# Constructed Wetlands in Enfield

Thames Water Surface Water Management Programme

Wednesday 9th March 2022

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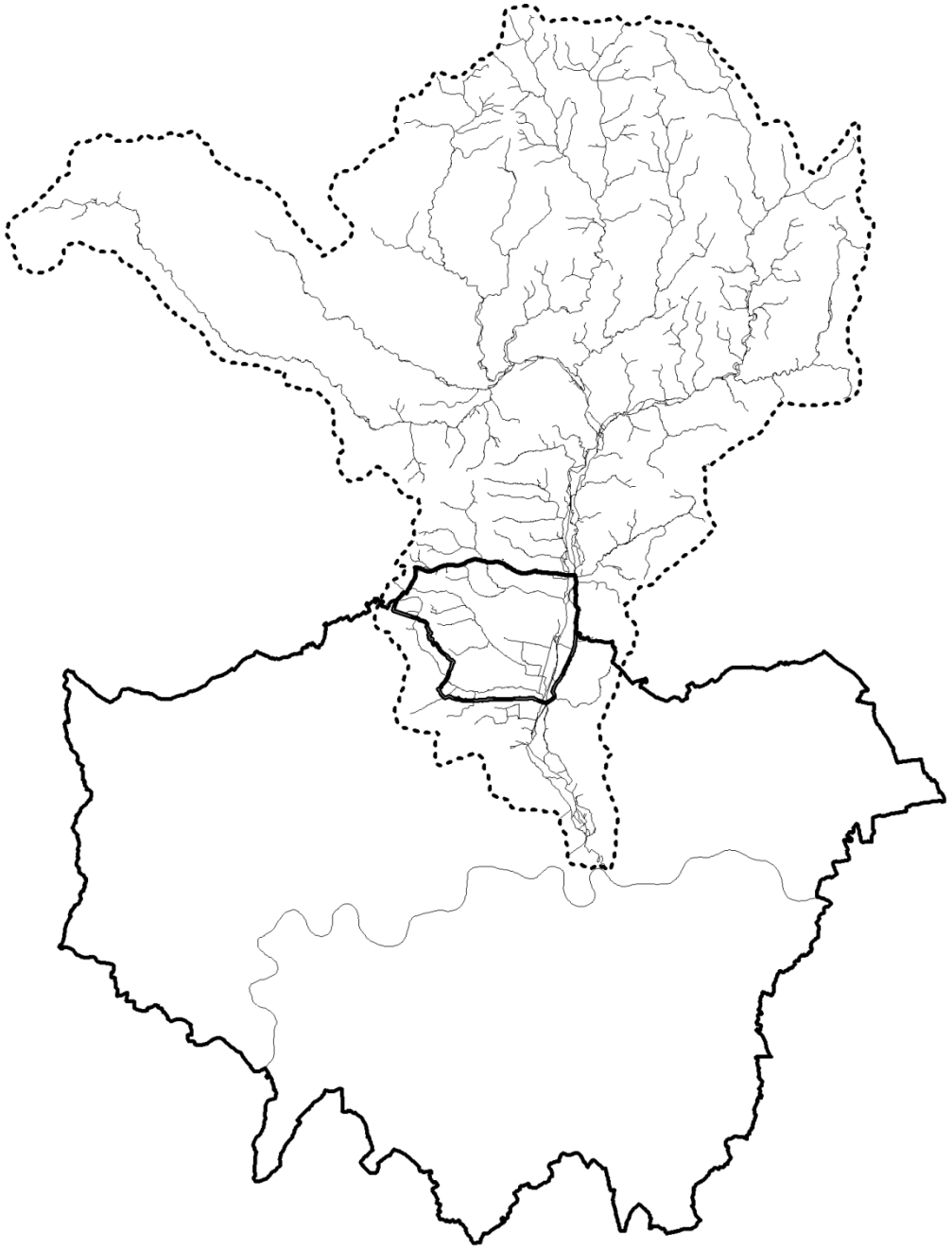
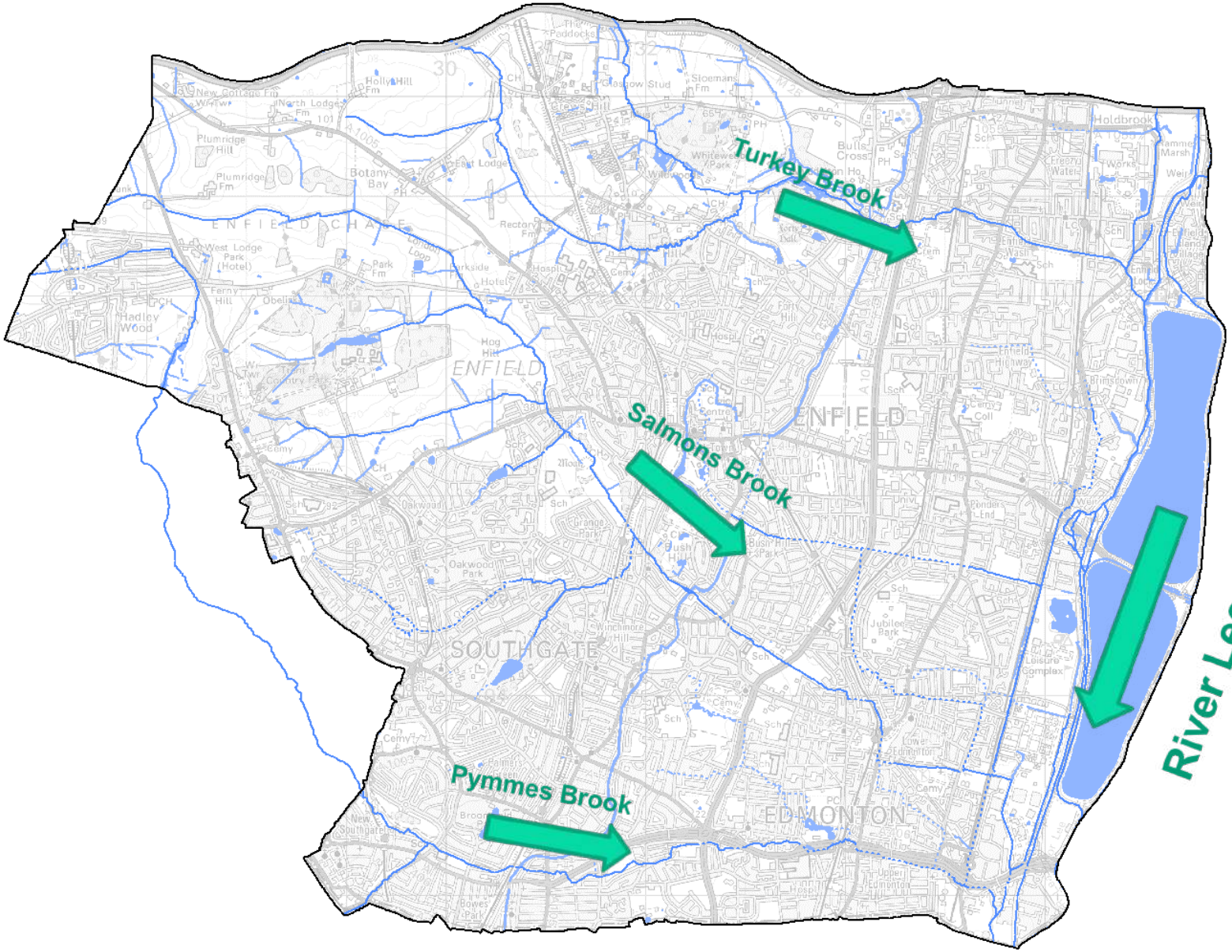
**River Lee catchment**

- Area ~ 140,000 hectares
- Geology Upper Lee - Chalk
- Geology Lower Lee – mostly London Clay



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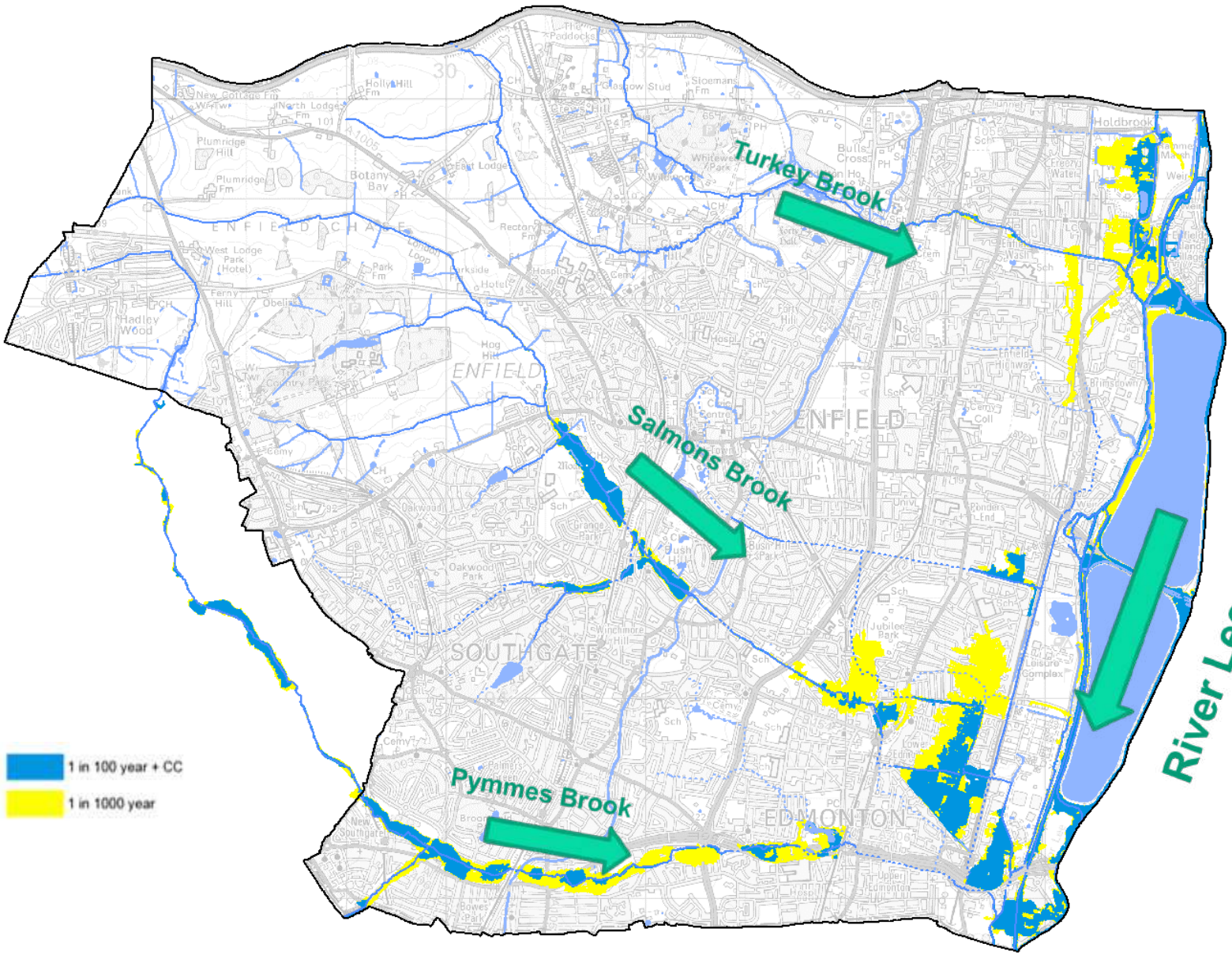


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## Unintended consequences of traditional piped drainage

- **Flooding** – the increased speed and volume of surface water runoff leads to increased risk of river flooding
- **Droughts** – the reduction in water soaking naturally into the ground leads to lower baseflow in rivers, increasing the frequency and impact of droughts
- **Blockages** – piped systems are more likely to fail due to blockages or other defects as they are out of sight and difficult to maintain
- **Polluted rivers** – sediments, oils and other pollutants are washed directly into rivers and streams

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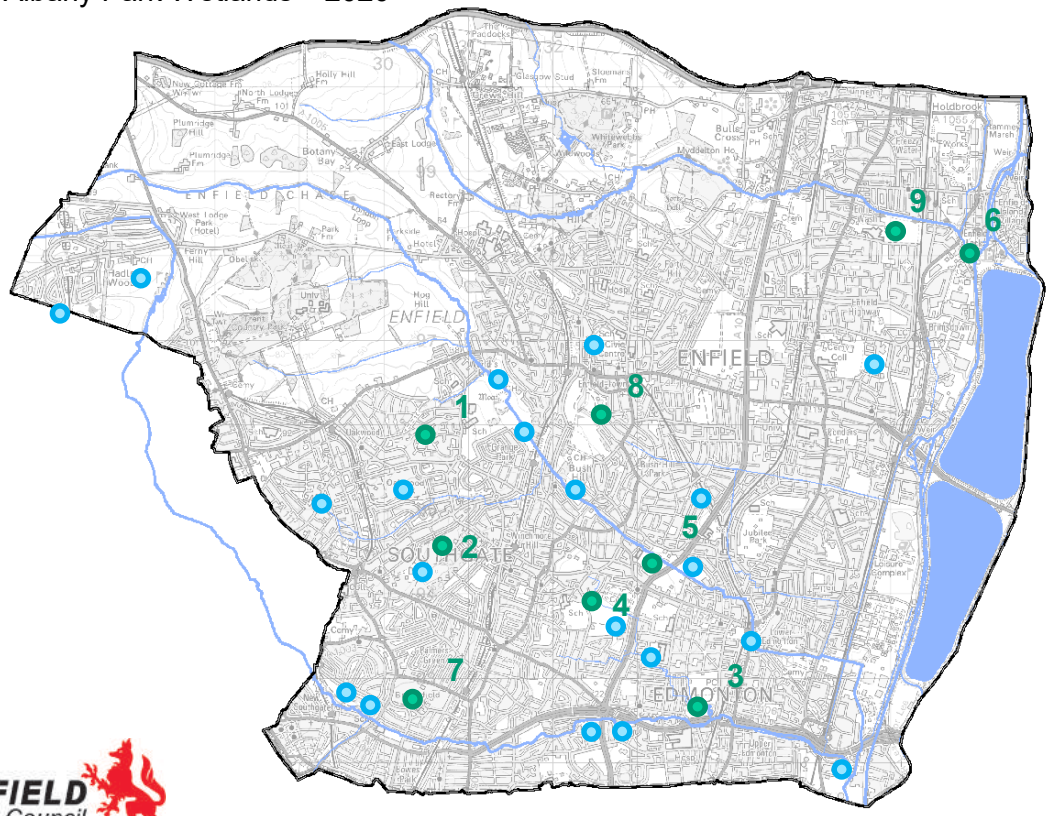
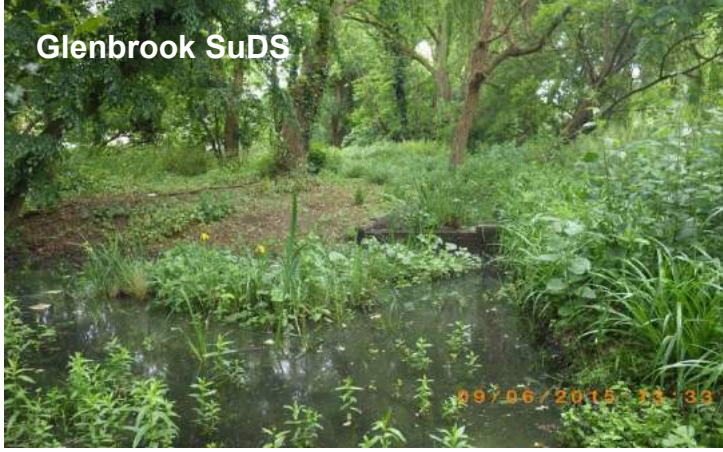
## Constructed Wetlands Slow the Flow

1. Glenbrook SuDS – 2014
2. Grovelands Park SuDS – 2014
3. Pymmes Park Wetlands – 2015
4. Firs Farm Wetlands – 2015
5. Bury Lodge Wetlands – 2016
6. Prince of Wales Wetlands – 2017
7. Enfield Town Wetlands – 2018
8. Broomfield Park Wetlands – 2019
9. Albany Park Wetlands – 2020

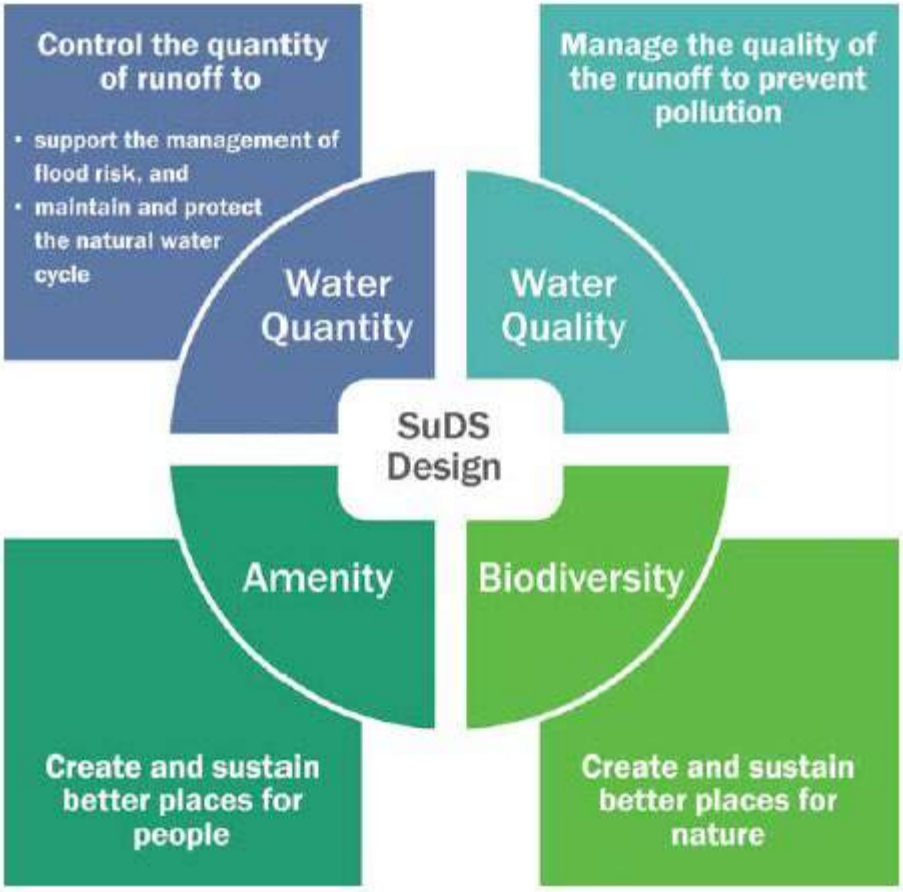


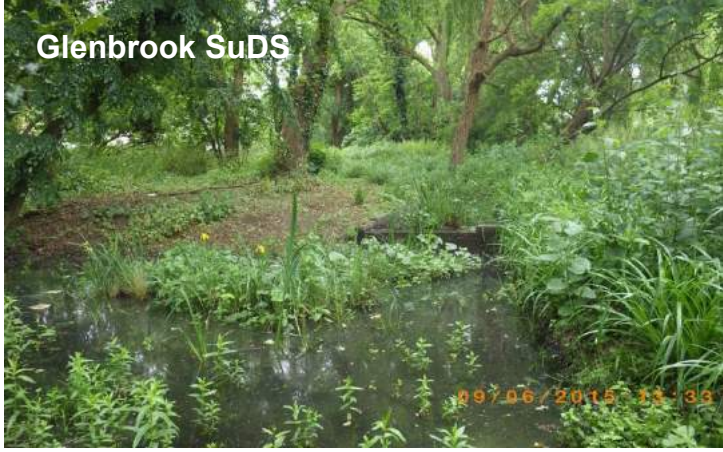





## Multiple benefits of wetlands

- Water quality
- Biodiversity
- Amenity
- Flood storage



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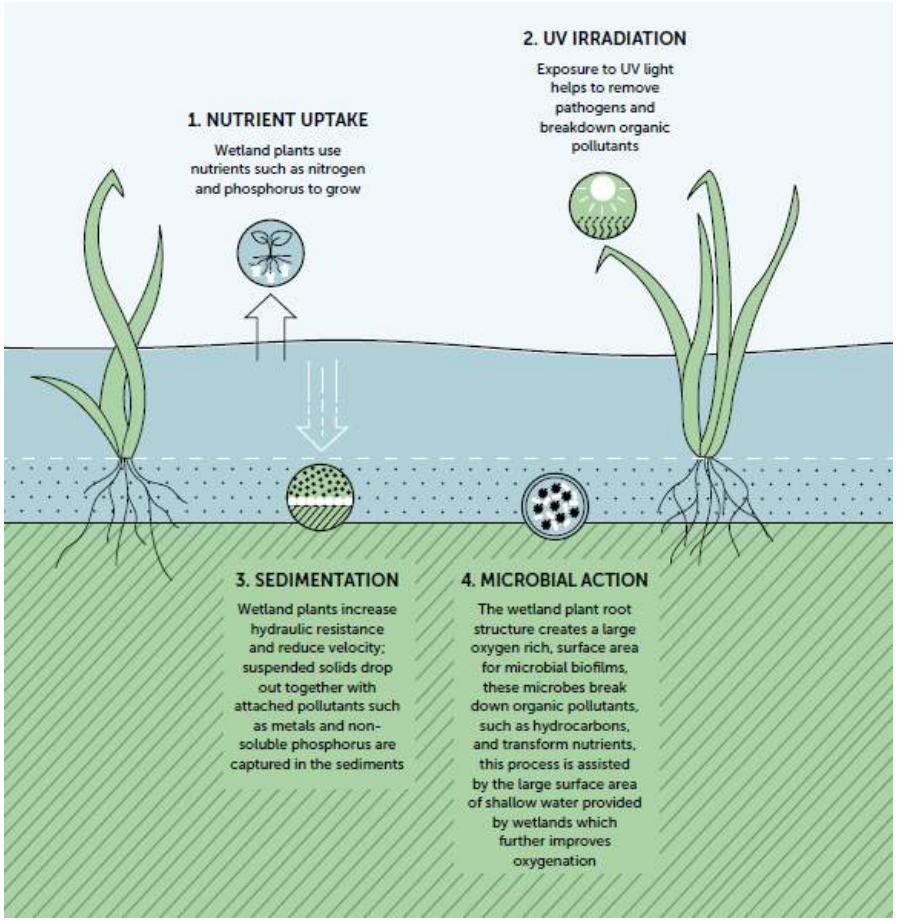


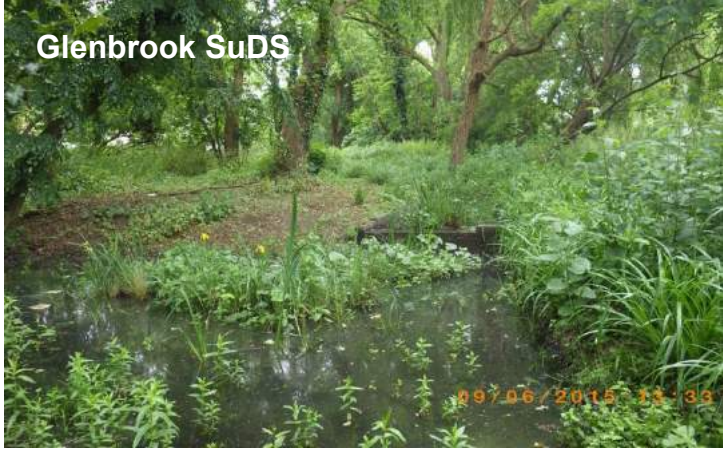




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- Water quality
- **Biodiversity**
- Amenity
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**Wildlife** – wetland species and habitats are in decline across the UK
**Wetland creation** – supports local and national targets to protect and restore key habitats

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## Multiple benefits of wetlands

- Water quality
- Biodiversity
- **Amenity**
- Flood storage

## Health and wellbeing benefits

- Evidence suggests that more biodiverse green spaces have a stronger restorative benefit
- Varied environments and those with water features particularly boost mental health and wellbeing


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## Multiple benefits of wetlands

- Water quality
- Biodiversity
- **Amenity**
- Flood storage

## Amenity features

- Footpaths
- Stepping stones
- Seating areas
- Outdoor classrooms
- Boardwalks
- Open water
- Interpretation features


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## Flood storage

- Volume stored depends on local topography and available space
- Wetlands constructed in Enfield vary from below 1,000m$^3$ to over 30,000m$^3$
- Using excess spoil to create a bund at the downstream end can significantly increase storage potential

Town Park Wetlands storage volume ~4,000m$^3$


Pymmes Park Wetlands storage volume ~5,000m$^3$

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## Flood storage

Surface water flood risk – wetlands situated to impede and store overland flows during extreme rainfall events

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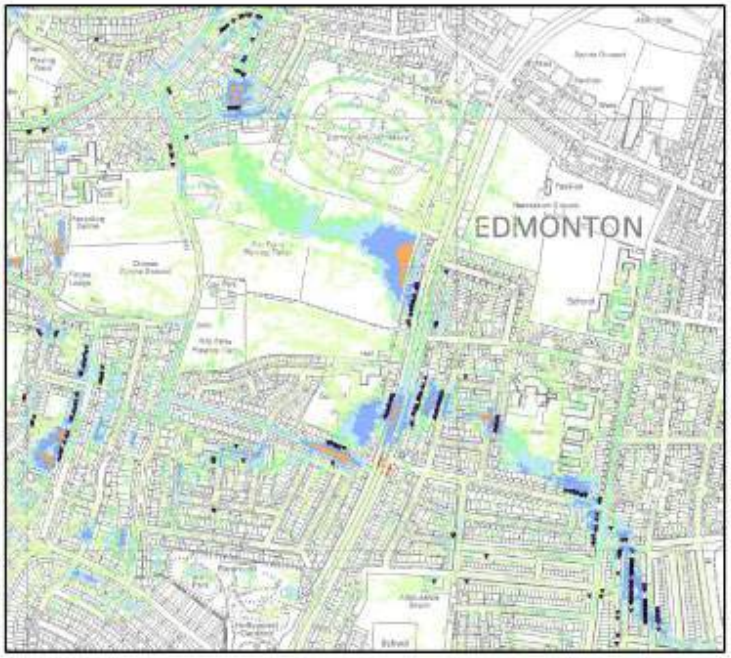


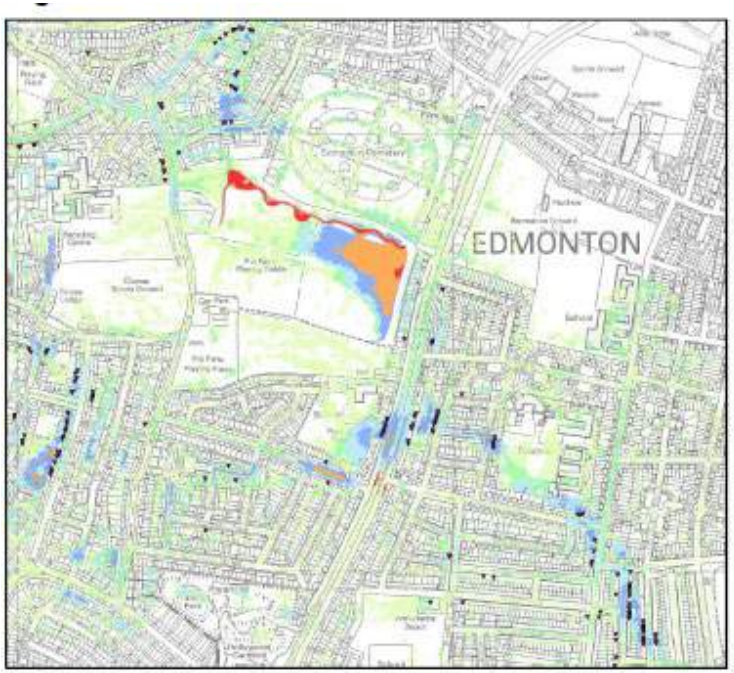


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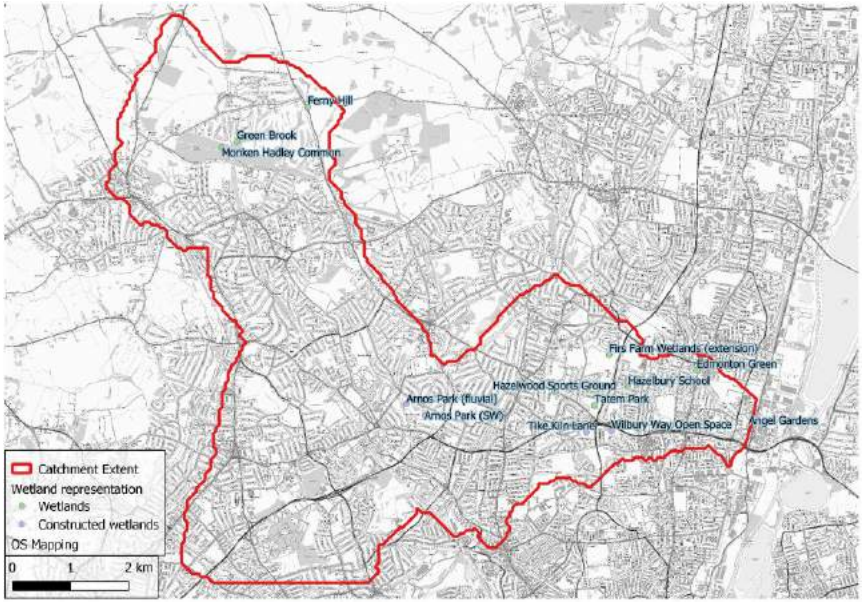
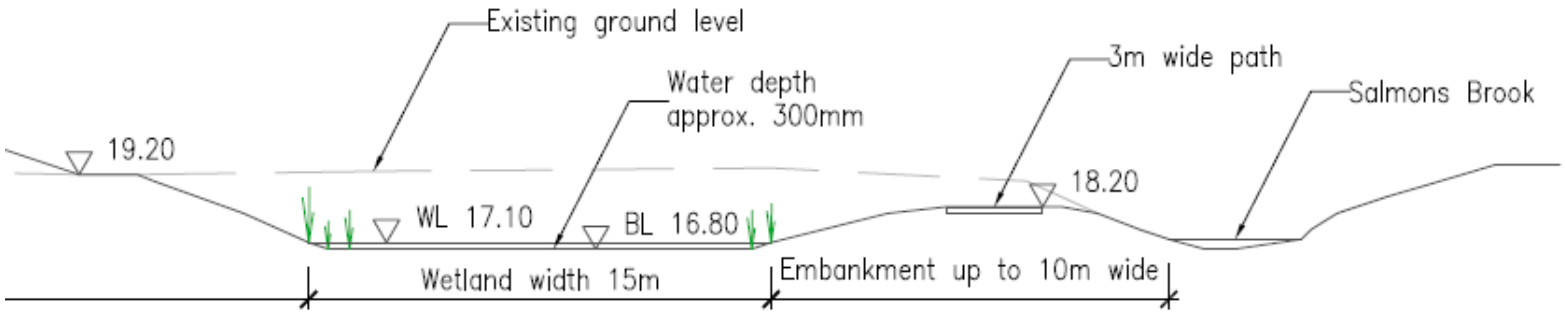
## Flood storage

- Fluvial flood risk – wetlands distributed throughout the catchment to attenuate runoff
- Pymmes Brook hydraulic modelling study – peak flows reduced by 10%

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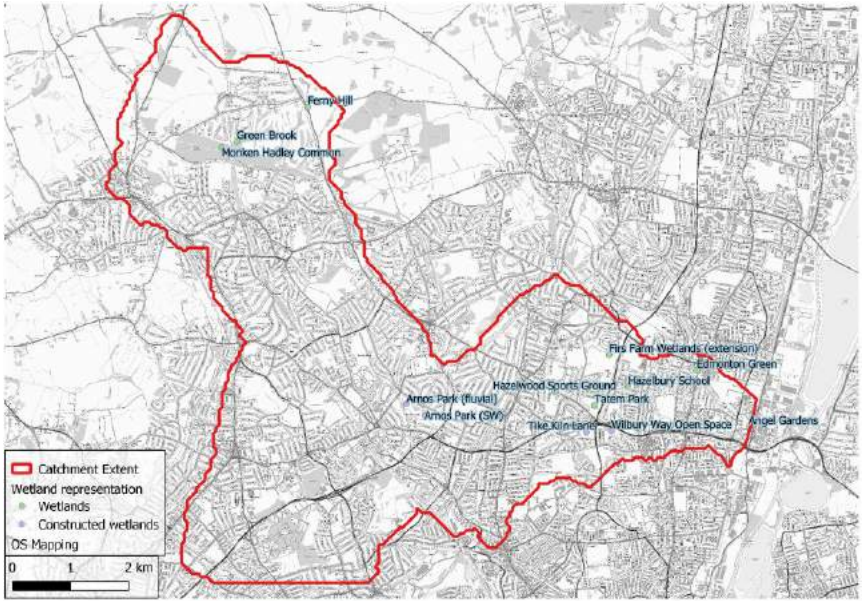


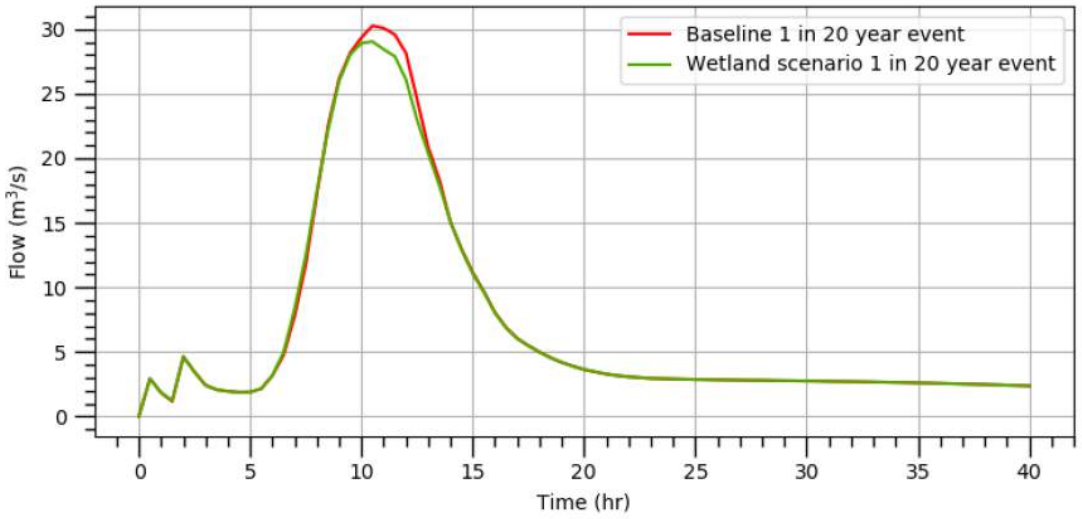


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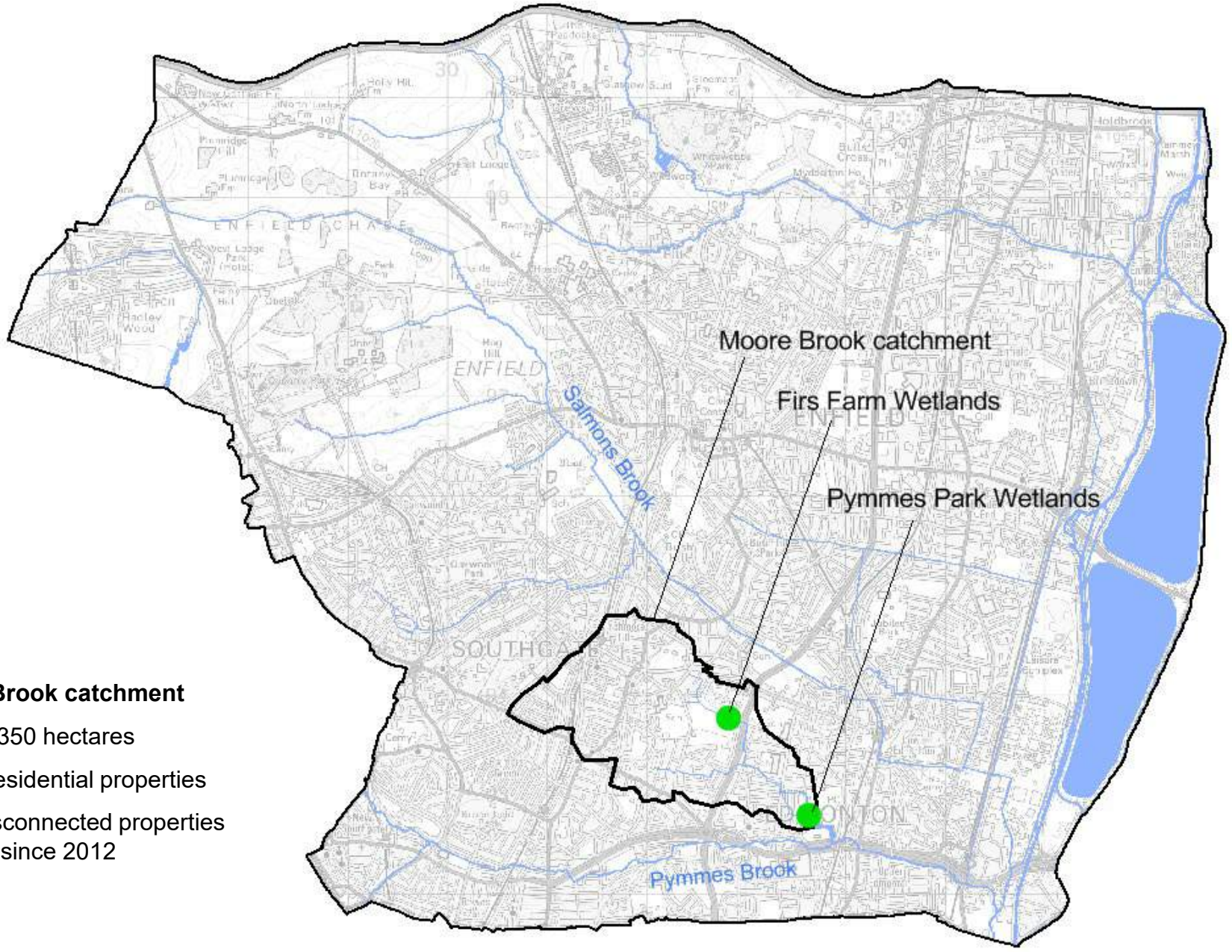



**Moore Brook catchment**

- Area ~ 350 hectares
- 8,000 residential properties
- 300 misconnected properties rectified since 2012

## Constructed Wetlands – sizing

- In general, the bigger the better (i.e. the larger the wetlands the more effective it will be at removing pollutants)
- Wetland plants increase hydraulic resistance and reduce velocity, suspended solids drop out
- Root structure creates surface area for microbial biofilm
- Plants uptake nutrients

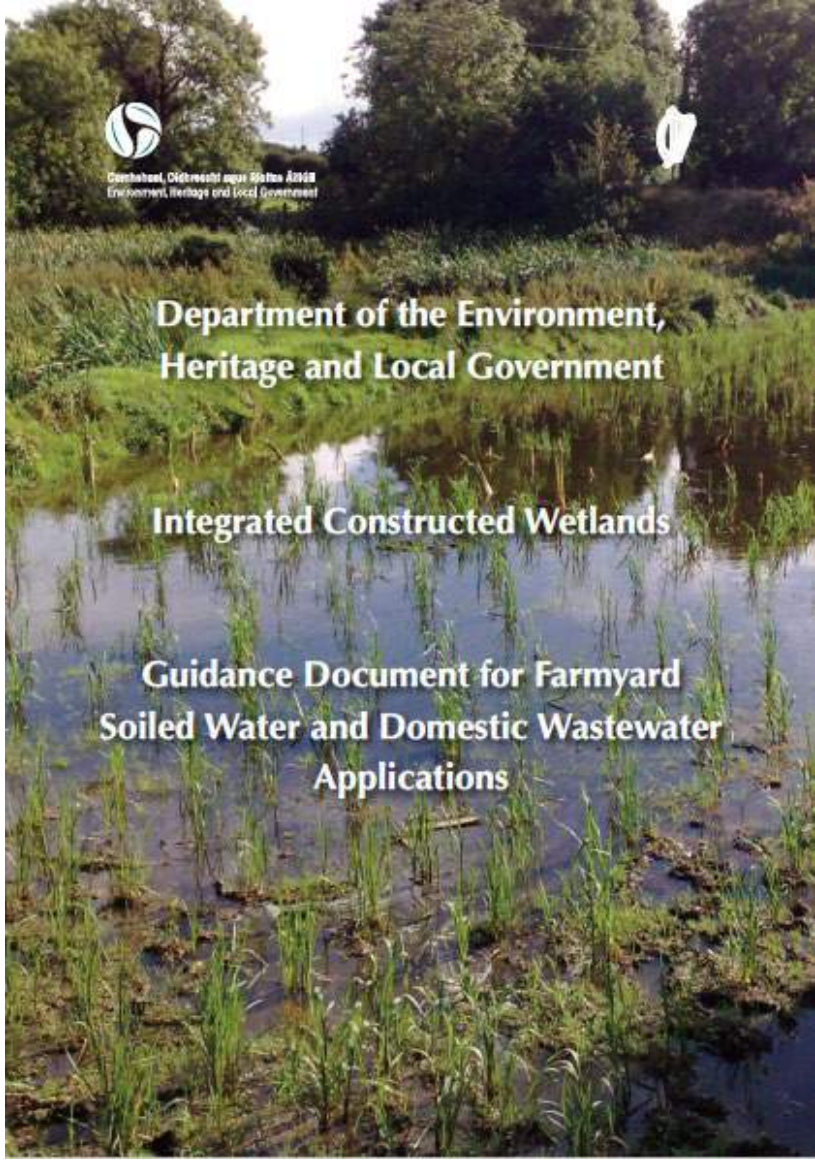
1 PE 54 g BOD5/day (source OECD Gloassary of Statistical Terms)
(for comparison raw sewage BOD5 = 230mg/L and typical daily use per person = 200L hence 46 g BOD5/day)

Area required for domestic wastewater integrated constructed wetland is calculated= PE x using the following formula (Integrated Constructed Wetlands Guidance Document):

Area ($m^2$) = PE x 40 (where includes stormwater) x 1.25 (allow for embankments and access)

North Outfall

| | | | |
|---|---|---|---|
| BOD5 | 4.1 | mg/L | (average based on 5 readings) |
| DWF | 30 | L/s | (estimated using bucket method) |
| BOD5/day | 10627.2 | g | |
| PE | 197 | | |
| Area | 9,840 | $m^2$ | |




A good rule of thumb is that the surface area of the wetland system should be 1-5% of the catchment area

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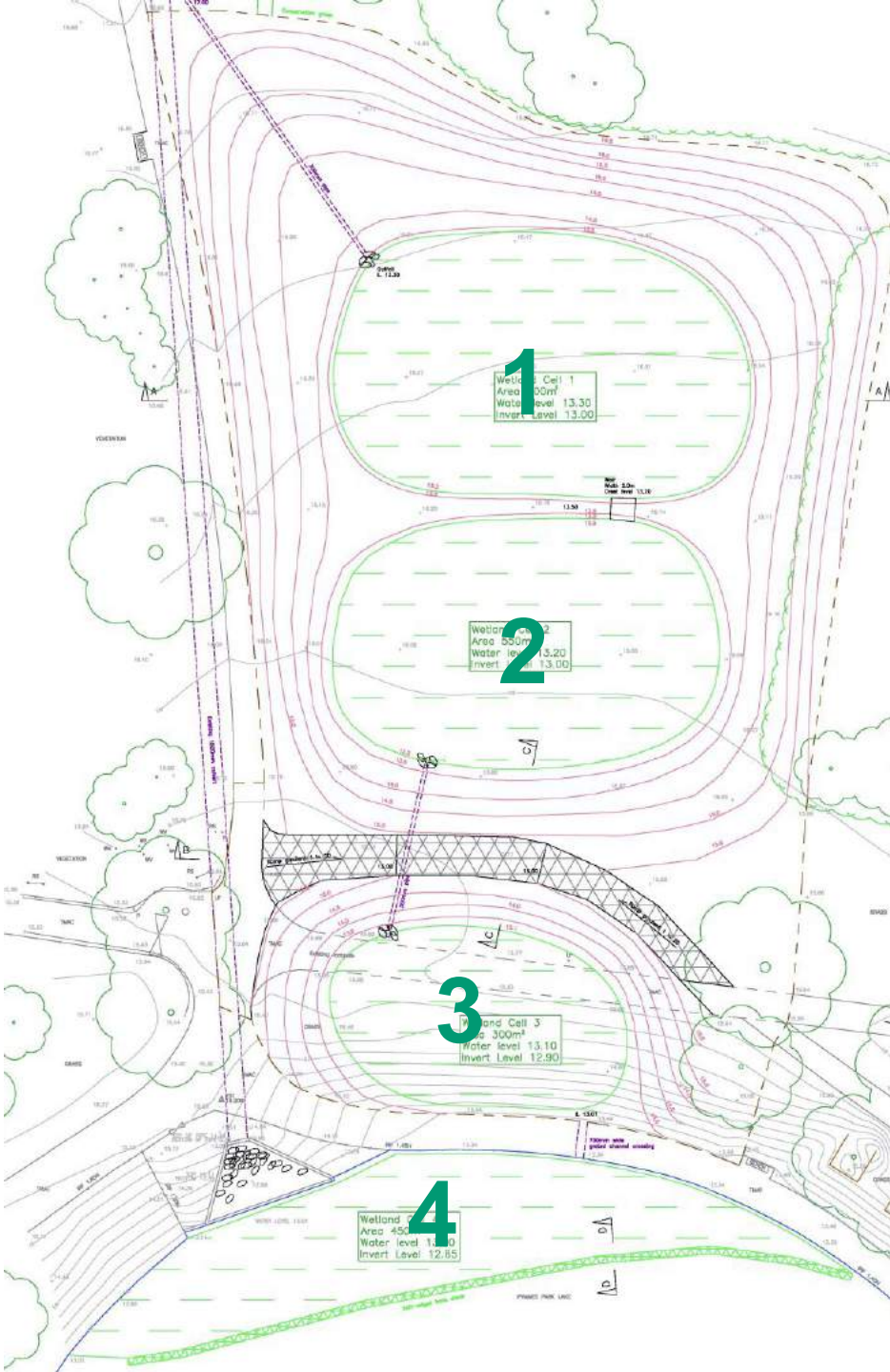
## Design considerations

- **Number of treatment cells**
- Sedimentation forebay
- Weirs/flow controls
- Preferential flowpath
- Transitional habitat
- Inlets/outlets



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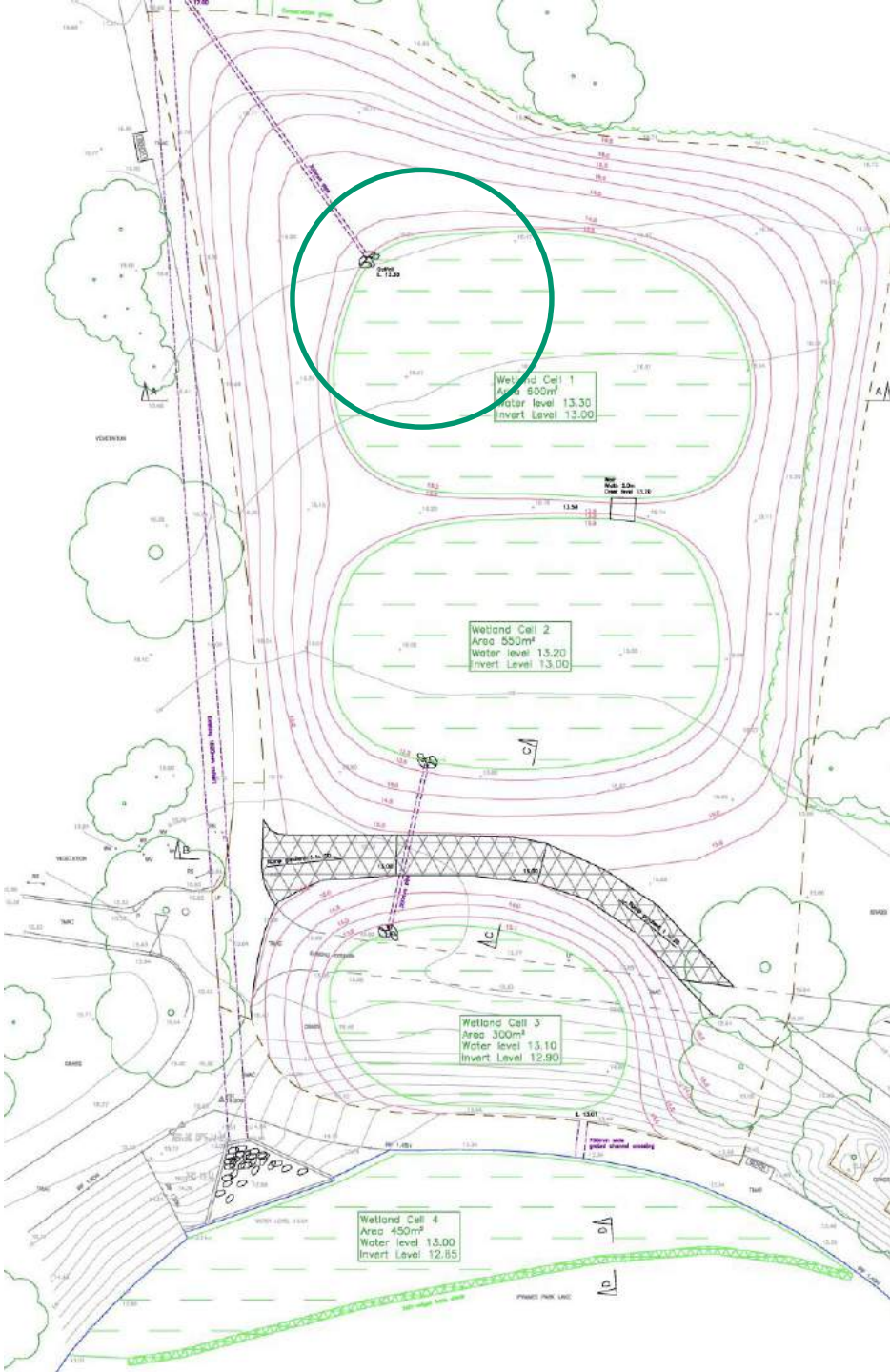

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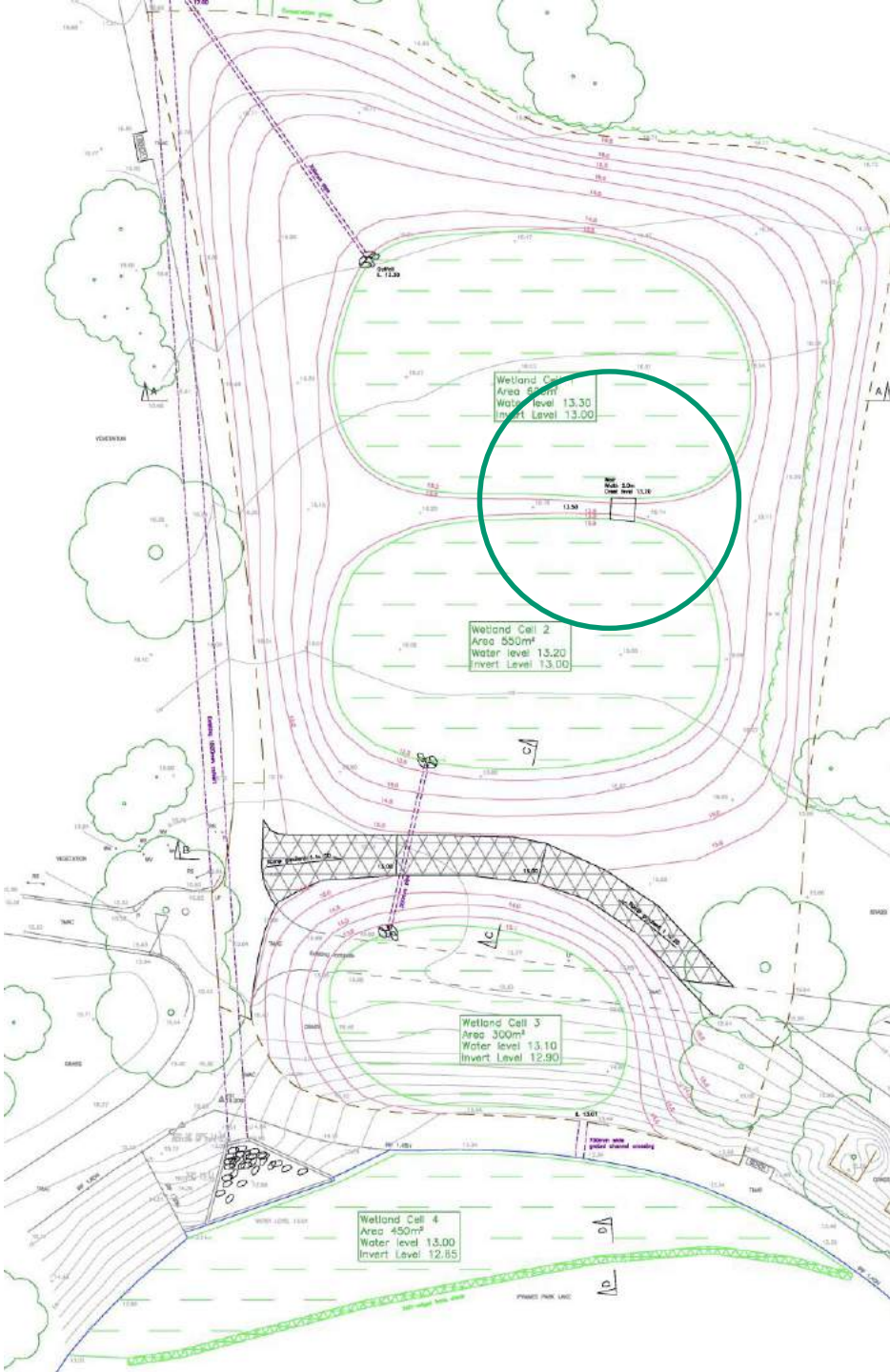

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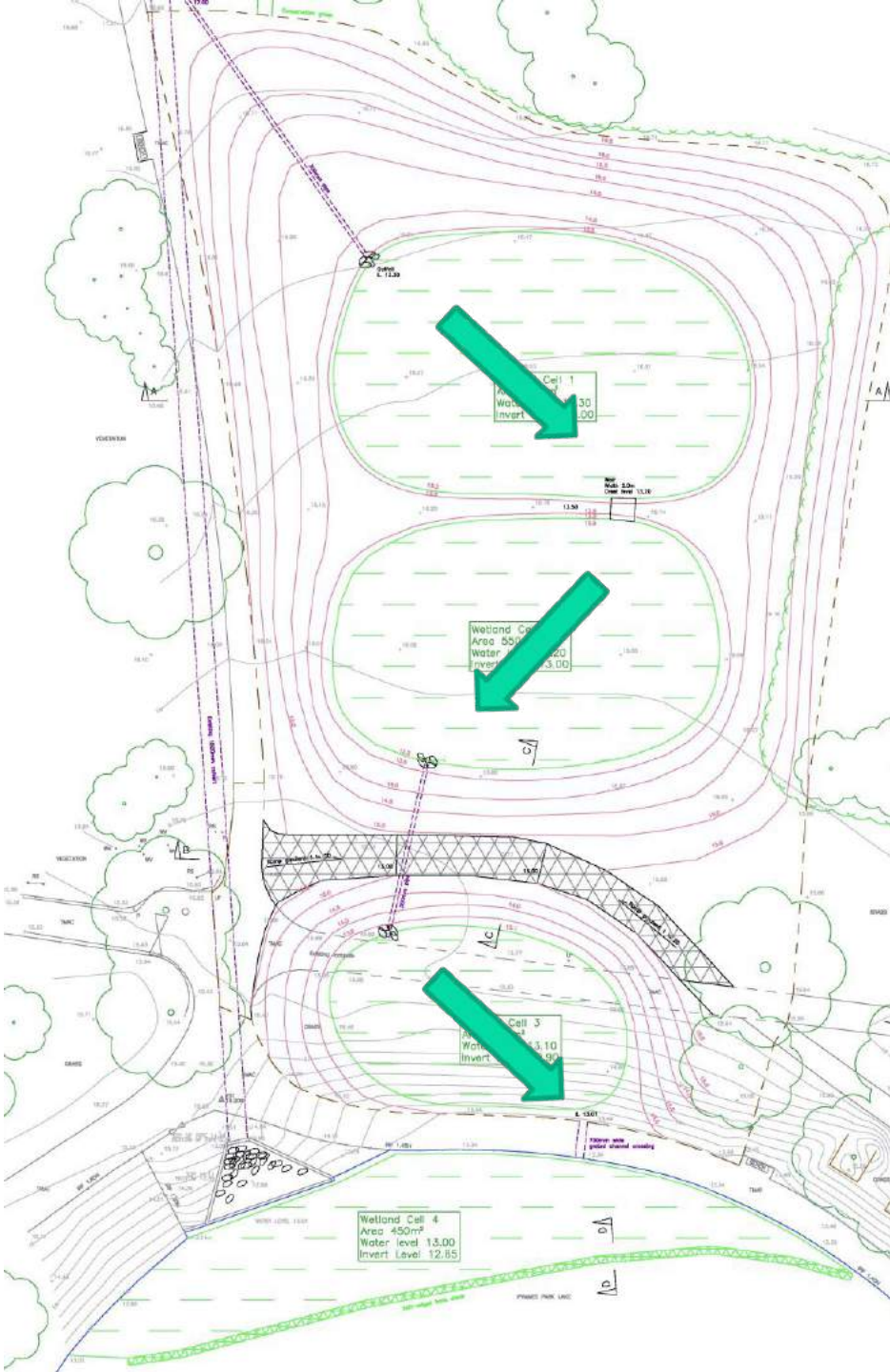

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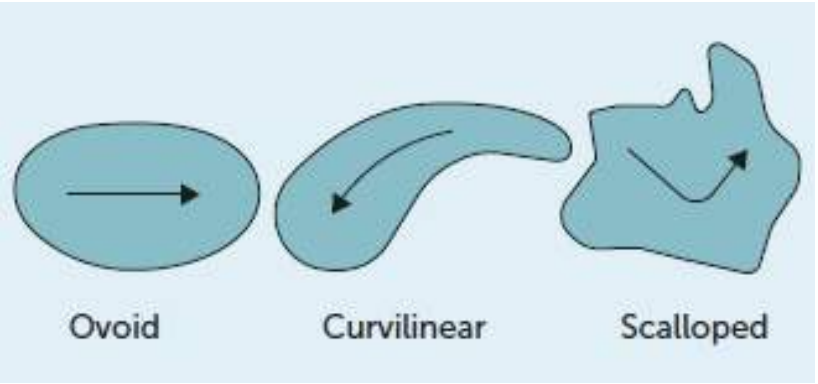


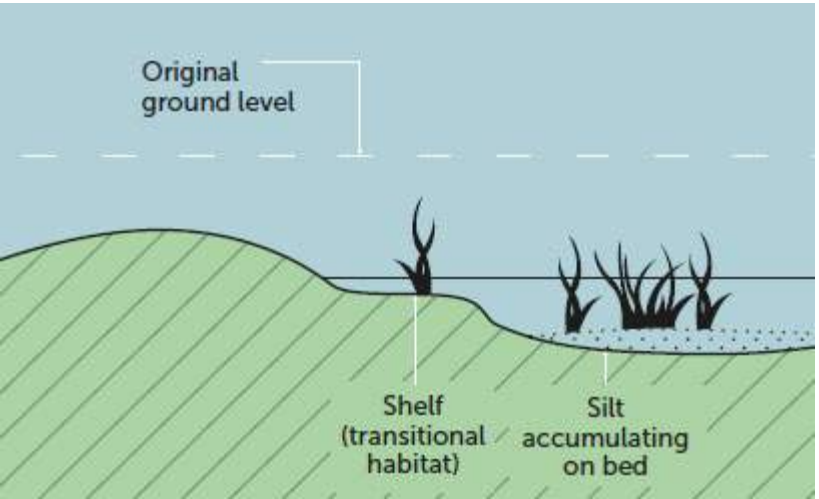


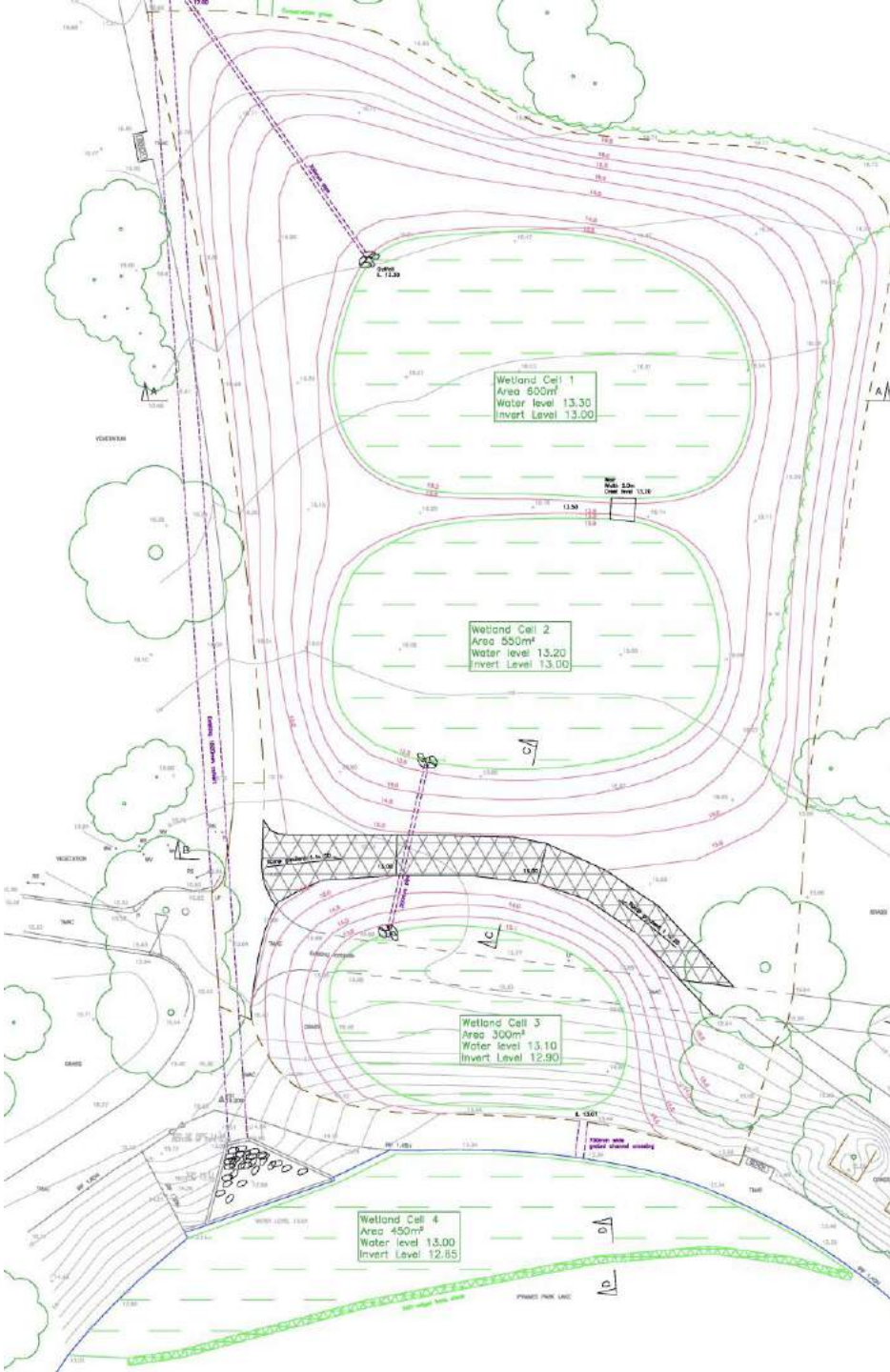

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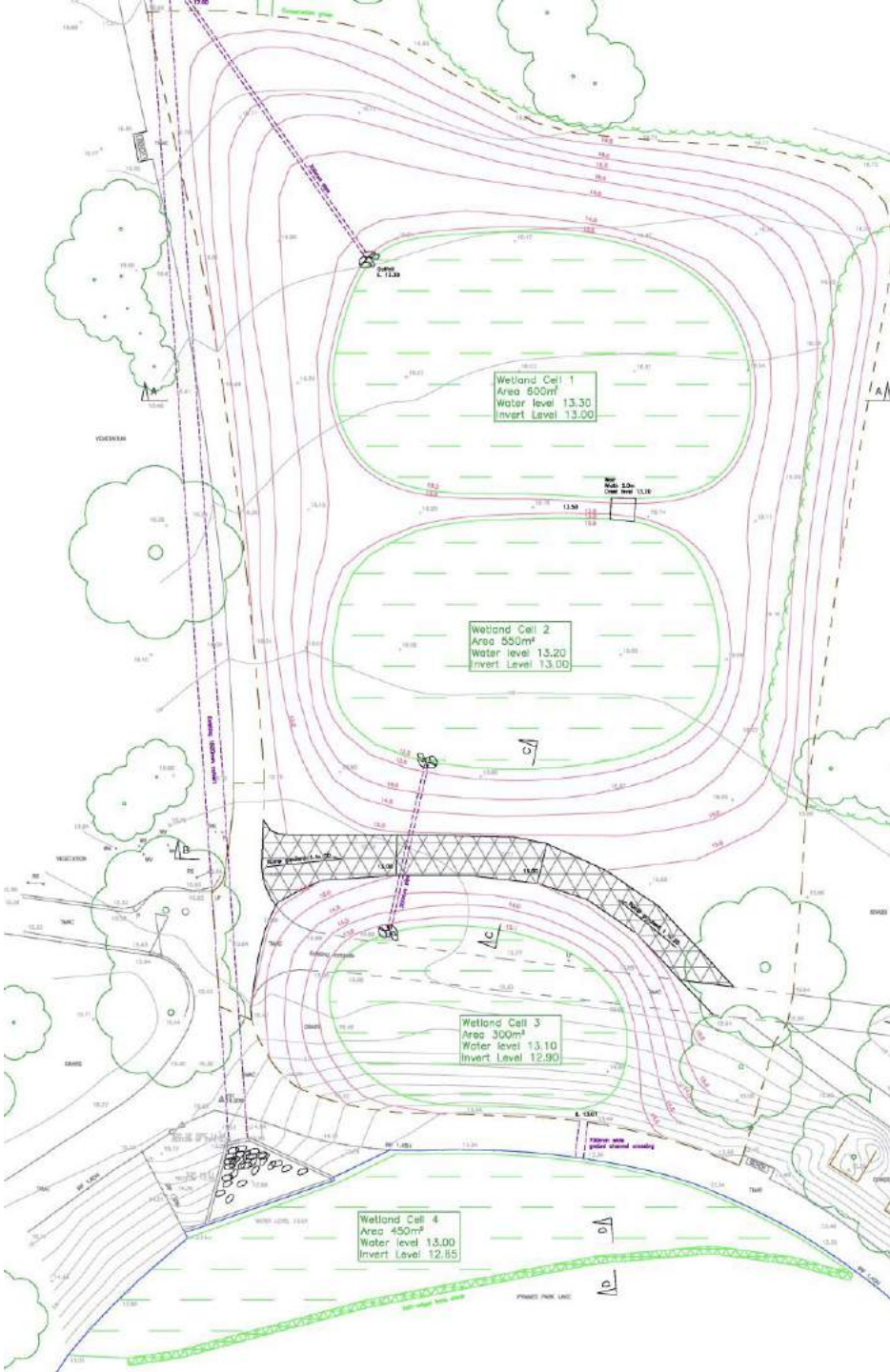


**Pymmes Park Wetlands**

- Total area ~ 5,000m$^2$
- Wetland area ~ 2,000m$^2$
- Volunteer planting in May 2015 organised by Thames21
- 600m$^2$ of pre-planted coir mats installed in 2 days


## Constructed Wetlands – suggested plant species

- Carex acutiformis (Lesser Pond Sedge)
- Juncus effusus (Soft Rush)
- Lythrum salicaria (Purple Loosestrife)
- Iris pseudacorus (Yellow Flag Iris)
- Caltha palustris (Marsh Marigold)
- Myosotis scorpioides (Water Forget Me Not)
- Ranunculus flammula (Lesser Spearwort)
- Alisma plantago-aquatica (Water Plantain)
- Mentha aquatica (Water mint)
- Phragmites australis (Common Reed)
- Butomus umbellatus (Flowering Rush)


Common Reed


Flowering Rush


Purple Loosestrife

## Vegetation management

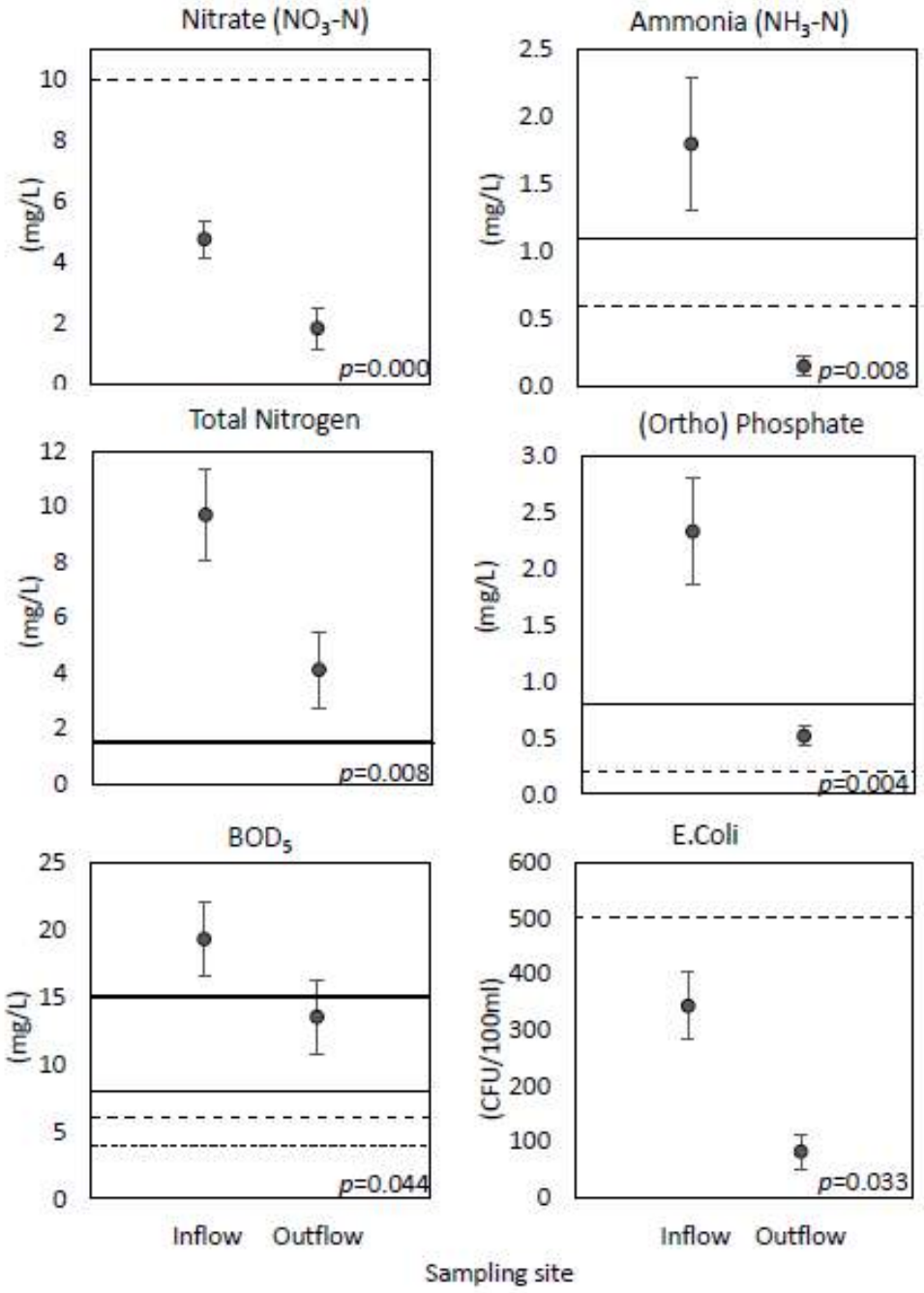
•Aim to remove one third annually, ideally in 1m strips perpendicular to flow direction with 2m in between

•Strim down to water level in September/October (before die-back)

•Capture as much dead matter as possible and remove it – can also rake out dead material in-between roots but do not damage roots

•At inlets/outlets remove all material (within 1m) so flow is not impeded by root mass

•Remove invasive species such as Bulrushes also

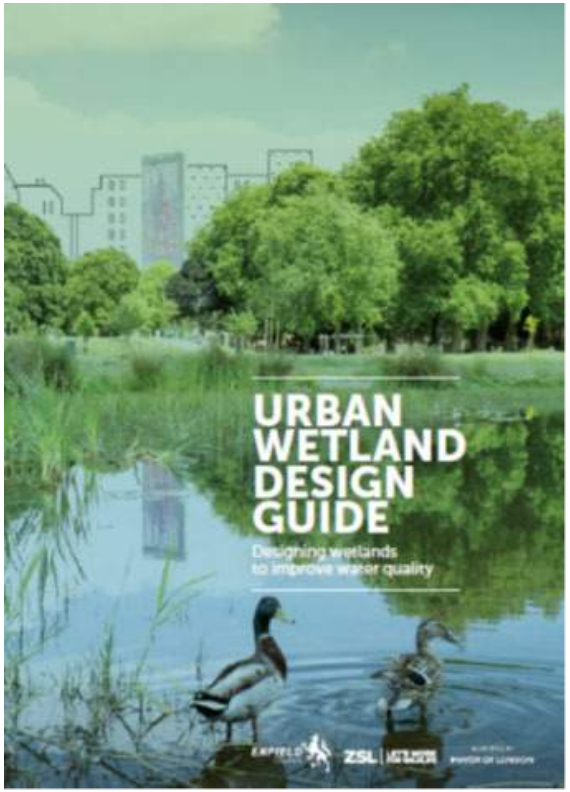



**Firs Farm Wetlands Interim Water Quality Report**

Dr Nathalie Gilbert, Thames 21, September 2016

Mean (± SE) parameter concentrations from the inflow to cell 1 (inflow) and the outflow sampled at the trash screen (outflow) from Firs Farm constructed wetland basins. Dashed lines represent threshold standards in water quality from the WFD or equivalent, simplified as poor (bold line), moderate (continuous line), good (dashed line), very good (dashed line).

# Thank you for Listening




**Contact**
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**Available from**

www.zsl.org/londons-rivers

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