

Thurrock Detailed Water Cycle Study

Thurrock Council

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Quality information

Prepared by	Checked by	Verified by	Approved by
Becci Ward Senior Flood Risk Consultant	Laura McKechnie Principal Consultant	Elizabeth Gent Associate Director	Elizabeth Gent Associate Director
Matthew Beauchamp Engineer			

Revision History

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P01	28/05/2026	Draft for client review	EG	Elizabeth Gent	Associate Director
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Prepared for:

Thurrock Council

Prepared by:

AECOM Limited
Midpoint, Alencon Link
Basingstoke
Hampshire RG21 7PP
United Kingdom

T: +44 (0)1256 310200
aecom.com

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Abbreviations

Acronym	Definition
ALS	Abstraction Licensing Strategies
AMP	Asset Management Plan
ESW	Essex and Suffolk Water
AWS	Anglian Water Services
BREAAM	Building Research Establishment Environmental Assessment Method
CAMS	Catchment Management Abstraction Strategy
CIWEM	Chartered Institution of Water & Environmental Management
Defra	Department for Environment, Food & Rural Affairs
DWF	Dry Weather Flow
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
EIS	Environmental Incentive Scheme (run by Anglian Water Services)
EIP	Environmental Improvement Plan (2023)
EFI	Environmental Flow Indicator
EWSC	Enabling Water Smart Communities
LFRMS	Local Flood Risk Management Strategy
LLFA	Lead Local Flood Authority
LPA	Local Planning Authority
MHCLG	Ministry of Housing and Local Government
MWELS	Mandatory Water Efficiency Labelling Scheme
NAV	New Appointment and Variation
NbS	Nature based Solution(s)
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
Ofwat	Office for Water Services
PCC	Per Capita Consumption
PPG	Planning Practice Guidance
RBMP	River Basin Management Plan
RNAG	Reasons for Not Achieving Good (WFD Regulations)
RQP	River Quality Planning
SFRA	Strategic Flood Risk Assessment
SPZ	Source Protection Zones
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TC	Thurrock Council
WAFU	Water Available For Use

Acronym	Definition
WCS	Water Cycle Study
WEDS	Water Efficient Design Statement
WFD	Water Framework Directive
WMS	Written Ministerial Statement
WRC	Water Recycling Centre
WRE	Water Resources East
WRMP	Water Resources Management Plan
WRZ	Water Resource Zone
WSI	Water Services Infrastructure
WWNP	Working with Natural Processes

1. Introduction

1.1 Water Cycle Study purpose

This Detailed Water Cycle Study (WCS) has been produced for Thurrock Council (TC) as part of the evidence base informing the Council's new Local Plan. The WCS has been produced in line with Environment Agency guidance¹ and follows TC's Scoping WCS report produced in March 2024².

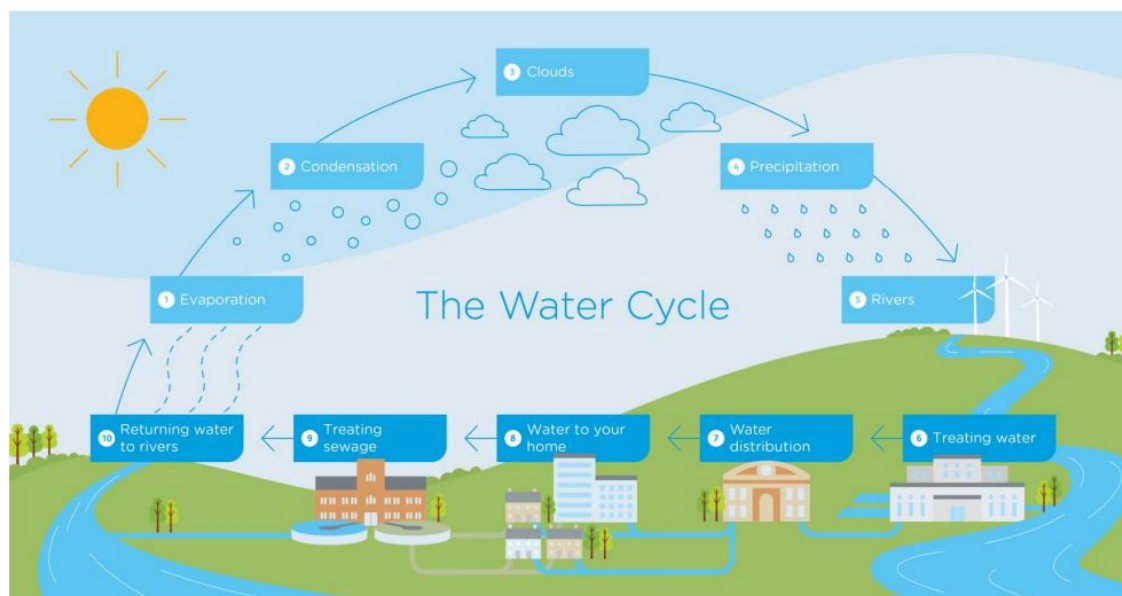


Figure 1-1 The water environment and water services infrastructure components

The objective Scoping WCS identified constraints on planned housing and employment growth that may be imposed by the water cycle. This Detailed WCS then identifies solutions to resolve constraints e.g. through ensuring that appropriate Water Services Infrastructure (WSI) can be provided to support the proposed development, including the planning policy required to deliver it.

A broad overview of the interaction between the water environment and WSI which the WCS is concerned with is provided within Figure 1-1³.

1.2 Study partners

The WCS has been carried out with the following contributors and partners:

- TC as the Local Planning Authority (LPA).
- Anglian Water Services (AWS) as the wastewater provider.
- Essex and Suffolk Water (ESW) as the provider of public water supply.
- The Environment Agency.

The WCS has also used relevant information from the following organisations:

- Natural England.
- Water Resources East (WRE).
- British Geological Survey.

¹ Environment Agency (2021) Water cycle studies. Available at: <https://www.gov.uk/guidance/water-cycle-studies> (Accessed January 2025)

² AECOM (2024) Thurrock Scoping Water Cycle Study

³ Source: <https://www.thameswater.co.uk/about-us/responsibility/education/the-water-cycle>

1.3 Report structure

The Detailed WCS report is structured as follows:

- Section 2: **Scoping Study outcomes** – explains the key findings of the Scoping Study regarding capacity issues and any updates to study drivers and the policy context since the scoping work was completed.
- Section 3: **Growth proposals and study area** - defines the study area and growth sites assessed.
- Section 4: **Water dependant habitats** - provides information on the existing hydrological baseline context in the TC administrative area.
- Section 5: **Water infrastructure baseline update** - provides information on the current WSI baseline, including capacity within the infrastructure before growth is assessed.
- Section 6: **Wastewater assessment** - sets out the assessment of wastewater infrastructure capacity and environmental capacity allowing for the impact of growth and identifies required solutions.
- Section 7: **Water supply assessment** - sets out the assessment of available water supply allowing for the impact of growth and identifies required solutions.
- Section 8: **Growth area summaries** – acts as a summary of the WCS findings, presented spatially across the TC area according to areas of growth.
- Section 9: **Recommendations** – summarises key recommendations for the Local Plan emerging from the WCS, including policy recommendations.

2. Scoping Study outcomes

The Scoping study completed a comprehensive review of the capacity of WSI and the Water Environment; this section of the report summarises those findings and also updates any of the policy or legislation based drivers, and relevant supporting studies and strategies which have changed since the Scoping Study was completed.

2.1 Key findings

The Scoping WCS identified where there are gaps in evidence required to give certainty that growth can be delivered sustainably and with feasible WSI solutions. The following evidence gaps were identified:

- Thurrock Council provided three potential growth options for the Borough to be considered in the Scoping WCS. Option 1 offered a 'low growth' strategy of 16,900 dwellings; Option 2 offered a 'medium growth' strategy with 23,180 dwellings while Option 3 offered a 'high growth' strategy with 33,480 dwellings. These growth strategies were split across 20 settlement areas. The Scoping WCS identified there is likely to be sufficient planned water resource measures to deliver housing growth for the lower of the three broad growth strategies (option 1), but further evidence would be required to demonstrate there are feasible water supply management measures to deliver the medium and higher growth strategies. In this Detailed WCS, Thurrock Council have provided specific growth numbers within their Local Plan which have replaced these growth options.
- There are uncertainties in the degree of potable water demand created for non-housing growth, including a significant potential for freshwater demand for hydrogen generation proposals, as well as other significant non-residential developments. Government targets to reduce non-residential demand for treated potable water may require alternative water solutions to be considered for this aspect of growth within the Local Plan.
- There is likely to be sufficient permitted quantitative treatment capacity at Tilbury WRC to cater for all three of the broad growth strategies, but the water quality implications of treating and discharging additional wastewater flows would need a water quality and water-dependent protected areas assessment for the Tidal Thames.
- The scale of growth from Thurrock that is likely to connect to Upminster WRC in the north of the Borough, is small in comparison to growth from neighbouring authorities which connect to that WRC. If preferred housing or employment sites for Thurrock are to be located within the Upminster WRC catchment, the study area for the Detailed WCS will need to expand to include estimates of growth from neighbouring authorities to allow a cumulative assessment of WRC capacity (quantity and quality) to be completed.
- The potential for developer contributions towards Nature Based Solutions (NBS) to offset water and flood risk impacts was identified: these could be explored in more detailed once preferred site and numbers known.

2.2 Changes to study drivers

2.2.1 National planning policy

The National Planning Policy Framework⁴ (NPPF) was updated in February 2025. Paragraph 20 states that the strategic policies in development plan documents should make sufficient provision for infrastructure for water supply, wastewater, flood risk and coastal change management. Paragraph 162 states that plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change and water supply.

⁴ Department for Levelling Up, Housing and Communities (2025) National Planning Policy Framework. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2> (Accessed May 2025)

Planning Policy Guidance⁵ (PPG) states that a WCS can help plan for sustainable growth. WCSs prepared at an early stage of plan-making can provide the evidence base to ensure local development plans are sound. This is the key driver for completing a WCS as part of the Local Plan evidence base.

2.2.2 Legislation

The primary legislative drivers for this study are the Water Environment Water Framework Directive (WFD) Regulations 2017, the Conservation of Habitats and Species Regulations 2017 (as amended) and the Environment Act (2021). There have been no updates to these documents since the production of the Scoping Study.

2.2.3 Relevant strategies and plans

The following plans and strategies have updated versions since the Scoping Study was completed.

E&SW WRMP (Oct 2024)

The Thurrock WCS scoping report's references to the WRMP are still valid and up to date. There are no substantive changes in the final WRMP that affect the findings or recommendations in the scoping report. The planning, policy, and technical context provided by the WRMP remains consistent between the draft and final versions. The conclusions of the scoping study remain largely the same with the exception of minor updates related to:

- Per Capita Consumption (PCC): The final WRMP included the most recent average PCC for ESW is 143.72 l/h/d (litres/head/day) in 2025/2026.
- Supply and Deficit: The final WRMP confirms the baseline supply deficit in the Essex WRZ for the whole planning period, with the deficit peaking at -43.87 Ml/d in 2034/35, which is slightly higher than the maximum deficit of -42.08 Mld which was reported in the draft WRMP.
- Thurrock Growth: The scoping study referred to the WRMP having an allowance of 27,244 new houses in Thurrock between 2022-2050. The final WRMP does not contain an explicit table or section that states the housing growth allowance for Thurrock as a standalone figure. The WRMP's methodology confirms that Thurrock's Local Plan growth is included in the Essex WRZ, but the specific number is not directly quoted. The reference to the Thurrock allowance in the scoping study is based on the underlying data and methodology described in the WRMP, but the WRMP itself aggregates growth at the WRZ level.

⁵ Department for Levelling Up, Housing and Communities, Ministry of Housing, Communities and Local Government (2024) Planning Practice Guidance. Available at: <https://www.gov.uk/government/collections/planning-practice-guidance> (Accessed May 2025)

3. Growth proposals and study area

3.1 Study area

The WCS study area is based largely on the administrative boundary of TC. The administrative area of TC is displayed in Appendix F Figure 1. The WCS study area extends into the administrative area of Brentwood Borough Council and Havering Borough Council to include the Upminster Water Recycling Centre (WRC); as the new settlement at West Horndon, which makes up part of the Local Plan, would drain wastewater to the Upminster WRC for treatment. This is explained further in Section 6. The Pitsea WRC also extends into the administrative boundary of TC. The WCS study area extends into the administrative area of Basildon Borough Council to include the Pitsea WRC due to the allocation at Corringham Park Farm which would drain wastewater to the Pitsea WRC for treatment.

3.2 Growth proposal summary

TC's updated Local Plan would cover the period 2024 to 2044 and will make new allocations which would deliver approximately 30,471 new dwellings over the plan period as shown in Table 3-1. Appendix F, Figure 1 shows the location of the allocation sites in the updated Plan.

For the wastewater assessments within the WCS, it has also been essential to include development which is not to be allocated in the new Plan, but which is already committed. This is to ensure the impact of cumulative growth on wastewater infrastructure capacity is fully understood. Table 3-1 includes details of existing commitments not yet built. Taking account of existing commitments and new allocations in the updated Plan gives a total of 30,798 dwellings assessed in the WCS.

Table 3-1 Growth proposals

WRC catchment	Potential Emerging Allocations	Existing Commitments	Total
Tilbury	25,921	327	26,248
Upminster	3,550	0	3,550
Pitsea	1,000	0	1,000
Total	30,471	327	30,798

4. Water dependent habitats

4.1 Introduction

There are nine statutory and non-statutory designated sites that have been identified with potential hydrological connectivity and therefore a material dependency on water. Failure of the WRC to meet its permitted discharge standards may result in elevated contaminant concentrations in the receiving waters, with potential downstream implications for water quality and ecological receptors. The water dependent habitats within Thurrock and the potential hydrological connectivity are identified in Table 4-1.

Table 4-1 Designated sites identified with potential hydrological connectivity

Site	Description
Thames Estuary & Marshes SPA / RAMSAR	Estuarine habitats, intertidal mudflats, saline lagoons
Mucking Flats & Marshes SSSI	Intertidal flats, saltmarsh
Holehaven Creek SSSI	Estuarine mudflats, saltmarsh
West Thurrock Lagoon & Marshes SSSI	Lagoon, brackish habitats
Grays Thurrock Chalk Pit SSSI	Geological, chalk exposure
Vange & Fobbing Marshes SSSI	Grazing marsh, ditches
Inner Thames Marshes SSSI	Grazing marsh, freshwater habitats
Langdon Ridge SSSI	Ancient woodland, geology
Purfleet Chalk Pits SSSI	Geological, chalk exposures

All other designated sites identified within the Borough are remote from watercourses into which the WRC discharges treated effluent. The ecological background to the statutory designated sites including the details of the interest features and relevant condition assessments are provided in Appendix G.

4.2 Water Quality Targets

A review of available information from Natural England and the Environment Agency^{6,7} indicates that site-specific numeric water quality targets are not published for the majority of designated sites within the Thurrock area. The Environment Agency's 'Targets for European Site Protected Areas' and the Water Framework Directive (WFD) "Good" status thresholds for the relevant receiving waterbodies should therefore be used as targets. A precautionary "no deterioration" should be considered, ensuring that the proposed discharges will not compromise the achievement of WFD objectives or the favourable condition of these designated sites.

The Thames Estuary & Marshes SPA/Ramsar and Mucking Flats & Marshes SSSI are the nearest designated sites to the Tilbury WRC, situated about 3.5 km downstream. It is expected that there will be a high degree of dilution and dispersion within the transitional waterbody.

4.3 Summary of water dependent habitats

Table 4-2 provides a summary for each water dependent habitat, including connected water body, WRCs which may influence water quality at the site, hydrological dependency and water based pressures.

⁶ Natural England Designated Sites View (2025). [Online] Available at: <https://designatedsites.naturalengland.org.uk/SiteSearch.aspx>

⁷ Natural England (2025) Site Improvement Plans: London & South East [Online] Available at: <https://publications.naturalengland.org.uk/category/6149691318206464>

Table 4-2 Water dependant habitats and hydrological connectivity

Site	Designation	Connected WRCs	Connected waterbody(s)	Distance of site to WFD watercourse (km)	Identified hydrological and water quality issues & pressures
Thames Estuary & Marshes	SPA / RAMSAR	Tilbury WRC	Thames Lower Transitional waterbody Thames Middle Transitional waterbody	0	Thames Lower: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. Thames Middle: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds.
Mucking Flats & Marshes	SSSI	Tilbury WRC	Thames Lower Transitional waterbody Thames Middle Transitional waterbody	0	Thames Lower: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. Thames Middle: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. There are no SSSI Pressures for this site.
Holehaven Creek	SSSI	Tilbury WRC	Thames Lower Transitional waterbody	0	Thames Lower: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds.

					SSSI Pressures for this site: Vehicles (Motorised) (Potential pressure with medium risk).
West Thurrock Lagoon & Marshes	SSSI	Tilbury WRC	Thames Middle Transitional waterbody	0	Thames Middle: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. SSSI Pressures for this site: Vehicles (Motorised) (Potential pressure with high risk), Water Abstraction (Active pressure with high risk), Flood and Coastal Erosion Risk Management Measures (FCERM) (Active pressure with high risk).
Grays Thurrock Chalk Pit	SSSI	Tilbury WRC	Thames Middle Transitional waterbody / White Chalk Subgroup – Principal Aquifer	1.1	Thames Middle: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. SSSI Pressures for this site: Recreational Disturbance (Potential pressure with medium risk), Uncontrolled Vegetation Fire (Potential pressure with low risk), Terrestrial Plants (Potential pressure with low risk), Scrub Encroachment (Potential pressure with low risk), Development (Other) (Potential pressure with high risk).
Vange & Fobbing Marshes	SSSI	Tilbury WRC	Thames Lower Transitional waterbody / Vange Creek, Fobbing Creek, Parting Gut	0.02	Thames Lower: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. SSSI Pressures for this site: Scrub Encroachment (Potential pressure with low risk).
Inner Thames Marshes	SSSI	Tilbury WRC	Thames Middle Transitional waterbody / Network of water drains	0	Thames Middle: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate)

					Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. SSSI Pressures for this site: Extreme Events (Potential pressure with high risk) and Water Level Changes (Not FRM or Abstraction Related) (Potential pressure with medium risk).
Langdon Ridge	SSSI	Tilbury WRC	Network of unnamed ordinary watercourses / Thames Lower Transitional waterbody	3.8	Thames Lower: - WFD classified waterbody – less than Good Status for: - Dissolved Inorganic Nitrogen (moderate) - Also fails WFD chemical status for Benzo(g-h-i)perylene, Mercury and Its Compounds, PBDE and Tributyltin Compounds. SSSI Pressures for this site: Recreational Disturbance (Active pressure with medium risk).
Purfleet Chalk Pits	SSSI	Tilbury WRC	Mardyke / White Chalk Subgroup – Principal Aquifer	0.49	Thames Lower: - WFD classified waterbody – less than Good Status for: - Ammonia (Phys-Chem) (poor) - Dissolved oxygen (bad) - Phosphate (poor) - Also fails WFD chemical status for Mercury and Its Compounds, PFOS and PBDE. SSSI Pressures for this site: Feature Obstructed - Other (Potential pressure with medium risk) and Transport (Road, Rail & Air) (Active pressure with high risk).

5. Water infrastructure baseline update

5.1 Water supply baseline

5.1.1 Water company supply

5.1.1.1 Essex WRZ

The conclusions of the scoping study remain largely the same with the exception of minor updates listed below. The assessment is consistent with that outlined in the scoping study, but the final WRMP incorporates updated forecasts for:

- Per Capita Consumption (PCC): The final WRMP included the most recent average PCC for ESW is 143.72 l/h/d (litres/head/day) in 2025/2026.
- Supply and Deficit: The final WRMP confirms the baseline supply deficit in the Essex WRZ for the whole planning period, with the deficit peaking at -43.87 Ml/d in 2034/35, which is slightly higher than the maximum deficit of -42.08 Mld reported in the draft WRMP.

5.2 Wastewater services baseline

Thurrock is served by three Water Recycling Centres (WRCs) which process, treat and return wastewater from housing and non-residential sources safely back to the water environment. The WRC coverage for Thurrock includes the Tilbury WRC which serves the majority of the urban areas of Thurrock. Pitsea WRC covers a very small area in the north-east of Thurrock and has been scoped in following changes to site allocations since the scoping report. Pitsea WRC's main catchment coverage is for populations within south Basildon. Upminster WRC covers a very small area in the north-west of Thurrock; Upminster WRC's main catchment coverage is for populations within the London Borough of Havering and also Brentwood.

Areas of Thurrock are connected to the WRCs by a wastewater network which is mainly separated into foul and surface water sewer. There are few locations across Thurrock where a combined network is present (mostly in South Ockenden). The WRC catchments and network can be seen in Appendix F Figure 2. Appendix F Figure 2 also identifies where there are catchment overflows linked to the wastewater network with only one located in Corringham; however, there are storm tank discharges at both Tilbury (to the tidal River Thames) and Upminster (to the Mardyke).

A baseline capacity assessment for each WRC was completed prior to considering the impact of growth on capacity⁸ (see Appendix B, B1 for detailed method and details). This identified that the baseline capacity of existing WRCs across TC is positive as shown in Table 5-1 which identifies capacity for WRCs where growth is likely to occur in the WRC drainage catchment.

The baseline capacity assessment shows that WRCs serving Tilbury, Pitsea and Upminster have existing capacity. The assessment of future capacity after growth is set out in Section 6.

Table 5-1: Baseline (pre-growth) capacity at WRCs likely to receive growth

Site Name	Permitted Capacity ⁹ Remaining
TILBURY	27%
PITSEA	48%
UPMINSTER	33%

⁸ This assessment used information available on measured WRC discharge volumes at the time the calculations were undertaken (during 2026) – see Appendix B, section B1.

⁹ Based on permitted Dry Weather Flows (DWF) see Appendix B1

5.2.1 Wastewater planning

AWS undertake long-term planning of wastewater assets via the production of a five-yearly DWMP. The DWMP sets out risks and solutions for wastewater asset management over a 25 year planning period.

AWS published their current DWMP¹⁰ in May 2023. The DWMP identifies existing risks to a series of planning objectives linked to capacity of the wastewater network and treatment capacity at WRCs. Where a very significant baseline risk (2020) to a planning objective has been identified for each of the WRC catchments in TC, these have been set out in Table 5-2.

Table 5-2 Existing (2025) ‘very significant’ risks to planning objectives for WRC catchments in TC

WRC/catchment	Sewer catchment risks	WRC risks
Tilbury	- Storm overflows - Sewer collapses - Internal sewer flooding	- Pollution risk - Flow (permit) compliance
Pitsea	- Storm overflows - Sewer collapses - Level of Green infrastructure	- None identified
Upminster	- Sewer collapses	- Pollution risk

¹⁰ Anglian Water (2023) Drainage and Wastewater Management Plan. Available at: <https://www.anglianwater.co.uk/about-us/our-strategies-and-plans/drainage-wastewater-management-plan/> (Accessed May 2025)

6. Wastewater assessment

This section presents the assessment of wastewater infrastructure capacity taking into consideration the scale and spatial pattern of preferred site allocations. It considers the following aspects of wastewater infrastructure:

- The capacity of wastewater treatment facilities (WRCs) to be able to accommodate additional wastewater from growth without impacting on the water environment.
- Connectivity of proposed site allocations to existing wastewater network – this identifies challenges with how site allocations can be connected to existing sewers, including operation of storm overflows.

6.1 Approach to assessments

6.1.1 WRC capacity

Each WRC has an environmental permit under the Environmental Permitting Regulations¹¹. For the majority of WRCs, these permits set out limitations on the discharge of treated wastewater to a water body, with the key aim of protecting environmental quality. The conditions generally include a limit on how much treated flow can be discharged to a water body as well as limits on the quality of the water discharged across a range of potentially polluting substances.

The limit on treated flow volumes essentially defines the flow capacity, or ‘headroom capacity’ of each WRC; this in turn determines how many additional people the facility can serve before a new permit, or treatment upgrades may be required. The conditions on quality influence the environmental capacity of the receiving waterbody and hence determine limits on how much additional wastewater flow (beyond their permitted limit) each WRC can realistically treat.

Both the flow capacity and environmental capacity of the WRCs in the TC study area have been considered based on the spatial distribution and scale of allocated sites. The assessment methodology detail is included in Appendix B and outcomes are presented in the WRC detailed assessments presented in this chapter.

6.1.2 Wastewater network connectivity

The WCS has also considered the location of sewer overflows relative to growth locations. This assessment has used publicly available information on measured spill frequency from existing overflows and compared it to the long term government set targets¹² for spill frequency reduction (no more than 10 spills per annum on average).

6.2 WRC detailed assessments

6.2.1 Assessment results summary

Appendix C sets out the results of the flow capacity assessments across all WRCs considering growth to the end of the Plan period. This assessment accounts for new dwelling connections based on:

- existing commitments which have planning permission, but which are not yet built and connected to the sewer system; and,
- sites to be allocated in the new plan.

The assessment also accounts for employment growth based on potential and available employment sites and areas that were provided by Thurrock Council. The scoping study sets out potential large quantum of growth linked to employment land within Thurrock, including London Gateway Park, Thames Enterprise Park, the oil refinery at Coryton, and potential Hydrogen schemes as well as

¹¹ Environmental Permitting Regulations 2016. Available at: <https://www.legislation.gov.uk/uksi/2016/1154/contents> (accessed Jan 2026)

¹² [Storm overflows discharge reduction plan](#) (updated September 2023)

employment and business growth linked to the Lower Thames Crossing. This assessment also accounts for an increase in water ingress to the sewer network (infiltration) based on a percentage increase - see Appendix B for details.

In summary, the capacity assessment demonstrates the following:

- A total of 3 WRCs would be expected to receive wastewater flows from allocations or existing commitments in TC by the end of the plan period. These WRCs are: Tilbury, Pitsea and Upminster. Pitsea WRC has been scoped in since the scoping WCS due to the inclusion of a new allocation at Corringham Park Farm. Pitsea WRC is expected to receive wastewater flows from this new allocation.
- Both Tilbury and Upminster WRC would be expected to be at, or to exceed flow limits within their existing discharge permits once all growth is considered and hence treatment capacity is a potential barrier to growth in these locations. Environmental capacity associated with the receiving watercourse has been tested at these WRCs, to determine if future solutions are feasible based on legislative water quality standards, wider environmental needs and limitations on the timing of funding within the AMP cycles.
- Pitsea WRC would have sufficient flow capacity within their existing permit to accommodate the level of proposed growth and would have greater than 10% of the permitted capacity remaining after growth is connected. Growth at Pitsea WRC does not represent a significant infrastructure barrier and hence simplified environmental and solution assessments only have been undertaken.

6.2.2 Cumulative growth from other authorities

Two WRCs which would receive growth from the new Local Plan have catchments with areas covering sections of neighbouring authorities and which therefore have the potential to be affected by cumulative growth.

Upminster WRC

The majority of the Upminster WRC catchment is located in the adjoining local authority areas of Brentwood Borough Council and Havering Borough Council. For the WCS, the planned developments have been considered for TC and the adjoining councils in combination; the findings are discussed below.

Brentwood Borough Council

The Brentwood Borough Council Local Plan was adopted in 2022, covers the local plan period from 2016 to 2033 and provides information on the housing, educational and employment proposed development. As part of the Local Plan evidence base, the Brentwood Water Cycle Study¹³ was produced in 2018. To ascertain the development proposed by Brentwood Borough Council in the Upminster WRC catchment, the Brentwood Water Cycle Study (2018) was used. The proposed housing is summarised in Table 6-1.

Following subsequent discussions with Anglian Water, it was identified that their response to the 2025 outline planning application for Dunton Hills Garden Village indicated flows would go into Basildon WRC rather than Upminster WRC. Therefore, the 2500 dwellings for Dunton Hills Garden Village have been removed from the neighbouring authorities allocations, leaving a total of 1,053 additional dwellings.

Table 6-1 Housing allocation sites from Brentwood Borough Council Water Cycle Study (2018)

Allocations	Dwellings
Council Depot, Warley	123
Ford Headquarters, Warley	350
West Horndon Industrial Estate*	580
Dunton Hills Garden Village**	2500
Total	3553

¹³ Brentwood Borough Council, 2018, Water Cycle Study. Available at: <https://document.brentwood.gov.uk/pdf/06022019113257000000.pdf>

**West Horndon Industrial estate dwellings were partially served by Shenfield WRC. New development was assumed to be solely in Upminster WRC catchment.*

***Over the local plan period*

Havering Borough Council

The Havering Borough Council Local Plan was adopted in 2021 and covers the local plan period from 2016 to 2031. The Council are currently collecting evidence for their new Local Plan however this information is not currently available to inform the WCS. To ascertain the development proposed by Havering Borough Council in the Upminster WRC catchment, the housing trajectory report¹⁴ (completed in 2019) was used, in conjunction with the 2021 Adopted Local Plan to determine the proposed housing development and growth in the Upminster WRC catchment. All growth detailed in the housing trajectory report which would discharge into the Upminster WRC catchment was expected to be completed by 2025.

Pitsea WRC

The majority of the Pitsea WRC catchment is located in the adjoining local authority area of Basildon Borough Council. For this WCS, the planned developments have been considered for TC and Basildon Borough Council. The figures in Table 6-2 were provided by Basildon Borough Council and have been produced for input into their Regulation 19 consultation.

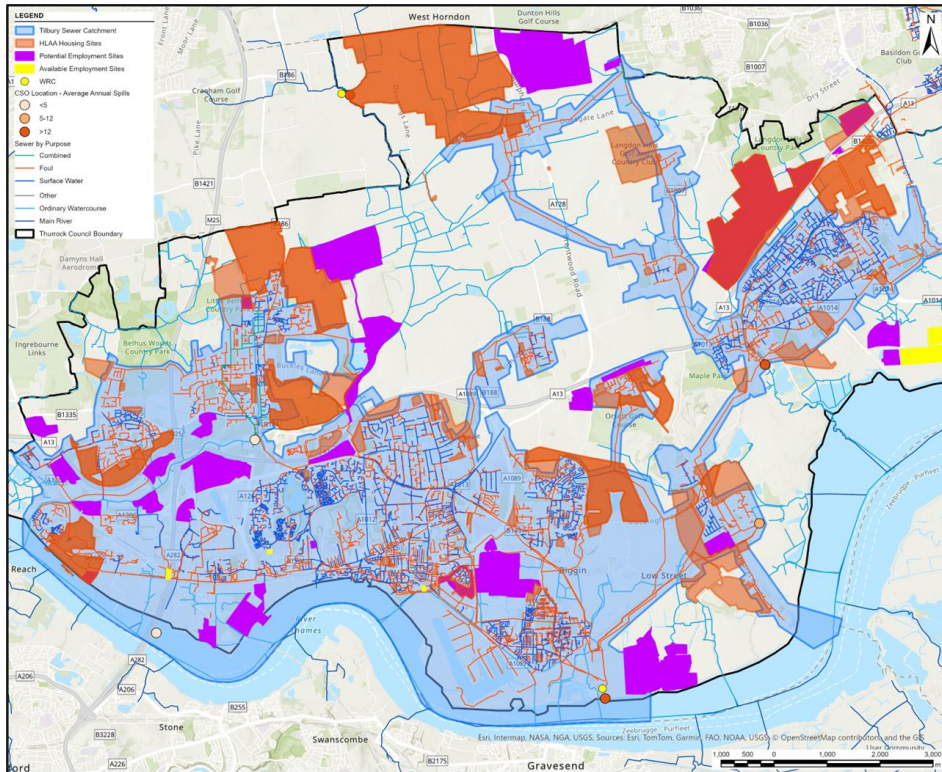
Table 6-2 Housing allocation sites provided by from Basildon Borough Council

Allocations	Dwellings
H9	0
H10	36
H13	507
H14	0
IF4	0
Total	543

¹⁴ Havering Borough Council, 2019, Housing Trajectory October 2019 (Update for the Local Plan Inspector). Available at: <https://www.havering.gov.uk/downloads/file/5448/mmc10-housing-trajectory-update-oct-2019>

6.2.3 Tilbury WRC

Figure 6-1: Tilbury WRC catchment - key features



6.2.3.1 Flow capacity assessment

Tilbury WRC serves the settlements of Tilbury, Horndon on the Hill, Stanford-le-Hope, Corringham, South Ockendon and Purfleet-on-Thames. A total of 26,248 dwellings would be constructed within the catchment of Tilbury WRC by the end of Plan period. 25,921 would be from allocations within the new plan and 327 from existing commitments. This represents 85.2% of the total housing to be delivered across TC over the Plan period.

The WRC is currently below its permitted maximum discharge volumes indicating DWF capacity; however, it is predicted to have inadequate capacity to accommodate all growth without a change in permit.

Therefore, an additional environmental capacity assessment was required. The WRC discharges to tidal waters, and hence RQP modelling was not suitable. A load standstill calculation has been completed to determine consent conditions required for future discharge volumes.

6.2.3.2 Environmental capacity assessment

High level water quality assessment

Tilbury WRC discharges into the Thames Middle Transitional WFD water body, (GB530603911402). Load standstill calculations (see Appendix D) show a small change in permitted quality conditions would be required to ensure that a new permit to discharge would not significantly alter the quality of the Thames Middle Transitional WFD water body. The changes are within TAL and hence achievable within the Plan period. However, upgrades in both flow and process capacity may be required and a new permit needs to be agreed and issued by the Environment Agency.

Connected water dependent habitats

Tilbury WRC discharges to the Thames Middle Transitional WFD water body which is hydrologically connected to the Thames Estuary and Marshes SPA and Ramsar, Mucking Flats and Marshes SSSI, West Thurrock Lagoon and Marshes SSSI, Greys Thurrock Chalk Pit SSSI and Inner Thames Marshes SSSI.

Managing the pollutant load through a new discharge permit and implementation of improvements to the discharge quality from the WRC such that there is no change in overall pollutant load would also ensure no impact on the designated sites identified here.

Future investment for treatment

The AWS DWMP identifies that increased attenuation in the network may be required in the medium term with implementing process optimisation and 10% surface water removal by 2050.

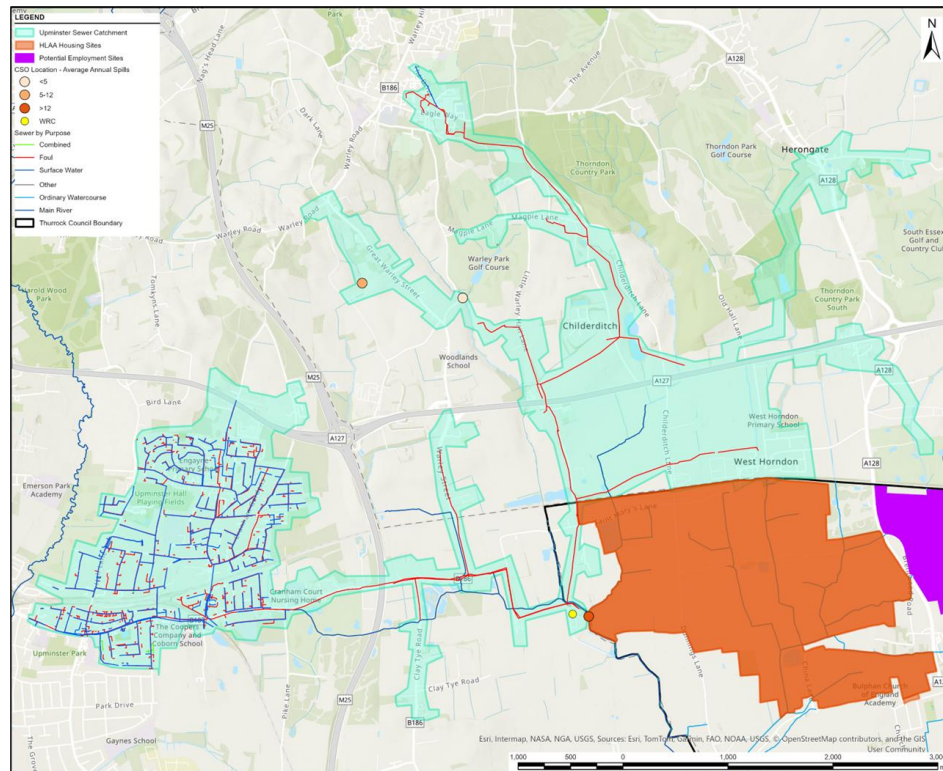
The current AWS Business Plan for the AMP8 investment includes planned investment at Tilbury WRC between 2025 and 2030. This includes installation of a Surplus Activated Sludge thickening plant, proactive sewer rehabilitation to large public sewers near major roads and emergency overflow monitors to be installed on network pumping stations by March 2030.

Sewer network and CSOs

There are 5 CSOs in the WRC sewer network as shown in Appendix F, Figure 3. The DWMP identifies Tilbury WRC as having a high risk related to the planning objective of managing storm overflows, indicating there is a sewer spill risk in the catchment. To enable spills to be managed in the long-term, the WCS recommends a policy for allocated development in these settlements which prevents surface water generated from sites from being discharged to the foul sewer network. Thurrock could consider ensuring windfall development is directed away from Tilbury WRC.

6.2.4 Upminster WRC

Figure 6-2: Upminster WRC catchment - key features



6.2.4.1 Flow capacity assessment

Upminster WRC serves the settlements of Upminster, Great Warley and Herongate. A total of 3,550 dwellings would be constructed within the catchment of Upminster WRC by the end of Plan period. All 3,550 of these would be from

the West Horndon allocation within the new plan. This represents 11.5% of the total housing to be delivered across TC over the Plan period.

The assessment also takes into account 1,053 dwellings from allocations within the Brentwood Borough Council Local Plan as outlined in Section 6.2.2 creating a total of 4,603 dwellings.

The WRC is currently below its permitted maximum discharge volumes indicating DWF capacity; however, it is predicted to become close to capacity to accommodate all growth without a change in permit. Therefore, additional environmental capacity assessment was undertaken using RQP modelling.

6.2.4.2 Environmental capacity assessment

Receiving water quality

Upminster WRC discharges into the River Mardyke, specifically the West Tributary WFD water body (GB106037028080) and RQP modelling for the discharge into this water body has been undertaken. Full results are provided in Appendix E. In summary, the modelling demonstrates that:

- The current quality of the River Mardyke (West Tributary) water body at the point of discharge can be maintained after growth if changes to the permitted quality limits are applied to the new permit to discharge for ammonia. However, the required ammonia concentration is below TAL and therefore may not be achievable in practice.
- Changes in permit quality conditions could be applied within TAL to ensure no deterioration in the Moderate WFD Ammonia status of the River Mardyke (West Tributary) water body at the discharge point to the river. No changes are required to maintain the current Bad Phosphate Status of the river.
- Tests assuming the phosphate quality of the River Mardyke (West Tributary) water body is improved to the future target Moderate WFD Status in the future (through catchment measures¹⁵) show that, improvements to the discharge quality, would not be required both with and without growth. Growth, related

¹⁵ This assumption is made to allow a test to demonstrate where discharges alone may be the limiting factor.

to Upminster WRC is therefore not a limiting factor on achieving future Moderate Status of the Mardyke.

It would therefore be possible to set a new permit that ensures no deterioration in the current quality of the River Mardyke when taking account of future WRC discharges. This would require improvements in the quality of discharge for BOD and phosphate.

Connected water dependent habitats

Upminster WRC discharges to the River Mardyke (West Tributary) WFD water body which is hydrologically connected to the Inner Thames Marshes SSSI via the River Mardyke.

Managing the pollutant load through a new discharge permit and implementation of improvements to the discharge quality from the WRC such that there is no change in overall pollutant load would also ensure no impact on the designated sites identified here.

Future investment for treatment

The AWS DWMP identifies that increased attenuation in the network may be required in the medium term with 10% surface water removal by 2050.

The current AWS Business Plan for the AMP8 investment period includes planned investment at Upminster WRC between 2025 and 2030. This includes investment specifically for the redirection of non-catchment import tankering points and a Phosphorus removal action to improve water quality at the 2021 baseline when compared to the 2015 baseline. This will include the imposition of a new 0.25 mg/l TAL Phosphorous standard.

Sewer network and CSOs

There are 3 CSOs in the WRC sewer network as shown in Appendix F, Figure 3. AWS are considering measures to address spills to meet the future target. To enable spills to be managed in the long-term, the WCS recommends a policy for allocated development in these settlements which prevents surface water generated from sites from being discharged to the foul or combined sewer network.

6.2.5 Pitsea WRC

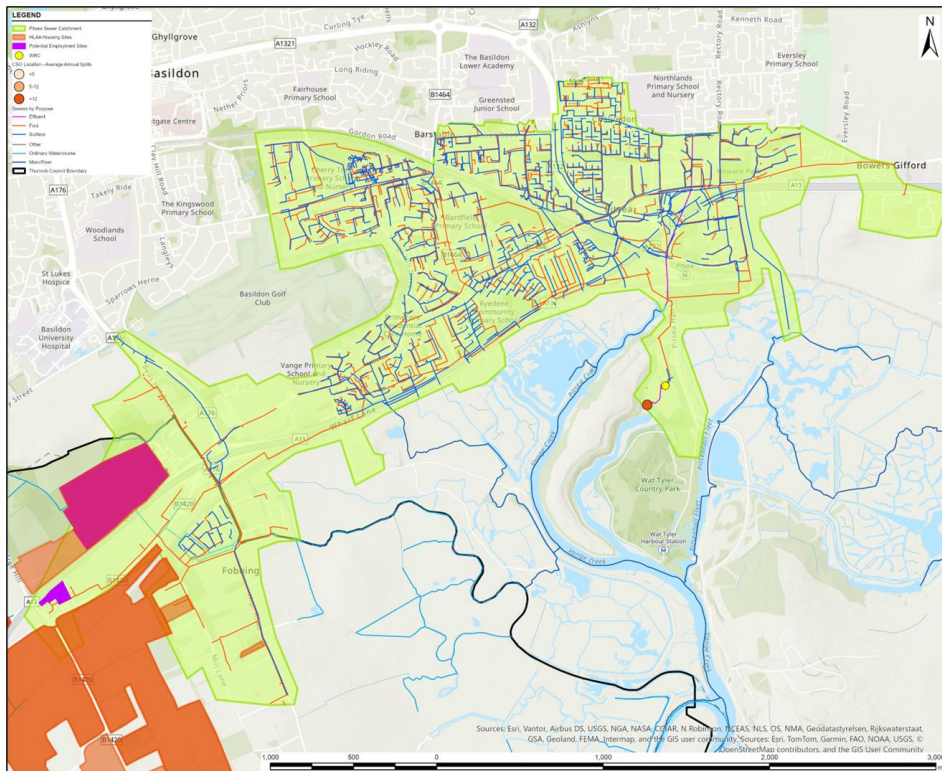


Figure 6-3: Pitsea WRC catchment - key features

6.2.5.1 Flow capacity assessment

Pitsea WRC serves the settlements of Pitsea, Vange and Fobbing. A total of 1,000 dwellings would be constructed within the catchment of Pitsea WRC by the end of Plan period. All 1,000 of these would be from the Corringham Park Farm allocation to the north of Fobbing (Site 60893) within the new plan. This represents 3.2% of the total housing to be delivered across TC over the Plan period.

The assessment also takes into account 543 dwellings from allocations within the Basildon Borough Council Local Plan as outlined in Section 6.2.2 creating a total of 1,543 dwellings.

The WRC currently has a large DWF headroom capacity in its permit (48% capacity remaining) which means there is sufficient headroom to serve the proposed growth without requiring WRC upgrades. The WRC would have 37% capacity remaining by the end of the Plan period. No detailed water quality modelling was therefore required.

6.2.5.2 Environmental capacity assessment

Receiving water quality

Pitsea WRC discharges into the Timberman's Creek / Pitsea Creek which then flows through Holehaven Creek into the River Thames estuary, specifically the Thames Lower Transitional WFD water body (GB530603911401).

Load standstill calculations (see Appendix D) show a small change in permitted quality conditions would be required to ensure that a new permit to discharge would not significantly alter the quality of the Thames Lower Transitional WFD water body. The changes are within TAL and hence achievable within the Plan period. However, upgrades in both flow and process capacity may be required and a new permit needs to be agreed and issued by the Environment Agency.

Connected water dependent habitats

Pitsea WRC discharges to the Thames Lower Transitional WFD water body which is hydrologically connected to the Thames Estuary and Marshes SPA and Ramsar, Mucking Flats and Marshes SSSI, Holehaven Creek SSSI, Vange and Fobbing Marshes SSSI and Landon Ridge SSSI.

Managing the pollutant load through a new discharge permit and implementation of improvements to the discharge quality from the WRC such that there is no change in overall pollutant load would also ensure no impact on the designated sites identified here.

Future investment for treatment

The AWS DWMP identifies that a mixed strategy with the main solution of SuDs may be required in the medium term with 25% surface water removal by 2050.

The current AWS Business Plan for the AMP8 investment period does not include for planned investment at Pitsea WRC.

Sewer network and CSOs

There is 1 CSO in the WRC sewer network as shown in Appendix F, Figure 3. The DWMP identifies Pitsea WRC as having a high risk related to the planning objective of managing storm overflows, indicating there is a sewer spill risk in the catchment. To enable spills to be managed in the long-term, the WCS recommends a policy for allocated development in these settlements which prevents surface water generated from sites from being discharged to the foul sewer network.

7. Water supply assessment

This part of the WCS sets out how E&SW proposes to meet the increase in expected water demand in the WRZ covering Thurrock. It summarises a comparison of E&SW's WRMP projections planned growth within the WRZ, with growth targets proposed by Thurrock in the Local Plan, to determine whether the WRMP adequately caters for the Local Plan level of growth.

Finally, it considers technical and practical requirements for a policy to reduce water demand in new development to ensure that the supply and demand balance predicted by E&SW can be achieved.

7.1 The supply and demand balance for Thurrock

7.1.1 Baseline summary

As set out in 5.1.1 of this report, E&SW calculate a supply deficit in the Essex WRZ for the whole planning horizon (2025-2050) without measures to manage demand and provide additional water supply. This is predominantly due to climate change and a reduction in summer flows as well as the impacts of housing and population growth. This means the Essex WRZ area would not have sufficient potable water to meet E&SW's minimum supply standards of service without the implementation of water resource management measures.

7.1.2 Proposed future solutions

As set out in their published WRMP, E&SW plans to overcome the predicted 2050 deficit in the Essex WRZ mainly through a demand management strategy (reducing water used by the existing users in the WRZ) as well as providing new, or delivering changes to existing, water supply sources.

The preferred demand management strategy includes a smart metering programme, leakage reductions, and non-household demand reduction. Table 7-1 outlines the proposed E&SW customer-side demand management measures across their supply area, which also apply to the Essex WRZ which Thurrock Council is located in.

Table 7-1 E&SW: Preferred demand management options - customer side

Measure	Action
Smart Metering	- All household and non-household properties to have smart meters by 2035 - Engagement with customers to further educate on smart meter use to monitor consumption patterns - Reduce customer supply pipe and plumbing losses by using meters to detect unusual patterns that may indicate leaks
Leakage Reduction	- Replacement and repair of leaking assets, both customer supply and network leaks 40% reduction by 2050
Water Efficiency	- Campaigns and targeted communications to educate customers on how to use the data provided by smart meters to reduce their water usage - Updating building regulations - Mandatory water efficiency labelling

Source: E&SW Demand Management Preferred Plan¹⁶

However, demand management alone will not be enough to balance the future supply and demand, and hence supply-side measures will also be required. E&SW have identified preferred supply-side measures for Essex WRZ as shown in Table 7-2.

Table 7-2 Preferred Supply-Side Options for Essex WRZ

Option Ref	Option	Description
ESW-ABS-003	Linford New WRC 10	A new WRC facility and borehole(s) designed to enhance water supply capacity in the Essex WRZ.
ESW-NIT-005	Langford Nitrate Scheme	Installation of nitrate removal systems at Langford treatment works to reduce unplanned outage due to elevated raw water nitrate concentrations.
ESW-UVC-001	Langford UV	Deployment of ultraviolet treatment at Langford treatment works to reduce unplanned outage due to cryptosporidium in raw water.
ESW-NIT-006	Langham Nitrate Scheme	Installation of nitrate removal systems at Langham treatment works to reduce unplanned outage due to elevated raw water nitrate concentrations.
ESW-PMP-001A	Abberton Raw Water Pumping Station and Langford Clarifiers	Enhancements to the reservoir's pumping station to allow deployable output gain from the Abberton to Langford Pipeline.

Source: Essex Supply Schemes Preferred Plan

The combined impact of the proposed demand management measures and supply side options in the Essex WRZ results in a forecast 1 in 500-year drought resilience to be achieved from 2031/32.

Engagement with E&SW has indicated there is potential that some WRC's would require investment to meet the peak demands of the developments in Thurrock, in addition to other developments in Essex. The growth forecast in the Local Plan would lead to a peak draw of around 30 Ml/d, with an average

¹⁶ Anglian Water (2023). Demand Management Preferred Plan. Available at: <https://www.anglianwater.co.uk/siteassets/household/about-us/wrmp/rdwrm24-demand-management-preferred-plan-technical-supporting-document-.pdf> (Accessed: 28/11/2024).

draw of 15 Ml/d. As such it is expected that additional potable water storage would need to be increased to the area to ensure resilience and security of supply to customers.

E&SW advise that early, proactive and continuous engagement is essential in relation to the proposed prioritisation of sites, including intended phasing, build out rates, and the identification of sites that may not be progressed. Failure to engage at an early stage significantly increases the risk of delays to delivery programmes arising from the need for network upgrades or reinforcement. Such engagement is therefore critical to ensure that water infrastructure planning is appropriately coordinated with development trajectories, programme timescales, and E&SW's statutory obligations to existing customers. Any network upgrades, renewals or improvements by E&SW will need to be assessed as a whole across the WRZ, including the cumulative impact arising from all growth, including growth outside of Thurrock.

Water companies do not have a statutory requirement to supply employment sites, and these can often be the largest consumers of water. As Essex is classified as a Serious Water Stressed Area by the Environment Agency, it is critical that all new developments, especially employment sites, must incorporate the most water efficient technologies. E&SW does not supply mains water to developments that use open loop water cooling systems, such as certain types of data centres. In addition, it is not possible to guarantee supply to any development that does not adopt the most stringent water efficiency standards.

7.1.3 Comparing growth – WRMP and the Local Plan

Consultation with Thurrock Council has indicated that the number of dwellings to be delivered over the plan period is slightly higher than the forecast dwelling and population increases assumed within the WRMP supply and demand forecasting process.

E&SW has assumed a forecast housing need of approximately 23,600 homes in the Thurrock region up to 2044 (noting that this number is additional to dwellings which already have planning permission and hence are included in the baseline supply and demand calculations). This figure was based on a high growth scenario and can be catered for under the preferred plan outlined in the WRMP without creating a water deficit.

In comparison, the growth allocations in the Thurrock Local Plan indicate that the number of dwellings to be delivered over the plan period is approximately 29,611. This shows that there is a shortfall of 6,011 dwellings assessed in the WRMP and potential options will need to be investigated to identify if the shortfall can be met.

This means the WRMP conclusions of E&SW can't be relied upon as evidence that water supply to meet domestic supply is planned for in the long-term. To address this shortfall in planned growth the following has been assessed:

- Sensitivity testing to see if lower PCC targets would offset the difference
- Research of what levels of efficiency New Appointments and Variations (NAV) providers have achieved for new developments
- Research where water credit systems have been developed

In addition to this, further detail on how future demand can be lowered through both household and non-household use has been discussed in Section 7.2.

7.1.3.1 Sensitivity Testing

In the WRMP, E&SW assumed new build properties to have a PCC of 115 l/hd/d in their baseline demand forecast. To assess if lower PCC targets would offset the difference in growth allocations between the local plan and WRMP, sensitivity testing has been completed. Assuming an occupancy rate of 2.30 people per household, the WRMP forecasts growth of approximately 54,280 people in comparison to 67,353 people in the local plan. This equates to additional water usage of 1,503,395 L/d accounted for in the WRMP forecasts. Using this water usage, and the population increase based on the local plan numbers, this would equate to a required PCC of approximately 93 L/hd/d. This figure is a realistically achievable PCC target based on use of maximum efficiency fixtures and fittings. Further discussion on how to achieve lower PCC targets are discussed in Section 7.2. Therefore, if lower PCC

requirements were implemented for new builds, this could possibly offset the difference between the WRMP and Local Plan forecasts.

7.1.3.2 New Appointments and Variations Providers Efficiency Levels

New Appointments and Variations (NAV) refer to companies that take over the role of the incumbent water and sewage company for a specific area. These providers cater to new developments, offering tailored water and wastewater services to meet the needs of developers and customers. NAV providers play a crucial role in ensuring efficient and sustainable utility services in areas outside the scope of incumbent water companies. They are often chosen for new developments because they can offer competitive pricing, innovative solutions, and a focus on sustainability¹⁷.

Developments served by NAVs often incorporate enhanced water efficiency measures, with more ambitious PCC targets than existing regulations. NAVs often have an incentive to promote such measures, especially when bulk supply agreements from incumbent companies are structured to pass through volumetric charges to the customer, meaning the NAV is not penalised financially for lower water usage. According to the WRMP, NAVs are increasing within the supply area, with a total of 25 either already in place or proposed in the near future. Some examples include Independent Water Networks, ESP Water Limited and Leep Networks.

Independent Water Networks Limited acts as the appointed water provider for the Eddington Development in Cambridge. The Eddington Development is a new innovative sustainable community which uses advanced water efficiency, aiming for 80 l/hd/d by integrating rainwater harvesting and a site-side non-potable water network for flushing toilets and irrigation¹⁸. However, while the infrastructure is in place, regulations have prevented the full activation of the greywater recycling systems for domestic use. This is because water companies cannot legally provide recycled water directly into properties for domestic purposes, even for non-potable uses. The government is actively reviewing legal barriers to support separate non-potable networks for water reuse in homes, which would be extremely beneficial in reducing household water usage.

It is recommended that TC consider the use of NAV for larger developments in the Local Plan such as in West Horndon.

7.1.3.3 Water Credit Systems

Water credit systems are market-based mechanisms designed to reduce water demand by incentivizing efficiency and offsetting consumption. These systems quantify water savings achieved through measures like installing water-efficient appliances, rainwater harvesting, or greywater reuse. Verified savings are converted into tradeable credits, which can be purchased by developers, businesses, or households to offset their water use. For households, this might involve retrofitting homes with low-flow fixtures or smart metres to reduce consumption, while businesses may implement industrial water-reuse systems or process optimisations. In the UK, water-credit systems have been applied in areas like Horsham and Crawley through the Sussex North Offsetting Water Scheme, where developers were required to achieve "water neutrality" by purchasing credits tied to regional water-saving projects¹⁹. Similarly, United Utilities offers financial incentives to developers who adopt water-efficient designs²⁰, and Thames Water supports businesses with grants and rebates for verified savings²¹. These initiatives not only reduce demand but also ensure sustainable growth in water-stressed regions. However, their success depends on robust verification, regulatory support, and public engagement to ensure savings are real and enduring.

7.2 Lowering future demand

The comparison of planned growth against the WRMP household projections shows planned housing growth is not catered for in the WRMP; however, there are clear drivers set out in this WCS, and within

¹⁷ Frontier Economics (2017). *Study of the NAV Market*, available at <https://www.ofwat.gov.uk/wp-content/uploads/2017/10/20170526-Frontier-Study-of-the-NAV-market-FINAL-REPORT.pdf>

¹⁸ Available at <https://eddingon-cambridge.co.uk/about-us>

¹⁹ Sussex Water Neutrality: About Water Neutrality (2025)

²⁰ United Utilities (2026). Environmental Incentives Scheme, available at <https://www.unitedutilities.com/builders-developers/your-development/environmental-incentives-scheme/>

²¹ Thames Water (2026). Water efficiency for businesses, available at <https://www.thameswater.co.uk/wholesale/water-efficiency>

legislation and wider national policy and strategies for targeting policies which reduce both PCC for new dwellings and demand in non-household water use.

7.2.1 Household demand – lowering PCC

At the time of completing this WCS, the only national mandatory PCC standard is set out in the Building Regulations (Part G)²², requiring new homes to be built to use no more than 125 l/p/d. The Regulations recommend an optional standard of 110 l/p/d, but this optional standard is not mandated through the Regulations. In October 2025, Defra and the Ministry of Housing Communities and Local Government (MHCLG) jointly launched a consultation on reviewing the water efficiency standards in the Building Regulations including a reduction in the mandatory target to 105 l/p/d and the optional target to 100 l/p/d. This consultation closed in December 2025.

Whilst the government have set out (and commenced) actions to review the need for higher PCC standards for new homes in water stressed parts of England, those actions have yet to result in mandated standards; at the time of completing this WCS, the findings from the consultation of water efficiency targets in the Building Regulations were not available. Therefore, Local Plans remain one of the only vehicles to mandate higher water efficiency standards for new development through effective local policy.

7.2.1.1 Demonstrating PCC reduction outcomes

Six household domestic water demand scenarios have been tested in this WCS (detailed in Table 7-3) to demonstrate the effect that lower PCCs can have on managing demand. These reflect a range of possible future PCCs for new dwellings ranging from the Building Regulations Mandatory standard to a PCC which would require both the highest efficiency fixtures and fittings as well as some level of water reuse technology for non-potable water uses. The estimated increase in demand has been calculated for the future scenarios and is shown graphically in Figure 7-1.

Table 7-3 Household domestic water demand scenarios.

Projection	PCC (l/p/d)	Reasoning
Projection 1	125	Building Regulations mandatory standard
Projection 2	110	Building Regulations optional standard.
Projection 3	100	A lower intervention approach using efficient fixtures and fittings
Projection 4	95	Thurrock Council's Policy
Projection 5	85	Lowest likely use achievable with only a fixtures and fittings approach.
Projection 6	80	Maximum efficiency fixtures and fittings and reuse (via rainwater harvesting).

²² [The Building Regulations \(2010\)](#) Part G

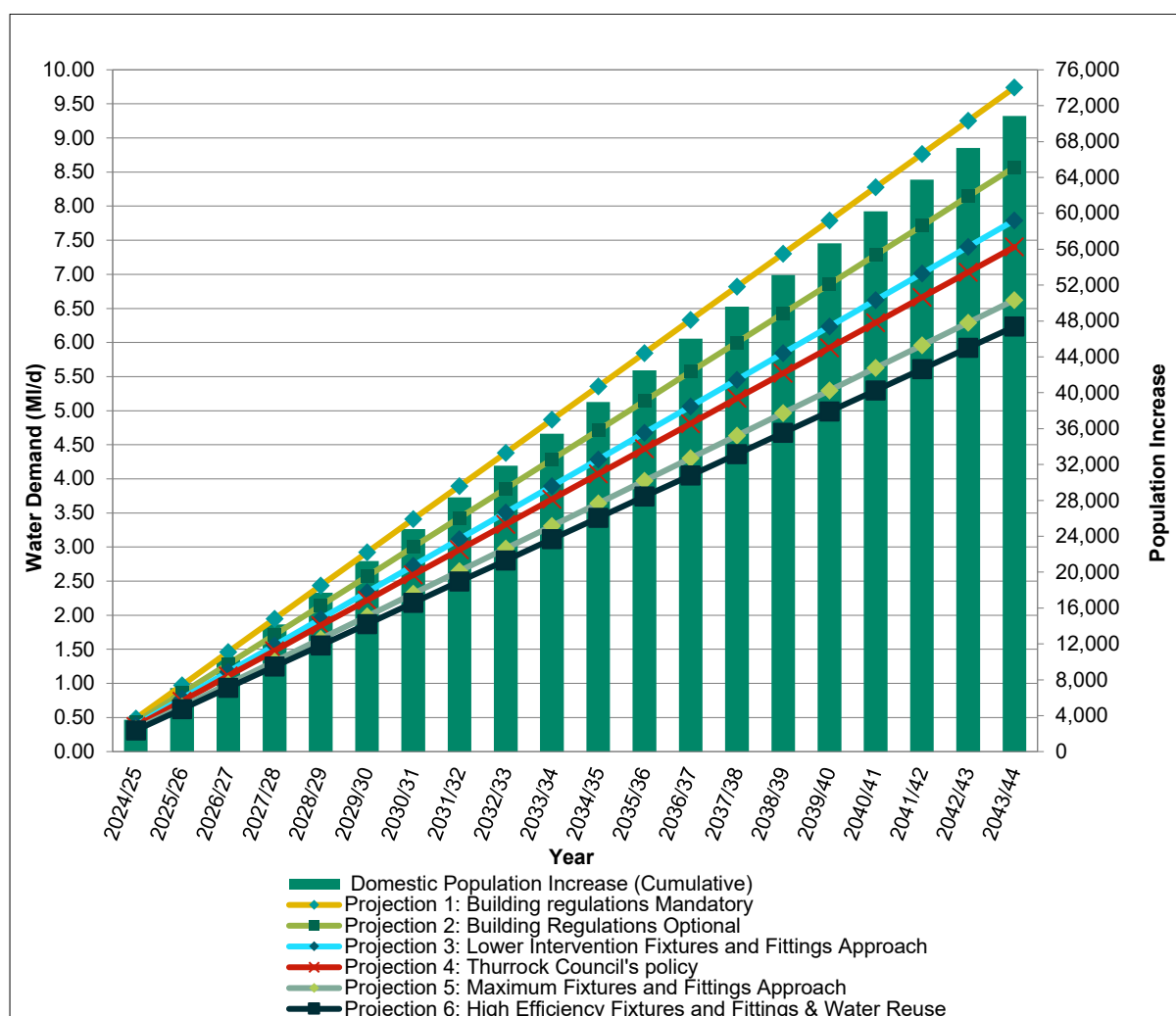


Figure 7-1: Household domestic water demand scenarios

The results show that, by 2043/44 the maximum increase in domestic water demand would be 9.74 MI/d (assuming PCC limited only by Building Regulations mandatory standard). Adopting a policy delivering 95 l/p/d PCC would result in a significantly lower total demand by the end of the plan period, at 7.40 MI/d (2.34 MI/d less than if a business as usual approach is adopted). This saving would significantly improve the supply and demand balance in the Essex South WRZ increasing resilience and reducing reliance on the timing of new strategic resources linked to Environmental Destinations in the long term. Adopting a stricter policy delivering 85 l/p/d PCC would result in a slightly lower total demand by the end of the plan period at 6.62 MI/d (3.13 MI/d less than if a business as usual approach is adopted)

7.2.1.2 Drivers for PCC reduction

WCS identified drivers

The Scoping WCS set out that TC is in area classified as 'Seriously Water Stressed', in particular because Essex relies on imports of water from outside of the County as it does not have sufficient resources within the surface water catchments and groundwater locally to provide for its current water needs.

The WCS has set out how demand management is essential to AW maintaining a surplus in the supply and demand balance to 2050 and achieving that beyond 2050. This requires both a reduction in existing household demand, as well as future demand from new households to be lowered as far as reasonably practicable. To deliver this part of their WRMP, AW are reliant on effective local plan policies to mandate higher water efficiency targets for new homes. Figure 7-1 demonstrate the efficiency of lowering PCC for new households on the cumulative increase in water demand by the end of the Plan period.

The WCS has also summarised that the preferred plan to balance supply and demand in the medium to long term relies on new supply-side solutions which have medium to long lead-in times, and hence there is a need to ensure that early phase new dwellings are designed to reduce water demand prior to these new sources being connected to the Essex South WRZ.

Finally, the WCS has set out that reducing PCC (to as low as 85 l/p/d) would have significant benefit in maintaining treatment headroom at some of the WRCs because less wastewater would be generated. This may delay the need for upgrades to WRCs within the Local Plan period and would have the effect of reducing impact on water bodies through reduced storm spills and reduced treated discharges from WRC. Reducing PPC should not be relied on to increase capacity.

Legislative, policy and strategy drivers for PCC reduction

The Environment Act 2021 includes a legally binding target to reduce the use of public water supply in England per head of population by 20% by 2038²³, with interim targets by 2027 and 2032. Minimising water demand in new households (and within non-households) is central to achieving this target.

The Act mandates the 5-yearly update of the 25 Year Environment Plan (2018), with the first update published in 2023 as the Environmental Improvement Plan²⁴ (EIP). The EIP sets out the actions needed to deliver on the legally binding public water supply reduction target, including the following related to PCC reduction in new housing:

- The production of a Roadmap to Water Efficiency in new developments (included in the EIP and the proceeding Plan for Water).
- Develop clear guidance on 'water positive' or 'net zero water' developments.
- Review water efficiency options in planning and building regulations.
- Work with Ofwat to ensure the water industry can play a central role in retrofitting water efficient products in households, businesses, charities and the public sector.
- Deliver the mandatory water efficiency labelling scheme.
- Investigate dual pipe systems and water reuse options for new housing development as part of the review of the planning framework.
- Enable innovative water efficiency approaches in buildings, including technologies and approaches to funding and maintenance.

The government followed the EIP with the development of the 2023 "Plan for Water"²⁵ which includes the following actions that build on, or are additional to the actions within the EIP:

- Establishing targets for water efficiency in new homes - the plan supports achieving a design standard of up to 85 l/p/d in new residential developments in some parts of England.
- Offering incentives to developers who incorporate water-saving measures and technologies in new homes - this includes financial incentives and support for implementing water reuse systems.
- Encouraging Integrated Water Management - promoting the use of integrated water management practices in new developments, such as rainwater harvesting and greywater recycling, to reduce reliance on mains water supply.

As part of the delivery of these actions, the Written Ministerial Statement (WMS) 'The Next Stage in Our Long Term Plan for Housing Update' (2023) encourages LPAs to set more stringent standards in Local Plans and in planning permissions in areas of water stress.

The Water Strategy for Essex²⁶ summarises that Essex faces significant water stress, consuming more water per person than most of England. By 2050, the East of England is expected to experience a public water supply shortage of around 730 million litres per day. The strategy highlights the importance of reducing demand through the implementation of water-efficient technologies to tackle this. It also sets out an action to ensure implementation of systems to reuse and recycle water for non-potable purposes.

²³ Against a 2019/20 baseline

²⁴ Environmental Improvement Plan (2023) Defra

²⁵ Plan for Water: Our Integrated Plan for Delivering Clean and Plentiful Water (2023) Defra

²⁶ Water Strategy for Essex (2024) Essex County Council

Related to the Essex Strategy, EEC are advising LPAs to target a PCC of between 80l/p/d to 90l/p/d for new homes through Local Plan updates to minimise water demand from housing growth.

Collectively, these drivers support the need for a local plan policy which sets water efficiency/PCC standards for new homes lower than the mandatory Building Regulations requirements. To this end, water companies in the east of England (including AW) have joined together with WRE, Natural England and the Environment Agency to produce a guidance document: Shared Standards in Water Efficiency for Local Plans²⁷ (referred to herein as the Shared Standards document). The Shared Standards document, along with other publicly available guidance, has been used in this WCS to set out an evidence base for how a policy of limiting water use in new homes to 85 l/p/d in TC can be achieved. This evidence is set out in the following sections.

7.2.1.3 How to achieve an 85 l/p/d PCC target

Fixtures and fittings approach

Within the industry, it has widely been considered that to achieve a standard lower than a 100 l/p/d requires some of the non-potable water uses in a home (e.g. toilet flushing, or outdoor use) to be met from recycled water (such as rainwater harvesting or greywater recycling) instead of using potable water for these purposes. However, Table 7-4 outlines water efficient appliances that are widely available on the market that can achieve 85 l/p/d through an efficient fixtures and fittings approach.

Table 7-4 Total Consumption of water efficient household appliances available to achieve a PCC of 85 l/p/d

Category	Unit	Litres	Basis	Product examples
Toilet	l/p/d	15.45	Short flush 3, Long flush 4.5	• EcoDelux Metro Water Saving Close Coupled Modern.
Basin Tap	l/p/d	7.9	4 litres / min	• Deva Profile Basin Taps (Pair) DCM101/FR101-4 Deck Mounted Chrome
Kitchen Tap	l/p/d	13.0	6 litres / min	• Class line eco swan neck kitchen tap -
Bath	l/p/d	0.00	n/a	-
Dishwasher	l/p/d	2.02	0.56 litres / place setting	• KENWOOD KID16X23 Full-size Fully Integrated Dishwasher
Washing Machine	l/p/d	10.29	4.9 litres /kg	• SAMSUNG Series 5 SpaceMax WW11DG5B25ABEU WiFi-enabled 11 kg 1400 Spin Washing Machine
Shower	l/p/d	39.2	7 litres / min	• Flowpoint Dark Grey Shower Head
Normalisation factor	Factor	0.91	n/a	-
External use	l/p/d	5	n/a	-
Total PCC	l/p/d	85.0		

Source: Shared Standards in Water Efficiency for Local Plans (2025)

The Shared Standards document states that the approach to water efficiency in new developments, as set out in Table 7-4, will be formalised by the Mandatory Water Efficiency Labelling Scheme (MWELS) with a government aim for implementation in 2025. MWELS applies to plumbing and water consuming appliances to ensure that water efficiency ratings are clearly identifiable to developers and consumers.

The Shared Standards document also refers to the Future Homes Hub's Water Ready report²⁸, commissioned by Defra to support the government's action of developing a Roadmap to Water Efficiency. Table 3 of the Water Ready report illustrates how water efficiency as low as 75 l/p/d could be achieved using a fittings-based approach, including with a variety of technology options. Achieving as low as 75 l/p/d includes both known and foreseeable fittings which may not be available at scale until

²⁷ [Shared Standards in Water Efficiency for Local Plans \(2025\)](#)

²⁸ [Water Ready Report \(2024\) Future Homes Hub](#)

2030; nevertheless, costs are provided in the report which demonstrate feasible and affordable options which will increase in availability and range as the Local Plan timeframe progresses.

Water reuse

At the time of completing this WCS, there is uncertainty as to whether statutory water companies²⁹ can legally supply recycled water³⁰ for use into properties which require water for domestic purposes, even in the case where it is to be used for non-potable uses; this is due to legislative definitions of statutory water companies needing to supply 'wholesome water' for domestic purposes regardless of its intended end use.

As part of the Roadmap to Water Efficiency (as set out in the EIP and the Plan for Water), Defra has committed to looking into this legislative barrier regarding the provision of wholesome water. Until that is resolved and the legislation updated, this uncertainty limits opportunity for new development to utilise water reuse as potential suppliers and operators of technology and facilities would be limited to private companies who are not statutory water companies. It should be noted that this specific legislative restriction does not apply to non-domestic purposes (i.e. industrial, manufacturing or car washing facilities) where statutory water companies can supply recycled water which does not need to be 'wholesome'.

Due to the current legislative restrictions, the Shared Standards document does not suggest that local plan policies are developed which rely on (or refer to the need for) water reuse. Despite this, there is available research from a publication³¹ by the Enabling Water Smart Communities (EWSC) and the Chartered Institution of Water and Environmental Managers (CIWEM) that provides evidence of the financial viability of privately operated community based water reuse schemes to deliver higher PCC standards. The cost ranges set out in Table 7-5 demonstrates that water reuse is a credible approach to significantly reducing PCC.

Table 7-5 Total per plot cost range for water reuse installations

Additional cost	Rainwater harvesting	Greywater recycling
Per community recycling	£1,100 - £3,700	£1,900 - £9,900
Per plot reuse	£1,900 - £6,400	£3,800 - £4,600

Source: *Water Reuse in New Housing (2025)* - ESWC & CIWEM

In summary the water reuse in new housing report concludes:

- Community-scale rainwater reuse is the most cost-effective option (rather than per plot), even for smaller sized developments of 40-50 homes.
- There is a significant fall in costs for water reuse approaches in developments of at least 100 units.
- Higher density development sites yield lower costs due to factors such as less pipework needed between properties.
- Water reuse can help achieve average per capita household water consumption levels of 80 l/p/d when supported by standard water efficient appliances.

The growth area summaries for this WCS (section 8) set out where allocated sites in key locations are of a sufficient size (150 dwellings or more) to consider water reuse opportunities, provided by private companies, based on the evidence presented. This is particularly pertinent to the proposals for new settlements within Thurrock such as West Horndon.

Offsetting options

In setting a policy which requires a PCC standard to be met, TC could consider adopting a water re-use offset scheme which allows developers to pay into an offset fund; this would be for the limited number of developers who can demonstrate they are unable to viably meet the set target. The offset fund would then be used by TC to install retrofit water reuse schemes in council owned property such as schools, council offices, and leisure centres within the Essex WRZ, thereby providing a water

²⁹ including companies new to the market known as New Appointments & Variations (or NAV)

³⁰ From rainwater harvesting or grey water recycling

³¹ [Water re-use in new housing – understanding the business case \(2025\) EWSC & CIWEM](#)

demand offset. Such a scheme has been developed by the London Borough of Tower Hamlets as part of its new Local Plan. Further information can be found in the Council's [Local Plan Topic Paper – Water Efficiency \(2024\)](#).

The government is leading development of a similar 'water credit' scheme for Cambridge as part of the "The Case for Cambridge"³² proposals for sustainable growth in the city. The proposals for growth in Cambridge are limited by lack of available water in the short-term whilst Cambridge Water and AWS work together to provide longer-term new supply sources. Detailed design work on the credits system is underway with the LPA, developers, the Environment Agency and other key stakeholders, but is not yet published and functional.

Developer Incentives

AW offer environmental incentives to developers to deliver water efficient homes in exchange for discounted infrastructure charges which would also assist in improving viability of a PCC policy.

Case studies for PCC policy

The Shared Standards document refers to Crawley Borough Council's [Local Plan](#) as a case study of how effective local policy can be set which requires stringent water efficiency targets as part of a wider policy need to ensure a 'water neutral' position. Water neutral refers to the outcome where new development does not increase total water supply demand above the baseline demand before the development is occupied. This need is driven by Natural England advice that a water neutral position is required to demonstrate new development/Local Plans in the affected WRZ will not adversely impact protected ecological sites. This is required until the unsustainable abstractions volumes currently impacting the sites are replaced with new supply schemes by Southern Water.

In response, the Council have developed a water neutral delivery system for their Local Plan which requires both an offset mechanism and strict water efficiency/PCC policy requirements from developers (85 l/p/d); this demonstrates that such PCC policies are viable and deliverable.

Horsham District Council are also affected by the issue within the same WRZ and in conjunction with Crawley Borough Council and other affected authorities, have developed an offsetting scheme called the [Sussex North Offsetting Water Scheme \(SNOWS\)](#). This allows developers to ensure that increased water demand does not exceed the water savings generated by Southern Water in their next Water Resources Management Plan (WRMP).

7.2.2 Non-housing growth – lowering demand

The Plan for Water includes proposals to reduce non-household water use by 9% by 2038 as part of the response to the legally binding target³³ to reduce the use of public water supply in England per head of population by the same date. This requires reductions in existing non-household demand and demand from new non-housing development to be managed.

The water supply baseline section of the Scoping WCS² sets out that locally available non-tidal water supply sources are spatially limited in the north of Thurrock due to confined chalk abstraction licencing limitations put in place for environmental protection. (see section 5.3.2 of the Scoping WCS). The remaining area of Thurrock is assumed to have water available for abstraction as chalk in this area is unconfined. This means that the groundwater unit balance shows groundwater available for licensing. Although there is some potential for abstraction from local sources, the volumes available are likely to be small due to the water stress classification assigned to the study area (as described in Section 7.2.1.2). This limits the available options non-household development has to source reliable, stand-alone supply. Therefore, the WCS recommends that the following policy (taken partly from the Shared Standards document) be adopted for non-household sites:

- All major non-household developments to include water saving measures and water reuse in their designs with a focus on rainwater harvesting as the primary source (unless it can be demonstrated that reuse is not viable).

³² [The Case for Cambridge \(2024\) HM Government](#)

³³ in the Environment Act

- New, extended or redeveloped non-household buildings aim to achieve full credits within the 4 water categories (WAT01, WAT02, WAT03, and WAT04) for BREAAAM standard within a minimum score of 3 credits within WAT01 Water Consumption issue category, or an equivalent standard set out in any future update to BREAAAM. The applicant will be required to justify and evidence why full credits is not possible/viable for the development.
- A Water Efficient Design Statement (WEDS) must be submitted with the application at the earliest stage to demonstrate how policy requirements have been met and will be maintained in relation to water efficient design. The statement shall provide, as a minimum, the following:
 - Baseline information relating to existing water use within a development site; and
 - Full calculations relating to expected water use within a proposed development (such as water efficient fixtures and fittings, rainwater/stormwater harvesting or reuse).

Non-household water management examples

The WRMP for E&SW recognises hydrogen production as an important new source of non-household water demand within the planning horizon. Hydrogen production, alongside new nuclear power stations, is specifically called out as a key factor contributing to the projected increase in non-household demand in the Essex and Suffolk supply areas.

The National Framework for Water Resources 2025³⁴ outlines England's long-term water needs and sets strategic actions to ensure resilient water supplies. It addresses increasing demands from various sectors, including hydrogen generation and suggests potential measures such as:

- Collaboration with water companies to use alternative water sources, such as treated effluent and rainwater harvesting
- Encouraging industries to adopt water credit systems, where developers contribute to regional water-saving initiatives to offset their water use.
- Recommendations for the energy sector to develop joint proposals for additional water resources in conjunction with other sectors.

Water Credit Systems

The national framework report highlights that in some areas across England, business growth has been constrained because increased abstraction would risk environmental damage. Collaboration between government, regulators, local planning authorities, and water companies is required to ensure that growth can continue without detriment to the environment. A water credit system or retrofitting scheme is recommended as a potential solution to enable near-term growth before longer term supply issues can be solved.

As an example, a water credit system has been implemented in Sussex which allows developers to purchase water credits from existing properties that have successfully implemented water-saving measures. These measures have been implemented in response to guidelines from Natural England making water neutrality mandatory in the region due to potential adverse effects on wildlife sites in the Arun Valley. These measures aim to mitigate any potential risks associated with further development without completely stalling growth in the short term. Some qualifying water saving measures include the installation of high efficiency plumbing fixtures, rainwater harvesting systems, grey water recycling and upgraded irrigation systems³⁵.

However, the National Framework for Water Resources only recommends the implementation of water credit schemes in exceptional circumstances to enable growth in the short term where there are temporary supply shortfalls while water infrastructure provision is being delivered. Delivery of the commitments in water resources management plans should be prioritised to avoid the need for water credit schemes³⁶.

Energy Sector

³⁴ [National Framework for Water Resources 2025: water for growth, nature and a resilient future - GOV.UK](#)

³⁵ [Sussex Water Neutrality: About Water Neutrality \(2025\)](#)

³⁶ [6. Taking action on public water supplies: National Framework for Water Resources 2025 - GOV.UK](#)

There is potential to develop multi-utility options going forward which would benefit both energy and water sectors and customers if costs are shared. Innovative joined up solutions could be explored, such as building hydrogen production plants at sites already selected for public water supply production through desalination and co-funding and sharing the available water. The Environment Agency's report on Delivering Water Neutrality³⁷ reinforces the opportunities and benefits of joining up different sectors, specifically linking water and energy efficiency initiatives.

Water Demand for Hydrogen Production

The UK Government Report on Water Demand for Hydrogen Production³⁸ explores the specific water requirements for producing low-carbon hydrogen in England, focusing on methods like electrolysis and steam methane reforming. It highlights the challenges of managing water sustainability while meeting increased water demands for hydrogen production. Water usage can vary significantly between different hydrogen production technologies. Suggested measures to reduce water usage in the industry include:

- Use of best-available technologies to minimise water use per unit of hydrogen produced
- Considering non-potable water, recycled water, or desalinated water for hydrogen plants
- Early engagement between hydrogen developers and water companies to assess and plan for water needs

Case Studies for Renewable Hydrogen Production

There are a number of examples of renewable hydrogen methods that are in research and development that are using alternative water sources as a feedstock or for cooling purposes. The Anglian Water and Element 2 hydrogen plan project in Cambridge includes a demonstration trial as part of the Triple Carbon Reduction Project³⁹. The facility uses an integrated electrolyser system powered by renewable energy to produce green hydrogen and oxygen. At demonstration scale, potable water will be supplied to the plant, but at scale up it aims to use treated effluent from wastewater. The trial is located at Anglian Water's Cambridge Water Recycling Centre in Milton, and the oxygen produced will be used as a resource in the treatment process, while the green hydrogen will either be used on site for power generation or sold.

In Germany, Graforce's Wastewater Plasmalyzer is already producing green hydrogen at a Berlin wastewater treatment plant⁴⁰. The world first plant produces up to 50kg of hydrogen per day from wastewater. The plant enables the treatment of industrial and municipal wastewater producing purified water, hydrogen, and nitrogen through a process known as wastewater plasmalysis. This process splits nitrogen and hydrocarbon compounds found in wastewater rather than splitting water molecules to produce hydrogen. This means that water is treated rather than consumed in the process of hydrogen production.

Other alternative solutions include the use of seawater either through desalination or direct seawater-to-hydrogen processes. Dolphyn Hydrogen is one example of an independent business that has patented technology for an offshore green hydrogen production process that uses desalinated water and wind turbines to power an electrolyser to produce green hydrogen in an offshore environment⁴¹. Dolphyn have completed trials of the system and are looking to deploy a first phase commercial scale project.

The Moolawatana Renewable Hydrogen Project is a now discontinued project In South Australia that aimed to use wind and solar power along with desalinated water to produce green hydrogen. The plant involved building wind and solar farms, electrolyser plants to produce hydrogen, a desalination plant to provide water, and a dedicated hydrogen pipeline to a port for export. The project was cancelled in May 2022 due to issues related to water supply, desalination, and high costs⁴². The cancellation highlights the challenges of water sourcing for green hydrogen production in water scarce regions, even with desalination technology. This also further reinforces the need for early engagement between hydrogen

³⁷ Delivering water neutrality: measures and funding strategies (2009) Environment Agency

³⁸ Water Demand for Hydrogen Production (2024) Climate Services for a Net Zero Resilient World

³⁹ Project: Triple Carbon Reduction (2024) Anglian Water

⁴⁰ Water Purification (2022) Synreform

⁴¹ Innovative Technology (2025) Dolphyn Hydrogen

⁴² Renew Economy: Massive 6,000MW renewable hydrogen plans shelved over "water issues" (2022) Sophie Vorrath

companies and water planners and where joint development between the energy and water sectors for co-funding and sharing available water could be beneficial.

Recommendations for water neutrality

Achieving water neutrality relies on effectively offsetting new water demand by encouraging the adoption of water-efficient devices, technologies, and practices. Implementing water neutrality can be achieved through a blend of voluntary, incentive-based, and regulatory measures. Drawing on the Environment Agency's guidance from the report *Delivering Water Neutrality: Measures and Funding Strategies*⁴³, the following approaches can drive the necessary uptake of interventions:

1. Voluntary Adoption
 - This approach depends on consumers and organizations choosing to reduce their water consumption through recommended good practices.
 - Publicity and awareness campaigns can effectively highlight the environmental benefits and cost savings of efficient water use, encouraging proactive behaviour.
 - Businesses motivated by the potential for financial savings through lower water and energy bills, as well as those with strong environmental policies, can incorporate water-saving measures into their operations.
 - To specifically target non-household users, informational campaigns distributed through local business networks and detailed in water company bills can help newly metered businesses assess their water use and identify opportunities for conservation.
2. Incentive-Based Measures
 - Monetary incentives can motivate consumers to cut water use by directly linking savings to action. These might include vouchers, subsidised products, tax exemptions, or money-back offers.
 - For non-household demand, offering free water audits can serve as a practical tool to pinpoint efficiency opportunities within buildings or industrial processes.
 - Financial incentives such as tax breaks and subsidies are also effective in encouraging businesses to invest in water-saving retrofits and technologies.
3. Regulatory Approaches
 - Mandatory measures can drive wider adoption of water efficiency practices through legislative requirements.
 - Examples include implementing seasonal tariffs during periods of peak water stress or mandating regular water audits to ensure minimal wastage and optimal use.
 - Regulations could also require the installation of rainwater or greywater recycling systems within targeted industries or for specific applications to further support water neutrality efforts.
 - Regulating the highest water-using sectors, such as hydrogen production mentioned above, to identify opportunities for non-household consumers to use alternative water sources such as recycled or desalinated water.
 - Implementing measures where new development proposals are required to demonstrate a combination of water efficiency measures and including a water budget showing details of the baseline and proposed water consumption. For example, the Sussex North Water Certification Scheme (SNWCS) which provides applicants with an affordable, accessible way to demonstrate that their development can be constructed meeting water neutrality requirements in the region⁴⁴.

These recommendations, based on the Environment Agency's framework, offer a balanced mix of voluntary, incentive-based, and compulsory actions that together can help achieve water neutrality.

⁴³ Delivering water neutrality: measures and funding strategies (2009) Environment Agency

⁴⁴ Sussex North Water Certification Scheme (2025) Horsham District Council

Implementing these measures can reduce net water consumption while supporting sustainable water resource management.

Implementation of Water Efficiency Measures

Essex & Suffolk Water (ESW) have suggested they will be introducing Section 55 agreements under the Water Industry Act 1991⁴⁵ to regulate water supply for non-domestic purposes, with a particular focus on data centres. These agreements aim to address the high-water demand from data centres in the water-stressed East of England by mandating sustainable water usage practices. A key requirement within these agreements is likely to include the adoption of closed-loop or near-zero-water cooling systems, which can reduce water consumption by up to 90% compared to traditional open-evaporative systems. These agreements can also be used to require developers to explore secondary water sources, such as rainwater harvesting and treated effluent, to further reduce reliance on potable water.

The agreements can be used to specify maximum water demand limits, require real-time metering and reporting, and include regular performance audits to ensure compliance. Non-compliance could result in escalating charges, supply restrictions, or termination of the agreement. ESW's approach aligns with its Water Resources Management Plan (WRMP24), which prioritises sustainable water use, climate resilience, and the protection of regional water resources. Developers must engage early with ESW to submit a Water Demand & Efficiency Strategy and integrate compliant cooling technologies into their designs. While closed-loop systems may involve higher upfront costs, they offer long-term savings, environmental benefits, and regulatory compliance, ensuring sustainable development in a water-constrained region.

This proactive approach reflects ESW's commitment to balancing the needs of large-scale developments with the preservation of critical water resources, supporting both environmental sustainability and regional growth.

⁴⁵ [Water Industry Act 1991](#)

8. Growth area summaries

8.1 Introduction

This section of the report provides a summary of the WCS assessments and outcomes. It has been presented as growth area summaries, to aid planners using the WCS to see the key infrastructure issues, phasing impacts and policy recommendations for different spatial areas.

WRC catchments have been used to define growth areas, as wastewater treatment is the key aspect which affects infrastructure timing delivery and phasing impacts across TC.

8.2 Tilbury

8.2.1 Wastewater treatment summary

Is there capacity at the WRC for any new dwellings?	No – WRC is at capacity
Is there a WRC solution proposed in the current investment period to 2030?	Yes, level of funding for improvement, is currently under review, but planned for delivery in AMP8.
Is there a medium to long term WRC solution proposed in the AWS Drainage and Wastewater Management Plan?	Yes – The AMP8 growth scheme may not provide sufficient capacity for the proposed Local Plan growth, but the DWMP outlines improvements with the main solution of increased attenuation in the network in the medium term (to 2035). Implementing process optimisation and 10% surface water removal in the longer-term 2050 Strategy.
Can a permit be implemented in the future to protect water quality within Technically Achievable Limits?	Yes – modelling has shown this would be feasible within TAL at a future point and minor permit condition changes would be required.

8.2.2 Wastewater sewer capacity

Is there a risk of sewer outfall discharges increasing?	- The sewer network is largely separated; however, there are some areas of combined sewers in South Ockendon and the DWMP identifies the catchment as a high risk for the planning objective of storm overflows. - There are five outfalls in the sewer catchment, two low risk (<5 spills) one medium risk (5-12 spills) and two high risk (>12 spills). Additional flows to the sewer may limit the efficacy of future spill reduction measures.
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8.2.3 Catchment risks and opportunities

Allocated sites are located in an area of TC which eventually drain to the Thames Middle (Transitional) WFD Water body catchment. Surface water runoff from these sites has the potential to influence water quality within this WFD water body. The Tilbury WRC which would treat wastewater from these sites, also discharge to this water body.

The water body is failing to meet Good Status, in part due to Nitrogen levels being less than Good Status. Physical modification of the waterbody and sewage discharge are confirmed reasons for not achieving Good Status.

The underlying South Essex Thurrock Chalk groundwater body also has a Poor overall status, due to Poor chemical and quantitative status.

This highlights the need for developments in this growth area to manage surface water through the provision of SuDS with a focus on managing water quality and to avoid development within riparian zones around watercourses to reduce pressures around watercourse modification.

There are numerous NBS opportunities for the allocated sites in this growth area. Developers of these sites should be encouraged to contribute towards NBS opportunities. The location of NBS opportunities in the Tilbury growth area are shown in Appendix F, Figure 5. Residential sites with over 1,000 dwellings have been identified for additional NBS opportunities and are described in more detail below.

Site 60844 - Land South of Aveley

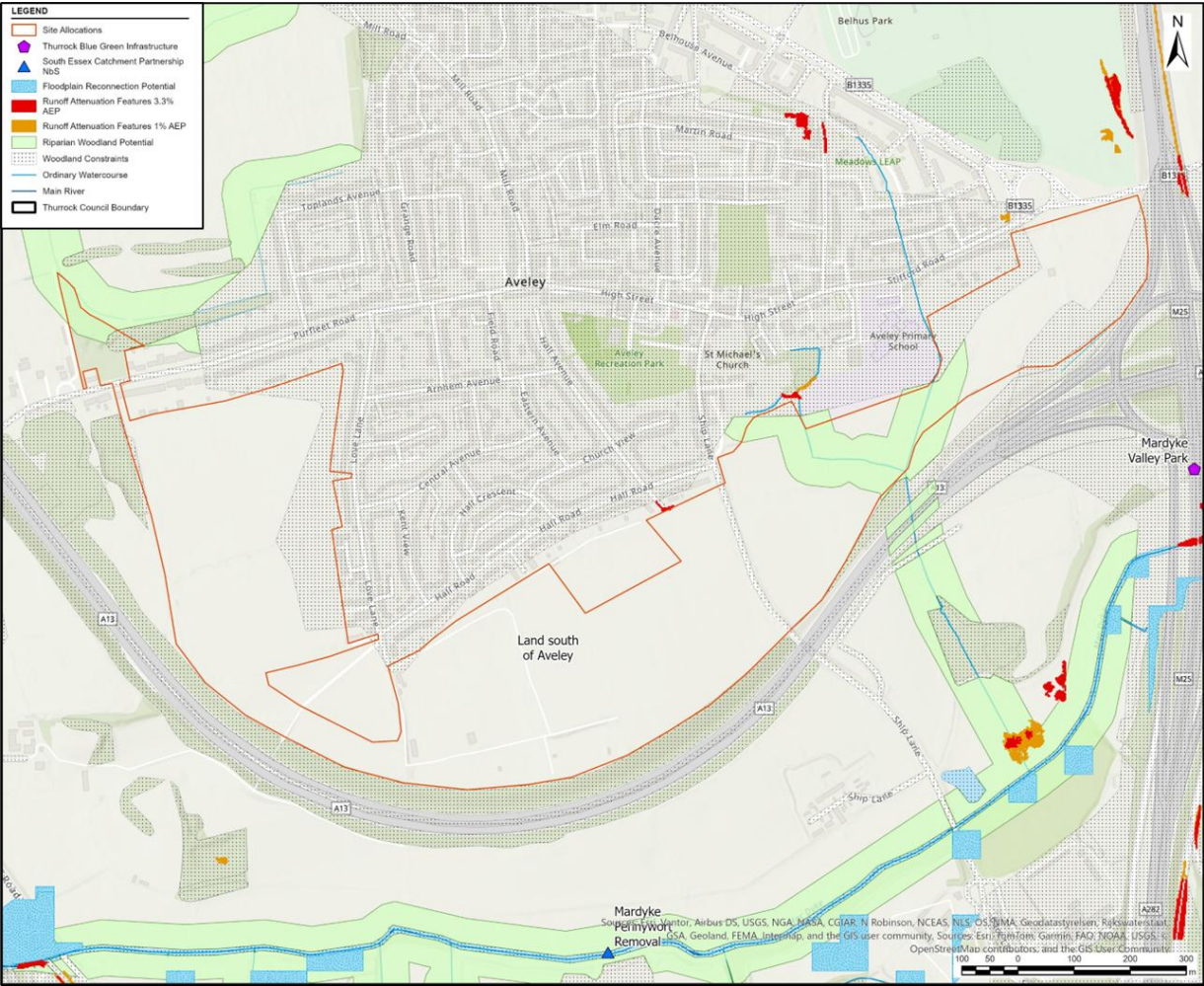


Figure 8-1: NBS opportunities for site 60844: Land south of Aveley

Figure 8-1 shows there is a small area of Riparian Woodland Potential in the east of the site. There are some areas of woodland constraints along the eastern and western boundary of the site. The site is located near the Mardyke Valley Park which is set out in the Thurrock Green Blue Infrastructure report as being a priority area in which to develop NBS to flood management and to increase biodiversity. Measures that would benefit biodiversity improvements and NFM are: new nature tree infill and woodland planting along the Mardyke Valley, creation of new wetland planting along the seasonal floodplain, reed bed planting.

Site 60853 - Land at the Mardyke Valley Golf Club, South Road, South Ockendon

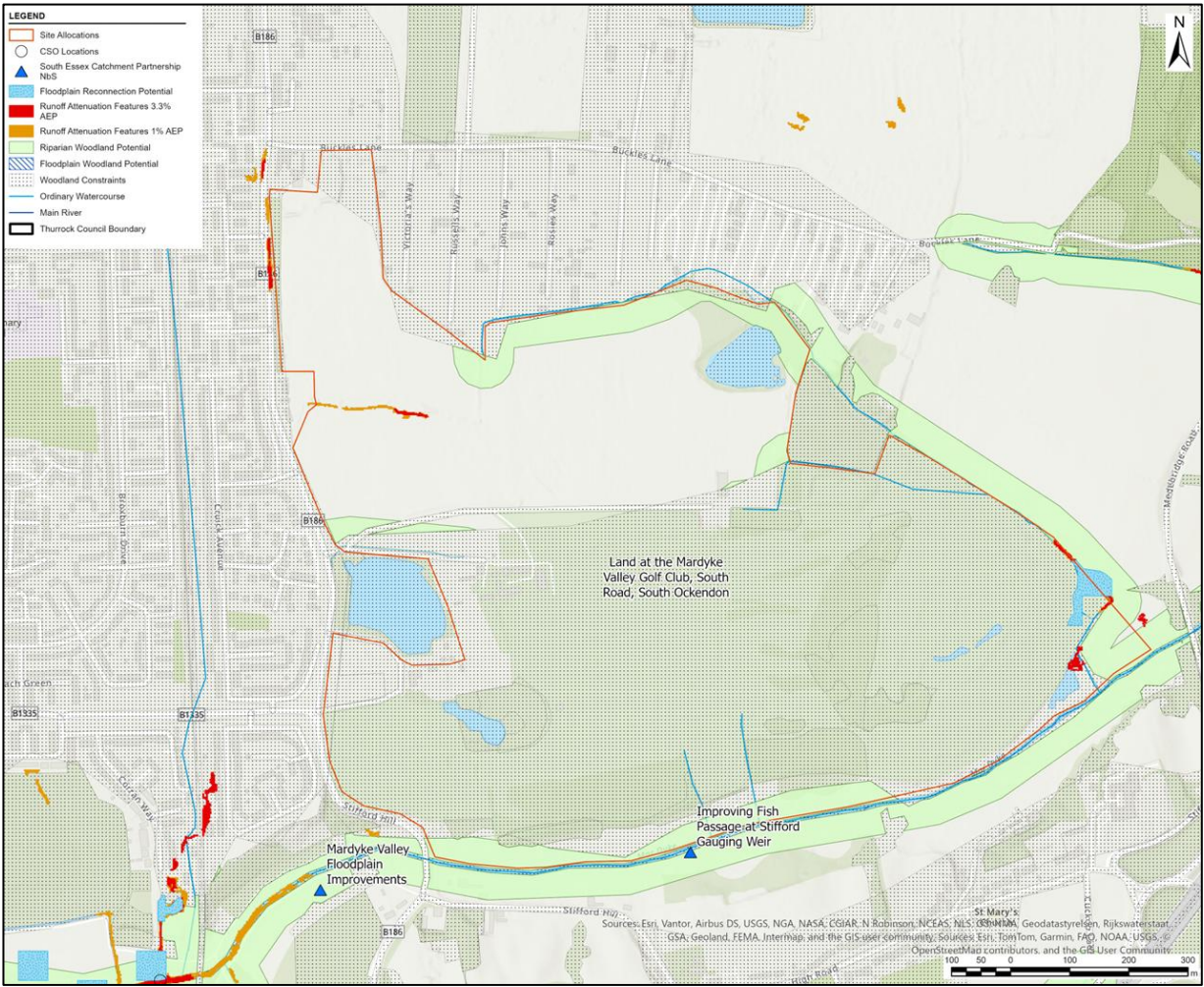


Figure 8-2: NBS opportunities for site 60853 - Land at the Mardyke Valley Golf Club, South Road, South Ockendon

Figure 8-2 shows there are opportunities for Riparian Woodland Potential in small areas along the southern and northern boundary of the site. A significant area to the south of the site has woodland constraints, along with some areas to the north of the site. There are some small areas with potential for runoff attenuation features and floodplain reconnection potential.

The River Mardyke flows to the south of the site where there are opportunities for improving the finish passage at Stifford Gauging Weir and also floodplain improvements to the Mardyke Valley, all as part of the South Essex Catchment Partnership NBS. These projects could contribute to improving the Ecological Status of the Mardyke.

Site 60856 - Land northeast of Corringham

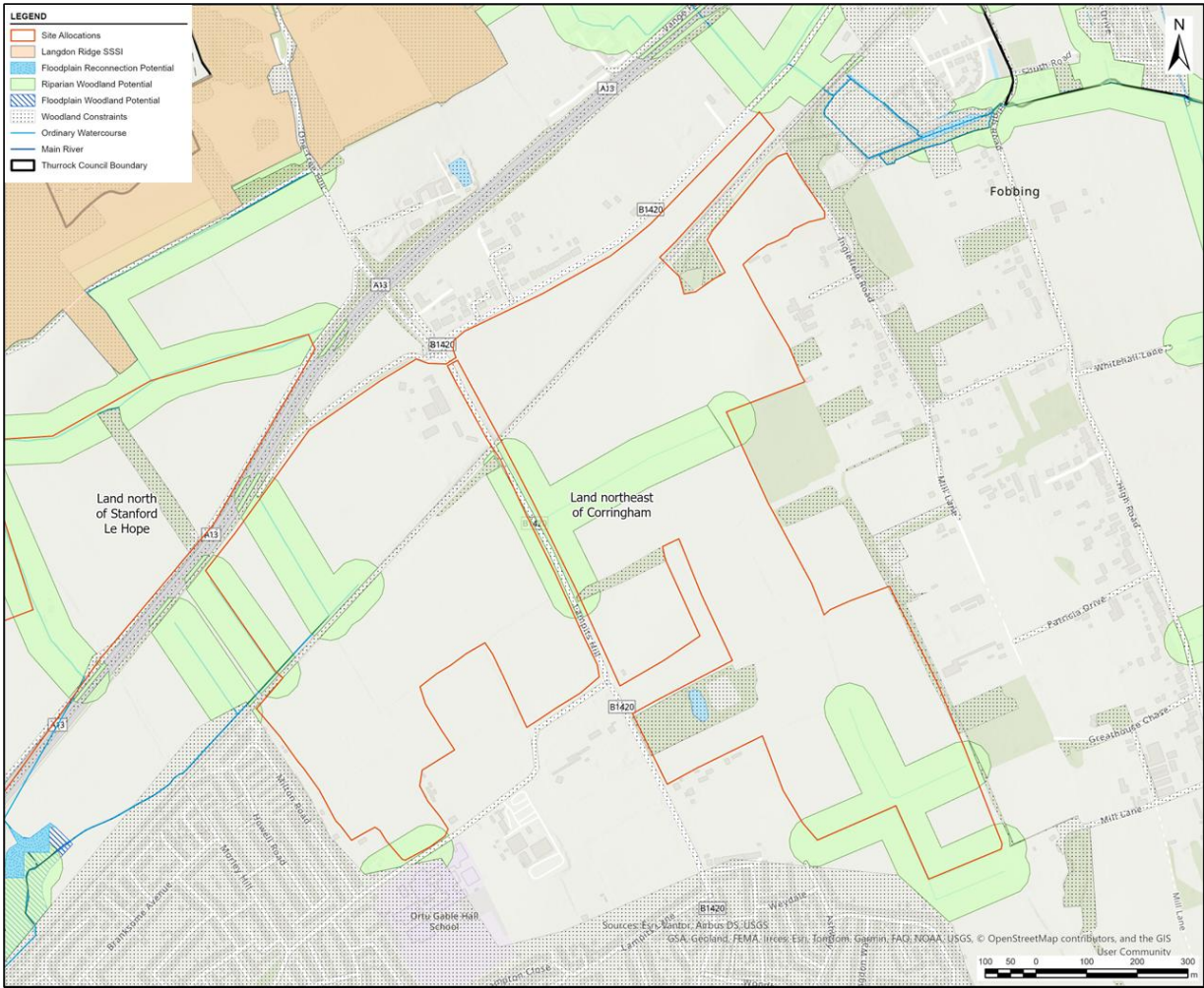


Figure 8-3: NBS opportunities for site 60856 - Land northeast of Corringham

Figure 8-3 shows there are some areas with opportunities for Riparian Woodland Potential and a small area of woodland constraint.

Site 60915 - Land North East of South Ockenden

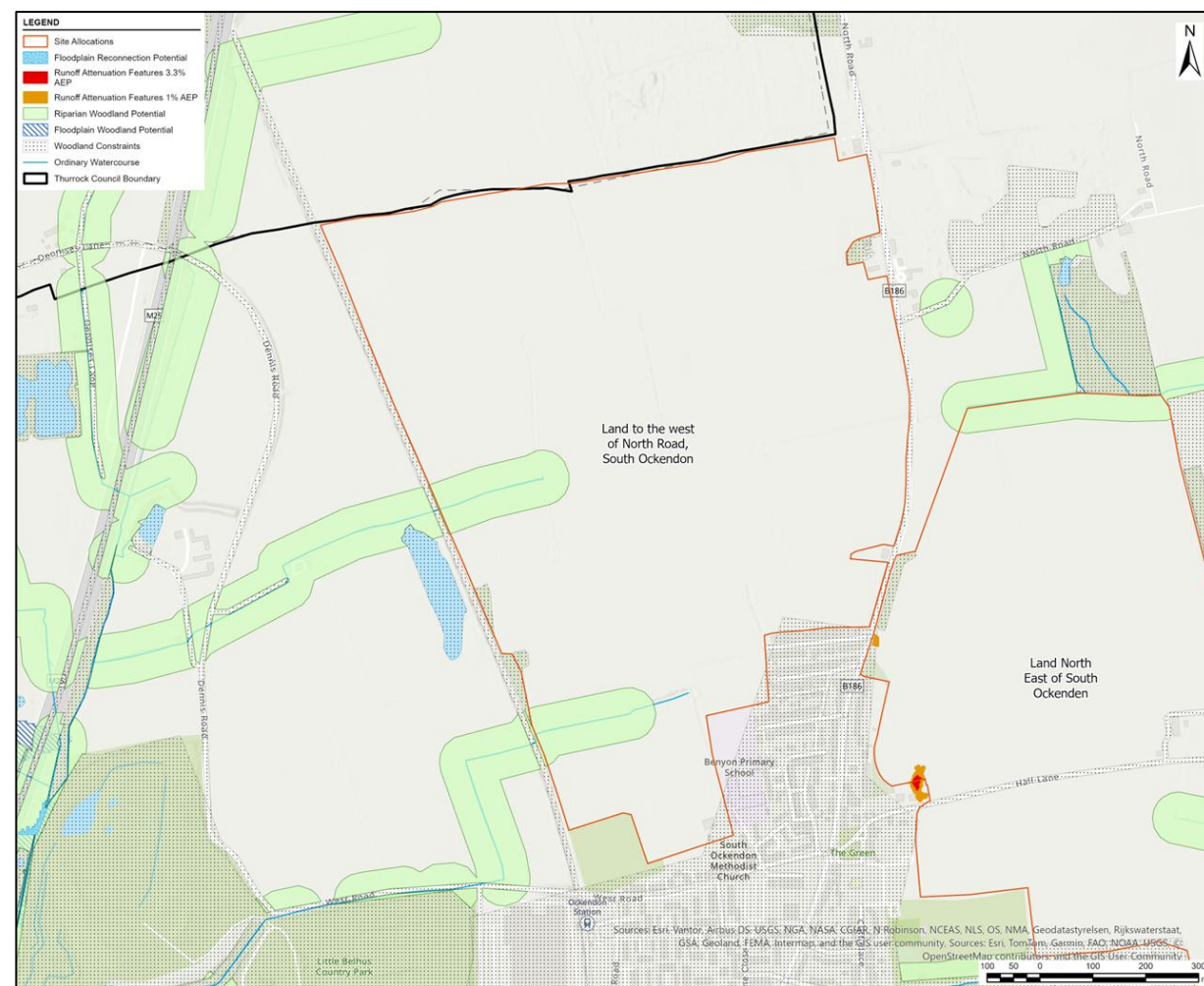
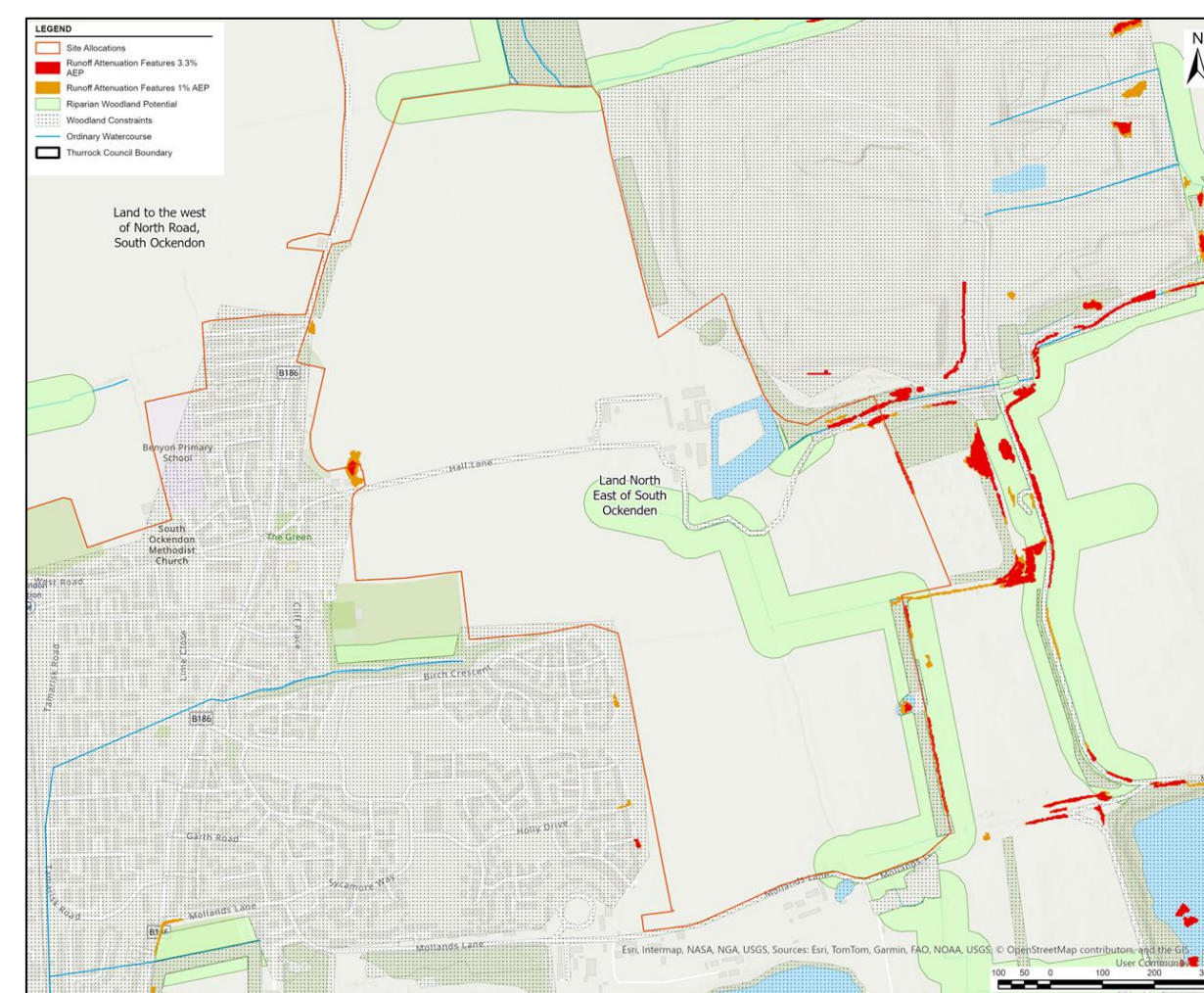


Figure 8-5: NBS opportunities for site 60915 - Land North East of South Ockenden

Figure 8-5 shows there are opportunities for NBS on this site as shown in the WWNP dataset including some small areas of runoff attenuation features on the boundary and riparian woodland potential in a small area to the north and in the southeast of the site. The dataset does show Woodland Constraints in some small areas across the site. There are opportunities to contribute to the Davy Down Floodplain Improvement project, Mardyke Valley Plan and the improving fish passage at Stifford Gauging Weir project which could contribute to improving the Ecological Status of the Mardyke. These are to the south of the site.



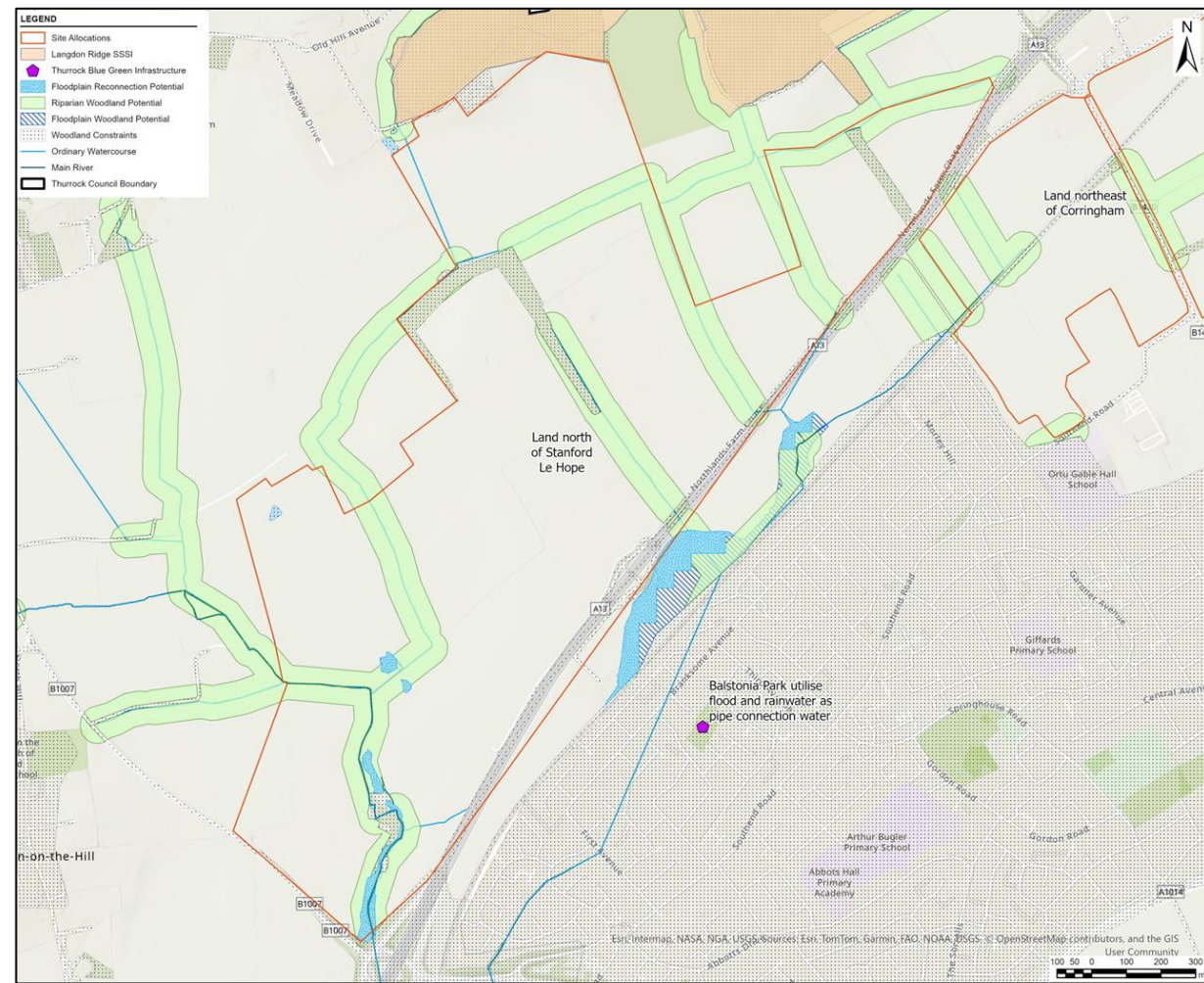
Site 60940 - Land north of Stanford Le Hope

Figure 8-6: NBS opportunities for site 60940 - Land north of Stanford Le Hope

Figure 8-6 shows there are opportunities for NBS on this site as shown in the WWNP dataset including areas of Riparian woodland potential, and a small area of floodplain reconnection potential. The dataset does show Woodland Constraints in some small areas across the site. There are opportunities to contribute to the Balstonia Park project to the south of the site, and implement this project in other locations to improve flood risk. There is also potential for the creation of woodland on the outskirts which could improve flood risk downstream.

Site 60953 - Land at East Quarry, North of Orsett Golf Club and South of the Stanford Road, Southfields

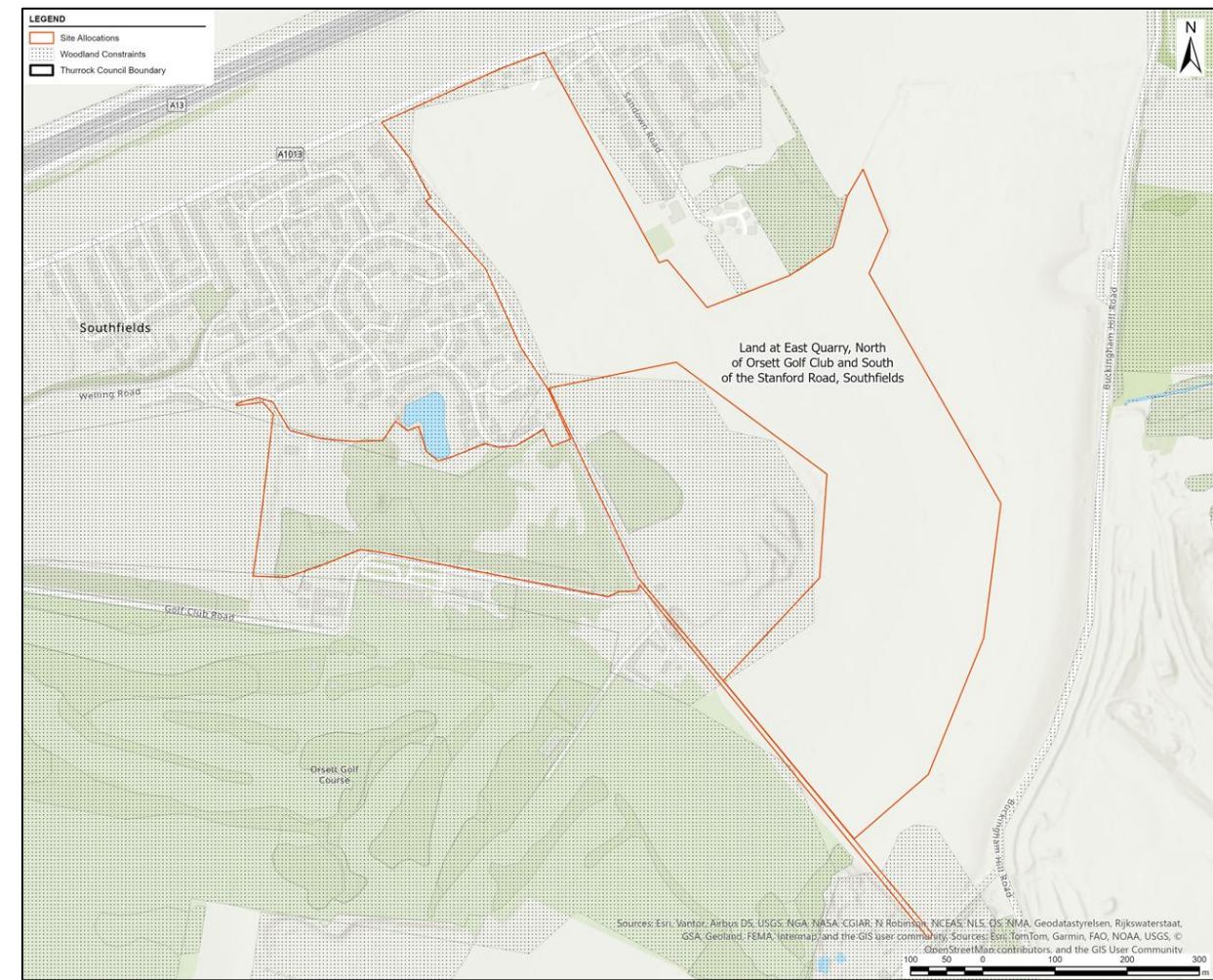


Figure 8-7: NBS opportunities for site 60953 - Land at East Quarry, North of Orsett Golf Club and South of the Stanford Road, Southfields

The WWNP dataset, as shown in Figure 8-7, shows there are no opportunities for NBS within this site and there are significant areas of woodland constraints in some of the site.

Site 60956 - Land East of Chadwell St Mary

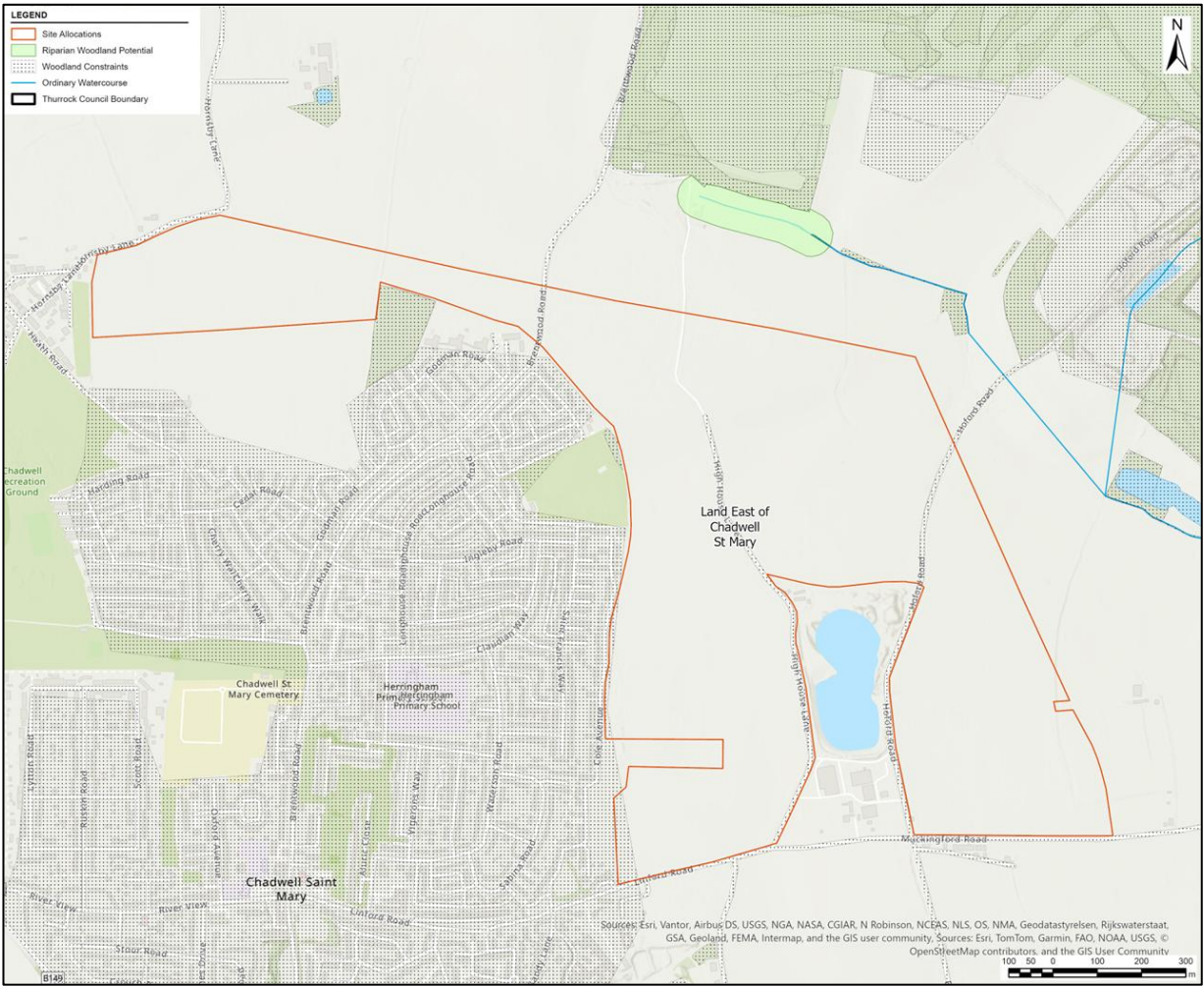


Figure 8-8: NBS opportunities for site 60956 - Land East of Chadwell St Mary

The WWNP dataset, as shown in Figure 8-8, shows there are no opportunities for NBS within this site and there are some small areas of woodland constraints associated with the roads.

Site 61209 - Development Land East Of Caspian Way And North And South Of London Road, Purfleet, Essex



Figure 8-9: NBS opportunities for site 61209 - Development Land East Of Caspian Way And North And South Of London Road, Purfleet, Essex

The WWNP dataset, as shown in Figure 8-9, shows there are no opportunities for NBS within the site and the whole site has woodland constraints.

There are opportunities to contribute to the Mardyke Valley Plan project and the Mardyke Pennywort Removal project upstream of the site which could help reduce flood risk and contribute to improving Ecological Status of the Mardyke water body.

8.2.4 Water Supply

There are no restrictions to water available for abstraction from groundwater in the majority of the growth area. Areas to the north of Tilbury may be restricted due to confined chalk. There is restricted water available for abstraction from surface water in very low flow conditions, however water is available for abstraction from surface water in low to higher flows. The growth area is located within the Essex WRZ managed by E&SW. The WCS has identified that a long term plan is in place to manage the scale of growth proposed within the Local Plan across this WRZ. E&SW have confirmed that upgrades to the distribution network will need to be considered in a pre-planning enquiry for the following:

- South Ockendon/Aveley/Purfleet – likely renewal of approximately 10 km of strategic main
- Chadwell/East Tilbury/Stanford-le-Hope: Likely renewal of approximately 12km of strategic main

There are 34 large sites (150 dwellings or more) which are of a scale where water reuse could be considered by developers for supplying non-potable uses to meet an 85l/p/d policy target (or lower). These sites are:

- Site 60442 Land at Grey Goose Farm, Greys

- Site 60459 Rippleside Metalworks, Thames Road, Grays
- Site 60820 Land to the east of Gable Hall school
- Site 60835 Land East of A1012
- Site 60836 Land North of Stifford Clays Road
- Site 60844 Land south of Aveley
- Site 60847 East Tilbury
- Site 60851 East Tilbury 2
- Site 60853 Land at the Mardyke Valley Golf Club, South Road, South Ockendon
- Site 60856 Land northeast of Corringham
- Site 60883 Land to the west of North Road, South Ockendon
- Site 60888 Land at Wharf Road, Stanford-le-Hope
- Site 60901 Land south of Welling Road
- Site 60911 Medebridge Road, South Ockendon
- Site 60912 Butts Lane, Stanford-le-Hope
- Site 60915 Land North East of South Ockenden
- Site 60918 Land north of Thurrock Garden Centre, South Ockenden
- Site 60935 Land to the west of Romford Road, Aveley
- Site 60939 Gobions Park, East Tilbury
- Site 60940 Land north of Stanford Le Hope
- Site 60942 Land East of Heath Road, Chadwell
- Site 60944 Land off Rainbow Lane
- Site 60953 Land at East Quarry, North of Orsett Golf Club and South of the Stanford Road, Southfields
- Site 60956 Land East of Chadwell St Mary
- Site 60972 Land at Kemps Farm, South Ockendon
- Site 61008 Distribution Centre, West Road, South Ockendon, RM15 6PD
- Site 61100 Blackshot Estate, Land south of Laird Avenue (Bevan & Morrison House)
- Site 61114 Former Culver Centre And Land To Rear Daiglen Drive South Ockendon Essex
- Site 61161 Langdon Hills Golf Course
- Site 61169 Land Part Of Little Thurrock Marshes, Thurrock Park Way, Tilbury, Essex
- Site 61171 Grays Shopping Centre, High Street, Grays
- Site 61187 Land adjacent and rear of George and Dragon Public House
- Site 61209 Development Land East Of Caspian Way And North And South Of London Road, Purfleet, Essex
- Site 60947 Land east of Lampits Hill, Corringham

Growth area specific policy

The following water policy areas are recommended for development for this growth area:

- An 85 l/p/d PCC target for new homes in these allocated sites; this will support both sustainable water resource provision as well as potentially remove the need for further upgrades to the WRC at the end of the plan period. It may also help with reducing impact from storm overflows.

- To enable CSO spills to be managed in the long-term, require all allocated development in these settlements to prevent surface water generated from sites being discharged to the foul sewer network.
- Require SuDS built to the updated national SuDS standards to attenuate surface water runoff for flood risk purposes and be expected to manage, and where possible improve water quality, particularly nutrient discharge.
- Encourage developers to contribute to NBS for riparian management.

8.3 Upminster

8.3.1 Wastewater treatment summary

Is there capacity at the WRC for any new dwellings?	Yes – approximately 439 dwelling capacity
Is there sufficient capacity for all new homes planned within the WRC catchment?	Yes – however only a small amount of capacity (3%) would be remaining
Is there a WRC solution proposed in the current investment period to 2030?	Yes, level of funding for improvement, is currently under review, but planned for delivery in AMP8.
Is there a medium to long term WRC solution proposed in the AWS Drainage and Wastewater Management Plan?	Yes – The AMP8 growth scheme may not provide sufficient capacity for the proposed Local Plan growth, but the DWMP outlines improvements with the main solution of increased attenuation in the network in the medium term (to 2035). 10% surface water removal in the longer-term 2050 Strategy.
Can a permit be implemented in the future to protect water quality within Technically Achievable Limits?	Yes – with upgrades which may be significant.

8.3.2 Wastewater sewer capacity

Is there a risk of sewer outfall discharges increasing?	• The sewer network is separated so the risk is generally low. • The DWMP identifies the catchment as a high risk for the planning objective of storm overflows. • There are three outfalls in the sewer catchment, two are medium risk (5-12 spills), the other is high risk (>12 spills). Additional flows to the sewer may limit the efficacy of future spill reduction measures.
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8.3.3 Catchment risks and opportunities

Allocated sites are located in an area of TC which eventually drain to the Mardyke (West Tributary) WFD Water body catchment. Surface water runoff from these sites has the potential to influence water quality within this WFD water body. The Upminster WRC which would treat wastewater from these sites, also discharge to this water body.

The water body is failing to meet Good Status, in part due to Ammonia and Phosphate levels being less than Good Status. Physical modification of the waterbody and sewage discharge are confirmed reasons for not achieving Good Status.

The underlying South Essex Thurrock Chalk groundwater body also has a Poor overall status, due to Poor chemical and quantitative status.

This highlights the need for developments in this growth area to manage surface water through the provision of SuDS with a focus on managing water quality and to avoid development within riparian zones around watercourses to reduce pressures around watercourse modification.

There are multiple NBS opportunities for the allocated site in this growth area. Developers of this site should be encouraged to contribute towards NBS opportunities. The location of NBS opportunities in the Upminster growth area

are shown in Appendix F, Figure 5. Residential sites with over 1,000 dwellings have been identified for additional NBS opportunities and are described in more detail below.

Site 60913 - West Horndon

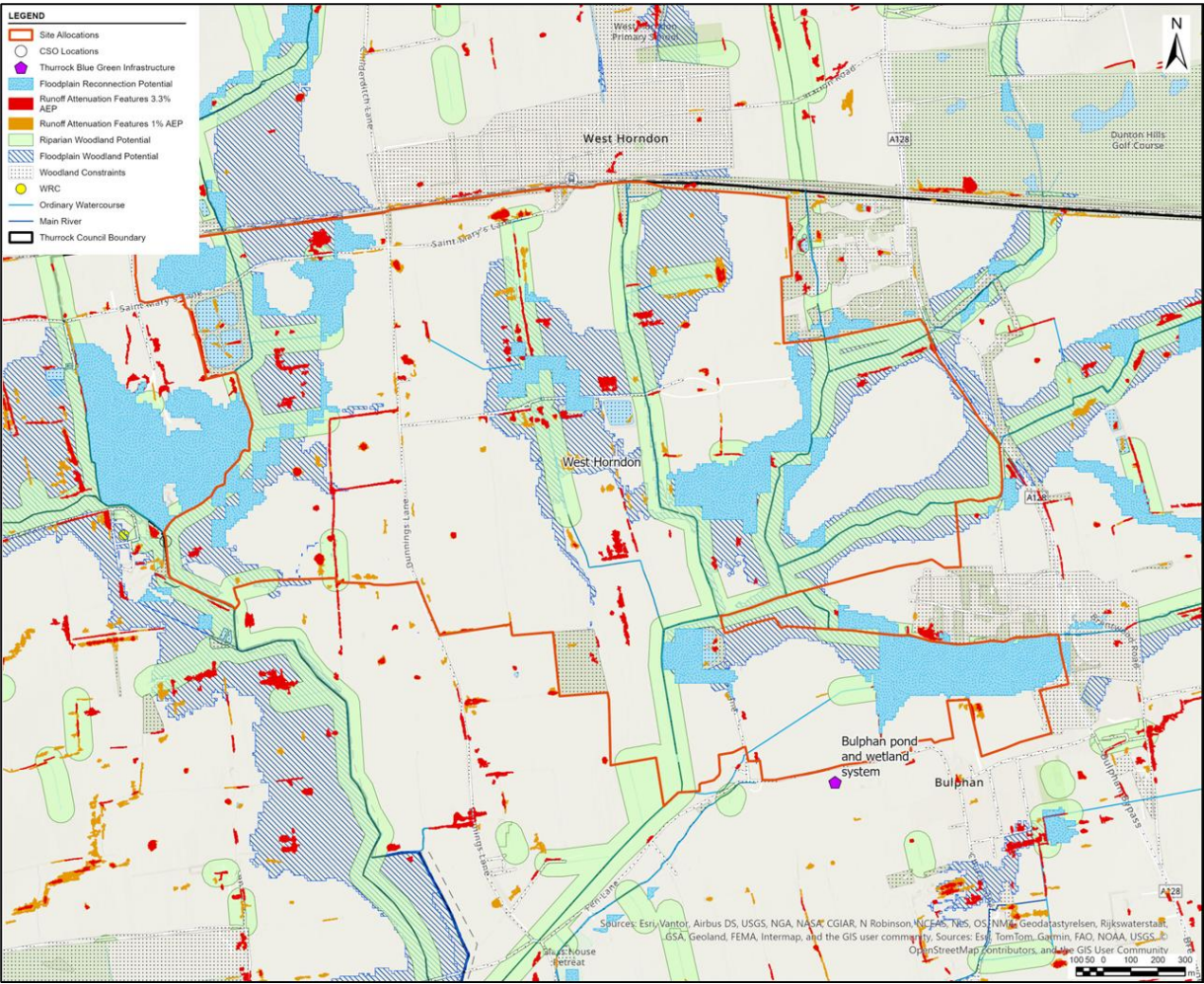


Figure 8-10: NBS opportunities for site 60913 - West Horndon

Figure 8-10 shows there are multiple opportunities for NBS throughout the site, including areas of floodplain reconnection potential, floodplain woodland potential, riparian woodland potential and runoff attenuation features. contribute to the NFM measures from ‘catchment to coast’ project to reduce downstream flood risk and contribute to improving the Ecological Status of the Mardyke (East Tributary) water body. The site is located near Bulphan which is highlighted in the Thurrock Green Blue Infrastructure report as receiving funding for a pond wetland system project. The Council aims to create interventions within the upper catchment which intend to help Bulphan in terms of flows and to build a large pond and wetland system as it is the lowest part of the catchment which then flows into the Mardyke River. The overall aim is to build flood resilience in Bulphan and to create a hydro citizenship to uptake these sorts of projects and maintain them down the line, aligning with the Thames River Basin Management Plan’s aim of encouraging communities to take ownership of water quality within their area.

8.3.4 Water Supply

Abstraction from groundwater is limited due to confined chalk. There is restricted water available for abstraction from surface water in very low flow conditions, however water is available for abstraction from surface water in low to higher flows. The growth area is located within the Essex WRZ managed by ESW. The WCS has identified that a long term plan is in place to manage the scale of growth proposed within the Local Plan across this WRZ. E&SW have confirmed that upgrades to the distribution network will need to be considered in a pre-planning enquiry for the following:

- West Horndon: Increased capacity of the existing 36' inch main supply to West Horndon _UP

Site 60913 West Horndon is a large site (150 dwellings or more) and of a scale where water reuse could be considered by developers for supplying non-potable uses to meet 85l/p/d PCC (or lower).

8.3.5 Growth area specific policy

The following water policy areas are recommended for development for this growth area:

- An 85 l/p/d PCC target for new homes in these allocated sites; this will support both sustainable water resource provision as well as potentially remove the need for further upgrades to the WRC at the end of the plan period. It may also help with reducing impact from storm overflows.
- To enable CSO spills to be managed in the long-term, require all allocated development in these settlements to prevent surface water generated from sites being discharged to the foul sewer network.
- Require SuDS built to the updated national SuDS standards to attenuate surface water runoff for flood risk purposes and be expected to manage, and where possible improve water quality, particularly nutrient discharge.
- Encourage developers to contribute to NBS for riparian management.

8.4 Pitsea

8.4.1 Wastewater treatment summary

Is there capacity at the WRC for any new dwellings?	Yes – approximately 5,500 dwelling capacity
Is there a WRC solution proposed in the current investment period to 2030?	No plans to increase treatment capacity by 2030 but the WCS has shown that growth is unlikely to use this headroom capacity before then.
Is there a medium to long term WRC solution proposed in the AWS Drainage and Wastewater Management Plan?	Yes – the DWMP outlines improvements to the network with a mixed strategy with the main solution of SuDs in the medium term (to 2035). 25% surface water removal in the longer-term 2050 Strategy.
Can a permit be implemented in the future to protect water quality within Technically Achievable Limits?	Yes – modelling has shown this would be feasible within TAL at a future point and minor permit condition changes would be required.

8.4.2 Wastewater sewer capacity

Is there a risk of sewer outfall discharges increasing?	• The sewer network is separated so the risk is generally low. • There is one outfall in the sewer catchment which is high risk (>12 spills). Additional flows to the sewer may limit the efficacy of future spill reduction measures.
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8.4.3 Catchment risks and opportunities

Allocated sites are located in area of TC which eventually drain to the Thames Lower WFD Water body catchment. Surface water runoff from these sites has the potential to influence water quality within this WFD water body. The Pitsea WRC which would treat wastewater from these sites, also discharge to this water body.

The water body is failing to meet Good Status, in part due to Nitrogen levels being less than Good Status. Physical modification of the waterbody and sewage discharge are confirmed reasons for not achieving Good Status.

This highlights the need for developments in this growth area to manage surface water through the provision of SuDS with a focus on managing water quality and to avoid development within riparian zones around watercourses to reduce pressures around watercourse modification.

There are some limited NBS opportunities for the allocated site in this growth area related to riparian woodland planting potential. Developers of these sites should be encouraged to contribute towards NBS opportunities. The location of NBS opportunities in the Pitsea growth area are shown in Appendix F, Figure 5. Residential sites with over 1,000 dwellings have been identified for additional NBS opportunities and are described in more detail below.

Site 60893 - Corringham Park Farm

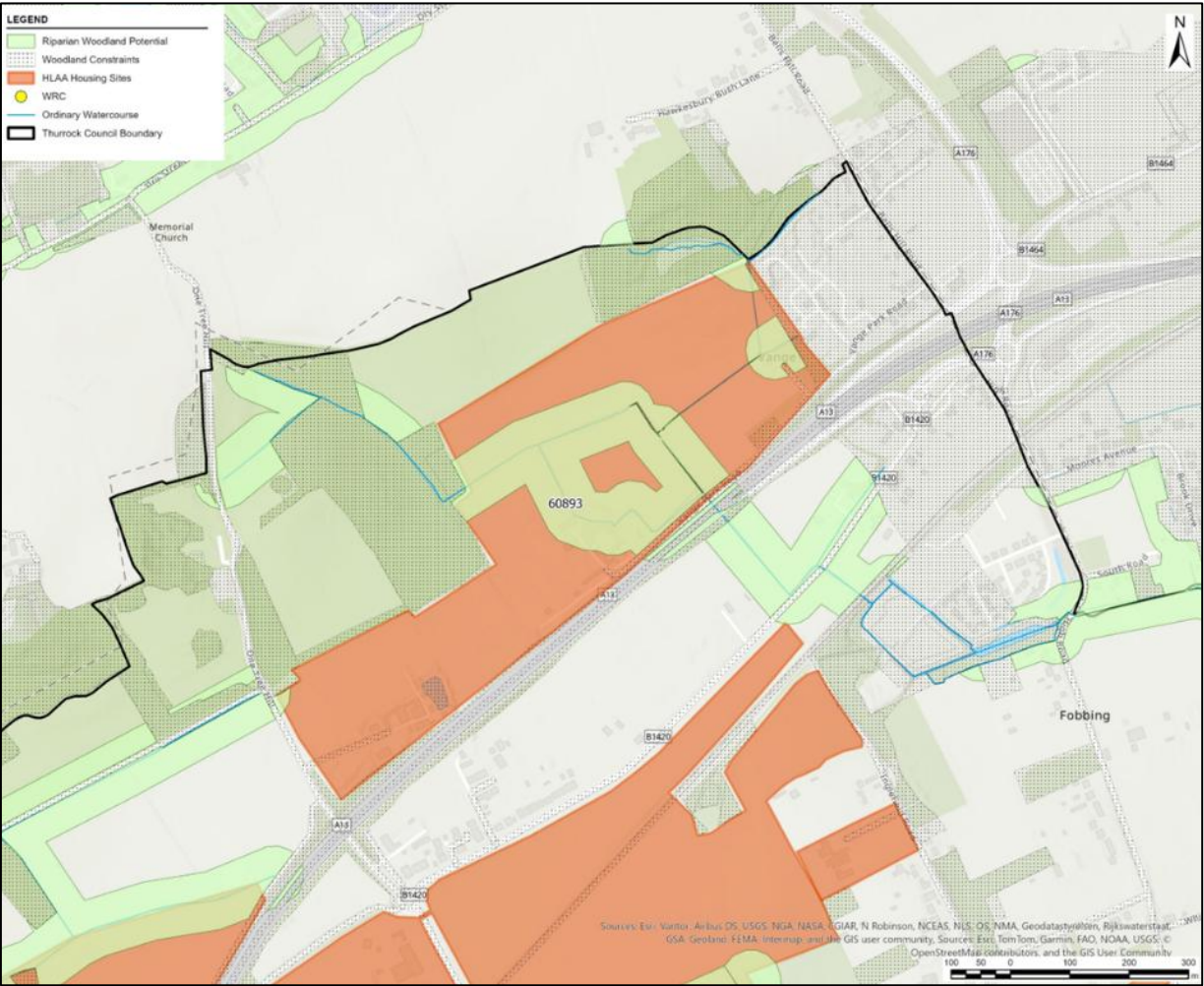


Figure 8-11: NBS opportunities for site 60893 - Corringham Park Farm

The WWNP dataset, as shown in Figure 8-11, shows there are limited opportunities for NBS throughout the site which only includes an area of Woodland Potential in the centre and north of the site.

8.4.4 Water Supply

Abstraction from groundwater is limited due to confined chalk. There is restricted water available for abstraction from surface water in very low flow conditions, however water is available for abstraction from surface water in low to higher flows. The growth area is located within the Essex WRZ managed by E&SW. The WCS has identified that a long term plan is in place to manage the scale of growth proposed within the Local Plan across this WRZ.

Site 60893 Corringham Park Farm is a large site (150 dwellings or more) and of a scale where water reuse could be considered by developers for supplying non-potable uses to meet 85l/p/d PCC (or lower).

8.4.5 Growth area specific policy

The following water policy areas are recommended for development for this growth area:

- An 85 l/p/d PCC target for new homes in these allocated sites; this will support both sustainable water resource provision as well as potentially remove the need for further upgrades to the WRC at the end of the plan period. It may also help with reducing impact from storm overflows.

- To enable CSO spills to be managed in the long-term, require all allocated development in these settlements to prevent surface water generated from sites being discharged to the foul sewer network.
- Require SuDS built to the updated national SuDS standards to attenuate surface water runoff for flood risk purposes and be expected to manage, and where possible improve water quality, particularly nutrient discharge.
- Encourage developers to contribute to NBS for riparian management.

9. Policy recommendations

9.1 Recommendations

Based on the assessments completed, the following policy recommendations have been put forward to TC for consideration as part of the Local Plan development.

9.1.1 Per capita consumption – domestic

The TC area is classified as water stressed by the Environment Agency. Whilst AW have measures to maintain a surplus of supply in the long term, this will require demand from new housing to be managed. Therefore, there is evidence that a stricter PCC policy for new development would significantly contribute to managing and maintaining a surplus of supply within the TC area. This is in keeping with Government plans to address water scarcity in response to the Environment Act 2021.

Additionally, the wastewater assessment has shown that proposed dwellings in some allocations being restricted to a water use of 85 l/p/d would significantly improve the available capacity at WRCs across the TC area, and in some cases, delaying the need for an improvement scheme to be implemented in the plan period. Reducing PPC should not be relied on to increase capacity.

It is recommended that a policy requiring all dwellings within allocated sites within the Local Plan to meet a PCC target of 85l/p/d. This WCS has set out evidence for why this target is applicable and how it can be achieved.

9.1.2 Confirmation of WRC capacity in key locations

There is no (or limited) baseline wastewater treatment capacity in two WRCs, however both of these have improvement plans proposed in the current 5-year water company investment period (AMP8 – from 2025 to 2030). This applies to:

- Tilbury; and
- Upminster

For development in these catchments, it is recommended that a Local Plan policy is developed requiring developers to undertake pre-planning engagement with Anglian Water at the earliest opportunity to assess infrastructure capacity, and any specific requirements that may be needed to deliver the proposed development, which may include sustainable points of connection to the water supply and wastewater networks to minimise impacts on existing communities and the environment.

9.1.3 SuDS and surface water management:

All new developments to provide separate surface water drainage systems and incorporate SuDS in accordance with the updated national SuDS standards and good practice guidance. Require SuDS to attenuate surface water runoff for flood risk purposes and be expected to manage, and where possible improve water quality, particularly nutrient discharge.

Surface water disposal routes should be considered in accordance with the surface water disposal hierarchy. No new surface water connections should be made to the foul sewer system.

9.2 Consultation recommendations

Specific areas for further consultation have been identified as follows:

9.2.1 AWS for wastewater

- Further discussion around the implications of the development on existing infrastructure capacity and investment needed to accommodate the development, including any significant local network constraints that might impact on the ability to deliver. To include more detailed understanding of dependence on further investment and the planned timing, and expectations for those catchments where the investment needs have not been defined or highlighted as needing investment in the DWMP. Also to clarify investment expected to be delivered as per the current business plan.
- Discussion around potential opportunities for development to contribute to investment, either through financial contributions or delivery as part of the development to consider how this may feed into policy.
- Discussion around expectations for consultation and involvement as the Local Plan is developed and as developments subsequently come forward to manage future delivery risks, particularly where there are no identified growth solutions in WRC catchments which have limited capacity to 2030.

9.2.2 E&SW for water supply

- Discussion around the implications of the development on existing infrastructure capacity and investment needed to accommodate the development, including any significant local network constraints that might impact on the ability to deliver.
- Discussion around potential opportunities for development to contribute to investment, either through financial contributions or delivery as part of the development to consider how this may feed into policy.
- Information regarding employment site allocations and expected use type should be provided to E&SW to allow a comprehensive assessment of water supply and network requirements.

Appendix A - Policy and legislative drivers shaping the WCS

A.1 WFD surface water body status

Status	Description
High	Near natural conditions. No restriction on the beneficial uses of the water body. No impacts on amenity, wildlife or fisheries
Good	Slight change from natural conditions as a result of human activity. No restriction on the beneficial uses of the water body. No impact on amenity or fisheries. Protects all but the most sensitive wildlife.
Moderate	Moderate change from natural conditions as a result of human activity. Some restriction on the beneficial uses of the water body. No impact on amenity. Some impact on wildlife and fisheries.
Poor	Major change from natural conditions as a result of human activity. Some restrictions on the beneficial uses of the waterbody. Some impact on amenity. Moderate impact on wildlife and fisheries.
Bad	Severe change from natural conditions as a result of human activity. Significant restriction on the beneficial uses of the water body. Major impact on amenity. Major impact on wildlife and fisheries with many species not present.

A.2 Relevant Legislation

Directive/Legislation/Guidance	Description
The Conservation of Offshore Marine Habitats and Species Regulations 2017	Provides for the designation of Special Protection Areas.
Building Regulations Approved Document G – sanitation, hot water safety and water efficiency (March 2010)	The current edition covers the standards required for cold water supply, water efficiency, hot water supply and systems, sanitary conveniences and washing facilities, bathrooms and kitchens and food preparation areas.
Environment Act 1995	Sets out the role and responsibility of the Environment Agency.
Environment Act 2021	Provides a legal framework for environmental governance in the UK. Brings in measures for improvement of the environment in relation to waste, resource efficiency, air quality, water, nature and biodiversity, and conservation.
Environmental Protection Act 1990	Integrated Pollution Control (IPC) system for emissions to air, land and water.
Flood & Water Management Act 2010	The Flood and Water Management Act 2010 is the outcome of a thorough review of the responsibilities of regulators, local authorities, water companies and other stakeholders in the management of flood risk and the water industry in the UK. Its key features relevant to this WCS are: 1. To give the Environment Agency an overview of all flood and coastal erosion risk management and unitary and county councils the lead in managing the risk of all local floods. 2. To encourage the uptake of sustainable drainage systems by removing the automatic right to connect to sewers and providing for unitary and county councils to adopt SuDS for new developments and redevelopments. 3. To widen the list of uses of water that water companies can control during periods of water shortage and enable Government to add to and remove uses from the list. 4. To enable water and sewerage companies to operate concessionary schemes for community groups on surface water drainage charges. 5. To make it easier for water and sewerage companies to develop and implement social tariffs where companies consider there is a good cause to do so, and in light of guidance that will be issued by the Secretary of State following a full public consultation.
Future Water, February 2008	Sets the Government's vision for water in England to 2030. The strategy sets out an integrated approach to the sustainable management of all aspects of the water cycle, from rainfall and drainage, through to treatment and discharge, focusing on practical ways to achieve the vision to ensure sustainable use of water. The aim is to ensure sustainable delivery of water supplies and help improve the water environment for future generations.

Directive/Legislation/Guidance	Description
The Groundwater (Water Framework Directive) (England) Direction 2016	To protect groundwater against pollution by 'List 1 and 2' Dangerous Substances.
The Conservation of Habitats and Species Regulations 2017	To conserve the natural habitats and to conserve wild fauna and flora with the main aim to promote the maintenance of biodiversity taking account of social, economic, cultural and regional requirements. In relation to abstractions and discharges, can require changes to these through if they are impacting on designated European Sites. Also, the legislation that provides for the designation of Special Areas of Conservation provides special protection to certain non-avian species and sets out the requirement for Appropriate Assessment of projects and plans likely to have a significant effect on an internationally designated wildlife site.
Land Drainage Act 1991	Sets out the statutory roles and responsibilities of key organisations such as Internal Drainage Boards, local authorities, the Environment Agency and Riparian owners with jurisdiction over watercourses and land drainage infrastructure.
National Planning Policy Framework	Planning policy in the UK is set by the National Planning Policy Framework (NPPF). NPPF advises local authorities and others on planning policy and operation of the planning system. A WCS helps to balance the requirements of various planning policy documents and ensure that land-use planning and water cycle infrastructure provision is sustainable.
Pollution Prevention and Control Act (PPCA) 1999	Implements the IPPC Directive. Replaces IPC with a Pollution Prevention and Control (PPC) system, which is similar but applies to a wider range of installations.
Ramsar Convention	Provides for the designation of wetlands of international importance
Urban Waste Water Treatment Directive (UWWTD)	This Directive concerns the collection, treatment and discharge of urban waste water and the treatment and discharge of waste water from certain industrial sectors. Its aim is to protect the environment from any adverse effects caused by the discharge of such waters.
Water Act 2003	Implements changes to the water abstraction management system and to regulatory arrangements to make water use more sustainable.
The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017	The WFD, combines water quantity and water quality issues together. An integrated approach to the management of all freshwater bodies, groundwaters, estuaries and coastal waters at the river basin level has been adopted. The overall requirement of the directive is that all river basins must achieve 'Good ecological status' by 2015 or by 2027 if there are no grounds for derogation. The Environment Agency is the body responsible for the implementation of the WFD in the UK. The Environment Agency have been supported by UKTAG ⁴⁶ , an advisory body which has proposed water quality, ecology, water abstraction and river flow standards to be adopted in order to ensure that the water bodies in the UK (including groundwater) meet the required status ⁴⁷ . Standards and waterbody classifications are published via River Management Plans (RBMP) the latest of which were completed in 2015.
Natural Environment & Rural Communities Act 2006	Covering Duties of public bodies – recognises that biodiversity is core to sustainable communities and that Public bodies have a statutory duty that states that "every public authority must, in exercising its functions, have regard, so far as is consistent with the proper exercise of those functions, to the purpose of conserving biodiversity.
Water Resources Act 1991	Protection of the quantity and quality of water resources and aquatic habitats. Parts have been amended by the Water Act 2003.
Wildlife & Countryside Act 1981 (as amended)	Legislation that provides for the protection and designation of SSSIs and specific protection for certain species of animal and plant among other provisions.

A.3 Strategies and plans

Category	Author	Document Name	Publication Date
Flood Risk	AECOM	Thurrock Council Level 1 Strategic Flood Risk Assessment	2024
Flood Risk	Thurrock Council	Thurrock Local Flood Risk Management Strategy	2015

⁴⁶ The UKTAG (UK Technical Advisory Group) is a working group of experts drawn from environment and conservation agencies. It was formed to provide technical advice to the UK's government administrations and its own member agencies. The UKTAG also includes representatives from the Republic of Ireland.

⁴⁷ UK Environmental Standards and Conditions (Phase I) Final Report, April 2008, UK Technical Advisory Group on the Water Framework Directive.

Category	Author	Document Name	Publication Date
Water Resources	AECOM	Thurrock Council Water Cycle Study Scoping Report	2024
Water Resources	Defra	Storm overflows discharge reduction plan	2023
Water Resources	DEFRA	Integrated Plan for Delivering Clean and Plentiful Water	2023
Water Resources	DEFRA	Environmental Improvement Plan	2023
Water Resources	Anglian Water	Drainage and Wastewater Management Plan	2023
Water Resources	Anglian Water	Water Resources Management Plan	2024
Water Resources	Essex and Suffolk Water	Water Resources Management Plan	2024
Water Resources	Water Resources East	Regional Water Resources Plan for Eastern England	2023
Water Resources/Flood Risk	Thurrock Council	Green and Blue Infrastructure Study	2023
Water Resources/Flood Risk	Thurrock Council	Climate Change Strategy Update	2023
Water Resources/Flood Risk	Arup	Thurrock Climate Change Action Plan Update	2021
Water Resources/Flood Risk	Association of South Essex Local Authorities	South Essex Green and Blue Infrastructure Study	2020

Appendix B – WRC capacity assessment methodologies

B1: Approach overview

An increase in residential and employment growth will have a corresponding increase in the volume and flow of wastewater generated within the study area, therefore it is essential to consider the capacity of each WRC in the study area to accept this additional wastewater flow. WRC capacity is considered in terms of flow capacity and environmental capacity.

WRC flow capacity

The flow (or treatment headroom) capacity of a WRC is defined as the volume of additional flow that a WRC can treat before it would exceed the volume of discharge it is allowed to discharge within the conditions of its discharge permit. The following questions were answered through the assessment:

- Is there sufficient treatment capacity (headroom) within existing WRCs?
- What new infrastructure is required to provide for the additional wastewater treatment?

Environmental capacity

Environmental capacity is defined in this WCS as the water quality needed in the receiving waterbodies to maintain the current (and future required) conditions of aquatic environments. The following objectives are answered through an assessment of environmental capacity using modelling and calculation techniques:

- Could an increase in WRC discharge cause deterioration in water quality?
- Could an increase in WRC discharge cause deterioration in WFD status of any element of a water body? It is a requirement of the WFD to prevent status deterioration.
- Could development alone prevent the receiving water from achieving its Future Target WFD Status or Potential? This is also a requirement of the WFD, which can be separated into the following two objectives:
 - Is the Future Target Status possible now assuming adoption of best available technology? To determine if it is TAL that would prevent the Future Target Status being achieved.
 - Is the Future Target Status technically possible after development and adoption of best available technology? To determine if it is growth that would prevent the Future Target Status being achieved.
- Will development cause deterioration in downstream designated water-dependent sites?

Assumptions and input data

Several key assumptions were used in the assessments as follows:

- The wastewater generation per new household was based on an assumed Occupancy Rate (OR) of 2.62 people per house and an average consumption of 125 l/p/d).
- The scoping study sets out potential large quantum of growth linked to employment land within Thurrock, including London Gateway Park, Thames Enterprise Park, the oil refinery at Coryton, and potential Hydrogen schemes as well as employment and business growth linked to the Lower Thames Crossing. Potential and available employment sites and areas were provided by Thurrock Council as shown in Appendix F, Figure 1. The total area of the employment sites (1592.38 hectares) and total job number target of 16,975 have been used to calculate an assumed employment flow, based on the total area of employment sites within each of the WRC catchments as shown in Table B-1. An assumed consumption per job of 0.016 m³/h/d has been used.

Table B-1: Employment Flow Calculations

WRC	Area of employment sites from total %	Calculated Job number target/demand	Employment Flow m3/d
Tilbury	90.3	15332	245.32
Upminster	9.7	1643	26.28

- The dwelling capacity assessment requires an estimate of water which would enter the drainage network via groundwater or water in the soil (called 'infiltration') as this uses available treatment capacity. A global assumption has been applied whereby a percentage of the water used by new dwellings would be added to as infiltration once in the sewer network to allow for this aspect. The infiltration percentage was set to 25% of water used.
- The WRC current/measured discharge flows were taken as the Q80 of measured flow to give the Dry Weather Flow (DWF) assumption. Measured flows were provided by AWS in 2025 (using the 5 years of data 2020 to 2024). Future discharge flows at each WRC were calculated by adding the volume of additional wastewater generated by new dwellings and employment (using an OR of 2.62 and a consumption value of 125l/p/d multiplied by 1.35 (10% for employment and 25% for infiltration) to the current permitted DWF value.
- WRC current discharge quality was taken as the last three years of permit monitoring data where available for each WRC, or the current permitted limits for each water quality element, allowing for recent AMP 7 improvements in phosphate consents where advised by AWS. Where monitoring data was not available, figures for the mean and standard deviation of each element were calculated based on permit levels using RQP 2.5 software.
- Raw river water quality data for modelling was taken from the Environment Agency WIMS database where available, using the nearest upstream monitoring locations and taking the last three years of data. Where no data was available, the current WFD Status was used, taking Status mid-points for each parameter.
- The WFD 'no deterioration' target for each WRC was the current Status for each water quality element of the receiving water body, based on the latest Status from the Catchment Data Explorer.
- For the purposes of this study, TAL for each determinant are considered to be:
 - 5mg/l for BOD;
 - 1mg/l for Ammoniacal-N; and
 - 0.25mg/l for Phosphate.

B2: Assessment methodology

WRC Flow capacity assessment

This assessment was the first step to determine both flow capacity and which WRC required water quality assessment. It also informed the type and complexity of water quality assessment required.

A WRC flow headroom calculator was developed and used to inform this assessment. The calculator identified which WRC within the study area will receive future growth based on allocation sites and existing commitment site locations.

The permitted flow headroom capacity within an existing permit is assumed to be usable; therefore, the following steps were applied to calculate approximately how much available headroom each WRC has:

1. Determine the quantity of growth within a WRC catchment to determine the additional flow expected at each WRC;
2. Calculate the additional wastewater flow generated at each WRC;
3. Calculate the remaining permitted flow headroom at each WRC;

4. Determine whether the growth can be accommodated within existing headroom (or PE allowance).

Results are presented Appendix C.

Environmental capacity – water quality assessment

Water quality assessment was then required whenever levels of growth (and hence wastewater generation) were defined as significant in relation to the available headroom at a WRC or the sensitivity of the watercourse receiving the treated flows; this defined the environmental capacity.

The water quality assessment determines whether significant growth served by a WRC has the potential to result in water quality impacts on receiving watercourse and is a key tool to determine where WRC treatment upgrades, or new treatment solutions may be required. In the context of the WCS aims, significant growth is defined as being when the future wastewater flows would result in:

- a WRC exceeding its permitted headroom and require a new discharge permit; or,
- a WRC having less than 10% remaining headroom when compared to the DWF permit limit.

WRCs which would receive significant growth and where they discharge to a fluvial (freshwater) water body, were identified for water quality modelling using the River Quality Planning tool (RQP). WRCs which would receive growth but where the growth is considered not to be significant (greater than 10% residual headroom after growth) had a simpler load standstill calculation undertaken to consider water quality implications. WRCs which would receive significant growth and which discharge to tidal water bodies also had load standstill calculations undertaken, and not RQP. WRCs which would receive no growth were scoped out of the assessment.

RQP Modelling

Modelling of the quality permits required to meet the two WFD requirements (no deterioration and future target Status) was undertaken, using RQP 2.5 (River Quality Planning). This tool is the Environment Agency's software for calculating permit conditions.

The software is a monte-carlo based statistical tool that determines what statistical quality is required from discharges to meet defined downstream targets, or to determine the impact of a discharge on downstream water quality compliance statistics. Modelling was completed for four tests under two main banners of 'no deterioration' and 'meeting future WFD Status':

Step 1: No deterioration – modelling to determine:

- 1.1. *Test C1*: the permit required after growth but which would maintain the same river quality at the discharge mixing point as modelled for the current discharge volume. This would ensure no deterioration from the current river condition;
- 1.2. *Test C2*: the permit required after growth but which would limit deterioration in the river at the mixing point to less than 10% of the current modelled quality; and,
- 1.3. *Test C3*: the permit required after growth that would ensure no deterioration in WFD status of the waterbody at the mixing point.

Step 2: whether growth would prevent future objective WFD status from being attained.

Step 1 – 'No Deterioration' – Tests C1 to C3

Table B-2 provides detail on each of the modelling steps related to no deterioration and the sequence in which these are performed.

Table B-2: Step 1, no deterioration tests, C1, C2 and C3.

Test Ref	Calculation Name	Calculation Detail	Reason for Calculation
----------	------------------	--------------------	------------------------

C1	Maintain mixing point quality	No change in current modelled discharge at mixing point	To determine if it is technically feasible to ensure no change in current quality as a result of growth
C2	Limit deterioration to 10%	No deterioration from current downstream quality + 10% with future effluent flow	To determine if it is technically feasible to limit deterioration to no more than 10% of the current downstream water quality
C3	No deterioration (Current)	No deterioration from current status with current effluent flow	To calculate what quality condition is currently needed to avoid deterioration in the current status downstream with the current flow

If 'No Deterioration' could be achieved, then a proposed discharge permit standard was calculated which will be needed as soon as the growth causes the WRC flow permit to be exceeded.

Step 2 – Meeting Future 'Good' Status – C4 and C5

For all WRC meeting the requirement for RQP modelling, and where the current downstream quality of the receiving watercourse is less than good, a calculation was undertaken to determine if the receiving watercourse could achieve its future objective status as set out in the online Catchment Data Explorer, with the proposed growth within Technically Achievable Limits (TAL) treatment technology and what permit limits would be required to achieve this.

The assessment of attainment of future status assumed that other measures will be put in place to ensure the target status upstream, so that the modelling assumed upstream water quality is at the midpoint of the target status for each element and set the downstream target as the lower boundary of the target status for each element.

If the target status could be achieved with growth with permits achievable within TAL, then a proposed discharge permit standard which may be needed in the future was determined.

If the modelling showed that the watercourse could not meet future target status with the proposed growth within TAL, then the scenario is rerun with current WRC flows. If the additional run shows that future targets could be met without growth, then it is concluded that growth would be a limiting factor in achieving the future target status and an alternative solution is required. If the modelling shows the future target status could not be achieved either with, or without growth, then the planned growth is concluded not to be a limiting factor in future target status requirements.

Table B-3: Step 2, meeting future 'Good' status, C4 and C5

Test Ref	Calculation Name	Calculation Detail	Reason for Calculation
C4	Achieve target status (Current)	Achieving target status with current effluent flow	To test what effluent quality would be needed to achieve target status with the current flow permit
C5	Achieve target status (Future)	Achieving target status with future effluent flow	To assess whether the future quality permit limits needed to achieve target status will be significantly more onerous and difficult to achieve than those currently needed (calculation 4)

Results are presented in Appendix E.

Load standstill calculations

For WRC where growth was not significant (more than 10% capacity remaining after growth), or where the growth is significant and the discharge is to a tidal water body, load standstill calculations were undertaken using Microsoft Excel. This used estimates of current measured flow at each WRC (Q80) to determine load amounts based on current permitted conditions for each quality parameter. These

load amounts were then compared to the load amounts that would occur with the same quality conditions applied but for the calculated WRC flow once growth had been accounted for. The goal seek tool in Excel was then used to adjust the future quality conditions required for each parameter to reduce future load amounts back to the load amounts calculated.

Where the quality conditions would need to be less than the TAL, then a new solution was deemed to be required.

Load standstill results are presented in Appendix D.

Appendix C – WRC flow capacity results

Table C1 sets out the results of the WRC headroom capacity assessment for each WRC receiving growth from allocations within the Thurrock Local Plan.

Table C1: Headroom capacity assessment summary

Water Recycling Centres	Total dwelling numbers assessed	DWF Permitted flow (m3/d)	Current measured DWF (Q80) (m3/d)	Headroom Capacity pre-growth (m3/d)	Post growth DWF estimate (m3/d)	Headroom Capacity post-growth (m3/d)	Percentage capacity after growth
Tilbury	26,248	40,000	29,400	10,600	40,390	-390	-1%
Pitsea	1,000	6,060	3171.4	2,889	3,803	2,257	37%
Upminster	3,550	6,300	4210.1	2,090	6,120	180	3%

As outlined in the assumptions and input data in Appendix B, employment flow has been accounted for based on potential and available employment sites and areas provided by Thurrock Council. The scoping study sets out potential large quantum of growth linked to employment land within Thurrock, including London Gateway Park, Thames Enterprise Park, the oil refinery at Coryton, and potential Hydrogen schemes as well as employment and business growth linked to the Lower Thames Crossing.

There is concern that employment flow from neighbouring authorities may not accurately be represented in the figures provided. For example, Havering Council's East Havering Data centre and Ecology Park which would deliver up to 400,000m² of data centre space has not been included. Anglian Water have indicated that data centres should be built water neutral so there should be limited impact on however the non-technical summary⁴⁸ produced in February 2026 suggests that foul flows would be discharged to the existing Anglian Water public foul sewer to the north of the site.

As a result, the WCS tested two further employment scenarios to assess how the post-growth capacity of Upminster WRC would be affected by additional employment growth. Scenario 2 applied a 10% uplift to the total number of dwellings to account for employment-related flows, while Scenario 3 applied a 20% uplift.

The results indicate that Scenario 2 would result in Upminster WRC operating with no remaining post-growth capacity, at approximately -4%. This represents a reduction of around 7% in capacity compared with Scenario 1. The more conservative Scenario 3 would reduce available capacity further to approximately -11%.

Table C2: Headroom capacity assessment summary for Upminster WRC– employment flow testing scenarios

Scenario	Total dwelling number assessed	Employment flow (m3/d)	DWF Permitted flow (m3/d)	Current measured DWF (Q80) (m3/d)	Headroom Capacity pre-growth (m3/d)	Post growth DWF estimate (m3/d)	Headroom Capacity post-growth (m3/d)	Percentage capacity after growth
1 – Thurrock Council figures	3,550	26	6,300	4210.1	2,090	6,120	180	3%

⁴⁸ Havering Council (2026) East Havering Data Centre Campus, Non-technical Summary. Available at: <https://democracy.havering.gov.uk/documents/s83041/APPENDIX%20-%20Environmental%20Statement%20Non-Technical%20Summary.pdf>

Scenario	Total dwelling number assessed	Employment flow (m3/d)	DWF Permitted flow (m3/d)	Current measured DWF (Q80) (m3/d)	Headroom Capacity pre-growth (m3/d)	Post growth DWF estimate (m3/d)	Headroom Capacity post-growth (m3/d)	Percentage capacity after growth
2 – 10% uplift on total dwellings	3,550	460	6,300	4210.1	2,090	6,555	-255	-4%
3 – 20% uplift on total dwellings	3,550	921	6,300	4210.1	2,090	7,015	-715	-11%

Appendix D – Load standstill results

A summary of the results from the water quality assessment using the load standstill method are included in this section and presented in Table D1.

Table D1: Load standstill results

	Tilbury WRC	Pitsea WRC
Current BOD Technically Achievable Limit (mg/l – 95th percentile)	5	5
Current Ammonia Technically Achievable Limit (mg/l – 95th percentile)	1	1
Current Phosphate Technically Achievable Limit (mg/l - AA)	0.25	0.25
Current DWF Permit (m3/day)	40,000	6,060
Measured flow Q80 (m3 /day)	29,400	3,171.4
Current DWF capacity (m3 /day)	10,600	2,889
BOD Permit limits (mg/l - 95% percentile)	95	40
Ammonia Permit Limits (mg/l - 95% percentile)	65	20
Phosphate Permit Limits (mg/l - annual average)	-	-
Future DWF (m3 /day)	40,390	3,803
Discharge Permit required*		
Effluent Quality permit required for BOD (mg/l - 95% percentile)	69.2	33.4
Effluent Quality permit required for Ammonia (mg/l - 95% percentile)	47.3	16.7
Effluent Quality permit required for Phosphate (mg/l - annual average)	-	-

***Colour key:** Green – no change to permit; Amber – change tightening, but within TAL; permit required not achievable within TAL.

Appendix E - RQP assessment results

The results from the water quality assessment using the RQP tool are included in this Appendix. A summary table of results is provided first, followed by an explanation of the findings for each WRC.

	UPMINSTER		
Parameters considered	Ammonia (mg/l - 95%ile)	BOD (mg/l - 95%ile)	Phosphate (mg/l - mean)
Permit condition	12	40	1
Measured quality of current discharge (taken from RQP output)	0.94	5.49	0.64
Technically achievable limits (TAL)	1	5	0.25
WFD receiving waterbody and WFD Waterbody ID	Mardyke (West Tributary) Water Body (106037028080)		
Parameters considered	Ammonia (mg/l - 90%ile)	BOD (mg/l - 90%ile)	Phosphate (mg/l - mean)
Receiving waterbody Quality Element Published Status	Moderate	N/A	Bad
Upstream sample point	AN-MD0517		
Measured quality upstream of discharge	0.06	3.23	0.53
Quality Element Status based on measured data	High	High	Poor
Test 1 - Maintain Current Quality and limit to 10% deterioration	Ammonia (mg/l)	BOD (mg/l)	Phosphate (mg/l)
Mixing Point Quality with current WRC flow	0.27	3.33	0.58
Modelled status at mixing point with current flow	High	High	Poor
Permit condition required to maintain mixing point quality	0.83	5.15	0.6
river target to limit to 10% deterioration limit	0.30	3.66	0.64
Permit condition required to be within 10% deterioration target	0.92	6.15	0.77
Test 2 - WFD Status: no deterioration (waterbody status)	Ammonia (mg/l)	BOD 90%ile (mg/l)	Phosphate (mg/l)
Threshold at which status deterioration would occur	1.10	N/A	1.1
permit condition required at mixing point - current WRC flow	4.06	N/A	2.06
permit condition required at mixing point - after growth	3.46	N/A	1.81
Test 3 - Future WFD Status	Ammonia 90%ile (mg/l)	BOD 90%ile (mg/l)	Phosphate mean (mg/l)
Is future objective /target WFD status higher than the current status?	No	N/A	Yes
Target future status	N/A	N/A	Moderate
Permit condition required - current WRC flow			0.32
Permit condition required - after growth			0.29
Will Growth prevent future target status?			No - moderate status can be achieved with Growth

E1. RQP outputs for WRCs

Upminster WRC assessment

Receiving watercourse

The Mardyke (West Tributary) (GB106037028080) receives treated effluent from Upminster WRC and currently has an overall 2022 waterbody status of Moderate. The 2022 status of the physico-chemical elements considered in this assessment are provided in Table E1. Phosphate is currently at Poor Status but has a future objective of Moderate Status by 2015 which must be considered for future wastewater discharges.

Table E1: WFD Status summary for the Mardyke (West Tributary) waterbody

Classification Element	Current Status (2022)	Future Objective
Ammonia	Moderate	Moderate
Phosphate	Bad	Moderate

Revised permit conditions – modelling results

The revised discharge permit required by the end of the plan period for each determinant and for each modelled scenario are presented in Table E2.

Table E2: RQP modelled permit quality conditions required for Upminster WRC

Determinant	2022 Status	Current permit condition	Maintain current mixing point quality	Limit deterioration to 10%	Ensure no deterioration in WFD element Status at mixing point	Achieve future WFD objective status (if 2022 status less than good)
Ammonia (mg/l 95%ile)	Moderate	12	0.83	0.92	3.46	N/A
BOD (mg/l 95%ile)	-	40	5.15	6.15	N/A	N/A
Phosphate (mg/l annual average)	Bad	1	0.6	0.77	1.81	0.29

Based on 2023 to 2025 data, the Upminster WRC flow permit would be exceeded once all the growth within its catchment is delivered by the end of the plan period and a new permit would be required.

Water quality modelling has shown that the new permit would require improvements to the permit limits for BOD and phosphate to ensure no change in current quality in the River Mardyke (West Tributary) and these are achievable within TAL. Current Status for phosphate can also be maintained at the point of mixing with improvements to permit limits which are within TAL.

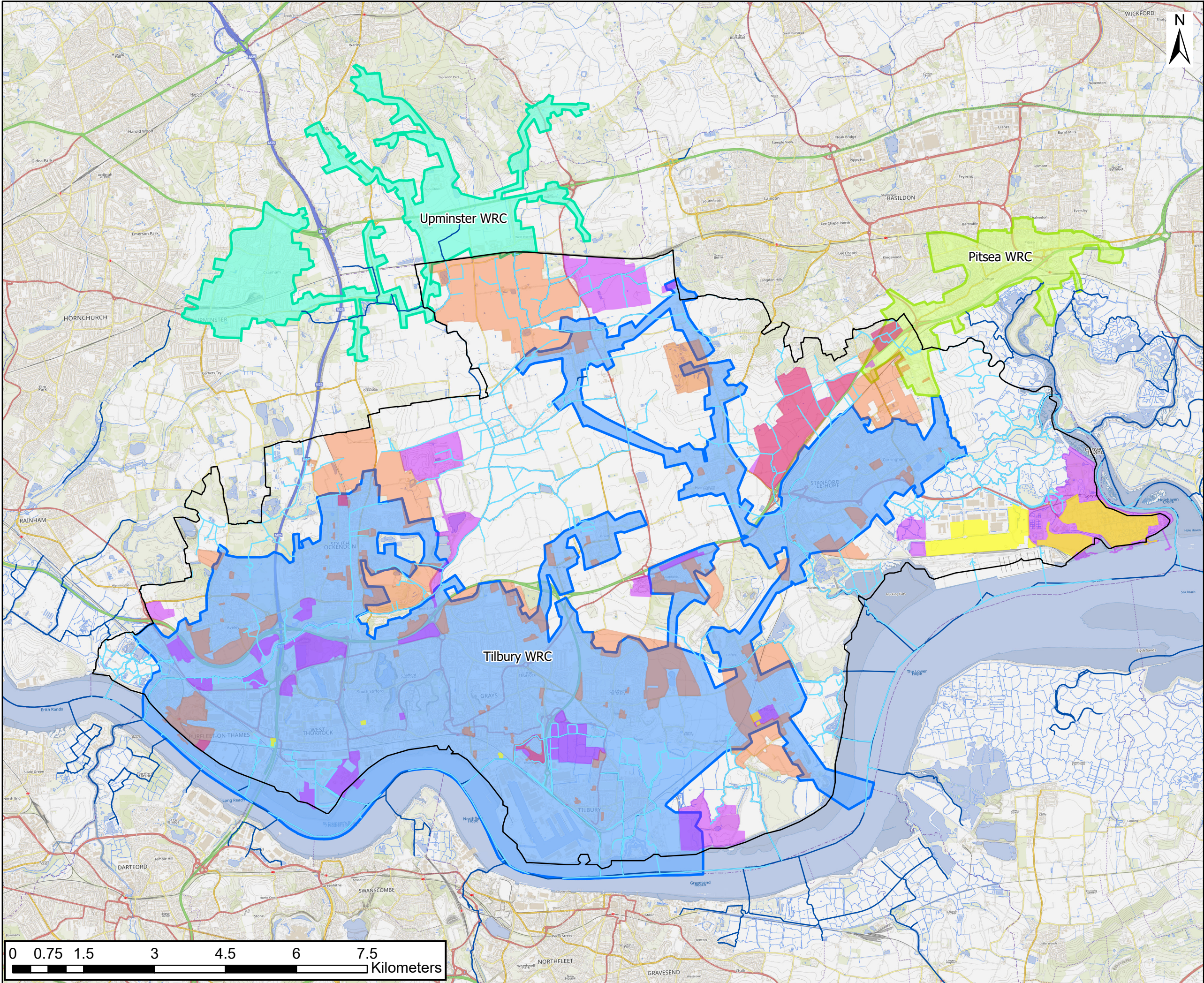
The modelling shows it would not be possible within TAL to ensure no reduction in quality at the mixing point for ammonia; however, it would be possible to maintain Moderate Status under the WFD at mixing

point and the water body as a whole within TAL; therefore, there is a solution which meets legislative requirements.

Modelling has also been undertaken to determine if Moderate status can be achieved for phosphate at the mixing point of the discharge (the current 2022 status is Bad). This modelling shows that it would be possible to achieve this status at this point in the watercourse once growth has been considered within TAL and therefore growth would not affect the future target WFD Status of the Roman River, if the required discharge improvements can be put in place.

Appendix F - Figures

- Figure 1 Study Area and Allocated Sites
- Figure 2 Wastewater Assets
- Figure 3 CSO Locations and Spill Frequency
- Figure 4 Nature Based Solutions Opportunities
- Figure 5 Water Dependent Habitats and Nature Based Solutions relative to allocated sites



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PROJECT

Thurrock Council
WATER CYCLE STUDY

CLIENT

Thurrock Council

CONSULTANT

AECOM Limited
3rd Floor Portwall Place
Portwall Lane
Bristol, United Kingdom
T +44 (0)117 315 0700
LEGEND

- Thurrock Council Boundary
- Ordinary Watercourse
- Main Rivers
- HLAA Housing Sites
- Available Employment Sites
- Potential Employment Sites
- Tilbury Sewer Catchment
- Pitsea Sewer Catchment
- Upminster Sewer Catchment

NOTES

This figure shows the allocated sites provided by Thurrock Council. Residential sites are shown in orange, and Employment sites in yellow and purple.

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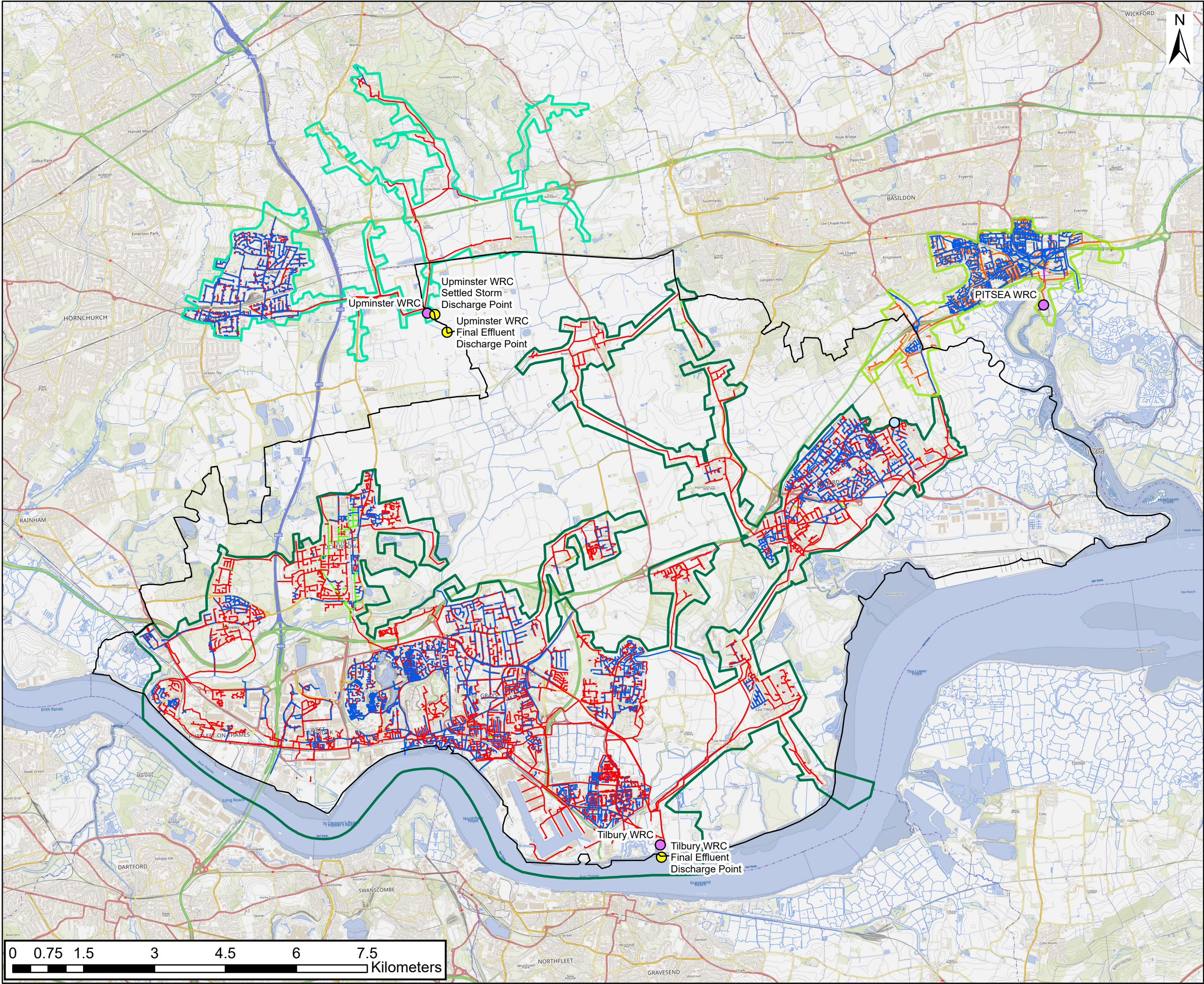
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FIGURE TITLE

Study Area and Allocated Sites

FIGURE NUMBER

Figure 1



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Bristol, United Kingdom
T +44 (0)117 315 0700
LEGEND

- Thurrock Council Boundary
- Tilbury WRC Catchment
- Pitsea Sewer Catchment
- Upminster WRC Catchment
- WRC
- WRC Discharge Point
- Catchment Overflow
- Sewer by Purpose
 - Combined
 - Foul
 - Surface Water
 - Other

NOTES

This map shows the sewer assets provided by Anglian Water, differentiated by use.

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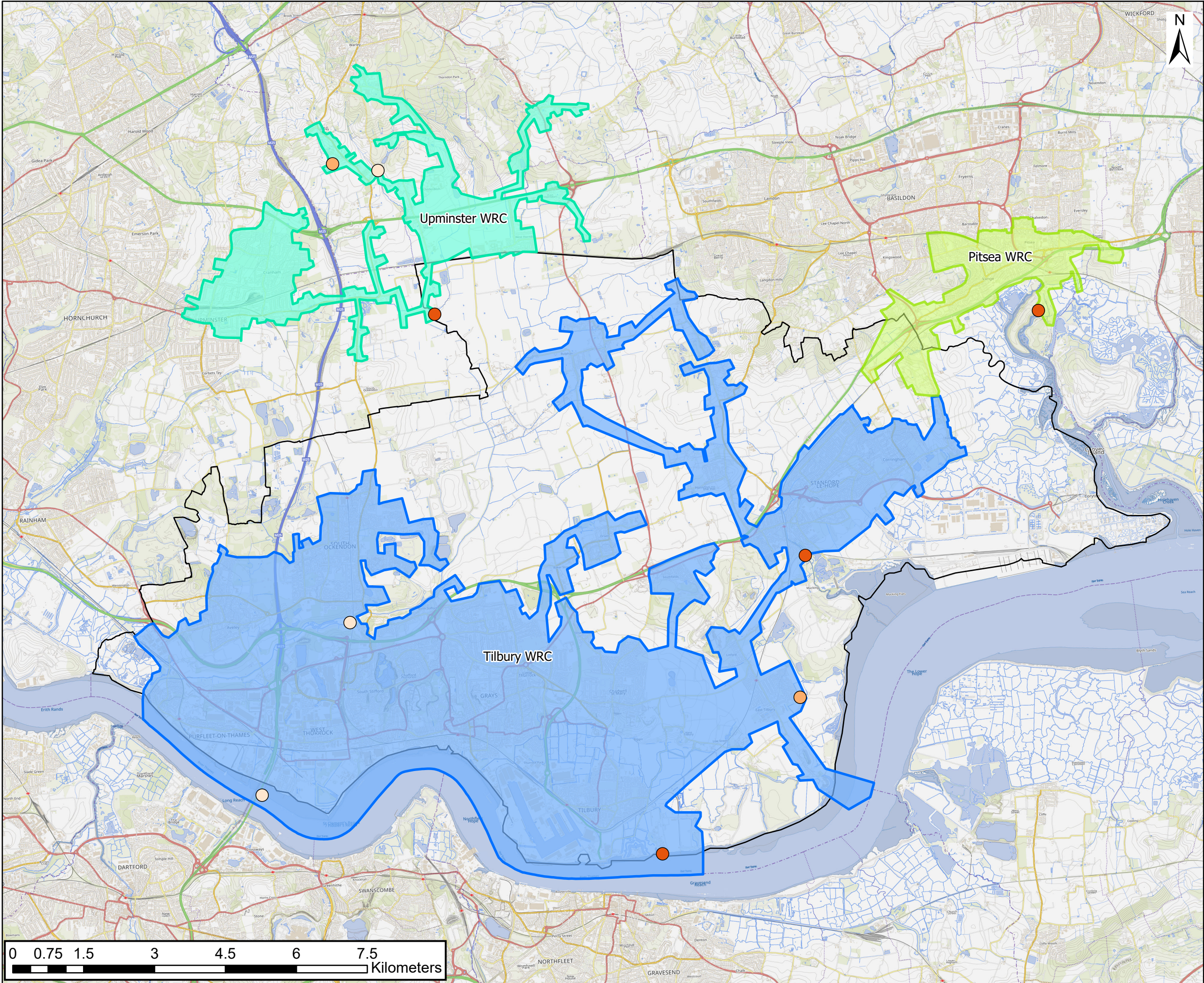
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FIGURE TITLE

Wastewater Assets

FIGURE NUMBER

Figure 2



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Thurrock Council

CONSULTANT

AECOM Limited
3rd Floor Portwall Place
Portwall Lane
Bristol, United Kingdom
T +44 (0)117 315 0700

LEGEND

- Thurrock Council Boundary
- CSO Location - Average Annual Spills
- Average
 - <5
 - 5-12
 - >12
- Tilbury Sewer Catchment
- Upminster Sewer Catchment
- Pitsea Sewer Catchment

NOTES

This map shows the average number of annual spills at each CSO location throughout the period 2021-2024

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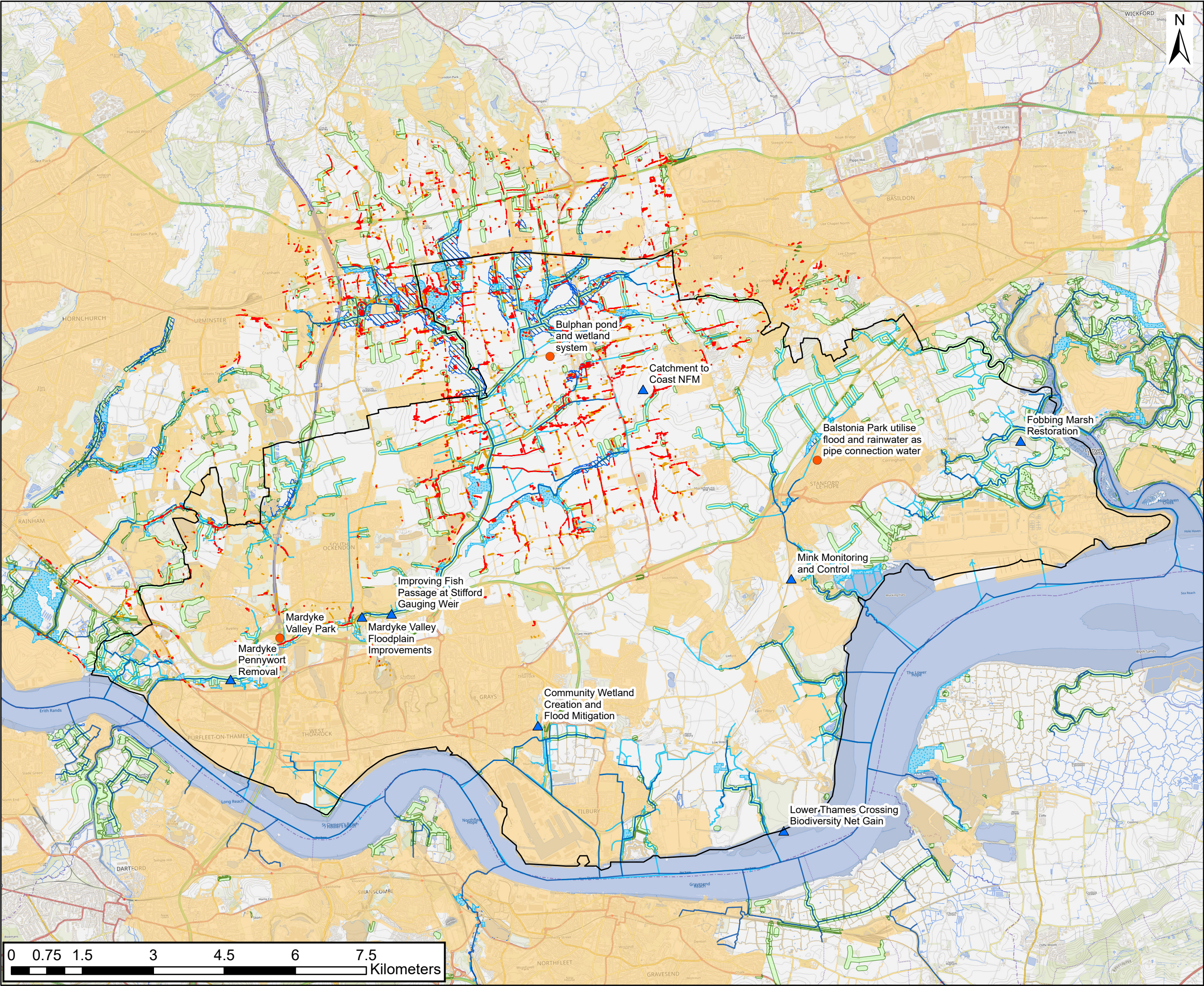
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FIGURE TITLE

CSO Count and Average Spill Frequency

FIGURE NUMBER

Figure 3



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Portwall Lane
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LEGEND

- Thurrock Borough Boundary
- Thurrock Blue Green Infrastructure Opportunities
- South Essex Catchment Partnership Opportunities
- Main River
- Ordinary Watercourse
- Runoff Attenuation Features 3.3% AEP
- Runoff Attenuation Features 1% AEP
- Floodplain ReconNECTION Potential
- Riparian Woodland Potential
- Floodplain Woodland Potential
- Woodland Constraints

NOTES

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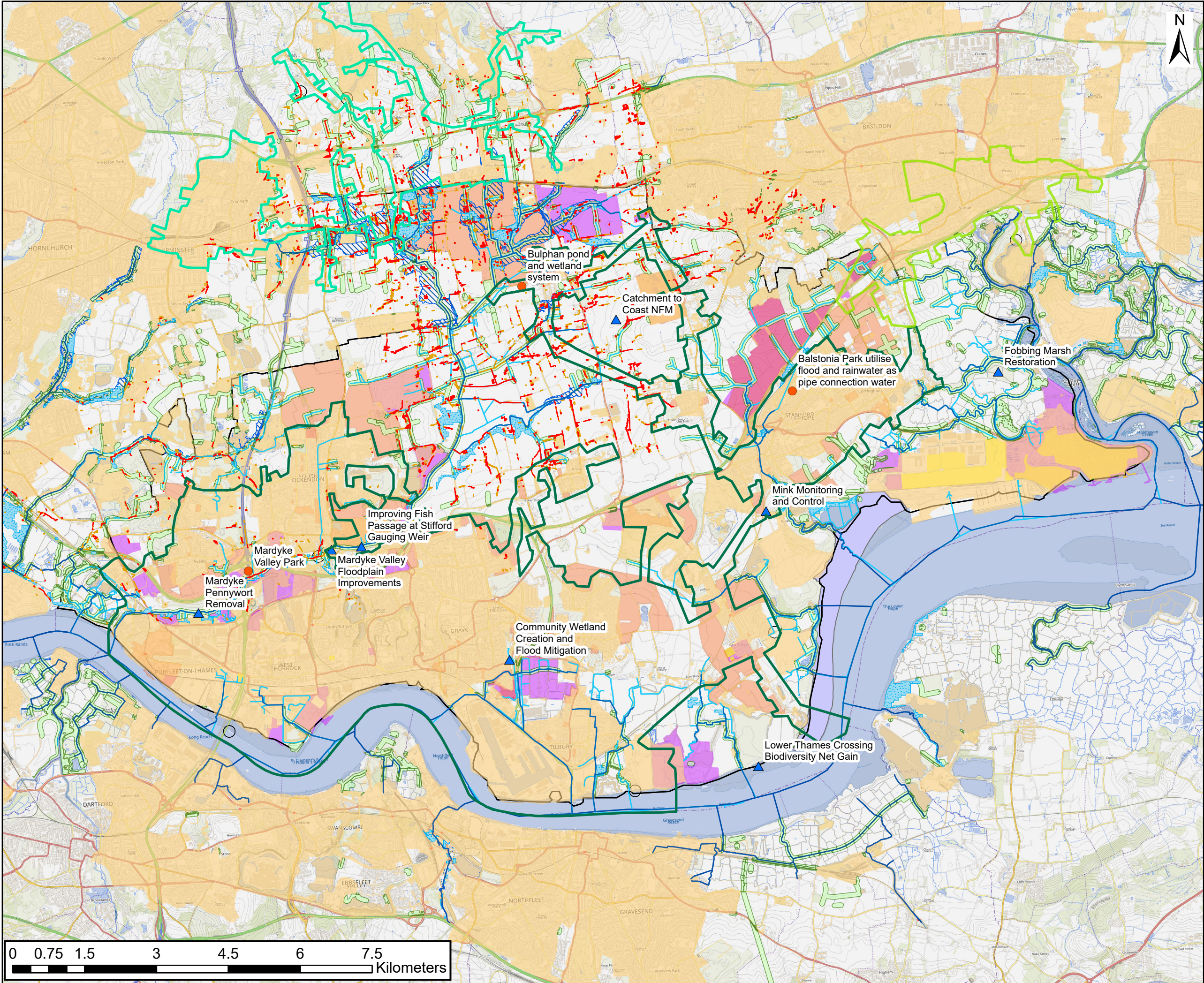
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FIGURE TITLE

Nature Based Solutions

FIGURE NUMBER

Figure 4



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3rd Floor Portwall Place
Portwall Lane
Bristol, United Kingdom
T +44 (0)117 315 0700

LEGEND

- Thurrock Council Boundary
- HLLA Housing Sites
- Potential Employment Sites
- Available Employment Sites
- Special Protection Area
- Thames Estuary & Marshes SPA
- Site of Special Scientific Interest
- Benfleet and Southend Marshes SSSI
- Canvey Wick SSSI
- Globe Pit SSSI
- Grays Thurrock Chalk Pit SSSI
- Hangman's Wood & Deneholes SSSI
- Holehaven Creek SSSI
- Langdon Ridge SSSI
- Lion Pit SSSI
- Mucking Flats and Marshes SSSI
- Pitsea Marsh SSSI
- South Thames Estuary and Marshes SSSI
- Swanscombe Peninsula SSSI
- Swanscombe Skull Site SSSI
- Vange & Fobbing Marshes SSSI
- West Thurrock Lagoon & Marshes SSSI
- Special Areas of Conservation
- CSO Locations
- Ordinary Watercourse
- Main Rivers
- Woodland Constraints
- Floodplain Woodland Potential
- Riparian Woodland Potential
- Floodplain Reconnection Potential
- Ordinary Watercourse
- Main River
- Runoff Attenuation Features 1% AEP
- Runoff Attenuation Features 3.3% AEP
- South Essex Catchment Partnership Opportunities
- Thurrock Blue Green Infrastructure Opportunities
- Tilbury WRC Catchment
- Upminster WRC Catchment
- Pitsea Sewer Catchment

NOTES

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FIGURE TITLE

Location of water dependent habitats and NBS relative to allocated sites

FIGURE NUMBER

Figure 5

Appendix G - Designated Site Background Detail

G.1 Thames Estuary & Marshes SPA / RAMSAR, legally underpinned by Mucking Flats & Marshes SSSI

Mucking Flats and Marshes comprise an extensive stretch of Thames mudflats and saltmarsh, together with sea wall grassland. Wintering wildfowl and waders reach both nationally and internationally important numbers on the mudflats, roosting and feeding on adjacent saltmarsh and disused silt lagoons.

The mudflats form the largest intertidal feeding area for wintering wildfowl and waders west of Canvey Island on the north bank of the Thames. Ringed Plover occur in internationally important numbers, with nationally important populations of Shelduck, Grey Plover, Dunlin, Black-tailed Godwit and Redshank. Other species occur in good numbers, with Avocet regularly present, sometimes in nationally important numbers. The mudflats and saltmarsh are also an important staging post for passage migrants, with significant numbers of waders such as Curlew sandpiper and an important late summer flock of yellow-legged herring gulls. The saltmarshes provide important high tide roosts, as do the disused silt lagoons at Coalhouse Fort. The value of the site is enhanced by its proximity to Cliffs and Cooling Marshes SSSI and Higham Marshes SSSI across the Thames in Kent, with which there is an interchange of roosting and feeding birds.

Between the sea wall and mean high water line lie areas of high level saltmarsh of a type uncommon in Essex. The vegetation is dominated by sea couch *Elymus pycnanthus* and sea purslane *Halimione portulacoides*, with sea aster *Aster tripolium*, common sealavender *Limonium vulgare* and common saltmarsh-grass *Puccinellia maritima*. Fragments of lower saltmarsh include glasswort *Salicornia spp.*, common cordgrass *Spartina anglica* and lesser sea-spurrey *Spergularia marina*, together with the nationally scarce golden samphire *Inula crithmoides*. The saltmarshes are truncated to their landward edge by sea walls, which in places are vegetated with a sward dominated by sea couch *Elymus pycnanthus*. The saltmarsh has a high invertebrate interest, which includes the rare spider *Baryphyma duffeyi*, as well as many notable and local species.

G.2 Holehaven Creek SSSI

The site consists of Holehaven Creek and part of the connecting Vange Creek and East Haven Creek. The tidal creek system acts as the principal drain for the surrounding grazing marshes and forms a confluence at Holehaven with the River Thames. The site is linked geographically and functionally with the wider Thames Estuary.

The intertidal mudflats and saltmarsh habitats of Holehaven Creek support a nationally important number of black-tailed godwit *Limosa limosa islandica*. This species also regularly occurs in numbers of international importance. The creek provides suitable conditions for black-tailed godwit, including an abundance of food in the mudflats (polychaete worms and bivalve molluscs), large areas of saltmarsh (e.g. Lower Horse) for high tide roosts and minimal levels of disturbance. These sheltered inner estuary conditions are rare within the Thames Estuary.

In addition to this, there are a number of features that are important within the context of the Thames Estuary. For example, the site regularly supports an assemblage of over 8,000 waterfowl during the winter, with curlew *Numenius arquata* and dunlin *Calidris alpina* occasionally occurring in nationally important numbers. Furthermore, Holehaven Creek supports two of the three basic saltmarsh communities characteristic of south-east and east England. These are formerly grazed saltmarshes with saltmarshgrass *Puccinellia maritima* and sea aster *Aster tripolium* often in extensive pioneer mid-marsh zones, and ungrazed or lightly grazed saltmarshes, typically with seapurslane *Atriplex portulacoides* being dominant.

G.3 West Thurrock Lagoon & Marshes SSSI

West Thurrock Lagoon and Marshes is one of the most important sites for wintering waders and wildfowl on the Inner Thames Estuary. The combination of extensive intertidal mudflats together with a large and secure high tide roost, attracts waders in nationally important numbers, with significant populations of other bird species. The adjacent Stone Ness saltmarsh is noted for the size and character of its high marsh plant community.

The lagoon is an important high tide roost for overwintering waders and wildfowl. Large reed beds with abundant common reed *Phragmites australis* and Sea Club-rush *Scirpus maritimus* border its south and eastern perimeter where Reed Warblers, Sedge Warblers and the notable Bearded Tit breed. In addition, locally important numbers of Teal, Snipe and Grey Heron roost on the shallow waters, grassy islands and lagoon margins. Recent changes in the management of the lagoon have improved the habitat as a high tide roost.

The mudflats form the single largest intertidal feeding area, for wintering waders and wildfowl, on the inner Thames estuary. In addition to providing a vital feeding area for the birds which roost on the lagoon, it is also regularly used as a low tide roost by migrant Common, Black and Arctic Terns, attracted by the rich food source around the warm water outfall from the adjacent power station.

Stone Ness saltings constitute the largest area of saltmarsh in the inner Thames estuary and are characteristically high marshes of low salinity. The vegetation is dominated by Sea Club-rush *Scirpus maritimus*, Sea Aster *Aster tripolium* and Spear-leaved orache *Atriplex prostrata*.

While the community is widespread in Essex it is more regularly found in small stands beside borrowdykes. Stone Ness is one of the few sites where it occurs outside the sea wall, and is unusually large in extent. Additional interest is provided by a wintering flock of several hundred mixed finches.

G.4 Grays Thurrock Chalk Pit SSSI

Grays Thurrock Chalk Pit is situated in the SW of Essex. Active mineral extraction ceased in the early 1920s and since that time natural colonisation of the pit bottom has created a range of woodland, scrub and calcareous grassland habitats that are important for the assemblage of invertebrate fauna they support.

The disused chalk pit lies about one mile north of the River Thames and two miles north east of the Dartford river crossings. Old records show that 25 ha of the quarry were excavated by 1860 and this had extended to about 40 ha when operations ceased shortly after the First World War in the early 1920s. The revegetation of the disused quarry represents the succession from bare chalk, through open grassland, scrub and young woodland to old woodland areas. The principal components of the scrub area, which is the most abundant habitat, are birch *Betula pendula* and *B. pubescens* with ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus* and oaks *Quercus petraea* and *Q. robur*. Shrubs include hawthorn *Crataegus monogyna*, spindle *Euonymus europaeus* and dogwood *Cornus sanguineus*. The ground flora is dominated by ivy *Hedera helix*. The areas of open grassland lie predominantly in the northern part of the site with rides and small clearings cut through the dense areas of scrub. There is an area of open water in the north east corner of the pit where the floor of the quarry dips below the water table.

The range of species within the following phylogenetic orders is an important feature: beetles (*Coleoptera*), moths and butterflies (*Lepidoptera*) and true flies (*Diptera*).

The beetle fauna is found in the full range of habitats across the site. *Mordellistena humeralis* and *M. neuwaldeggiana* are two Red Data Book (RDB) species that are thought to develop in rotting wood whilst the RDB beetle *Cryptocephalus sexpunctatus* is associated with hazel, birch, aspen or crack willow. The other twenty notable species include *Apion semivittatum*, a small weevil associated with ruderal habitats; *Apion flavimanum*, another weevil but associated with calcareous grassland or field margins and a water beetle *Hydroporus marginatus*, a southern species which is usually found in chalk and limestone streams. The flea beetle *Podagrica fuscipes* share the same host plant as the micro moth larvae of *Digitivalva perlepidella*, *P. fuscipes* larvae developing at the roots of plants whilst the larvae of

the moth *D. perlepidella* feed on the flowers and seeds of *Malva sylvestris*. Other moths include the RDB species *Dahlica triquetrala*, and currently 27 other notable species. The four RDB true flies include *Dicranoptycha fuscus*, a crane fly discovered in this country in the 1970s and so far only recorded from Kent and Essex. The life cycle of this crane fly is unknown but on the continent this species is associated with dry scrub and woodland. *Zodion notatum* larvae are probably parasitoids of certain solitary bees, though again, the precise hosts are unknown. The two other RDB true flies are *Chrysotus veralli* and *Platypalpus niveiset*. There are presently a further 11 notable true flies recorded recently from the site.

The assemblage of invertebrate fauna mean this site has the best concentration and diversity of calcareous invertebrate fauna in Essex. Some species, such as the notable spider *Centromerus serratus* and locally important spider *Entelecora flavipes* are found nowhere else in Essex.

The site is also noted for its flora which includes the largest populations of Round-leaved wintergreen *Pyrola rotundifolia* and Man Orchid *Aceras anthropophorum* in Essex.

G.5 Vange & Fobbing Marshes SSSI

Vange & Fobbing Marshes lie on the alluvial plain of the lower River Thames. The unimproved coastal grassland and associated dykes and creeks support a diversity of maritime grasses and herbs. Many of these species are nationally uncommon or rare, and together form an outstanding assemblage of plants.

The grassland is dominated by a mixture of grasses such as Creeping Bent *Agrostis stolonifera*, Sweet Vernal-grass *Anthoxanthum odoratum*, Soft-brome *Bromus hordeaceus*, Crested Dog's-tail *Cynosurus cristatus*, Cock's-foot *Dactylis glomerata*, Common Couch *Elymus repens*, Red Fescue *Festuca rubra*, Cat's-tails *Phleum spp.*, and Meadow-grasses *Poa spp.*, with such characteristic herbs as Hairy Buttercup *Ranunculus sardous* and Grass Vetchling *Lathyrus nissolia*. Coastal species, which are inherently restricted in their distribution and therefore nationally uncommon, include Sea Barley *Hordeum marinum*, Slender Hair's-ear *Bupleurum tenuissimum* and Sea Clover *Trifolium squamosum* which grow on the sea walls, whilst Stiff Saltmarsh-grass *Puccinellia rupestris* is found along the margins of the main fleet at Fobbing. Herbs which are uncommon in Essex include Hound's-tongue *Cynoglossum officinale*, Corn Parsley *Petroselinum segetum* and Narrow-leaved Bird's-foot-trefoil *Lotus tenuis*. Least Lettuce *Lactuca saligna*, a national rarity which is specially protected under the Wildlife and Countryside Act 1981, has its main British population at this locality.

The uncommon Brackish Water-crowfoot *Ranunculus baudotii* occurs in the brackish ditches in which Sea Club-rush *Scirpus maritimus*, Common Reed *Phragmites australis* and Floating Sweetgrass *Glyceria fluitans* are typically dominant. Fine-leaved Water dropwort *Oenanthe aquatica*, a declining species in Essex through the general infilling of ditches, is also present.

The combination of grazing land, water courses and fringing saltmarsh also provides an ideal habitat for numerous invertebrates and birds. Two species with very restricted national distributions, the Scarce Emerald Dragonfly *Lestes dryas* and Roesel's Bush Cricket *Metrioptera roeselii*, occur as well as such locally important species as the Great Green Bush Cricket *Tettigonia viridissima* and the Velvet Ant *Mutilla europaea*. Anthills formed by the Meadow Ant *Lasius flavus* are numerous in the grassland. Significant numbers of Redshank breed on the pastures, while Short-eared Owls frequently hunt along the sea walls during the winter.

G.6 Inner Thames Marshes SSSI

The Inner Thames Marshes form the largest remaining expanse of wetland bordering the upper reaches of the Thames Estuary. The site is of particular note for its diverse ornithological interest and especially for the variety of breeding birds and the numbers of wintering wildfowl, waders, finches and birds of prey, with wintering teal populations reaching levels of international importance. The Marshes also support a wide range of wetland plants and insects with a restricted distribution in the London area, including some that are nationally rare or scarce.

The site comprises a major relic of low-lying grazing marsh with a variety of grassland communities dissected by a network of fresh to brackish water drains. These Marshes are divided into two main blocks by an extensive series of bunded lagoons used for the disposal of silt dredgings. The discharge of silt and river water into the lagoons produces a changing complex of dry or flooded mud flats and developing saltmarsh. These lagoon habitats are complemented by more restricted areas of naturally derived saltmarsh and intertidal mud along the Thames foreshore.

The grazing marshes are dominated by the more common grasses of neutral soils and are of interest on account of their structural characteristics. An open, short, tussocky grassland structure has been created on the eastern Wennington and Aveley Marshes where traditional management by sheep and cattle grazing is continued. This contrasts with the tall ungrazed grasslands on the Western Rainham Marshes. The grasslands, particularly those on the Wennington and Aveley Marshes, are also important for the large extent and abundance of divided sedge *Carex divisa*. This nationally scarce plant is a characteristic species of the Thames estuary but its distribution along with other species has become much decreased with a widespread and continuing loss of grazing marsh habitat. The Aveley Marshes are additionally of note for the local abundance of ant hills.

Where the water table is high, some marsh drains remain flooded throughout the year while others are flooded on a seasonal basis. These drains are characterised by a limited range of aquatic and emergent plants, several of which are rare or scarce in the London area. These include lesser pondweed *Potamogeton pusillus*, threadleaved watercress *Ranunculus trochophyllous* and two nationally scarce species: soft hornwort *Ceratophyllum sumersum* and brackish water-crowfoot *Ranunculus baudotii*. Elsewhere the drains are largely dominated by common reed *Phragmites australis*. The seasonally wet drains and shallow depressions scattered amongst the grasslands hold a different wetland flora. This includes locally scarce species such as saltmarsh rush *Juncus gerardii* and pink water-speedwell *Veronica catenata*. In places these seasonally wet areas are also important for the occurrence and abundance of the nationally scarce marsh dock *Rumex palustris* and the nationally scarce and decreasing golden dock *Rumex maritimus*. One of the drains on Rainham Marshes is more saline and supports a strong population of stiff saltmarsh-grass *Puccinellia rupestris*, a further nationally scarce plant now only known in the London area from this locality and elsewhere in the site: a few shallow depressions on the Wennington Marshes.

Surveys in recent years have revealed a diverse and important invertebrate fauna which includes Rec Data Book and nationally scarce species of dragonflies (*Odonata*), moths (*Lepidoptera*), beetles (*Coleoptera*) and flies (*Diptera*). Most of this interest is centred on the areas of grazing marsh, especially the network of drains. These support a moderately rich fauna which differs quite markedly from that found on the majority of the remaining Essex and Kent marshes along the outer part of the Thames estuary in being strongly characterised by species of freshwater conditions. Molluscs and beetles are well represented and several nationally scarce and local species occur such as water snail *Bithynia leachii* and the water beetles *Noterus crassicornis* and *Helophorus nanus*.

The invertebrate species recorded from the drains also includes specialists of brackish water conditions. Among the nationally rare species are the 'scarce' emerald damselfly *Lestes dryas* (Vulnerable) and a meniscus midge *Dixella attica* (Rare) as well as several other species which are nationally scarce such as the water beetles *Agabus conspersus* and *Haliplus apicalis*. Overall, the invertebrate community provides an unusual example in the Thames estuary of an assemblage at the freshwater end of the transition from fresh to brackish conditions.

The marsh grasslands support a further range of important invertebrate species with differences between the grazed and ungrazed areas. Insects present and which are nationally scarce include Roesel's bush cricket *Metrioptera roeselii*, the wormwood moth *Cucillia absinthii* and a hoverfly *Tropidia scita*. The invertebrates supported by the areas of saltmarsh along the Thames foreshore are less recorded but include a rare spider *Baryphyma duffeyi* (provisional RDB category 3: Rare).

G.7 Langdon Ridge SSSI

Langdon Ridge SSSI is a landscape-scale interconnected area of conservation priority located to the south and west of the town of Basildon. It supports a diverse mosaic of semi-natural habitats, including grasslands, fen meadows, woodlands, scrub, species-rich hedgerows and ponds. The SSSI includes

the following areas: Dunton Plotlands and Lincewood, Langdon Hills Recreation Ground, Hall Wood and Gravelhill Wood, Marks Hill Wood, Westley Heights, Long Wood, Willow Park, Coombe Wood and The Park, Old Hill and Great Sutton Woods, Northlands Wood, One Tree Hill and Hawkesbury Bush.

The underlying geology of the area is composed of Bagshot Sand overlying Claygate Beds and London Clay. The southerly slopes that characterise the Hawkesbury Bush area lie on a transition zone onto the Claygate formations. The higher points are capped with flint gravel, known as 'Pebble Gravel' or 'Stanmore Gravel'. Historically this gravel was used for road mending and depressions from such excavations can still be detected. The sands and clays of the ridge once supported historic brick and tile making industries in the area.

The Langdon Ridge is influenced by the history of the 'Plotlands'. These were small plots of rural land sold, mainly to Londoners, in the first half of the 20th century. These plots were used to build weekend cottages, holiday bungalows or small holdings. The last of the 'Plotlands' were abandoned in the 1980s but the grid of grass avenues and remains of bungalows can be seen amongst the mature scrub at Dunton Plotlands.

The building of Basildon New Town during the 1950s to the 1970s transformed the area and Langdon Ridge is now situated directly on the urban fringe. Several of the meadows, especially in Willow Park, were top-soil stripped in preparation for development as part of the New Town proposals but the development plans were later abandoned. The resulting removal of nutrients has almost certainly benefited the botanical richness of these meadows.

G.8 Purfleet Chalk Pits SSSI

Mid-Pleistocene sand and gravel deposits overlying Chalk are exposed in a series of disused quarries at Purfleet, Essex. The complex lithostratigraphical and biostratigraphical evidence contained at Purfleet clearly indicates the importance of this site in the scientific study of both the evolution of the Thames and Northern European interglacial sequences.

At Purfleet Chalk Pits, fluvially derived sands and gravels overlie Chalk. These sands and gravels are terrace deposits associated with the development of the River Thames. They are separated from the present-day Thames by the Purfleet Anticline and now lie in the valley of the Mar Dyke.

These Lower Thames deposits are extremely variable and include sands, gravels, chalk rich shelly facies and laminated beds, possibly of estuarine origin. Site investigations have yielded rich mammal, mollusc, pollen and ostracod records, which provide important evidence of both the environmental and fluvial conditions at the time of deposition. In addition to the palaeo-environmental information contained within the terrace deposits, up to three separate palaeolithic (archaeological) horizons have also been recorded.

This terrace sequence has been most recently attributed to the Middle Pleistocene Corbetts Tey Formation, although earlier work suggests that the deposits are older, placing them in the Boyn Hill Terrace Formation.

