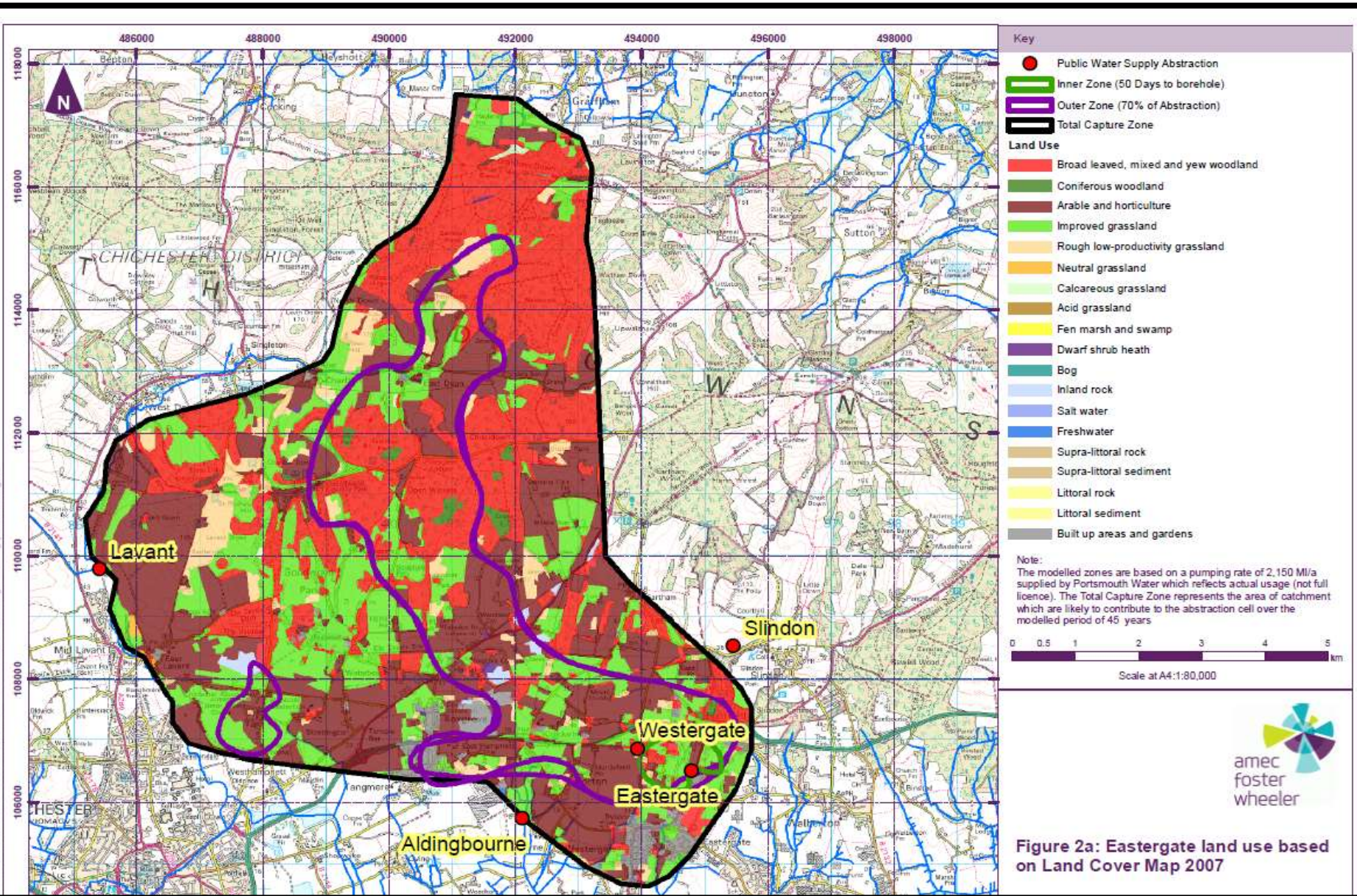


Figure 2a: Eastergate land use based on Land Cover Map 2007

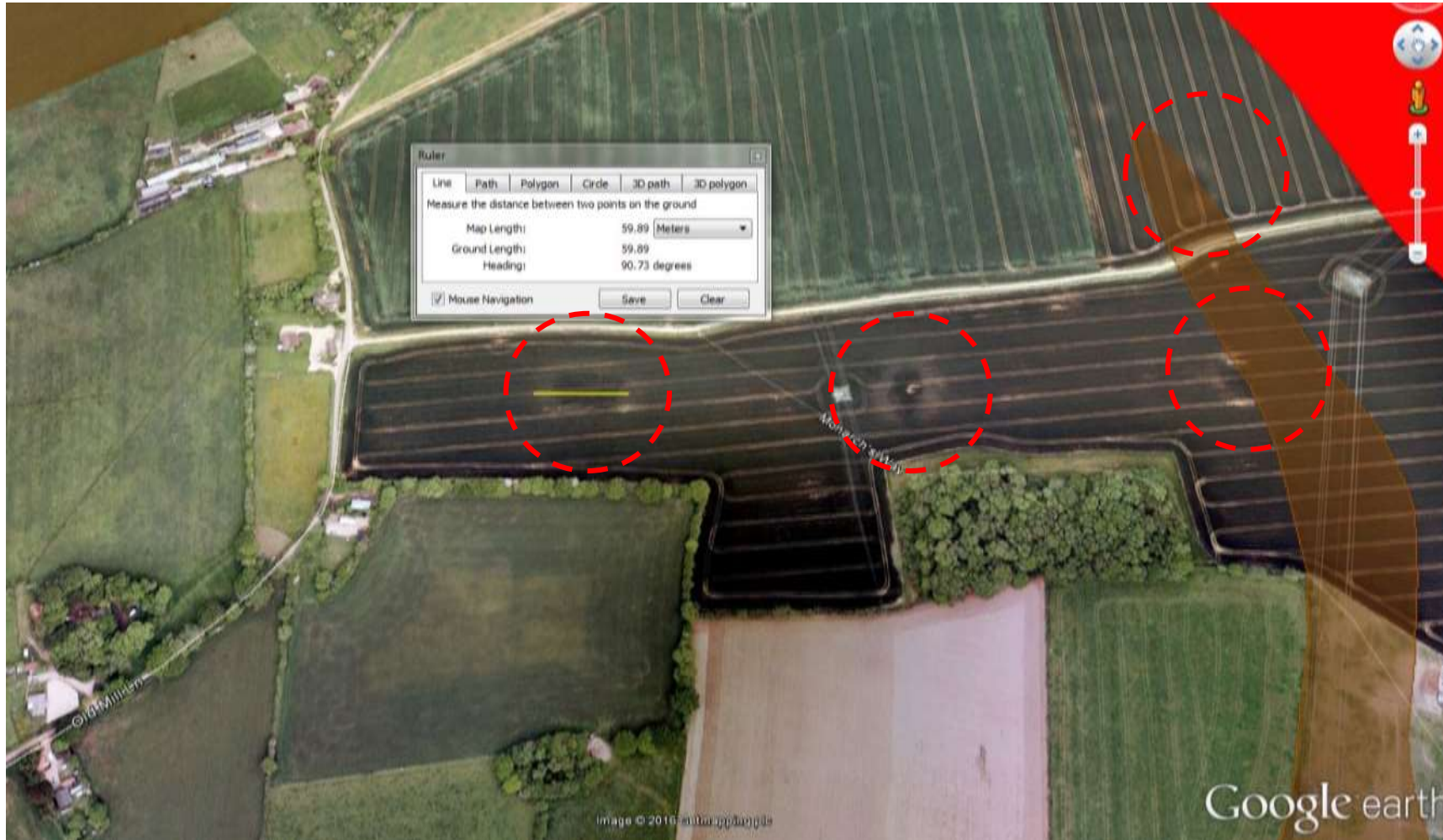
# Pathway

- Through the dual porosity of the Chalk – matrix flow and karstic flow via expressions at the surface

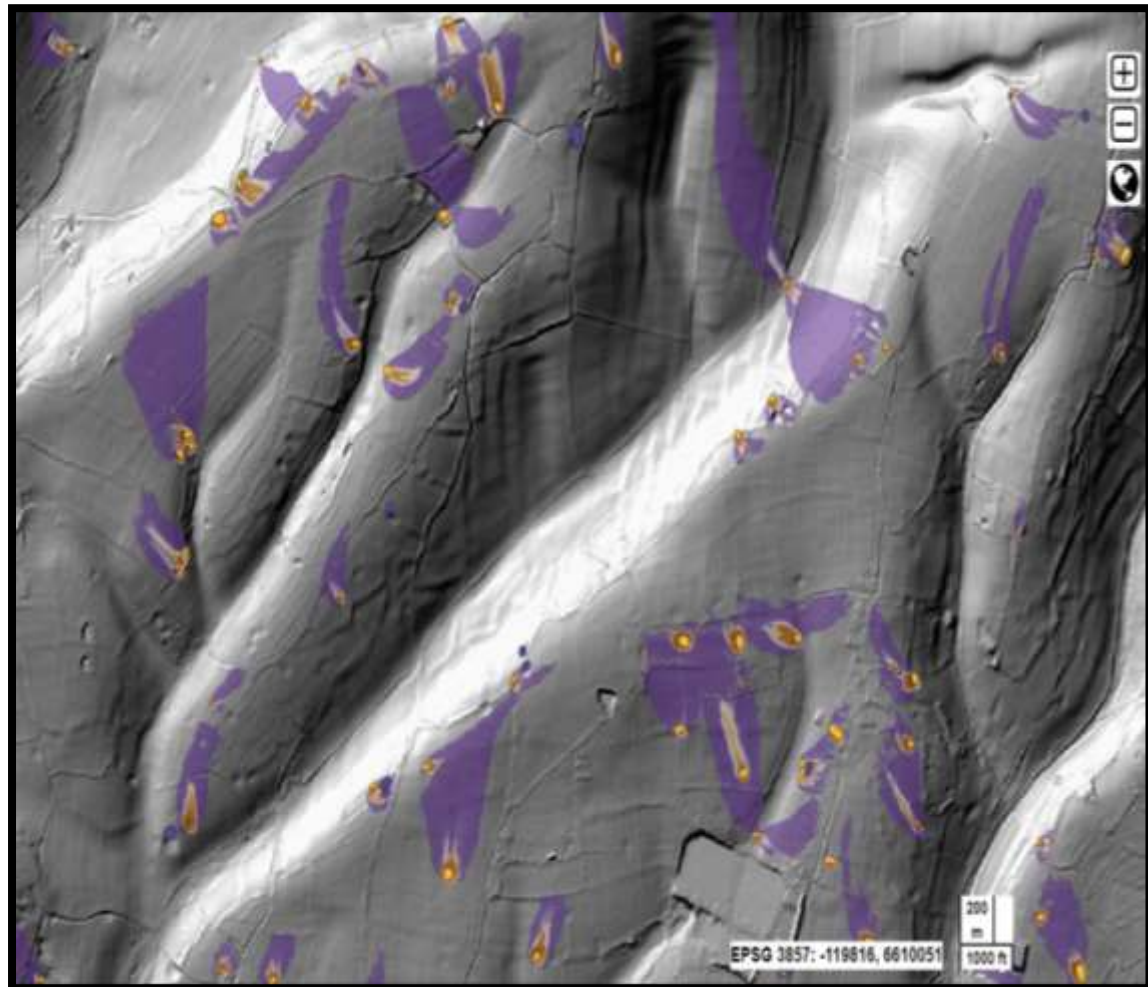




# Pathway



# Pathway



# Receptor

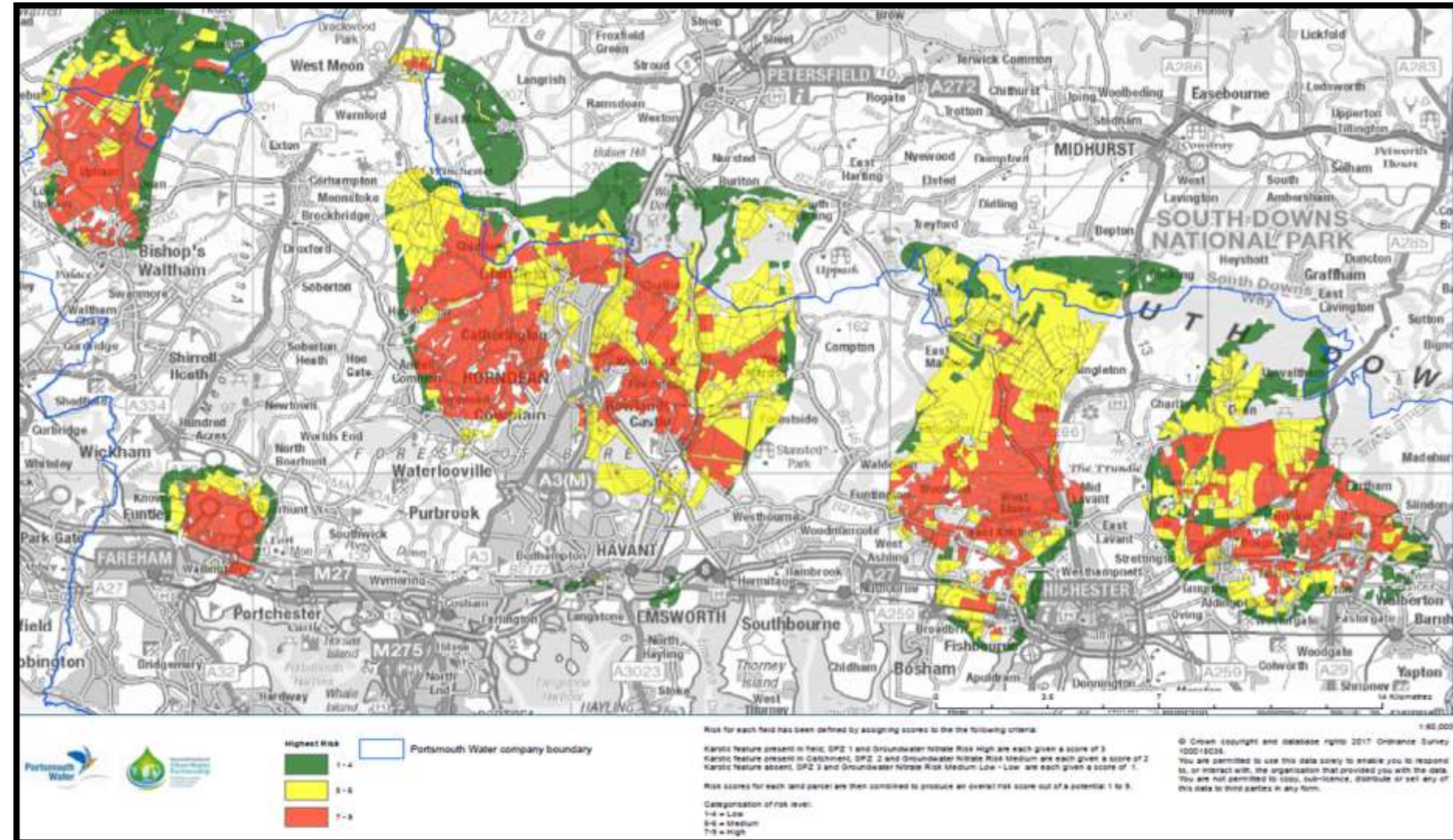


# In summary...

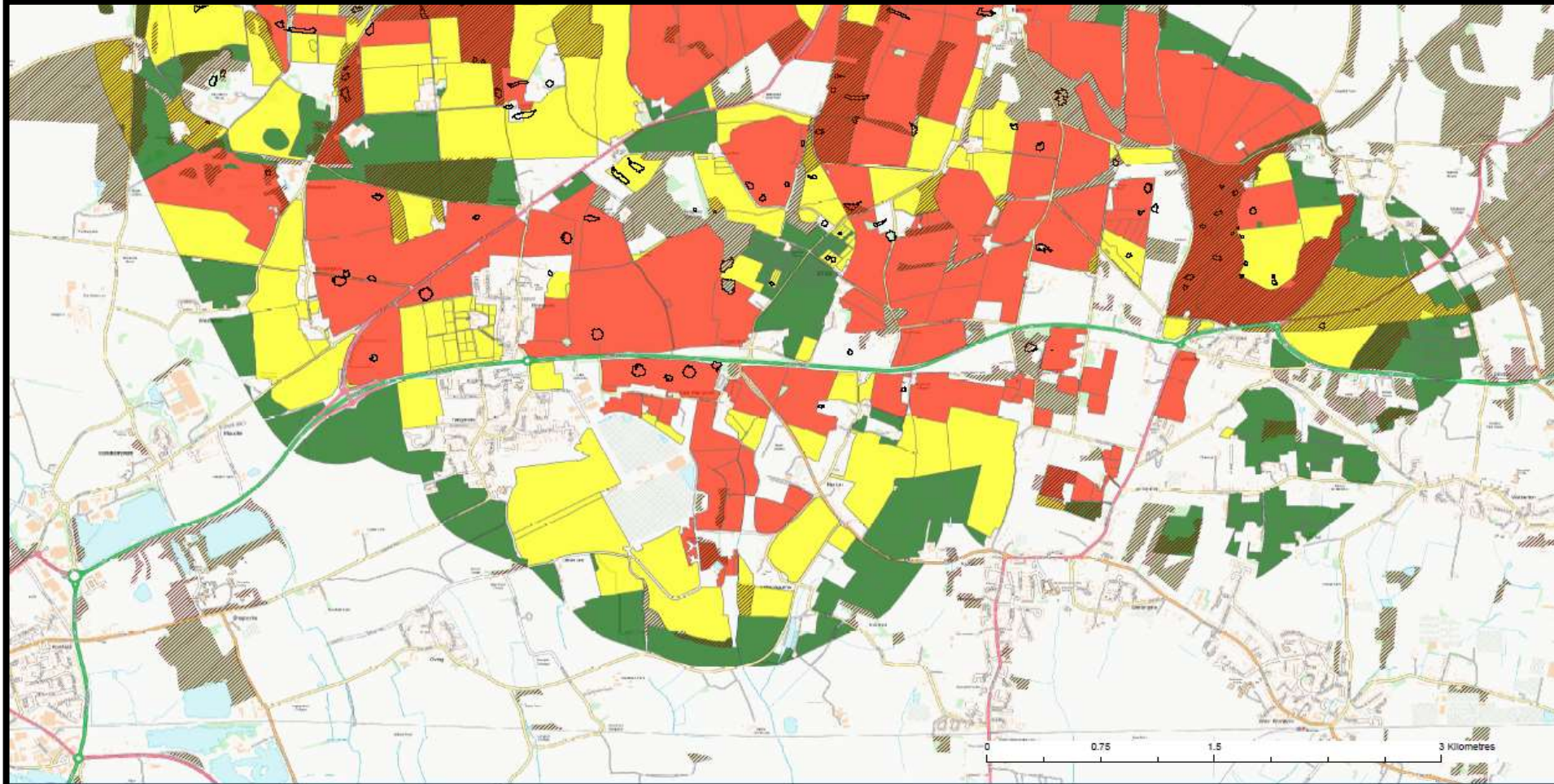
- Defined the **source** of nitrate – source apportionment
- Defined the **pathway** of nitrate – catchment boundary modelling, karstic features mapping, tracer testing
- Defined the impact at the **receptor** – real time nitrate monitors

# Priority Areas

- These have been defined by pulling together the source > pathway > receptor evidence



# Priority Areas

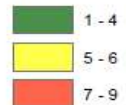


Scale at A2 1:26,600



## Amalgamated Risk Score: Aldingbourne, Arundel, Eastergate, Westergate and Slindon catchments

### Risk



Risk for each field has been defined by assigning scores to the the following criteria:

- Karstic feature present in field; SPZ 1 and Groundwater Nitrate Risk High are each given a score of 3
- Runoff to karstic feature present within catchment, SPZ 2 and Groundwater Nitrate Risk Medium are each given a score of 2
- Karstic feature absent, SPZ 3 and Groundwater Nitrate Risk Medium Low - Low are each given a score of 1.

Risk scores for each land parcel are then combined to produce an overall risk score out of a potential 1 to 9.

Categorisation of risk level:

- 1-4 = Low
- 5-6 = Medium
- 7-9 = High

## THE SEARCH FOR 'SPIKES' – PORTSMOUTH WATER'S CATCHMENT MANAGEMENT PROGRAMME



A Downs and Harbours Chlone Water  
Partnership will encompass work for

Portsmouth Water has been supplying water to Portsmouth and the surrounding area since 1857. The area supplied by the Company extends through South East Hampshire and West Sussex from the River Meon in the West to the River Arun in the East, encompassing 868 km<sup>2</sup>. (Figure 1)

All of the Company's public water sources are reliant on the chalk aquifer of the South Downs – from the chalk-fed River Itchen, the Havant and Dedhampton Springs, to the numerous abstractions directly from groundwater.

■ assessing the current and predicted nitrate concentrations at sources and the likely timescale of reductions that might be achieved through catchment management; and,

Farmers and landowners are offered free and confidential advice, including management plans for fertilisers and soil as well as workshops, one-to-one consultations and farm demonstrations of best management practices. This partnership will

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Case Study Progress

# PES schemes to be trialled

- Economic analysis – woodland creation (including biomass cropping) and soil management measures (including cover crops) most cost effective measures
- These will form the two components of the case study



# Woodland Creation

- Working with the UK Forestry Commission
- Refine target areas - early summer 2018
- Farmer engagement - late summer 2018
- Develop schemes, including Portsmouth Water/CPES contributions - Xmas 2018
- Planting - Autumn 2019
- Monitor, measure impact and report – ongoing (to inform CPES evaluation report and AMP 7)



# Cover Crop Trial

- Cover crops - a crop grown to reduce nitrate leaching to groundwater
- Aims:
  1. to determine how effective cover crops are at recovering/capturing residual nitrate across our catchments
  2. how practical/cost-effective they are
  3. how well they work for farmers – in terms of tillage, sustainability and soil improvements
- Start autumn 2018, finish spring 2021



# Thank you!

