Waltham Forest Strategic Infrastructure Plan
Utilities & Physical Infrastructure Needs Assessment

Client - London Borough of Waltham Forest
In association with Integrated Services & Utilities Ltd

November 2009
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Utilities and Physical Infrastructure Needs Assessment

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1. INTRODUCTION

1.1. Purpose and Scope

Waltham Forest is a densely populated London borough covering an area of 38km² with a population of over 226,000. It is a dynamic and ethnically diverse borough in the North East of London. The area is at the confluence of a number of social, economic and environmental opportunities, being part of the Lea Valley, the London-Stansted-Cambridge corridor and in strategic proximity to the Olympic Development Opportunity Area.

The Sustainable Community Strategy sets out that the key to a successful future for the borough is increasing the prosperity of all its residents. Jobs, the relevant skills and good access to them, are the priority. Our Place in London sets out what the Council needs to do and how increasing prosperity will change life in the borough for the better. In summary, the Council’s ambition for the future is that:

1. The borough is vital to London’s success, particularly relating to the legacy of the Olympics and Stratford City
2. People aspire to live here
3. All its children are happy, resilient and successful
4. None of its residents live in poverty
5. Vulnerable people get the support they need
6. It is the greenest borough in London

The predicted increase in London Borough of Waltham Forest’s (hereafter referred to as ‘LB Waltham Forest’) population and housing provisions over the next 20 years, as determined by the Greater London Authority, will create increased pressure on the existing infrastructure within the borough and will in turn generate a need for the provision of further green, physical and social infrastructure.

In order to be genuinely sustainable, the anticipated housing and employment growth will need to be supported by the timely delivery of the necessary infrastructure. Strategic infrastructure, including transport and utilities will be needed, as well as more localised social infrastructure, such as schools, healthcare services and community facilities, police and emergency services.

This Strategic Infrastructure Plan assesses these needs and has been developed through a process of collaboration with the Council and the Local Strategic Partners. This study sets out the infrastructure capacity and future needs for the borough. The plan will be utilised to inform land use and growth allocations in the Local Development Framework (LDF).

This technical report is part of the Waltham Forest Strategic Infrastructure Plan. The purpose of this report is to identify the utilities and physical infrastructure needs of the
London borough of Waltham Forest (hereafter referred to as LB Waltham Forest) over the period 2009 to 2026.

The report supports the principles and priorities in the Core Strategy Issues and Options, which outline the challenges and requirements in which Waltham Forest Council will work to ensure the provision of facilities and services for the community. Utilities and physical infrastructure is an important element to address when assessing the increase in population up to 2026.

In particular, the report examines the following types of infrastructure:

- General utilities (water, energy and telecommunication)
- Foul and surface water drainage (sewerage and flood risk)
- Waste management facilities
- Emergency services (police, ambulances and fire).

1.2. Planning for Utilities and Physical Infrastructure

Utilities, waste management facilities, flood risk measures and emergency services are essential for development to go forward and for communities to adapt to a growing population. However, strategic planning for their delivery can prove challenging, as explained in greater detail below.

The primary, if obvious, reason for this is that local planning authorities are not directly in charge with planning for the provision of utilities and physical infrastructure. Utility providers are private companies that operate in a private market, albeit heavily regulated to ensure that the incentives to under provision are minimised, where they contract arrangements directly with their end users. Similarly, flood defence in Waltham Forest involves a number of bodies including Thames Water, in its capacity as sewer operator, and the Environment Agency, as the agency responsible for overseeing regulatory responses to minimise flood risk. Waste management is predominantly planned by the North London Waste Authority, which is a planning body including the LB Waltham Forest in co-operation with the other North London authorities. Finally, emergency services are provided by Greater London wide agencies, namely the Metropolitan Police, the London Ambulance Services NHS Trust and the London Fire Brigades.

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1 Furthermore, competition has meant that third parties can install a network and then seek adoption by the host operator (broadly following conventional techniques, albeit not using host operator direct labour teams). Under particular circumstances, a third party may also request the host network operator to provide a boundary point of connection and install an ‘inset’ or ‘island’ network that is totally independent, in terms of interconnectivity, of the surrounding historical network. The protocols associated with operational targets remain, given that the third party vehicles are basically bound by the same rules as the host operators.

2 This is the case even if Waltham Forest Council is responsible for the collection and management of waste.

Secondly, the physical facilities and infrastructure under investigation are not provided in unitised form, but are delivered in variable sizes and capacities. Whilst we are able to model the additional demand for electricity, gas, water and sewerage for Waltham Forest's sub-areas areas up to 2026, URS is not in a position to translate this additional demand into requirements for physical infrastructure without assistance from the relevant agencies, which is not always readily forthcoming.

Thirdly, all the infrastructure areas covered within this report are managed and/or planned for at a geographical level that is wider than Waltham Forest's administrative boundaries. Waste disposal is planned at the North London level and emergency services at the Greater London level. Utilities providers cover even wider geographical areas, with the Thames Water region in which Waltham Forest is located extending over most of the Thames Valley. This means that baseline information and forecasts are unlikely to be available at the Waltham Forest level, with ad hoc (and expensive) modelling exercises required if the implications of growth within the borough are to be accurately assessed in terms of additional physical requirements. For this reason, it should be noted that it has not been possible to definitively conclude an assessment of specific infrastructure requirements for some utilities.

Fourthly, whilst providers plan at a wider geographical level, the time horizon tends to be short (or sometimes medium) term only. For instance, utility companies work on the basis of five year plans. Utilities providers in particular tend to adopt a reactive rather than proactive approach that subsequently reflects a given solution for a particular development. Also, each of the providers works under different growth assumptions, which do not necessarily relate to local authorities’ residential and commercial growth targets and aspirations. As a result even if the planning horizon were in line with the LDF planning period (2026) period, the demand for additional services that they would estimate as part of their own planning process would be likely to differ substantially from what would emerge from the Council’s growth trajectory.

Finally, the demand for some of the infrastructure covered in this report is not proportionally linked to population or employment growth. In the case of emergency services for instance, the demand of additional staff and the associated physical facilities are driven by historical rates of provision or political decisions taken from time to time to prioritise provision of additional resources, and flood risk measure are partly driven by climate change and national policy. With regards to utilities, it is possible to estimate the additional demand arising from the projected residential and commercial growth. However, estimating the extent and cost of the associated physical infrastructure needs is practically impossible at a strategic level, as the specifics of the location of need and of the individual sites are the key determinants of the scale and cost of works.

3 For instance, Thames Water is likely to charge the Council in the region of £50,000 to undertake a detailed assessment of the impact of projected growth for the entire borough.

4 Thames Water also has a 25 years plan which does not however provide investment details beyond 2015.

5 For instance the Metropolitan Police Authority estimate future needs based on the number of emergency calls and crime at the local authority level, although it considers both the projected population and any large scale development coming forward.
For all the aforementioned reasons the approach of this utilities and physical infrastructure needs assessment differs from the one adopted to identify the impact of growth on social infrastructure and transport.

1.3. Approach and Structure

Research Methods

This report has been prepared as a technical study and is a desktop review that has drawn on published written sources of information; information provided by various; and phone interviews and meetings with various utilities and services or infrastructure providers and agencies; and additional written information provided by those agencies. A detailed list of sources is provided in footnotes in the relevant chapters.

Waltham Forest Infrastructure Model

URS has produced a bespoke Waltham Forest Infrastructure Model that can be used to help assess and model the demand for infrastructure arising from development. However, the Model is of most use for assessing demand where there is a clear and direct relationship between residential and/or commercial development and infrastructure that is measurable at the local level. This is not the case for infrastructure such as flood defence or waste, but can be used (to a degree) to assist in modelling demand for utilities. Hence the model has only been applied as follows:

- URS has modelled expected future flows for water and sewerage and loads for energy (including gas and electricity), and discussed the implications from a sustainable energy perspective. However URS has not modelled the physical requirements associated with such expected flows and load6.
- For the physical infrastructure associated with flood risk, waste management and emergency services URS did not model future demand.

With regard to looking at the spatial distribution of growth and for the purposes of this study, the borough is broken down into four areas for which residential and commercial development growth has been forecasted (see Figures 1-1 and 1-2 for the two development scenarios).

Appendix A sets out all of the assumptions made in the model by infrastructure area.

Growth Scenarios

The LDF process sets out how new development will be planned for and managed over the next 15 years. However, for consistency with the London Plan, LB Waltham Forest will plan forwards to 2026. To ensure that the assessment of infrastructure requirements is as robust as possible, forecasts for development have been divided into two five-year

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6 Planning undertaken by utilities companies is generally reactive rather than proactive. It also depends on complicated flow modelling to which each respective utilities company solely holds the rights. EDF, National Grid and Thames Water would need to undertake the assessment themselves to ensure that the impact of growth on their entire network is fully considered.
development periods to 2019 and one seven year development period extending to the planning horizon of 2026. As there is a greater level of uncertainty of the precise nature of development post 2019 it is not as important to apply the five-yearly phasing framework from this point on.

The GLA’s housing targets for the borough are based on historic housing land availability assessments (at a strategic level) and were updated by the 2008 Housing Land Availability Study commissioned by the Council. A range of housing development of between 665 and 710 new homes per annum seems to be the consensus of separate studies and is accepted as the target by Waltham Forest Council. However, emerging information from the ambitious regeneration programmes in the borough indicate that a greater level of housing development may be possible. We use this emerging information to test the implications of growth at a higher rate to understand what infrastructure would be required in this scenario.

The emerging information suggests that up to 21,260 new homes could be developed in the borough from 2009-2026. This is almost double the 11,410 new homes expected by the most recently published GLA document. These two growth rates form two scenarios - the lower growth rate as presented in the 2008 Round Demographic Projections and a higher growth scenario as determined by emerging Council information. The lower growth scenario will inform the next stage of the LDF process, whereas the higher growth is a test of the upper parameters of possible housing development. Table 1-1 presents the two housing development scenarios.

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7 This housing trajectory is used for the lower growth scenario rather than that of the Waltham Forest Housing Land Availability Study because it is based on the most up-to-date information published by the GLA and was developed in consultation with Waltham Forest Council; it is consistent with the London Plan timeframe to 2026; it is closer to the current London Plan target of 665 new homes per annum; and it is used to produce a set of ward-level population projections that can inform the assessment of infrastructure requirements in this study.
Table 1-1: New Housing Projections by Sub-area, 2009-2026

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<td>2,290 8,778</td>
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<td><strong>3,445 7,350</strong></td>
<td><strong>4,520 8,696</strong></td>
<td><strong>11,410 21,260</strong></td>
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Source: 2008 Round Demographic Projections, 2009 (GLA DMAG) background tables, Waltham Forest Council

Sub Areas

In planning infrastructure for growth, PPS12 confirms that it is often relevant to consider the location of growth and relative issues of growth in different locations. To this end, we have divided the borough up into four sub-areas, determined largely by urban character and locations for major new housing development. The sub-areas follow ward boundaries. There are three main character areas in Chingford to the north - Northern Waltham Forest sub-area, Walthamstow centre - Central Waltham Forest sub-area - and Leyton - Southern Waltham Forest sub-area - to the south-east. Blackhorse Lane to the west of Walthamstow town centre is a focus for significant regeneration.

However, as discussed in Section 1.2 understanding the need for utilities and physical infrastructure faces some peculiar challenges, which make detailed analysis at such a low geographical level either not appropriate or not feasible in the context of such a strategic piece of work. Wherever possible therefore the projected demand for specific facilities has been estimated at the sub-area level, this is the case for water, energy and sewerage. For other types of infrastructure sub-areas are considered to discuss potentially sub-area specific issues, but no detailed assessment has been undertaken.

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8 The housing trajectory for Waltham Forest is estimated by sub-area by applying the Council’s expected locations and quantum of growth to the figures.

9 Further detail of how the sub areas and sub-areas have been defined is provided in the Waltham Forest Infrastructure Study: Executive Summary and Strategic Infrastructure Plan
Figure 1-1: Waltham Forest’s Development Trajectory, 2009 to 2026, Lower Growth Scenario

Waltham Forest 2009 - 2026 Lower Growth Trajectory

### NORTHERN WALTHAM FOREST

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### TOTAL BOROUGH

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### SOURCES

- Based on joint analysis by London borough of Waltham Forest and URS Corporation.

Northfleet

Total Forecast: 3,064

Blackhorse Lane

Total Forecast: 2,200

Central Waltham Forest

Total Forecast: 3,758

Southern Waltham Forest

Total Forecast: 2,200

*Source Based on Joint analysis by London borough of Waltham Forest and URS Corporation*
Figure 1-2: Waltham Forest's Development Trajectory, 2009 to 2026, Higher Growth Scenario

Waltham Forest 2009 - 2026 Higher Growth Trajectory

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Source Based on Joint analysis by London borough of Waltham Forest and URS Corporation
Report Structure

The report has a two-level structure:

- First, the report is broken into a series of sections that deal with each type of infrastructure in turn.

- Secondly, each section is then laid out in accordance with the approach that has been taken to investigate the implications of growth for that type of infrastructure.

In terms of the upper level, the report is structured as follows:

- **Part A** covers general utilities infrastructure including:
  - Water
  - Energy
  - Sustainable Energy
  - Telecommunications

- **Part B** covers foul and surface water drainage including:
  - Sewerage
  - Flood risk

- **Part C** covers waste management.

- **Part D** covers emergency services including:
  - Police
  - Ambulance and
  - Fire services

For each type of infrastructure listed above the corresponding section is set out to reflect the approach that has been taken to examining the demand and resulting need (where it has been possible to reach a definitive conclusion) for infrastructure. Figure 1-2 below illustrates this process and is followed by an explanation of the approach.
In terms of the structure within each section corresponding to a different type of infrastructure a common, albeit flexible, approach has been adopted to ensure consistency whilst also accounting for the differences in the level of information available and in the operational arrangements between infrastructure types. The assessment is structured in accordance with a step-by-step process as described below:

- **Context**: This section sets out the framework for provision of each infrastructure item. It also defines the scope of the analysis.

- **Policy**: This section sets out the relevant policy driver for each type of infrastructure and the context in which providers operate.

- **Baseline**: This section provides an account of the baseline position with respect to the existing level of provision of the infrastructure in question, and any imminent (and therefore certain) planned investments that will add to existing provision. Where possible, detail is given as to how the forthcoming infrastructure provision has been funded and its cost. It finally concludes on the adequacy of existing and committed infrastructure.

- **Estimating future demand** (provision standards or policy requirements and related issues or trends):
  - For the infrastructure areas covered in **Part A** of this report (general utilities) and for sewerage (**Part B**) the industry follows certain provision standards, and these standards are the ideal means for estimating future demand for utilities.
Demand arising from growth:

- For the infrastructure covered in Parts C, D (waste and emergency services) and for flood risk (Part B) policy requirements at the national, regional and local levels are referenced wherever available.

- Trends or issues that could impact upon future provision are also explored as part of this section.

**Demand arising from growth:**

- For the infrastructure covered in Part A (general utilities) and for sewerage (Part B) of this report this section sets out, with reference to the Infrastructure Model, the extent and location of future additional demand for services.

- For the infrastructure areas covered in Parts C, D (waste and emergency services) and for flood risk (Part B) the section instead sets out and discusses the infrastructure needs, any additional action that would help the Council accurately estimate the impact of projected growth on the relevant infrastructure area and ensure that additional demand is not unmet.

**Resulting infrastructure requirement:**

- For the infrastructure covered in Part A (general utilities) and for sewerage (Part B) of this report this section discusses the likely implications for the provision of new facilities to provide a broad understanding of the scale of the requirements associated with the projected levels of growth. It also identifies, with reference to the Infrastructure Model, when the additional demand is likely to come forward. It discusses how/whether the infrastructure can be provided over a funding cycle.

- For the infrastructure areas covered in Parts C, D (waste and emergency services) and for flood risk (Part B) this section highlights whether the projected phasing of residential and commercial growth is expected to trigger the need for additional provision.

**Funding of infrastructure:** The section sets out the funding options to support the delivery of any infrastructure facilities or studies and investigations identified in the infrastructure needs assessment section. If appropriate, the section differentiates between financial resources available to fund both local and strategic infrastructure.

**Summary and Recommendations:** This section sets out a summary of the infrastructure needs assessment findings, together with any recommended actions or a list of infrastructure requirements wherever appropriate.
PART A – GENERAL UTILITIES

2. WATER

2.1. Context

Scope

Drinking, or potable, water for Waltham Forest is afforded via a system of pipes, owned and operated by Thames Water, laid under the streets of the borough. The water is frequently monitored to ensure that it is safe to drink.

This section aims to review infrastructure that currently exists and establish what the water network is capable of doing when compared to what it actually does. Taking into account the natural, or ‘organic’, growth in usage (infill development for example) as well as the projected impact of the aspirations of the borough, risks and opportunities to delivering the proposed growth should subsequently be established.

Management Arrangements and Responsibilities

As previously identified, the incumbent water network operator for Waltham Forest, and the majority of London plus the Thames Valley, is Thames Water. Thames Water is the historic Water Board privatised in 1988 as part of a Government programme and is responsible for the safe operation of the water network.

Waltham Forest is part of the London Water Resource Zone (WRZ), which is defined as an area within which all water resources can be shared, ensuring that all customers experience the same level of service. Water resources are planned at a WRZ level. The largest WRZ in Thames Water’s area is London which covers the Greater London area. Within each Water Resource Zone (WRZ), there are numerous water supply zones that are more local networks which interconnect and support each other.

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10 For both Part A and Part B Waltham Forest Unitary Development Plan (2006) is generally the most relevant planning document, to which therefore the report refers to. Where appropriate reference to the Core Strategy Issues and Options document is also made.

11 Consultation with Thames Water has not resulted in a detailed understanding of the current and future capacity conditions in the borough. Therefore this section discusses water provision in Waltham Forest mostly based on a desktop assessment of publicly available information and the estimated demand calculated in the Waltham Forest Infrastructure Model.

12 The Thames Water region includes most of the Thames catchment area, from Warwickshire to Sussex and from Gloucestershire to Essex.

13 The other five WRZs, SWOX (Swindon, North and South Oxfordshire), Kennet Valley, Henley, SWA (Slough, Wycombe and Aylesbury), and Guildford are collectively called the Thames Valley WRZs.
Thames Water are tasked, via obligations placed upon them by the regulator OFWAT and the Water Act of 1989, to supply potable water to the borough. They are subsequently measured in terms of performance by various means, including security of supply and quality of drinking water.

Thames Water review their network against known development and project capital expenditure programmes to match their obligations, noting that there is also an inherent weakness that encourages reactive management in many instances. In essence, whilst Thames Water do consider the forward planning of asset replacement and capacity provision, the system, particularly at a local level, only reacts to developments that are actively in planning and therefore any extension of the network is geared to that sole requirement, generally limiting opportunity to plan for the wider area. This reactive approach also encourages financing to be developer lead although future revenues are acknowledged when pricing of new mains is undertaken.

The use of boreholes that draw water from aquifers can also be a source for end users but for the majority, river water is used. All water extraction is managed by the Environment Agency who are responsible for the general well being of the wider water system in the UK.

**Waltham Forest’s Water System**

Waltham Forest’s water network is part of the wider London network that began predominantly in the Victorian era and subsequently extended as additional requirements have been identified. The network is based upon large cross sectional diameter mains that decrease in size until service pipes afford final connection into individual properties.

The pipes are a mixture of material, nowadays using polyethylene but historically a mixture of ductile iron and/or lead was prevalent.

Thames Water manages the network in and around Waltham Forest, which is part of an area defined as the London WRZ. **Figure 2-1** shows the London WRZ and the other zones managed by Thames Water; please note that Thames Water manage sewerage as well as potable water and this does not necessarily reflect the same boundaries as the area for sewage is larger than that of clean water.
Clean water resources for Waltham Forest, and London in general, are largely based on abstraction from the River Thames and River Lee, and subsequently stored in reservoirs at Crossness, near Bexley, and Walthamstow Marshes. There are minor boreholes that are used as well as a new de-salination plant at Beckton to support the overall process.

**Drinking Water Provision**

‘Raw’ water is taken from a variety of both natural and manmade resources including rivers and lakes and reservoirs and transported via pipes to the treatment works.

The pipes take the water to an underground service reservoir or a water tower. The reservoirs are covered with grass or gravel so that the water will stay clean. When the pipes lead to a water tower, the water is pumped to the top, then gravity will transport the water to houses and factories.

From here water travels through smaller mains, flowing into the network of pipes in our towns and cities. All the water that then flows into our homes is of drinking water quality. In some areas it can take up to a week for the water to get from the treatment works to our homes and more chlorine will be added to ensure that it is still clean when it comes through to our taps.

*Source: waterguide.org.uk*

The service pipes that provide water to individual properties are installed of a size that reflects the requirement of the building; this too is true of mains in the road. A main located in a main thoroughfare therefore is likely to have a greater cross sectional area than, for instance, a main that services a secondary road. Likewise, a pipe that serves a swimming pool is likely to be greater in cross sectional area than that of an individual dwelling.
Typically, and as an example only, two storey dwellings will use a 25mm² or 32mm² service pipe for each unit; for an apartment building, the intake is likely to be, indicatively, 63mm².

To ease both the impact on the water network and to provide suitable pressure, particularly in high rise buildings, it is normal to store water in tanks and use pumps. For developments of semi detached or detached properties, generally not exceeding three floors, this is not required.

The management of the impact on the water system by storage means that buildings store enough water to manage normal consumption and the tanks are then replenished with a steady ‘trickle’ rather than a substantial draw down that would cause problems on the wider network. With enough storage, and as an example only, a large building could run off the same size service pipe as that of a single residential unit: in reality, this would not be the case but the point is hopefully demonstrated.

The sizing of all mains and services is critical as Thames Water provide a minimum pressure of 1Bar for the purposes of getting appliances, such as washing machines, to work and also to keep the water flowing; this latter point is crucial as water needs to be kept moving in the distribution system.

If the assumption is made that water is effectively a ‘food’ item, there is a need to consider this in the context of health; water therefore that doesn’t flow can stagnate and this inaction may generate bugs that subsequently cause illness in humans.

2.2. Policy

In the context of the study undertaken the assessment of the water network is necessary, when considered against the impact of ever increasing demand incurred by development, as there is a finite level of capability contained within the existing system.

The Waltham Forest Unitary Development Plan (2006) requires all developments and developers to consider the following guidelines:

- Protecting existing drinking water and foul water infrastructure
- Making sure development incorporates efficient water and foul water infrastructure
- Ensuring development does not cause harm to the water environment and / or water quality

To reflect national policies, Thames Water submit a water management plan to the Secretary of State for the Department of Environment, Food and Rural Affairs (DEFRA), who then seeks a technical review from the Environment Agency to ensure that economic

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and environmental aspects are fully considered. OfWAT, the Regulator, subsequently assesses the draft proposal against the context of the AMP5 business plan. Once the process has been reviewed and commented upon, the Secretary of State for Environment, Food and Rural Affairs (DEFRA) ultimately approves the final document.

Thames Water have recently submitted their proposals, known as AMP5, for approval and a decision is anticipated during the latter end of 2009 in preparation for the 2010 to 2015 period.

This document serves to determine the capital expenditure that Thames Water are committed to (for example, to replace existing assets or promote new water resources) as well as agreeing a formula to recover costs from end users.

2.3. Baseline

Existing Provision

As discussed in Section 2.1, clean water resources for Waltham Forest and London are predominantly drawn from the River Thames and River Lee, and subsequently stored in reservoirs at Crossness, near Bexley, and Walthamstow.

Figure 2-2 illustrates the water consumption breakdown for the whole Thames Water region for the year 2006/07.

Figure 2-2: Water Consumption in the Thames Water Region, 2007/2006


In the whole of the Thames Water supply area it is estimated that 2006/07 household consumption accounted for 47% of demand, non-household consumption 21%, and unbilled and operational use 2%.
Given the ageing network and historical limited funding for asset replacement, leakage from the network accounted to some 30% of total demand, split into 22% distribution losses (mains in road) and 8% customer service pipe (individual service pipes to properties) losses. Leakage equates to 713M litres of water per day\textsuperscript{15}. Recent commentary from Thames Water identifies that the network, which was developed largely from the Victorian era, has leaks that may never prove to be economical to repair.

The London WRZ is predominantly made up of service sector industries and Thames Water report that there has been a marked decline in non-service sector demand (mainly in the food, drink and tobacco sector), albeit this reduction has been more than off-set by a rise in the former, with an anticipated ongoing stronger growth in demand against this.

Within the London WRZ there are three water supply zones that furnish supplies to Waltham Forest, namely Chigwell, Sewardstone and Woodford\textsuperscript{16}. The supply zones afford supplies to adjacent boroughs as well as Waltham Forest as the water network is not split into borough specific zones but more operationally defined activities. These networks potentially contain a mixture of underground storage facilities, pumping stations, large cross section mains as well as smaller bore mains and services.

\textsuperscript{15} Thames Water: \url{http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/848.htm} accessed on 18/04/2009.

\textsuperscript{16} Thames Water: \url{http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/5330_5494.htm} accessed on 18/04/2009.
The consultant team have engaged with Thames Water in order to understand the extent of existing water system capability, plans for the borough at both local and strategic levels, as well as what would be required to deliver growth in Waltham Forest.\(^{17}\)

**Planned Investment**

From published documents\(^{18}\), and based upon current forecasts, Thames Water predict as a whole that the London WRZ will have a deficit in provision of potable water by 2025 in that the current surplus of +1\% in 2009/10 is projected to become -15\% by 2034/35. The deficit is essentially being driven by demand, noting that leakage management may offset an element of the shortfall.

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\(^{17}\) Information has been requested from Thames Water on Waltham Forest specific details beyond that furnished from published material.

\(^{18}\) Thames Water: [http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/5390.htm](http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/5390.htm) and [http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/2804.htm](http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/2804.htm) accessed on 18/04/09
Thames Water identify that despite the increasing pressure to use more water efficient appliances, and an improvement in the education of the wider population to use water more wisely, this will not be enough to off-set the ever increasing demand from both commercial and residential requirements.

Thames Water believe that a ‘twin track approach’ in balancing the supply and demand that involves the use of enhanced demand management activities combined with the development of new resource schemes, such as reservoirs, will be required to deliver ongoing capacity capability.

**Demand Management**

Thames Water published Water Resource Management Plan in May 2008, outlining its strategy to support and promote demand management. To close the supply - demand deficit. These primarily include:

- Leakage reduction techniques (the replacement of Victorian mains) over the period 2010 to 2015
- Active leakage control
- A progressive programme to employ compulsory metering to all new developments as well as retro fitting to existing housing stock (the plan being to increase the proportion of domestic properties with meters from 25% to approximately 54% over the next 5 years)
- Establish an enhanced water efficiency programme.

The borough will need to play an important role in supporting demand management programmes, particularly when considering refurbishment of existing housing stock. The demand management programmes are key mechanisms, along with the major capital expenditure projects, in securing water resources.

**New Resource Schemes**

Management of demand alone however is unlikely to close the deficit and therefore a desalination water treatment plant is being constructed in Beckton and works are already underway with completion planned for early 2010. This will afford enough water for a further 400,000 households or 900,000 people, pumping water into the reservoirs that also feed into Waltham Forest. The total cost of the project, including the pipeline, is £250m, and is funded by Thames Water, with costs recovered via customer bills between 2005 and 201019.

Further afield, there are also plans for construction of a large reservoir in Oxfordshire which was planned to enter service in 2021, and again paid for by Thames Water but

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financially recovered, in essence, by customers of Thames Water\textsuperscript{20}. Recent public releases from Thames Water note that the date is likely to be deferred to 2026 on the basis that in the short term growth can be accommodated from existing resources and from those new projects, such as Beckton, which are in the process of completion. The size of the proposed Oxfordshire reservoir has yet to be determined (100m\textsuperscript{3} instead of 150m\textsuperscript{3} of water) but the inherent need is still anticipated.

**Assessment of Need/ Adequacy**

The works in Beckton, and ultimately Oxfordshire, are assumed to afford growth capability for Waltham Forest and the wider London area\textsuperscript{21}.

However, as with all London boroughs, space in existing highway is extremely limited. Therefore works to replace mains are expensive and constrained, particularly when considering that other statutory bodies, such as gas, electricity and telecommunication providers, are also under extreme pressure to maintain their own regulatory obligations.

In addition to physical constraints, indirect pressures and requirements are also inherent in the delivery process. Typically, they include pressure from local stakeholders whom are continually affected by excavations in highways, working hour’s restrictions and limited resources. The utility industry as a whole is already under-resourced and therefore major events such as the 2012 Olympic and Paralympic Games tend to exacerbate mains replacement programmes even further.

### 2.4. Estimating Future Demand

**Provision Standard**

To secure a basic understanding of the system capabilities, each type of additional development will need to have recognised water consumption demand placed against it.

The ability to apply a straightforward approach for residential and non residential land uses remains a challenge although the former is covered via a historical application of 160litres/day of clean water so computations should readily reflect known dwelling numbers.

\textsuperscript{20} Thames Water website, \url{http://www.thameswater.co.uk/cps/rde/xchg/corp/hs.xsl/2550.htm} and \url{http://www.thameswater.co.uk/cps/rde/xbcrl/corp/newsletter-issue-05.pdf}, accessed on 18/08/2009.

\textsuperscript{21} Attempts to verify this assumption with Thames Water have not been successful at the time of writing despite repeated inquiries.
Figure 2-4: Residential Water Consumption, 2006/09 and 2034/35

London 2006/2007


Figure 2-4 represent the shift in likely usage in residential applications over the course of the next 25 years for properties that have unmeasured water supplies. The above charts identify properties that are unmeasured (i.e. without a water meter) with a noticeable increase in consumption based on population habits and the potential impact of climate change.
Using Thames Water data and predicted outturn figures, the use of meters on properties records a benefit of some 8 litres of water per head per day at today's consumption rates when compared against unmeasured properties; however, for the projected Thames Water forecasts for 2035, this benefit is completely negated via ongoing changes in population habits. Based upon the projections, there will be a deficit of circa 1.2 litres per head per day.

The non residential element is more difficult and computation exercises have determined an approach that works on a per employee basis approach and offers a degree of knowledge but this will be subjected to ongoing review.

The resulting loads will facilitate projections of water demand against historical data so that shortfalls and / or excess can be considered. The figures projected will need to be further discussed with Thames Water to establish existing system viability as each development comes forward.

Regardless of the figures utilised, outturn figures however will only proffer likely engineering requirements as, until a formal design is completed against set network criteria, the water system, given its 'dynamic' nature, is always subject to change and reconfiguration. In saying that, the assessments made will reflect reasonable judgements and / or scenarios so that the client team have an understanding of the requirements in order to deliver the greater growth.

Conventional computations, normally derived by mechanical and electrical consultants utilise figures for specific and known quantums; i.e. a building with a particular specification will require a given level of water consumption.

The utility industry applies diversity factors to those figures and these change somewhat dependant upon the strategic level – for example, a main in Blackhorse Lane will have a lower diversity factor applied than that of say computations for a new main that is required for elsewhere in the borough.

Over the whole of its supply area, Thames Water estimate that each person uses on average 160 litres of water per day although conventional planning approaches normally apply a slightly lower range of 150l/day. It is worth noting that historical figures used by Thames Water were based upon 140l/day/person but these have risen in recent years as expectations in provision rise.

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22 Consultation with Thames Water has not provided specific Waltham Forest detail.

23 Diversity factors are those applied to networks that assume that not all appliances are to be utilised at the same time. As an example, a building may have a total requirement, if all appliances within it were used, of 200 litres of water. Given that not all items will be used, the actual likely local impact on the water network may be, say, 100 litres. On the network in Waltham Forest, as a borough, this may translate into, say, 50 litres and for the London WRZ, say 10 litres. These are purely fictional figures but the purpose is to demonstrate that when more and more buildings are considered, the impact changes at different levels of the network.

24 Thames Water currently assess that water usage per person will increase given the status quo; however, the impact of the Code for Sustainable Homes and other legislation may decrease this to a lower level.
Based on Thames Water residential consumption target of 150l/day/per it is assumed that employees' consumption in the workplace is typically limited to eight hours as opposed to the 16 hours generally considered for residential consumers.

### Table 2-1: Water Provision Standards

<table>
<thead>
<tr>
<th>Development</th>
<th>Provision Standard</th>
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<tbody>
<tr>
<td>Residential</td>
<td>160 l/day per person</td>
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<tr>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Offices</td>
<td>80 l/day per person</td>
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<tr>
<td>Retail</td>
<td>80 l/day per person</td>
</tr>
<tr>
<td>Industrial</td>
<td>80 l/day per person</td>
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</table>

Source: Residential standards are those published by Thames Water; commercial standards have been computed from known projects but these will vary as they are ultimately dependent upon actual fittings.

#### Issues/ Future Trends

Water use per person is affected by several factors, which typically include:

- Household occupancy
- Water use via appliances
- Fixture and fittings within the property
- Householders’ water use behaviour, including garden use and
- Whether the property is metered or not

The figure of 160l/day/person used to estimate future residential water consumption is a current baseline utilised by Thames Water; noting that there is an aspiration, partly via the establishment of the Code for Sustainable Homes, to reduce this value to at least 150l/person/day, there is a potential adjustment in this figure. Opportunities on new developments include rainwater harvesting (i.e. to use ‘raw’ water for toilets as an example), more efficient appliances and general education are all being promoted but given the timing of the report, actual trends are not known at this juncture.

However, Thames Water forecast that demand for water will rise predominantly due to:

- An increasing population
- An increase rise in single occupancy houses still using all the appliances of a larger unit

Notwithstanding this, there is also the added impact, potentially short term, of the economic downturn. Current predictions are 135l/person/day but this is not a proven figure and potentially a risk. Thames Water assess that current planning for 2021 onwards, based upon a reduction of 10l/person/day (i.e. 150l/person/day), remains a sensible approach. Derived from the draft Water Resources Management Plan issued by Thames Water (http://www.thameswater.co.uk/cps/rde/xbcr/corp/drwmp-01-summary-overview.pdf).
- Smaller family groups
- Climate change

As a result, despite the Code for Sustainable Homes criteria to significantly reduce water in new build projects, the magnitude of the increase in residential numbers alone is expected to continue to exacerbate any shortfall.

Noting the issues over leakages experienced in the wider water network, other aspects of population habits are likely to continue to increase demand via organic means; for instance, high volume high pressure showers somewhat negate the benefit of showering.

Added to the pressures of managing our resources better, global warming, or climate change, is likely to result in hotter, drier summers and milder, wetter winters. Thames Water also expect to experience more extreme weather events (such as droughts or flooding) in the future.

As a result of climate change, there is an expectation of greater demand for water in the Summer as people bathe, shower or water their gardens more frequently noting that the South East is likely to be warmer than other areas of the UK. Thames Water already report that over the last six years, they have seen an average use of water, per person per day, increase by 12l/person/day when compared to other water companies in the UK. In addition to the impact of weather, there is an assumption that greater affluence also plays a part in consumption.

On average, about 6 per cent of household water is used in the garden, but on hot days this can already rise to over 50 per cent.

The amount of water businesses use is also likely to rise as air conditioning is increasingly used to cool offices and IT systems. Whilst not necessarily an issue in Waltham Forest, the agricultural industry is also expected to be affected; climate change is predicted to result in soils being able to hold less moisture, meaning that more water for crops is likely to be needed.

This increased demand for water will come at a time when existing water resources are under increasing pressure. Climate change will reduce the period when our groundwater sources can refill and will reduce Summer rainfall. As a result, managing demand for water though activities like wider water metering and water efficiency programmes to encourage people to use water wisely will be increasingly important in adapting to the impacts of climate change. New sources of water, such as desalination, will also need to be developed.
On a more immediate and practical front, the mains located in the Waltham Forest area have been designed for a lifecycle of between 40 and 60 years and therefore replacement of existing assets is likely to continue at pace given their age. In saying that, major works in Waltham Forest have currently been concluded albeit, overall, Thames Water are targeting, across the whole of London, to have replaced some 1,300 miles of mains over a six year period that ends in 2010.

2.5. Demand for Water Arising from Growth

Typically, the utility industry works on reactive processes that use specific data provided at the design stage to get an engineering proposal. Whilst this will still be partly the case in the scenario above, the advanced installation of strategic mains, if required, is beneficial.

Currently, up until 2034/35, Thames Water has assessed that within the London WRZ, the population will rise by 1M people with consideration of an additional allowance for clandestine (‘uncounted’) and / or short term migratory population patterns. Thames Water has calculated non-household volumes by subtracting measured household volumes from total billed measured volumes and, from this reasonably basic assessment, they have produced forecasts for both service and non-service sectors in each WRZ. The
2006 figures\textsuperscript{25} reflect some 315.83Ml/day for service sector industries, including education and health, with the remaining 92.26Ml/day being non-service sector.

Table 2-2 shows the estimated water flow rates resulting from new residential and commercial development by sub area up to 2026, for the lower and higher growth scenarios based on URS calculations. In the absence of clear indication of how Thames Water estimate future demand, it is not possible at this stage to assess whether Thames Water estimates are in line with the scale of projected growth in Waltham Forest.

Table 2-2: Future Water Demand in Waltham Forest’s Sub Areas by Type of Development, 2009 to 2026, 000s

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<tr>
<td>Southern Waltham Forest</td>
<td>Residential</td>
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<td>453</td>
<td>157</td>
<td>1,054</td>
<td>160</td>
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<td>601</td>
<td>3,410</td>
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<td></td>
<td>Non-Residential\textsuperscript{26}</td>
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<td>49</td>
<td>57</td>
<td>57</td>
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<tr>
<td></td>
<td>Total</td>
<td>333</td>
<td>502</td>
<td>214</td>
<td>1,111</td>
<td>240</td>
<td>1,983</td>
<td>786</td>
<td>3,596</td>
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<tr>
<td>Central Waltham Forest</td>
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<td>479</td>
<td>479</td>
<td>600</td>
<td>709</td>
<td>801</td>
<td>866</td>
<td>1,880</td>
<td>2,053</td>
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<tr>
<td></td>
<td>Non-Residential</td>
<td>37</td>
<td>37</td>
<td>46</td>
<td>46</td>
<td>65</td>
<td>65</td>
<td>147</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
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<td>516</td>
<td>646</td>
<td>755</td>
<td>865</td>
<td>930</td>
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<td>118</td>
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<td>-18</td>
<td>199</td>
<td>1,265</td>
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<td>Northern Waltham Forest</td>
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<td>Non-Residential</td>
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<td>6</td>
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<td></td>
<td>Total</td>
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<td>41</td>
<td>57</td>
<td>273</td>
<td>218</td>
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<td>316</td>
<td>532</td>
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<td></td>
<td>Non-Residential</td>
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<td>74</td>
<td>98</td>
<td>98</td>
<td>140</td>
<td>140</td>
<td>312</td>
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<td>1,305</td>
<td>3,113</td>
<td>3,329</td>
<td>7,595</td>
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</tr>
</tbody>
</table>

Source: URS calculations based on joint analysis by LB Waltham Forest and URS Corporation.

2.6. Resulting Water Infrastructure Requirements

Without further input from Thames Water, it is not possible to accurately forecast the physical infrastructure requirements associated with the projected growth. In particular, this is because identifying the infrastructure needs for growth critically depends upon understanding the context of both local and strategic protocols. In essence, the mains

\textsuperscript{25} Thames Water: \url{http://www.thameswater.co.uk/cps/rde/xbrcr/corp/dwmp-04-london-dry-year.pdf} accessed 18/04/2009.

\textsuperscript{26} Commercial includes office, retail and industrial developments.
that serve the immediate local area will have a defined capacity and this will be able to afford supplies or not; the strategic mains are no different. Principally, it is feasible that one or other may be able to accommodate the growth whilst the other may not\(^\text{27}\).

An increase in demand could result in the need for additional infrastructure both at the local level – e.g. additional mains serving the new development as well as improvements to the local distribution network – and at the strategic level. This may be triggered for either growth scenario or it may be only required for the higher growth scenario and not the lower growth.

**Phasing**

In the light of the absence of firm recommendations on water infrastructure requirements it is not possible to set out an infrastructure phasing plan at this time.

As discussed in Section 2.5 residential and commercial growth can be expected to have an impact on the local infrastructure, on the strategic infrastructure, or on both. Noting that the more strategic requirements will generally require longer lead in times, the study aims to assess the point at which the system fails, or trigger points. So, as an example, it may be that the local mains can afford an extra 500 residential units but 501 requires a new main from location A to location B. Strategically, the capability may be significantly different so whilst the local mains are suitable for 500 units, the strategic capability may only be able to support, for instance, 200\(^\text{28}\).

Water infrastructure is planned and funded over five-yearly investment programmes. Currently Thames Water is undertaking Asset Management Plan (AMP) 4 which is due to end in 2010. AMP 5 will run from 2010 to 2015, followed by AMP 6 in 2015-2020 and AMP 7 in 2020-2025. The scope of this report extends to 2026 which is one year into the AMP 8 period of 2025-2030. Complementing this is the ‘Draft Water Resources Management Plan’ that runs in conjunction with the AMP programmes and targets strategic requirements until 2035 noting development aspirations identified via Local Authorities.

### 2.7. Funding

Thames Water, being the incumbent network operator, will be obliged to afford suitable water capacity utilising capital expenditure recovery mechanisms permitted via their operational licence issued by OFWAT. Whilst this is partly through customer bills and set by agreed capital expenditure programmes, there are direct contributions likely from developers.

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\(^\text{27}\) For the purposes of defining specific infrastructure requirements to accommodate growth, baseline criteria specific to Waltham Forest is required and this has not been forthcoming from Thames Water; as such, the potential impact of works are not identified at this stage.

\(^\text{28}\) It is this understanding of likely works required to service the growth plans that Thames Water ideally would have responded to.
In certain areas of the UK, other water companies are charging what is effectively a ‘roof tax’ against each dwelling given that the infrastructure required is so significant. This has been approved by OFWAT and the process is underway; the benefit is that the infrastructure will be available for the developments as they ‘go live’.

Thames Water have recently submitted proposals to OFWAT for the provision of network, be it replacement of assets or network reinforcement, that they perceive as being required to meet known growth plans for the period 2010 to 2015, and set against a Water Resource Management Plan that extends to 2035.

Growth over and above these projections may need to be paid for by third parties, i.e. developers. If the timeframes are within the review period Thames Water will have already allocated their funds to the schemes they perceive as being necessary. If the development process goes beyond the OFWAT review period, then reinforcement schemes can be submitted for subsequent approval.

Up until recently, financial contributions from third parties would have been placed solely against local infrastructure with strategic works being funded via the OFWAT assessment. Over the last three years or so, other water companies have identified significant assets that are required to furnish supplies to new development and this has been charged via the ‘roof tax’ previously identified.

2.8. Summary

Summary of Infrastructure Requirements Assessment

As is the case for sewage and other utilities infrastructure, for the reasons presented throughout the section, it is not possible within this report to definitively conclude an assessment of specific infrastructure requirements for Waltham Forest between 2009 and 2026.

The scale of additional demand resulting from the additional residential and commercial development could require water mains and pumping stations (or at least upgraded pumping stations) to be added to the Thames Water network. As Thames Water is already planning for an additional reservoir and de-salination plant, it can be expected that additional resources at a strategic level will be adequate to support the projected growth. More locally, the additional amount of potable water required would equate to a football pitch sized reservoir, if all the development was to be constructed in one place. However, this does not account for Waltham Forest's specific spare capacity or shortages in current provision.

Thames Water need to assess the impact of all growth against the baseline values they are currently operating to as this will then identify potential shortfalls. The report, whilst wishing to identify this, has yet to fully establish out turn positions.

Recommendations

It has not been possible to conclude specific infrastructure requirements arising from the projected residential and commercial growth in Waltham Forest. Thames Water have
commented upon the draft report and their views have been accommodated in the final version. It is suggested that the borough should continue to engage with Thames Water via the representative already involved to clarify their ability to furnish potable water supplies to growth plans and to include timeframes, cost implications and delivery risks / opportunities.
3. ENERGY (ELECTRICITY AND GAS)

3.1. Context

Scope

This section will review the potential implications of growth in residential and commercial development for energy networks, i.e. both electricity and gas networks, in Waltham Forest. Energy for the borough is afforded via a system of pipes or cables. These pipes or cables are laid under the streets of Waltham Forest and designed to give regulated pressure requirements and security.

An assessment of future infrastructure demand arising from growth cannot be undertaken without also considering the natural, or ‘organic’, growth in usage (infill development for example). In order to undertake this assessment, a thorough understanding of each energy network is required to ascertain if there is available spare capacity to accommodate further growth and demand. This is important so as to be able to establish an understanding of the risks and opportunities for delivering the proposed growth, which requires the input of the relevant utility network operators.

The process is meant to cover first tier infrastructure that is broadly strategic for the borough. On-site infrastructure, whilst important, will be determined via the application of planning policies, specification aspirations and timing. Typically, and particularly as policies start to gain momentum (Code for Sustainable Homes, London Mayoral aspirations etc), factors will increasingly influence ‘on site’ works.

The growth anticipated for Waltham Forest, in the context of energy consumption, is significant and therefore the report aims to consider the use of CHP, or similar technologies, to support the aspiration of low carbon energy provision. This will be discussed in the next section.

Management Arrangements and Responsibilities

EDF is the electricity network operator for Waltham Forest and they supply energy via a system of underground cables to each connection required. Historically, EDF was London Electricity Board and Eastern Electricity Board, since privatised as part of a Government programme, but it has subsequently been absorbed into the EDF conglomerate.

For gas, the network operator is National Grid (historically nationalised as British Gas and more recently Transco) with a system broadly the same as EDF’s but with pipes as opposed to cables.

29 While it would be possible to assess electricity and gas infrastructure requirements separately as they are to some degree interchangeable sources of energy there are significant benefits in treating them together in this section.
Both National Grid (NG) and EDF manage their respective network against the backdrop of a regulatory process that is controlled by the Office of the Gas and Electricity Markets (OFGEM). This process includes monitoring the success of each operator and those throughout the UK, measuring performance via set criteria. The headlines for each network that is mostly visible to the general public include quality of supply and security of supply.

Regardless of the requirements arising from residential and commercial growth in Waltham Forest, both EDF and NG review their network against known development that is derived from the general planning process and as part of the statutory consultee process. Subsequently, a capital expenditure programme is then prepared to match their obligations. The system however suffers from inherent weaknesses in that it encourages reactive management in many instances.

With regards to sustainable energy, a major vehicle driving the uptake of decentralised energy systems at the London level is the London Development Agency (LDA) and its Decentralised Energy Delivery (DED) Unit.

**Waltham Forest’s Energy Network**

Historically, the London Electricity Board (LEB), Eastern Electricity Board (EEB) and British Gas Board afforded electricity and gas supplies to the borough. Since the mid-1980's both providers were privatised and, more recently, through acquisition and/or re-branding have become EDF Energy (electricity) and National Grid (gas).

For electricity, EDF is operational in what is known as ‘LPN’, or London Power Networks, and EPN (Eastern Power Networks), where technical criteria is specifically set for this area as it is a system unique in the UK, recognising that security of supply is of utmost importance. The LPN zone alone covers some 665 sq km and employs circa 30,000 km of cables, extending from SW14 in the west to Dartford in the east. Of course, Waltham Forest constitutes only an element of the overall zone.

As for Gas, National Grid have a local management team that look after the ‘North Thames LDZ’ or local distribution zone. Whilst the technical requirements are identical to those of other areas, the working environment in the North Thames LDZ is wholly different in that the number of stakeholders, the level of co-ordination, the intensity of energy consumption is far greater than most other provincial circumstances.

For both electricity and gas, the level of domestic use was lower, when measured in kWh per annum, than the UK National Average during 2007.

Regardless of consumption, the streets are congested both above and below ground to an extent that, particularly in the business areas, the options to work are very limited.

The expansion of each network has continued for many years with the last 40 years seeing an ever increasing demand for energy. The energy networks typically are designed for a 40 years life cycle although, of course, extending asset life is beneficial to the owners of the network as well as the wider environment in general.
Energy resources for Waltham Forest, and the UK in general, are derived via a grid connected system that has mains of varying capacities and pressures that depend upon the strategic nature of the asset. A main for a side street in Waltham Forest is not going to be the same cross-sectional area, or indeed pressure, as that of a main serving the whole borough.

The gas and electricity infrastructure delivers energy to individual properties via mains and service pipes that are sized to reflect the requirement. The operational concept is that energy is drawn from each respective grid and subsequently transformed down to appropriate ‘point of use’ pressures.

Maintaining pressures is important for many technical reasons. From an end user point of view, the most obvious is that home appliances are designed to operate within defined criteria\(^\text{30}\) and operating outside of this could cause damage to the unit or result in it operating ineffectively (low voltage causes a kettle to take longer to boil water for example).

Gas

National Grid have a system of mains throughout Waltham Forest that deliver gas to each connection point; in essence, gas is transported as shown in Figure 3-1, at different pressures but this is dependant upon the strategic nature of the asset.

**Figure 3-1: Gas Network**

![Gas Network Diagram](http://www.nationalgrid.com/uk/Gas/About)


\(^{30}\) The basic national requirement is that gas is afforded at 21mB and electricity, assuming a single phase connection, 230 volts with a performance criteria of +10% -6%.
In Waltham Forest, the system operates at medium and low pressure. The medium pressure network distributes gas to pressure reducing stations (PRS) located at various points within the borough and it is at this juncture that gas is subsequently reduced to a lower pressure. This low pressure network is the system that affords most residential supplies and some commercial requirements; for certain installations where gas demand is high (factories / large office facilities), there is however an ability to secure a medium pressure connection.

The gas capacity contained within the borough is projected by National Grid to provide sufficient energy without the need of upstream reinforcement, albeit it is worth noting that all utility networks are dynamic and subject to change at relatively short notice.

**Electricity**

With regards to electricity, EDF operate a similar system to that of the gas in terms of distribution. In essence, electricity for Waltham Forest is broadly provided by an 11kV (11,000 volts) network that extends throughout the borough and connects into local substations. The substations subsequently transform the voltage from 11kV to 400V/230V which is the voltage that is typically utilised in residential circumstances.

As with the gas, if there is a large energy user, the connection into the property could be 11kV and not the lower ‘residential’ value. Commercial applications, such as factories, large office facilities and supermarkets all fall within this category.

EDF Energy have reported that they will review the impact of growth within the borough but have yet to clarify when this is likely to be delivered. The Council will receive their comments following publication of this report.

### 3.2. Regulatory Drivers

As required under national guidance, both EDF and National Grid submit their own growth plans to OFGEM, the regulator, to ensure that economic and environmental aspects are fully considered. Once the process has been reviewed and commented upon, the Secretary of State for Environment, Food and Rural Affairs (DEFRA) ultimately approves the final document. These five year plans ultimately serve to determine the capital expenditure that each company is committed to (for example, to replace existing assets or promote new capacity) as well as agreeing a formula to recover costs from end users.

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31 The medium pressure network is locally strategic for the borough but not necessarily London whilst the low pressure is the local delivery network. In addition, there are intermediate and high pressure networks that operate up to 85Bar provide this function as strategic mains serving areas wider than Waltham Forest itself.
3.3. **Baseline**

*Existing Provision*

**Gas**

The energy networks in Waltham Forest deliver substantial usage for both residential and non-residential users alike. The chart below represents both the number of connections and usage, both for Waltham Forest and the wider London network.

**Figure 3-2: Current Gas Usage in Waltham Forest (2007)**

<table>
<thead>
<tr>
<th>Energy Consumption - Gas, GWh</th>
<th>Number of Connections - Gas, Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic 81%</td>
<td>Domestic 99%</td>
</tr>
<tr>
<td>Commercial &amp; Industrial 19%</td>
<td>Commercial &amp; Industrial 1%</td>
</tr>
</tbody>
</table>


**Electricity**

For the electricity network, EDF expect that energy consumed through their network will decrease if decentralised energy and the Code for Sustainable Homes impacts as predicted; however this is not a given[^32]. **Figure 3-3** below presents the baseline consumption figures for Waltham Forest.

**Figure 3-3: Current Electricity Usage in Waltham Forest (2007)**

<table>
<thead>
<tr>
<th>Energy Consumption - Electricity, GWh</th>
<th>Number of Connections - Electricity, Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic 51%</td>
<td>Domestic 91%</td>
</tr>
<tr>
<td>Commercial &amp; Industrial 49%</td>
<td>Commercial &amp; Industrial 9%</td>
</tr>
</tbody>
</table>


[^32]: EDF Energy: [http://edfenergynetworks.dialoguebydesign.net/docs/PlanningForTheFuture_Screen.pdf](http://edfenergynetworks.dialoguebydesign.net/docs/PlanningForTheFuture_Screen.pdf)
At the time of writing, EDF have yet to afford borough specific details.

**Committed and Planned Investment**

Given the ageing networks, the requirement for each company is not only to develop capacity but also undertake significant asset replacement as the tendency to fail increases and their efficiency, and inherent safety, deteriorates. The greatest growth occurred in the 1960s and therefore, with most assets using a 40 year lifecycle, will need replacing in the short term. The electricity network also saw a second ‘explosion’ of growth during the 1990s and therefore the cycle will be repeated in future years.

**Gas**

Based upon current forecasts, NG predict a growth of -1% for the North Thames distribution zone (see Figure 3-4 below) and therefore, on the basis that NG have identified that the projected load demand can be taken on the network without reinforcement, the planned investment for Waltham Forest is predominantly reflected in mains replacement. This is subject to stringent requirements by OFGEM as the capital expenditure programme is covered via the five yearly plan submitted to, and approved by, OFGEM.

**Figure 3-4: North Thames Gas Distribution Zone (Historical & Forecast 1 in 20 Peak Gas Demand)**

Source: National Grid, emailed data for NL LDZ

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The likely impact of the Code for Sustainable Homes supports this in principle although the actual quantum is unknown and also noting that the increased desire for decentralised energy may well utilise gas as the primary energy source.

**Electricity**

**Figure 3-5** below shows the LPN network, representing the London area of the EDF business with the black outline identifying the extent of the operational area. The adjacent pink areas are also under the control of EDF but are contained in adjacent licensed areas (SEEBoard and Eastern operational ‘footprints’).

**Figure 3-5: EDF Prediction of Load Growth for 2007/2008**

![LPN Load Growth (MW)](image)

<table>
<thead>
<tr>
<th>LPN Load Growth (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 10</td>
</tr>
<tr>
<td>10 - 20</td>
</tr>
<tr>
<td>20 - 30</td>
</tr>
<tr>
<td>30 - 40</td>
</tr>
<tr>
<td>40 - 50</td>
</tr>
<tr>
<td>50 - 100</td>
</tr>
<tr>
<td>100 - 200</td>
</tr>
<tr>
<td>200 - 560</td>
</tr>
</tbody>
</table>

*Source: EDF Energy: issued via email following presentation*

EDF have not so far commented on the projected impact and investment specifically for Waltham Forest though they have confirmed that the growth figures are consistent with their own.
For both gas and electricity, data currently employed to develop projections of future load reflects that of historical consumption but of course the impact of the Code for Sustainable Homes and the desire to employ low carbon technology or renewables to furnish energy in Waltham Forest, is somewhat of an unknown quantum and therefore are likely to be assessed with a degree of scepticism. The impact of building regulations is discussed in greater detail in Section 4.4.

**Assessment of Need/ Adequacy**

Gas supplies in Waltham Forest are understood to be able to afford capacity provision and therefore the implications inferred are likely not to require additional provision; electricity, however, is likely to require a degree of reinforcement but the magnitude is not identified.

EDF do have a committed capital expenditure programme but the allocation specifically for Waltham Forest is not known at this juncture.

As with all London boroughs, space in existing highway is extremely limited. Therefore works to replace mains are expensive and constrained, particularly when considering that other statutory bodies, such as water and telecommunication providers, are also under extreme pressure to maintain their own regulatory obligations.

As with works on water infrastructure, the delivery of improved or additional infrastructure is also subject to indirect pressures and requirements. Typically, they include pressure from local stakeholders whom are continually affected by excavations in highways, working hours restrictions and limited resources. The utility industry as a whole is already under-resourced and therefore major events such as the 2012 Olympic and Paralympic Games tend to exacerbate mains replacement programmes even further.

### 3.4. Estimating Future Demand

**Provision Standard**

To secure a basic understanding of the system capabilities, each type of additional development requirement will need to have recognised energy consumption demand placed against it, noting earlier comments on the impact of the Code for Sustainable Homes.

The resulting demand figures will facilitate projections of against historical data so that shortfalls and / or excess can be considered. Consultation with EDF to establish their viability has been unsuccessful.

Regardless of the figures utilised, outturn figures will however only proffer likely engineering requirements as, until a formal design is completed against set network criteria, the system, given its ‘dynamic’ nature, is always subject to change and re-configuration. In saying that, the assessments made will reflect reasonable judgements and / or scenarios so that the client team have an understanding of the requirements in order to deliver the greater growth.
Table 3-1 identifies the initial electrical and gas demand computations utilised in the Waltham Forest Infrastructure Model.

### Table 3-1: Gas and Electricity Provision Standards

<table>
<thead>
<tr>
<th>Development</th>
<th>Provision Standard</th>
<th>Gas</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td></td>
<td>1 m$^3$ per hour per dwelling$^{34}$</td>
<td>1.6 kVA per dwelling</td>
</tr>
<tr>
<td>Commercial</td>
<td>Offices</td>
<td>0 m$^3$ per hour per sqm</td>
<td>0.08 kVA per sqm</td>
</tr>
<tr>
<td>Retail</td>
<td></td>
<td>0.01 m$^3$ per hour per sqm</td>
<td>0.12 kVA per sqm</td>
</tr>
<tr>
<td>Industrial</td>
<td></td>
<td>0.05 m$^3$ per hour per sqm</td>
<td>0.04 kVA per sqm</td>
</tr>
</tbody>
</table>

Source: All figures are typical utility company figures for both development design and strategic planning; it should be noted that the strategic planning figures change with volume and the information is not published as it is commercially sensitive.

Current electrical computations for residential units utilise a simple basis of assessment which generally only distinguishes between electrically heated units and non electrically heated units. For commercial application, this can be broadly broken down into floorspace and type albeit an office will attract an energy profile different to that of a small shop$^{35}$.

For gas, there is a difference in approach although the systems are broadly similar; for residential gas computations, the energy will broadly be designed on a consumption rate of 1m$^3$ of gas per dwelling. Commercial requirements vary greatly as the application of energy is so diverse; an office facility, if using gas as opposed to air conditioning will have a completely different footprint to that, say, of a swimming pool whilst the floor area may well be identical.

### Issues/ Future Trends

Added into the complexity of network assessment is the desire to become more energy efficient and an acceptance that energy is a valuable commodity.

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$^{34}$ This is an average between design figures of 1.13, 0.79 and 0.51, for a low, medium and high density residential development respectively with gas central heating.

$^{35}$ Diversity is applied but this is not based upon published information as the utility industry is somewhat self regulating, with performance measurement being the basis of assessment as opposed to detailed technical connection data. It is noteworthy that figures utilised for a single development will inherently be different to that of the whole borough given that diversity does differ; as a single example, a residential dwelling using gas central heating in a say, 100-unit development will have a baseline design criteria of 2kVA - there is a very distinct difference between M&E assessment and utility assessments, in this instance M&E consultants will normally apply a figure closer to 12kVA. For the strategic network in Waltham Forest, this 2kVA figure may be 1.4kVA; for the strategic network across London, this may reduce further to, say, 0.8kVA.
The Code for Sustainable Homes

The Code for Sustainable Homes (CfSH) aspires to a decrease in energy consumption via the application of building materials and an encouragement to utilise energy efficient apparatus. Data is not yet available and therefore assumptions will need to be afforded in order to project likely impact on deliverability; for the purposes of estimating future gas and electricity demand in this section, please note that no allowance has been made for CfSH. Part of this reasoning is reflected in the balance of certain improvements that the CfSH will bring to that of the wider population whom generally aspire to a more affluent lifestyle. The CfSH may afford savings if the status quo remained but, in all reality, this is unlikely to fully be case. Building regulations are however considered in Section 4.4 to assess the opportunity to meet energy consumption through sustainable energy infrastructure.

Energy Consumption Trends

That said, National Grid are anticipating a negative growth period (see Section 3.3) of -1% for the distribution zone area, noting that high unit prices, the pressure to utilise more efficient appliances, the potential impact of the CfSH (CfSH is likely to impact on the gas network greater than the electricity in the view of the author) and a greater shift towards air conditioned buildings are all likely to influence matters.

Efficient Appliances and Inefficient Behaviours

The CfSH requires appliances, such as washing machines and refrigerators, to be energy efficient so that energy consumed is kept to a minimum. There is also a wider tendency to encourage this trend for the general population when replacing old appliances given that the CfSH does not currently apply to existing housing stock.

The CfSH policy, and the wider political will, assumes to a certain extent that the status quo remains – i.e. population habits and aspirations don’t change. In reality, modern life involves a far greater use of technology that, whilst individually doesn’t have a huge impact, negates some of the Government committed environmental targets.

For instance, people nowadays have mobile telephones that need charging, computers, televisions (probably in more than one room), a refrigerator for food, etc. – the list is long but the trend is a greater reliance upon electricity and not necessarily less.

Another example is that of television: 20 years ago, a single television would most likely have served a home. It is now quite normal for a property to have several televisions, as well as Sky or Freeview digiboxes as well as games consoles. Whilst this is not a criticism of modernity, there is an inherent consequence on the utility networks.

As climate change begins to take a toll, the requirement to provide air conditioning becomes more prevalent in the market, both for non-domestic and domestic applications. This is another contributing factor.

3.5. Energy Demand Arising from Growth

EDF and National Grid, both being the incumbent utility operator for their respective networks, are obliged to afford capacity provision utilising capital expenditure recovery
mechanisms permitted via their operational licence issued by OFGEM. They are expected to be the primary funder of any necessary works, partly through customer bills and set by agreed capital expenditure programmes, but also by means of direct contributions from developers.

Typically, the utility industry works on reactive processes that use specific data provided at the design stage to achieve an engineering proposal.

Current estimates, using basic assessment techniques, identify an increase in energy consumption, based upon the status quo, of between 26MVA and 42MVA of electricity and between 6,000m³ and 15,000m³ of gas. Table 3-2 and Table 3-3 show the estimated demand resulting from new residential and commercial development by sub area up to 2026.

Attempts to confirm the benchmark figures of growth used by EDF when computing their own capacity requirements have been unsuccessful.

### Table 3-2: Future Electricity Demand in Waltham Forest's Sub Areas by Type of Development, 2009 to 2026, 000s

<table>
<thead>
<tr>
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<tr>
<td></td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Southern Waltham Forest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>1.5</td>
<td>2.1</td>
<td>1.0</td>
<td>4.3</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>0.9</td>
<td>0.9</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>2.4</td>
<td>3.0</td>
<td>2.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Central Waltham Forest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>3.1</td>
<td>3.1</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>1.0</td>
<td>1.0</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Total</td>
<td>4.0</td>
<td>4.0</td>
<td>4.8</td>
<td>5.2</td>
</tr>
<tr>
<td>Blackhorse Lane</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>0.6</td>
<td>2.8</td>
<td>0.6</td>
<td>2.3</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.1</td>
</tr>
<tr>
<td>Total</td>
<td>0.5</td>
<td>2.7</td>
<td>0.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Northern Waltham Forest</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>0.4</td>
<td>0.4</td>
<td>0.4</td>
<td>1.2</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>0.1</td>
<td>0.1</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>0.4</td>
<td>0.4</td>
<td>0.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>5.5</td>
<td>8.3</td>
<td>5.5</td>
<td>11.8</td>
</tr>
</tbody>
</table>

Source: URS calculations based on joint analysis by LB Waltham Forest and URS Corporation.

36 Commercial includes office, retail and industrial developments.
### Table 3-3: Future Gas Demand in Waltham Forest’s Sub Areas by Type of Development, 2009 to 2026, 000s

<table>
<thead>
<tr>
<th></th>
<th></th>
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<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td><strong>Southern Waltham</strong></td>
<td><strong>Residential</strong></td>
<td>0.7</td>
<td>1.1</td>
<td>0.5</td>
<td>2.2</td>
<td>0.6</td>
<td>3.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Forest</td>
<td><strong>Non-Residential</strong></td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.1</td>
<td>-0.1</td>
<td>-0.2</td>
<td>-0.2</td>
<td>-0.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>0.6</td>
<td>0.9</td>
<td>0.4</td>
<td>2.1</td>
<td>0.4</td>
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<td>1.6</td>
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<td>2.0</td>
<td>2.4</td>
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</tr>
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<td>1.6</td>
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<td>2.0</td>
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<td>2.5</td>
<td>5.7</td>
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<td>3.7</td>
<td>7.1</td>
<td>9.3</td>
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<td><strong>Non-Residential</strong></td>
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<td>-1.0</td>
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<td>2.1</td>
<td>5.2</td>
<td>2.7</td>
<td>6.1</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Source: URS calculations based on joint analysis by LB Waltham Forest and URS Corporation.

### 3.6. Resulting Energy Infrastructure Requirements

In light of the difficulties in liaising with EDF, it is not possible at this time to accurately project the physical infrastructure requirements associated with the projected growth in electricity demand. For gas, other than local reinforcement specific to each a development parcel, it is reported by National Grid that no major works are required to support the growth plans.

However, as with water, it is crucial to understand the infrastructure needs for growth and this needs to extend to both local and strategic requirements. In essence, mains that serve the immediate area will have a defined capacity and the assessment will consider their ability to cater for further capacity requirements. The strategic mains are no different and it is feasible that only one may be able to accommodate the growth agenda.

In either case, the projected growth may well trigger reinforcement of infrastructure and this may be regardless of the numbers: i.e. should the lower growth scenario realise, this may well trigger infrastructure requirements once only 5% of the units are developed, with no further works required following that. Conversely, the lower growth scenario may well

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37 Commercial includes office, retail and industrial developments.
not trigger the need for any works on the respective network but the higher growth scenario will.

As such, it has not been possible to identify specific infrastructure requirements arising from growing demand within this study and this is due to the lack of detailed baseline information on the adequacy of each network within Waltham Forest.

However, based on forecast demand it is possible to gauge the quantum of energy infrastructure that is indicative of the scale of the infrastructure needed to support such levels of growth in Waltham Forest up to 2026, but does not incorporate detailed considerations of existing spare capacity. For electricity, this includes in the region of up to one additional primary substation (converting electricity typically from 33kV to 11kV), upgrading one new grid site (converting electricity typically from 132kV to 33kV) and up to an additional 42 1MVA substations (i.e. secondary substation catering for local demand). For gas, the network is assumed to be functional and without need of uprating for the most part, with the exception of local reinforcement works that may be applicable. Assuming no capacity is available in the existing network, there may be a requirement for the equivalent of one new pressure reducing stations (transforming the gas from medium pressure to low pressure).

Section 4.4 will discuss how sustainable energy infrastructure can help meet Waltham Forest existing and forecasted energy consumption.

**Phasing**

As for the assessment of the implications of growth on water infrastructure, in the light of the absence of firm recommendations on energy infrastructure requirements it is not possible to set out an infrastructure phasing plan at this time.

All growth will impact upon local infrastructure and the strategic network. Noting that the more strategic requirements will generally require longer lead in times, the study aimed to assess the point at which the system fails.

The design of the system will establish a point at which it will fail technically so, as an example, it may be that the local mains can afford an extra 500 residential units but the 501st requires a new main from location A to location B. Strategically, the capability may be significantly different so whilst the local mains are suitable for 500 units, the strategic capability may only be able to support, say, 200.

The ability to understand the trigger points is what will determine the level of reinforcement required. From current assessments and on the basis that National Grid report favourable capacity provision, the likelihood is that major improvement works are not necessary for the gas network; however, the electricity network is anticipated to require upstream reinforcement.

Energy infrastructure is planned and funded over five-yearly investment programmes. Currently, EDF are submitting plans for the period 2010 to 2015 and this process will be repeated in 2014 for the period 2015-2020.
For both networks, elements of reinforcement may already be planned however as part of an internal process whereby asset replacement programmes necessitate the need to replace apparatus.

3.7. Funding

Both National Grid and EDF are responsible for providing strategic capacity and the five yearly regulatory reviews\(^{38}\) take into account projected growth, system performance improvements, safety improvements and maintenance. It is this vehicle that determines part of the price for energy that each consumer in the UK pays and as a result the main financial resource available to the utilities providers to fund works to their networks.

The current rules established by OFGEM however encourage reactive management to a certain degree. This is because works required to provide connection for new developments and the associated increased energy requirements and diversions can broadly be charged to third parties, e.g. developers.

Accordingly, works that are planned for by providers in advance of the actual need will be funded by the providers themselves; whereby, on the other hand, if the works are needed as a result of a specific development, then the respective utility company can charge private developers. This system, particularly for local infrastructure, therefore provides an opportunity to undertake works only when they become strictly necessary.

Most developments will have a charge made for developing each respective utility network, particularly electricity. The general argument is that the existing system is capable of working without load increase and therefore the changes required to accommodate growth must be paid for by the development. In the event that the utility company gains benefit from the network extension or upgrade, there are rules which effectively apportion cost.

In defence of the utility industry, developments do not always proceed and given that energy requirements are based upon individual client specifications, it is difficult to design and install apparatus in advance. Likewise, from a business point of view, having a third party pay for assets is an attractive proposition as it means that all capital expenditure is focused upon managing assets and providing for natural growth. Current rules employed by OFGEM support this position.

The downside of this arrangement is that infrastructure is then only planned against individual requirements, and normally reactively.

Options for consideration are to lobby OFGEM for a change in process whereby the development parcel is allocated a load profile and EDF or National Grid is charged with establishing capacity to a given point in advance. The incoming developer would then be

\(^{38}\) Every five years the utility industry submits proposals to their respective regulators to establish capital expenditure programmes and revenue generating formulas.
tasked with designing a building to that profile and this inherently encourages developing technologies or stimulating engineering excellence.

Alternatively, Waltham Forest, as an asset provider, could install utility apparatus based upon the above and recover costs plus administration from each developer – effectively a ‘roof tax’ but based upon a business model.

In most cases, the political winds will determine how this is to be tackled ongoing; as the system operates currently there is little encouragement to develop utility networks in advance of development.

3.8. Summary

Summary of Infrastructure Requirements Assessment

It has not been possible to conclude specific infrastructure requirements arising from the projected residential and commercial growth in Waltham Forest.

The scale of energy demand in Waltham Forest up to 2026 may equate to the need for 1no. primary substations, an upgrade to one grid site (converting electricity typically from 132kV to 33kV) and up to an additional 42 1MVA substations (i.e. secondary substation catering for local demand). However, this is only indicative of scale of the likely physical requirements as the position is unclear other than the anticipated outturn report from EDF is that there is a shortfall in provision. The magnitude, the limitations and the locations are not yet identified.

With regard to the gas network, the reported National Grid position is that the capability is there to accept the predicted growth and therefore no shortfall is assumed to exist.

Recommendations

In light of the above, it is suggested that Waltham Forest Council continue to engage with EDF and National Grid via the representatives identified in the consultation process. The utility providers need to assess the impact of all growth against the baseline values they are currently operating to as this will then identify potential shortfalls. Consultation with EDF has been unsuccessful in establishing a baseline position, however, the gas network is reported by National Grid as being capable of accepting current forecasts of increased consumption. National Grid have responded positively to the approach taken in this report.

Engagement with National Grid and EDF should be on an ongoing basis to clarify their ability to furnish energy supplies to growth plans and to include timeframes, cost implications and delivery risks / opportunities.
4. SUSTAINABLE ENERGY

4.1. Context

This section reviews existing Combined Heat and Power (CHP) facilities in the borough and assesses the potential infrastructure implications linked to the growth in residential, commercial, retail and industrial land uses in Waltham Forest. It relies on parallel work currently being undertaken for the Council by URS and Urban Practitioners.

On site infrastructure will be determined during the planning application process via the implementation of planning policies, meeting client brief expectations and working to a predetermined programme for development. Typically, and particularly as legislative drivers start to gain momentum (e.g. the predicted step changes in Building Regulations and the associated Code for Sustainable Homes Level requirements), these factors will increasingly influence development design.

An assessment of future infrastructure demand arising from growth cannot be undertaken without considering the natural, or ‘organic’, growth in usage (infill development for example). In order to undertake this assessment, a thorough understanding of the existing CHP facilities and utility grid infrastructure is required to ascertain if there is available spare capacity to accommodate further growth and demand.

The use of CHP technology, i.e. low carbon technology, is a fundamental component in supporting London’s aspiration of moving towards a low carbon society. CHP technology that provides heating and power to standalone development or a wider community through district heating and private schemes are termed decentralised energy systems or sustainability energy infrastructure. Decentralised energy systems are a key component in the delivery of regional targets, in that it offers an opportunity to achieve significant savings in carbon dioxide emissions.

Scope

The overall intent of this section is to establish the baseline energy consumption for Waltham Forest in terms of gas and electricity consumption; in addition, the likely implementation of decentralised energy systems will be considered when assessing the projected growth in domestic and non-domestic energy use, including opportunities for cross-borough sustainable energy infrastructure.

Whilst potential CHP capacities for the sub-areas are identified when considering both the existing and projected growth in energy demand, the scope for this section predominantly covers a strategic overview of the delivery of sustainable energy infrastructure, driven by the Mayor’s Climate Change Action Plan (CCAP), which sets out an ambition that 25% of London’s energy demand is met by decentralised energy systems by 2025, and 50% by 2050.

39 London borough of Waltham Forest (Forthcoming), Waltham Forest Climate Change Evidence Base Study
**CHP technology**

CHP is the generation of thermal and electrical energy in a single process. In this way, optimum use can be made of the energy available from the fuel. CHP installations can typically convert between 75% and 90% of the energy in the fuel into electrical power and useful heat. This compares very favourably with conventional power generation, which has a delivered energy efficiency of around 30-35% due to the non-utilisation of the waste heat energy and distribution losses in the grid infrastructure (see Figure 4-1 below).

CHP plant sited near to end users offers the most efficient method of heat transfer as the short distance the heat has to travel reduces energy lost during transmission.

**Figure 4-1: CHP energy flow diagram**

Source: URS

A wide variety of fuels can be used to power CHP plant, i.e. Natural Gas, LPG, Oil (Diesel), and energy from waste opportunities, e.g. biofuels and biogas/syngas.

Decentralised energy systems have proved very successful in Scandinavia and parts of Europe, but take-up in the UK has been limited. Still, London is home to a number of successful decentralised energy systems such as the Pimlico District Heating Undertaking (PDHU) in Pimlico, Westminster, and the Barkantine CHP and district heating scheme in the Isle of Dogs, Tower Hamlets.

CHP plant, usually burning natural gas, can offer good CO₂ savings, with an output of 0.30 kgCO₂/kWh, in comparison to the 0.501 kgCO₂/kWh produced overall in the UK in 2007. Decentralised energy systems can also offer a 0.05 kgCO₂/KWh saving against modern centralised combined cycle gas turbine stations⁴⁰.

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⁴⁰ Institution of Civil Engineers (ICE) (May 2009): Why Waste Heat?, ICE
4.2. Policy

The Mayor’s Climate Change Action Plan\textsuperscript{41}, demonstrates that the Mayor’s priority for reducing London’s carbon dioxide emissions is to move away from reliance on the national grid and on to a local, low carbon energy supply. This approach is often termed ‘decentralised energy’.

The Mayor’s goal is to enable a quarter of London’s energy supply to be moved off the grid and on to local, decentralised energy systems by 2025, with the majority of London’s energy being supplied in this way by 2050.

Waltham Forest’s spatial vision is very much in keeping with the ambitions of the Mayor of London, and this vision is being developed and realised within Waltham Forest’s Unitary Development Plan\textsuperscript{42}; and the emerging Core Strategy document (\url{http://www.walthamforest.gov.uk/csio-4july08.pdf}). The Waltham Forest Unitary Development Plan requires all developments and developers to consider the following guidelines:

- Reducing carbon emissions from the redevelopment, construction and occupation of buildings by ensuring developments use less energy, making use of energy from efficient sources and the use of renewable energy
- An expectation that all developments will take measures to reduce the effects of, and adapt to, climate change and meet the highest feasible environmental standards during construction and occupation
- Setting Waltham Forest specific targets on environmental performance including BREEAM, EcoHomes assessments as well as the Code for Sustainable Homes

London’s push for a decentralised, sustainable energy supply will include dramatically increasing the rollout of decentralised energy systems. Through the requirements of the London Plan\textsuperscript{43} and Planning Policy Statement: Planning and Climate Change, Supplement to Planning Policy 1\textsuperscript{44}, December 2007, supplying energy efficiently is now essential for major developments. However, the bulk of the carbon dioxide emissions savings potential will need to be realised through supplying London’s existing building stock.

\textsuperscript{41} Mayor of London, (2007), The Mayor’s Climate Change Action Plan, GLA.
\textsuperscript{42} Waltham Forest (2006), Waltham Forest Unitary Development Plan: First Review 2006.
\textsuperscript{43} Mayor of London (2008), The London Plan, Spatial Development Strategy for Greater London, Consolidated with Alterations since 2004, GLA.
\textsuperscript{44} CLG (2007), Planning Policy Statement: Planning and Climate Change, Supplement to Planning Policy 1, TSO.
4.3. **Baseline**

The distribution of existing and future energy demand for Waltham Forest has been examined in order to understand how decentralised energy systems could be deployed to meet the existing and future growth in energy demand.

**Existing Energy Demand**

For the *Waltham Forest Climate Change Evidence Base Study* URS have mapped existing gas and electrical demand densities for the borough. The detailed description of the baseline gas and electrical demand densities is provided within borough Context – Section A of the same report.

**Electricity**

The electricity demand densities are demonstrated in **Figure 4-2** for domestic sector, in **Figure 4-3** for non-domestic sector, and in **Figure 4-4** for the total domestic and non-domestic sectors, all on a ward basis.

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45 When considering the electricity and gas demand density maps for Waltham Forest it is important to take note of the electricity and gas demand density range illustrated within the map legends. A range has been established that reflects the lowest and highest electrical and gas demand density at a ward level across the borough, and takes account of both the domestic and non-domestic energy demand densities. In other words, when considering **Figure 4-4** and **Figure 4-7**, these maps reflects the sum of the domestic and non-domestic electricity (**Figure 4-2** and **Figure 4-3**) and gas (**Figure 4-5** and **Figure 4-6**) demand densities, respectively.
Figure 4-2: Domestic electricity demand density in Waltham Forest

Source: URS analysis of BERR data
Figure 4-3: Non-domestic electricity demand density in Waltham Forest

Source: URS analysis of BERR data
Figure 4-4: Total electricity demand density in Waltham Forest

Source: URS analysis of BERR data
The electricity demand density characteristics shown in Figure 4-2 demonstrate an increasing tendency towards the south and south west of the borough, i.e. the Central and Southern Waltham Forest sub-areas, where residential density is greatest as Victorian terraces predominate. In particular, the Hoe Street, Grove Green, Cathall and Cann Hall wards in the Southern Waltham Forest sub-area have the highest electricity demand densities. Towards the northern end of the borough, i.e. the Northern Waltham Forest and Blackhorse Lane sub-areas, the electricity demand densities are the lowest, reflecting a lower residential density due to inter-war housing predominating.

Figure 4-3 shows that the non-domestic electricity demand density is generally focussed in the south and south west of the borough where a significant proportion of Waltham Forest’s industrial and retail uses are located, i.e. within the Wood Street, Hoe Street, High Street, Markhouse, Lea Bridge, Leyton, Grove Green and Leytonstone wards. Outside of these predominantly led industrial areas, as with the domestic electricity demand densities, the non-domestic electricity demand densities are highest towards the southern end of the borough. This reflects higher land use intensity in the south than in the north.

Figure 4-4 confirms the findings of the domestic and non-domestic mapping exercise. The electricity demand density is greater in the south than in the north, with hotspots around the centres of Leyton (Leyton, Leytonstone, Grove Green, Cathall and Cann Hall wards) and Walthamstow (Hoe Street, Wood Street and Markhouse wards), and around the predominantly industrial areas of the High Street and Lea Bridge wards. The key attribute reflected in the previous figures is that the electricity demand density is predominantly driven by the domestic land use. The distribution of housing density across the borough is more influential in determining the electricity demand density than the existing non-domestic building stock.

Gas

The gas demand density is demonstrated in a similar manner as the electricity demand density; Figure 4-5 (domestic), Figure 4-6 (non-domestic) and Figure 4-7 (total).
Figure 4-5: Domestic gas demand in Waltham Forest

Source: URS analysis of BERR data
Figure 4-7: Total gas demand in Waltham Forest

Source: URS analysis of BERR data
The gas demand density characteristics shown in Figure 4-5 demonstrate an increasing tendency towards the southern end of the borough, i.e. the Central and Southern Waltham Forest sub-areas, where, as discussed above, residential density is greatest and there are no substantial areas of open space. In particular, the William Morris, Wood Street, Chapel End and Hoe Street wards in the Central Waltham Forest sub-area, and the Grove Green, Leytonstone, Cathall and Cann Hall wards in the Southern Waltham Forest sub-area have the highest gas demand densities.

Towards the northern end of the borough, i.e. the Northern Waltham Forest and Blackhorse Lane sub-areas, the gas demand densities are the lowest, reflecting a lower residential density as inter-war housing (early twentieth century typologies) predominates and a significant proportion of these areas is open space.

Figure 4-6 shows that the non-domestic gas demand density is generally focussed in the south west of the borough where a significant proportion of Waltham Forest's high gas-consuming industrial and manufacturing activities are located in industrial estates, i.e. within the High Street, Markhouse and Lea Bridge wards. Outside of these predominantly led industrial areas, as with the domestic gas demand densities, the non-domestic gas demand densities are highest towards the southern end of the borough. This reflects higher land use intensity in the south than in the north. Much of the employment / industrial activity is in older and inefficient buildings, so any gas heating is likely being inefficiently used. This is discussed in further detail in the Strategy Section of the Waltham Forest Climate Change Evidence Base Study which considers the Lean aspects as they apply to the existing non-domestic building stock.

Figure 4-7 confirms the findings of the domestic and non-domestic mapping exercise. The gas demand density is greater in the south than in the north, with hotspots around the centres of Leyton (Grove Green, Cathall and Cann Hall wards) and Walthamstow (William Morris, Hoe Street and Wood Street wards), and around the predominantly industrial and retail areas of the Markhouse and Lea Bridge wards. The key attribute reflected in the previous figures is that the gas demand density is predominantly driven by the domestic land use. The distribution of housing density across the borough is more influential in determining the gas demand density than the existing non-domestic building stock.

**Existing CHP Infrastructure**

Figure 4-8 – CHP Plant Locations shows the existing CHP schemes and details whether these existing systems are operational or non-operational. This map is further described within Section 3B. Existing energy infrastructure, of the Waltham Forest Climate Change Evidence Base Study. It has been estimated that there is currently a CHP capacity of circa 1MWe within the borough.
Figure 4-8: Existing operational and non-operational CHP in Waltham Forest

Source: URS analysis (2009)

Analysis

Figure 4-2 to Figure 4-7 illustrate the total, domestic and non-domestic electricity and gas demand densities in the borough, respectively. The maps demonstrate that the
domestic land use leads the gas and electricity demand for the borough. When considering the implementation of decentralised energy systems, determining areas with medium to high electricity and gas demand densities is essential in delivering a viable delivery strategy. The medium to high electricity and gas demand densities areas are:

**Southern Waltham Forest sub-area**
- Grove Green Ward
- Lea Bridge Ward
- Leyton Ward
- Cann Hall Ward
- Cathall Ward
- Leytonstone Ward

**Central Waltham Forest sub-area**
- Hoe Street Ward
- William Morris Ward
- High Street Ward
- Markhouse Ward, and
- Wood Street Ward

**Blackhorse Lane sub-area**
- Higham Hill

These areas indicate the opportunities for implementing decentralised energy systems, i.e. geographical areas where there is a significant heat and electrical demand.

Based on Figure 4-8 there are currently 12 CHP systems in the borough, offering a capacity that varies from 13KWe to 330KWe.

### 4.4. Estimating Future Energy Consumption

The energy consumption associated with the existing domestic and non-domestic building stock was determined by taking the domestic and non-domestic gas and electricity consumption for Waltham Forest in 2007. Details on the methodology applied to arrive to the forecasted energy demands arising from expected residential and commercial growth are presented in Appendix B.

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46 Waltham Forest LSP (September 2008), Climate Change Strategy, Waltham Forest.
A range of factors have been considered in the analysis; these are presented below.

**Policy Requirements**

The projected development figures for the forecast periods (i.e. 2009-2014, 2014-2019, 2019-2026) were broken down into annual figures to take account of the step changes in Building Regulations. The improvements in energy performance required by Building Regulations used in the modelling are shown in Table 4-1. Regulated energy refers to fixed building services i.e. heating (space and domestic hot water), lighting, comfort cooling and auxiliary energy (pumps and fans), whilst non-regulated energy refers to other energy uses such as cooking and appliances (domestic), and equipment (non-domestic, e.g. communications equipment, small power, etc.).

<table>
<thead>
<tr>
<th>Building Regulations start year</th>
<th>Domestic buildings – required improvement over current standards</th>
<th>Non-Domestic buildings – required improvement over current standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>25% – Code Level 3</td>
<td>25%</td>
</tr>
<tr>
<td>2013</td>
<td>44% – Code Level 4</td>
<td>44%</td>
</tr>
<tr>
<td>2016</td>
<td>Zero Carbon (incl. non-regulated energy) – Code Level 6</td>
<td>Zero Carbon (regulated energy only)</td>
</tr>
<tr>
<td>2019/20</td>
<td>Zero Carbon (incl. non-regulated energy)</td>
<td>Zero Carbon (incl. non-regulated energy)</td>
</tr>
</tbody>
</table>


**Issues/ Future Trends**

It is anticipated that the requirement to meet energy efficiency targets is likely to have a greater impact on the gas network than on the electricity network as the most cost effective energy efficiency measures are introduced within construction standards, i.e. the thermal performance of the building fabric, ventilation and air leakage. As these standards improve, the requirement for space heating will be significantly reduced, resulting in an anticipated general reduction in gas consumption.

4.5. **Energy Consumption Arising From Growth**

The energy consumption (i.e. kWh) arising from growth is based on the expected growth in floorspace when considering the non-domestic land uses, and the growth in residential units and population when considering the domestic land use. Figures provided in Section 3 are based on conventional utility figures associated with delivering gas (m$^3$/hour) and electricity (kVA) infrastructure to accommodate the expected growth. The divergence in these figures is related to how the gas and electricity market is regulated and demonstrates the approach taken by utility companies when benchmarking demand associated with forecast growth. Energy consumption (kWh) is analysed in this case as it allows an analysis of optimum capacities of CHP plant to be undertaken on a ward basis.
The residential and commercial growth trajectory scenarios have been translated into an energy demand increase for each sub-area. To derive new build energy demands, the energy consumption associated with the non-domestic floorspace / domestic unit growth in each forecast period is scaled to reflect the predicted energy efficiency requirements of Building Regulations, as set out in Table 4-1. As Building Regulations tighten over the forecast periods up to 2026, sophisticated energy profiling software developed by Carbon Descent (previously SEA/Renue) took account of these step changes. The energy profiling considers each land use type (i.e. domestic, commercial, industrial and retail) and is based on typical demand use patterns set out in the National Calculation Methodology (NCM) developed by the CLG.

When considering domestic buildings, the aspiration of the CLG is to move toward zero carbon homes by 2016 (Code for Sustainable Homes Level 6) through step changes to the Building Regulations in 2010 (25% – Code for Sustainable Homes Level 3) and 2013 (44% – Code for Sustainable Homes Level 4) (see Table 4-1).

For non-domestic buildings assumptions were made based on the work produced by the UK Green Building Council in their report to the CLG: Definition of zero carbon homes and non-domestic buildings, which set out a similar step change to that for domestic buildings but with an additional step at 2019 (see Table 4-1).

In line with the growth trajectory scenarios, the total anticipated energy demand is expected to increase in the Central Waltham Forest sub-area. This is in accordance with the vision for the Central Waltham Forest sub-area as a vibrant, sustainable town centre with specialist shops and market stalls, a well developed cultural and leisure centre, where new homes will be built. In line with the anticipated increase in residential units, the domestic energy demand is set to increase by 1.68% for gas and 6.53% for electricity for the low housing growth scenario, and 1.74% and 6.89% for gas and electricity for the high housing growth scenario. The increased retail land use is expected to result in an increase of 11.14% in electricity demand and an increase of 0.92% in gas demand. As offices will become a larger provider of employment space, a 74.84% increase in electricity demand for commercial office land use is also anticipated. A decrease of 2.05% in electricity demand is expected for the industrial land use.

The total anticipated energy demand is also expected to increase significantly in the Southern Waltham Forest sub-area. The Southern Waltham Forest sub-area is identified as a significant location of regeneration activity in the borough. The Lower Lea Valley Opportunity Area Planning Framework identifies an excess of 40 hectares of vacant or underused land in the area, most of which is currently being redeveloped. The area will benefit from access to the Olympic Park and the sports facilities at Eton Manor during and after the 2012 Olympic and Paralympic Games. Accordingly, it is anticipated that energy use associated with commercial office and retail uses will significantly increase.

The Blackhorse Lane sub-area is expected to demonstrate a reduction of circa 2% in the total energy demand by 2026 when considering the low housing growth scenario, or an increase of circa 4.5% in the total energy demand by 2026 when considering the high housing growth scenario, due to a significant decrease in industrial land use. Specifically, electricity demand for industrial uses will decrease by 13%, and gas demand will
decrease by 21%, compared to current levels. Blackhorse Lane has been identified as an area for significant regeneration and renewal because of its location as a gateway entrance point to the borough, high levels of public transport accessibility and land availability. Accordingly, domestic energy demand is also anticipated to increase by 2026 when compared to current levels.

In the Northern Waltham Forest sub-area, there are isolated sites of potential new housing development but in comparison to the other sub-areas it is expected to experience relatively low rates of growth for both the low and high housing growth trajectories.

**Figure 4-9** and **Figure 4-10** demonstrate the forecast gas and electricity consumption for the sub-areas of the borough. The percentage increase in the energy demand for the forecast period of 2009-2026 is presented for each sub-area. Two different housing growth trajectories are also considered i.e. a low housing and a high housing growth trajectory.
Figure 4-8: Estimated forecast gas consumption in Waltham Forest and the percentage increase in gas consumption when compared against the baseline gas consumption (lower and higher housing growth scenarios)

Source: URS Analysis (2009) based on Carbon Descent energy modelling
Figure 4-10: Estimated forecast electricity consumption in Waltham Forest and the percentage increase in electricity consumption when compared against the electricity baseline consumption (lower and higher housing growth scenarios)

Source: URS Analysis (2009) based on Carbon Descent energy modelling
4.6. Resulting Sustainable Energy Infrastructure Requirements

Meeting the future energy demand through decentralised energy systems is essential to driving the ambition of a low carbon London. By simply moving energy generation and supply from distant, large scale power stations to local decentralised energy systems, significant carbon dioxide emissions savings can be achieved due to improved operational efficiencies. This is a result of being able to utilise the heat energy, a by-product of electrical power generation, for the surrounding area (district heating network), and reduced grid losses due to local distribution of electrical power. Thus, even in instances of business as usual, provided heat and electrical power can be met through decentralised energy systems, significant carbon dioxide emissions savings will result.

A Council Energy Strategy has been produced to drive down energy use and consequent greenhouse gas emissions. The Energy Strategy outlines an action plan for improving the Council’s energy efficiency and investment in renewable and low carbon energy generation.

Waltham Forest’s Climate Change Strategy (CCS)\(^{47}\), Section 4.4.2 Building mitigation actions, states that the Local Strategic Partnership (LSP) suggest potential nodes be identified for a district heating network based around areas of high public and private sector demand, including the possibility of expanding the 12 existing CHP systems in the borough (see Section 4.2). As part of this process neighbouring authorities should be consulted to ensure there is the potential for interconnection should they be considering developing their own sustainable energy infrastructure (e.g. Tottenham Hale in the London borough of Haringey – cross-borough opportunity when considering a potential node in Blackhorse Lane, and the Olympic Park in the London borough of Newham – cross-borough opportunity when considering a number of potential nodes in the Southern Waltham Forest sub-area).

Waltham Forest places a strong emphasis on the implementation of decentralised energy systems in appropriate locations throughout the borough, with built in flexibility to consider cross-borough connections. Decentralised energy networks are recognised as one of the key means to promote a sustainable Waltham Forest and tackle climate change. The opportunities and incentives to deliver decentralised energy to meet the existing and additional energy demand deriving from the projected residential and commercial growth in Waltham Forest are discussed later in this section.

The overall decentralised energy ambition for Waltham Forest should be in compliance with the Mayor’s Climate Change Action Plan\(^{48}\), i.e. enable a quarter of the borough’s energy supply to be moved off the grid and on to local, decentralised energy systems by 2025, with half by 2050.

\(^{47}\) Waltham Forest Local Strategic Partnership (2009), Waltham Forest Climate Change strategy, London borough of Waltham Forest

\(^{48}\) Mayor of London (2007), Action Today to Protect Tomorrow: The Mayor’s Climate Change Action Plan, GLA.
Optimum CHP System Capacities

The following tables represent optimum CHP system capacities based on the total energy consumption for each sub-area, i.e. what capacity of CHP plant would be needed to deliver optimised carbon dioxide emissions savings on a £ per kgCO₂ basis when considering the demand profiles for each sub-area. The constraints and limitations to the implementation of CHP systems across the sub-areas are discussed in the Section 4.7.

The CHP system capacities represented illustrate an optimum arrangement that considers both the existing and forecast energy demand for each sub-area. In reality, the delivery of this level of CHP plant capacity in the borough is unlikely due to viability issues, i.e. the Northern Waltham Forest sub-area is unlikely to support a decentralised energy system due to negligible non-domestic land uses and a very low housing density. The forecast growth in the Northern Waltham Forest sub-area is also unlikely to occur in a concentrated area. If the Central Waltham Forest sub-area is considered, a significant amount of the forecast growth is expected to occur in Walthamstow town centre, but the existing demand reflects the entire sub-area. The optimum CHP system capacities reflected are an ideal interpretation of implementation of decentralised energy systems and it is unlikely that the capacities proposed will be installed. It is far more likely that a number of smaller capacity decentralised energy systems will be installed, local to demand, and driven by new development and financial viability.

Please see Appendix B for a description of the assumptions used to estimate the CHP requirements to meet the estimated total energy demand in Waltham Forest up to 2026 (inclusive of both existing and projected future demand).
### Table 4-2 Model results (Lower Growth Scenario)

<table>
<thead>
<tr>
<th></th>
<th>Blackhorse Lane</th>
<th>Northern Waltham Forest</th>
<th>Southern Waltham Forest</th>
<th>Central Waltham Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHP engine sizes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>kWe</td>
<td>5,100</td>
<td>25,500</td>
<td>21,250</td>
<td>25,500</td>
</tr>
<tr>
<td>kWth</td>
<td>4,102</td>
<td>26,055</td>
<td>21,713</td>
<td>26,055</td>
</tr>
<tr>
<td>kWfuel</td>
<td>12,307</td>
<td>61,532</td>
<td>51,276</td>
<td>61,532</td>
</tr>
<tr>
<td>CO₂ savings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tonnes per year</td>
<td>5,926</td>
<td>23,807</td>
<td>18,209</td>
<td>23,560</td>
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<tr>
<td>NPV analysis</td>
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<td></td>
</tr>
<tr>
<td>£k</td>
<td>3,211</td>
<td>31,275</td>
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<td>30,725</td>
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<tr>
<td>NPV per unit CO₂</td>
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<td></td>
<td></td>
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<tr>
<td>(£/tCO₂)</td>
<td>21,673</td>
<td>52,546</td>
<td>46,855</td>
<td>52,164</td>
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<td>Energy inputs</td>
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<tr>
<td>MWh/yr</td>
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<td>306,163</td>
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<td>302,906</td>
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<td>Energy outputs</td>
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<tr>
<td>MWh/yr</td>
<td>43,377</td>
<td>256,522</td>
<td>196,107</td>
<td>253,793</td>
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</table>

*Source: Carbon Descent Analysis (2009)*
Table 4-3 Model Results (Higher Growth Scenario)

<table>
<thead>
<tr>
<th></th>
<th>Blackhorse Lane</th>
<th>Northern Waltham Forest</th>
<th>Southern Waltham Forest</th>
<th>Central Waltham Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CHP engine sizes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>kWe</td>
<td>5,100</td>
<td>25,500</td>
<td>21,250</td>
</tr>
<tr>
<td></td>
<td>kWth</td>
<td>4,102</td>
<td>26,055</td>
<td>21,713</td>
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<tr>
<td></td>
<td>kWfuel</td>
<td>12,307</td>
<td>61,532</td>
<td>51,276</td>
</tr>
<tr>
<td><strong>CO₂ savings</strong></td>
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<td></td>
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<tr>
<td></td>
<td>tonnes per year</td>
<td>6,122</td>
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<td></td>
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<tr>
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<td>£/tCO₂</td>
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<td>52.844</td>
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<td><strong>Energy inputs</strong></td>
<td>MWh/yr</td>
<td>59,927</td>
<td>306,316</td>
<td>235,309</td>
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<tr>
<td><strong>Energy outputs</strong></td>
<td>MWh/yr</td>
<td>44,810</td>
<td>256,650</td>
<td>197,156</td>
</tr>
</tbody>
</table>

Source: Carbon Descent Analysis (2009)

**Sustainable Energy Infrastructure – A vision for Waltham Forest**

The development of sustainable energy infrastructure for Waltham Forest has been considered at a local level (e.g. within the borough) and at a higher, more strategic level, i.e. considering future connection with the planned or present infrastructure outside of the borough and in Central London.

The existing energy demand densities for each Waltham Forest ward is indicated in the figures in Section 4.2. Figure 3.2 and 3.3 in the Waltham Forest Climate Change Evidence Base Study\(^\text{20}\) demonstrate the domestic and non-domestic land use for the borough. Forecast energy demands for each sub-area have been calculated by Carbon Descent as indicated in the figures in Section 4.3. Optimum CHP system capacities have been defined for each sub-area and presented in Section 4.6.

Typically, a mix of uses offering a diverse load profile aids in improving the viability of decentralised energy systems. Areas where there are high densities of domestic and non-domestic buildings are also particularly suitable for decentralised energy systems.
**Figure 4-11** gives a graphical representation of a likely, high level implementation strategy for sustainable energy infrastructure. The most viable locations for decentralised energy are demonstrated for the suitable sub-areas, identifying cross-borough opportunities (e.g. the Tottenham Hale intensification area in the London borough of Haringey to the west of the Blackhorse Lane sub-area, and the strategic Olympic Park site to the south of the Southern Waltham Forest sub-area in the Lea River Valley) to aid in determining viable routes to achieve connection with planned/existing infrastructure (e.g. London Thames Gateway heat network scheme – Olympic Park; Tower Hamlets planned district heating network; Central London – Islington, City of London).
Figure 4-11: A high level strategic overview of the likely implementation of sustainable energy infrastructure

Source: URS analysis (2009)
Northern Waltham Forest

Based on the poor existing demand densities and the limited future energy demand forecasted for the Northern Waltham Forest sub-area, the provision of a decentralised energy system in this area is currently deemed not to be viable. The low housing density and limited non-domestic land use (see figures in Section 4.2) is unlikely to offer a viable financial model for implementation of decentralised energy systems. For the larger developments within the sub-area, standalone CHP systems offer the most cost effective delivery scenario.

Opportunities to fuel the CHP systems via sustainable fuel sources are discussed in Section 4.7 below.

Blackhorse Lane

The energy demand density in Blackhorse Lane is lower than in the Central or Southern Waltham Forest sub-areas. However, figures in Section 4.2 indicate typically low density housing but a large industrial land use, respectively.

A decentralised energy system in the Blackhorse Lane area will mainly support the energy demand arising from the growth in commercial and industrial activities. The sub-area is bounded to the west by significant open space provision in the Lea River Valley, including a number of reservoirs. As a result, any growth/new development is likely to occur in a concentrated area around Blackhorse Lane. The optimum CHP system capacity proposed for Blackhorse Lane, 5.1MWe, is the smallest for the borough.

The implementation of a decentralised energy system in Blackhorse Lane is seen as a strategic location as there is an opportunity for a cross-borough decentralised energy network. Tottenham Hale, west of Blackhorse Lane, in the London borough of Haringey, is identified as an opportunity area for intensification during the forecast period of 2009-2026. Tottenham Hale offers a link for Waltham Forest with the planned/existing sustainable energy infrastructure in Central London, via Islington (see Figure 4-11).

Phasing: When addressing the phasing of a decentralised energy system for Blackhorse Lane, coordination with the growth/intensification of the Tottenham Hale opportunity area is essential to deliver the most viable financial models. By supplying heat and power to the majority of new development in both growth areas, a robust customer base can be established to facilitate infrastructure expansion and provide an improving financial return over the lifetime of the decentralised energy system(s).

Central Waltham Forest

The Central Waltham Forest sub-area offers an opportunity for the implementation of decentralised energy systems. An existing cluster of CHP systems located in housing estates/public buildings in the vicinity of Walthamstow town centre, i.e. Goddarts House, Holmcroft House, Stocksfield Estate, Marlowe Road estate and Waltham Forest Council (see Figure 4-8), could support the delivery of a decentralised energy system by making use of the existing plant space/energy centre provision and connected customer base.
The Walthamstow town centre location is overlapped by the Hoe Street, High Street and Lea Bridge wards. These wards show significant gas and electricity demand densities (see figures in Section 4.2). This central area is predominantly comprised of retail land use, with some small industrial land use clusters. There is a significant energy demand from existing housing stock, with denser housing densities being displayed (predominantly terrace housing) than the Northern Waltham Forest sub-area or Blackhorse Lane. Additionally, it is expected that the commercial office land use will significantly increase in the future. The Walthamstow town centre has been identified as a suitable location for implementation of decentralised energy.

*Phasing:* The forecast growth for Walthamstow town centre is predicted to occur at a fairly constant rate. In order to affect the maximum carbon dioxide emissions savings from decentralised energy systems the implementation of a decentralised energy system should be undertaken as soon as is practical to account for as much of the new development as possible, i.e. ensure a diverse customer base for connection.

**Southern Waltham Forest**

The south east wards of the Southern Waltham Forest sub-area, i.e. the Grove Green, Leyton, Cathall, Cann Hall and Leytonstone wards, is led by the high gas and electricity demand densities of the domestic land uses, which is only set to increase based on the forecast housing growth predicted for the sub-area. Figures in Section 4.2 also show the significant existing industrial and domestic land uses within the Southern Waltham Forest sub-area, thus offering a diverse load profile and supporting the viability of a decentralised energy system.

The energy demand density of the Southern Waltham Forest sub-area is currently the highest for the whole borough.

The implementation of a decentralised energy system in the Southern Waltham Forest sub-area is seen as a strategic location as there is an opportunity for a cross-borough decentralised energy network. The Olympic Park, south of the Southern Waltham Forest sub-area, in the London borough of Newham, is identified as a strategic site. It offers a link for Waltham Forest with planned/existing sustainable energy infrastructure i.e. the London Thames Gateway heat network scheme, and the eventual connection to Central London (City of London) sustainable energy infrastructure, via the planned district heating network in Tower Hamlets (see Figure 4-11).

*Phasing:* When addressing the phasing of a decentralised energy system for the Southern Waltham Forest sub-area, coordination with the strategic Olympic Park site is essential to deliver the most viable financial models. By supplying heat and power to the majority of new development in both growth areas, a robust customer base can be established to facilitate infrastructure expansion and provide an improving financial return over the lifetime of the decentralised energy system(s).
4.7. Delivering Sustainable Energy Infrastructure in Waltham Forest

Decentralised Energy Scenarios

Three likely decentralised energy scenarios have been considered when determining the constraints, opportunities and risks associated with delivering sustainable energy infrastructure for Waltham Forest.

For each of these three scenarios, and decentralised energy system will need to supply heat and power to the same reliability, and offer the same diversity of load, as conventional grid infrastructure.

Scenario 1 – CHP plant serving a district heating network and exporting electricity to the grid

The first scenario assumes that CHP plant will serve a district heating/cooling network and will export the generated electricity to the grid.

From a technical point of view, particularly in the context of electricity, the grid has never been designed to readily accept generation and interconnectivity as in other parts of the world. The fault levels that result inherently limit opportunity, particularly at the higher voltage levels, and this is likely to constitute a constraint to connecting onto the electricity grid and exporting any spare electrical generation capacity. It is possible that the grid operator, EDF, will pursue a policy of not permitting connection for generators or suchlike.

These supposed limitations facing the market over the next few years will require significant investment to implement an asset replacement programme to upgrade the grid infrastructure to accommodate connection to decentralised energy systems, and a political will and acceptance that choice, particularly when considering environmental impact, may not be best served by existing guidelines.

Scenario 2 – CHP serving a district heating network in combination with a private wire scheme

This scenario assumes that CHP plant will serve a district heating/cooling network and a private wire scheme, which will serve a local customer base.

The reinvestment required for the asset replacement programmes necessary to upgrade the grid infrastructure to accommodate connection to decentralised energy systems is likely to be prescriptive. A private wire scenario is considered in order to mitigate the impact on the existing electricity infrastructure.

A private wire scheme generally offers an improved financial viability for decentralised energy schemes as both the heat and electricity generated can be sold locally by connection to a local customer base. Electricity supply offers a higher income stream than heat supply alone.

Sale of electricity to end consumers by an unlicensed supply company through an unlicensed distribution network is known as "private wire". Integrating private wire
schemes with district heating/cooling networks (where the infrastructure costs are already written down against the district heating/cooling infrastructure) is cost effective since the cost of implementing private wire is a comparatively small in the overall cost of the decentralised energy scheme and yet yields the greatest income.

A supply or distribution licence is currently required when the private wire networks supplies electricity to more than approx. 1,000 homes. However, the ECJ (European Court of Justice) does require that private wire networks allow for third party access. Therefore the right of the customers to switch to another supplier is maintained, even though the network owner can carry on without a supply or distribution license. This impacts on the viability of a decentralised energy system, as a reduction in the customer base reduces the financial viability.

Furthermore, the regulatory process does not fully encourage the use of low carbon technology such as CHP given that the whole ethos of OFGEM is to encourage customer choice and competition, and this inherently assumes that both facilitate price and/or service benefits. Current regulations allow very limited opportunity for combining the operational aspects of installing a CHP plant on the basis that the preference appears to be that of being a generator, or a distributor, or a supplier of energy, but not all three.

In order to fully exploit the opportunities that exist with low carbon technology, the regulatory process needs to be examined so that benefits can be fully maximised. The balance will ultimately prove to be that of customer choice, cost and environmental requirements.

**Scenario 3 – Standalone decentralised energy systems supplemented by a biogas/syngas infrastructure**

A final decentralised energy scenario is considered that assesses the opportunity to deliver decentralised energy systems, taking account of:

- The limitations of private wire schemes and associated third party connection rights
- The financial viability of establishing a decentralised energy scheme through Public Private Partnerships (PPP’s) and/or Privately Funded Initiatives (PFI’s), such as Energy Services Company (ESCo’s)
- Prescriptive reinvestment requirements associated with the asset replacement programmes necessary to upgrade the grid infrastructure to accommodate connection of decentralised energy systems

These limitations can be accommodated by moving to a standalone scenario, whereby CHP plant is provided on a development only basis and would meet the baseload energy demands of the development. Whilst carbon dioxide emissions savings will be achieved, far greater carbon dioxide emissions savings can be achieved through decentralised energy schemes supporting district heating/cooling networks and exporting electricity to the grid, or distributing electricity via a private wire scheme.
In order to improve the carbon dioxide emissions savings performance of the standalone CHP plant scenario, Energy from Waste (EfW) opportunities could be applied (this is further discussed in Section 6. Green Options of the Waltham Forest Climate Change Evidence Base Study39) through the provision of anaerobic digestion (AD) facilities to produce and supply biogas and/or gasification facilities to produce and supply syngas to act as a sustainable fuel supply for the standalone CHP systems. The biogas/syngas would be distributed through a new pipework infrastructure or blended into the existing gas pipework infrastructure to local standalone CHP systems in the surrounding community.

**Decentralised Energy Scenarios: Constraints and Limitations**

The implementation of these possible decentralised energy scenarios is highly dependent on the borough’s characteristics, and in all likelihood a combination of these scenarios could be applied. Energy from Waste (EfW) opportunities should be considered as an underlying thread for all three scenarios.

Each scenario is subject to constraints and limitations. The financial viability and changing political will associated with the application of decentralised energy systems is constantly evolving as Government incentives begin to take affect and developers and suppliers, through PPPs or PFIs shoulder the burden to deliver borough wide and cross-borough sustainable energy infrastructure. Developers recognise the changing planning landscape and the increasing demands to deliver sustainable development. The delivery of sustainable energy infrastructure enables new development to cost effectively align with the zero carbon trajectories for domestic and non-domestic buildings. Due to emerging Government funding programmes, such as updates to the Renewables Obligation Certificate (ROC) mechanism, it is likely that investment in decentralised energy schemes will continue to make good business sense. Economic incentives and funding opportunities are discussed in Section 6. Clean Options of the Waltham Forest Climate Change Evidence Base Study39.

The funding vehicle for a biogas/syngas infrastructure would be driven by achievable supply tariffs, Government funding mechanisms, and a secure financial investment plan, which is supported by transparent policies that cover the life expectancy of the scheme and incentivises suppliers to expand into this new, emerging market. The ability of the existing gas infrastructure to act as a conduit for low carbon fuel sources (biogas/syngas) also needs to be investigated by the National Grid.

**4.8. Funding**

Both National Grid and EDF are responsible for providing strategic capacity and the five yearly regulatory reviews49 take into account projected growth, system performance improvements, safety improvements and maintenance. It is this vehicle that determines

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49 Every five years the utility industry submits proposals to their respective regulators to establish capital expenditure programmes and revenue generating formulae.
part of the price for energy that each consumer in the UK pays and as a result the main financial resource available to the utility providers to fund works to their networks.

The current rules established by OFGEM, however, encourage reactive management to a certain degree. This is because the works required to provide connection for new developments and the associated increased energy requirements and diversions can broadly be charged to third parties, e.g. developers.

Accordingly, works that are planned for by providers in advance of the actual need will be funded by the providers themselves; whereby, on the other hand, if the works are needed as a result of a specific development, then the respective utility company can charge private developers. This system, particularly for local infrastructure, therefore provides an opportunity to undertake works only when they become strictly necessary.

Most developments will have a charge made for reinforcing the utility network, particularly electricity. The general argument is that the existing system is capable of working without load increase and therefore the changes required to accommodate growth must be paid for by the development. In the event that the utility company gains benefit from the network extension or upgrade, there are rules which effectively apportion cost.

In defence of the utility industry, developments do not always proceed and given that energy requirements are based upon individual client specifications, it is difficult to design and install apparatus in advance. Likewise, from a business point of view, having a third party pay for assets is an attractive proposition as it means that all capital expenditure is focussed upon managing assets and providing for natural growth. Current rules employed by OFGEM support this position.

The negative element to this is that infrastructure is then only planned against individual requirements, and normally reactively.

Options for consideration are to lobby OFGEM for a change in process whereby the development parcel is allocated a load profile and EDF or National Grid is charged with establishing capacity to a given point in advance. The incoming developer would then be tasked with designing a building to that profile and this inherently encourages developing technologies or stimulating engineering excellence.

Alternatively, Waltham Forest, as an asset provider, could install utility apparatus based upon the above and recover costs plus administration from each developer – effectively a roof tax but based upon a true business model.

**Funding Sustainable Energy Generation: Partnerships for Funding and Delivery**

Bodies such as the LDA’s DED Unit are in a position to take advantage of possible Government funding, and to establish ‘inter’ and ‘cross’ boundary PPP’s to deliver decentralised energy. They are responsible for actively seeking to invest in projects and create commercially viable ESCo’s serving local communities. Their involvement is critical to implement a successful sustainable energy infrastructure.
PFI's and PPP's are typically the funding vehicle required to achieve financial viability for projects, and a number have already been established by ESCo’s. With the enactment of the Energy Act 2008, economic incentives have been established for renewable electricity and heat with the introduction of feed-in tariffs. Additionally, the work being carried out by OFGEM and BERR in this area in relation to the distributed/decentralised generation review, the renewable energy strategy and the heat strategy will strengthen the viability of PFI’s and PPP’s. Banks and energy services companies will need to work together on innovative ways of securing funding for low carbon decentralised energy projects.
5. TELECOMMUNICATIONS

5.1. Context

Scope

Telecommunications for Waltham Forest is provided via a system of ducts and chambers, owned and operated by various companies although BT (British Telecommunications) is considered to be the largest.

The ducts and chambers are laid under the streets of Waltham Forest; extending the network does not inherently mean that the works to upgrade or replace existing system capability will be intrusive given that old cabling can be recovered, thus providing spare ‘space’.

The study will not project telecommunications demand as the infrastructure is likely to be broadly in place and is far less predictable than other utility networks. In the event that cabling needs to be replaced, the complex duct system broadly means that redundant cables can be removed and new ones inserted without the need for intrusive works.

Management Arrangements and Responsibilities

Within the modern telecommunications market, there are numerous companies now affording services to a wide client base; this extends from Virgin Media through to COLT (City of London Telecom) that provide services to specific target audiences.

Historically, British Telecommunications (BT), in a former life as the GPO (General Post Office), is considered to be the incumbent provider albeit this is purely down to volume of assets owned and operated, as opposed to services.

The telecommunications industry is perceived to be far more dynamic in terms of change when compared to other utility industries. The influx of technology has lead to significant changes in user requirements and this has been managed by the introduction of new cables; for example fibre optic.

This facet of the utility marketplace is very much client-led and therefore demands are wholly different to that of water or energy given that the latter two are a necessity to live, whilst telecommunications are more lifestyle necessity.

The basis of the report is therefore to consider what delivery constraints may be identified given that the strategic infrastructure is likely to demand less space under current technology than, for instance, forty years ago.
Telecommunications in Waltham Forest

The following companies are believed to have elements of telecommunications in Waltham Forest:

- British Telecommunications
- COLT Telecom (City of London Telecommunications)
- Energis
- Global Crossing
- Virgin

5.2. Baseline

Existing Provision

New entrants to the marketplace have installed their own telecommunication equipment relatively recently, and as a result BT is the provider whose assets suffer the most from ageing and need of replacement. Older parts of Waltham Forest, particularly in residential areas, are likely to be provided with telecommunications using old cables whilst business areas, or indeed re-development areas, are likely to be serviced with more modern facilities.

BT have planned works in Waltham Forest\(^{50}\) where residential areas will have systems updated to facilitate broadband but there is no distinction in terms of how intrusive the works themselves may be. This is due to the fact that telecommunications networks are all based upon chambers/ boxes and ducts that pass between these chambers/ boxes. If a cable needs to be replaced, intrusive works may not be necessarily required. As a result, it is difficult to anticipate whether BT planned works will cause minor disruption to local stakeholder rather than, for instance, those requiring major highway excavations.

Committed and Planned Investment

Investment will be formed by civil works (excavations in highway for example) and/ or cabling. Neither facet has been identified as is it a market that changes in terms of technology and therefore customer provision.

Currently, the residential areas are likely to require a greater number of above ground cabinets to afford connectivity and these will be placed adjacent to existing units and generally to the rear of footways. BT confirm that for these areas, there is little projected requirement to complete intrusive works (i.e. highway excavation). Of course, extending the system into new developments will still be required.

\(^{50}\) Email from BT - Senior Regulatory Specialist.
In the business areas of Waltham Forest, BT confirm that they have enough growth capacity for the next 20 years and therefore intrusive works are not projected.

**Assessment of Need/ Adequacy**

The system, as previously identified, contains a mixture of copper and fibre cables that will need replacing due to high failure rates, insufficient capacity or damage by third parties. The works may involve intrusive techniques (i.e. excavations in highway) or simple chamber access only whereby old redundant cables are removed and new ones inserted.

Telecommunications are wholly different to that of the other networks as equipment generally has reduced in size so that existing telephone exchanges can easily accommodate growth without new ones being required. Likewise with cabling; new fibre optic cables are able to carry a greater volume, and to a higher grade, of data than that of historical counterparts.

**5.3. Estimating Future Demand**

BT, or the appointed telecommunications provider, will install new boxes and ducts throughout the development; once this ‘civils’ element is concluded, cabling will be inserted and connection made to each point of use.

The number of lines required will determine the volume of duct installed; whilst it is feasible to predict that each residential unit will require one landline, this is not a given noting the availability of mobile phone technology and internet connection via the same. To this end, the predictability is that duct tracks will be required to serve each development parcel but the number of lines is not easily estimated.

**Issues/ Future Trends**

Government aspirations are that each dwelling has access to high quality telecommunications such as broadband. On the assumption that the bulk of this will be via landlines, this is likely to incur a greater number of asset replacement programmes, mostly by BT, and some can be expected to be ‘ground intrusive’.

As noted earlier however, mobile phone technology and mobile internet connectivity via ‘dongles’ is increasingly available and predictability on the use of landlines becomes less so.

**5.4. Telecommunications Needs Arising from Growth**

The provision of telecommunications is likely to impact upon the borough albeit the actual location and the magnitude of the works remain unknown. The impact may be nominal via the replacement of existing cabling in existing duct tracks or it may require significant excavations in highway. In reality, there is likely to be a mix of both but this will only be determined at the time of development.
Of course, alternative suppliers exist so an independent provider, such as Virgin Media, may well bundle telecommunications, broadband, television and other data requirements into a single service. The provision of infrastructure by, say, BT may then be wholly negated and the environmental impact will have served no purpose whatsoever.

**Infrastructure Requirements**

On the assumption that each development will install the ability to connect to a telecommunications network, each property will have a service duct connected to a main duct track located in highway. This main will then extend back to an existing duct track located close to the entrance to the site.

As and when a customer requires a connection, cabling will then be installed unless the specification of the building requires this to occur by default. Most high density housing follows this protocol but it is not a given.

The assumptions made are that each residential dwelling would then require a single landline capable of broadband and voice transmission.

**Phasing**

Infrastructure will generally only be installed once end users demand a service. All providers will be updating capability (for example, consider the speed changes in broadband even over the last two years) ongoing and works required will only be determined once application is made for connection.

**5.5. Funding**

The telecommunications process is wholly reactive and funding is established via the provider and, more recently, the developer. As with the other utility networks, infrastructure will only be installed once a definitive design has been concluded and this will be based upon trends at the time.

Normal protocols are that the construction team will make application to the provider of their choice and costs, designs, impacts on the environment and local stakeholders will become clearer at that time.

**5.6. Summary**

**Summary of Infrastructure Requirements Assessment**

Telecommunications is a fast moving market and therefore predicting growth impacts, customer choice and likely works to achieve delivery is difficult.

**Recommendations**

BT have responded to the request for information on capacity provision but this does not specifically identify work locations. As such, in light of the increasing demand for telecommunication services in Waltham Forest up to 2026, it is recommended that Waltham Forest Council maintains dialogue with telecommunication providers so as to
co-ordinate the use of highway space and the ability to pre-install, if at all possible, duct runs that mitigate the need to re-excavate highway.
PART B – FOUL AND SURFACE WATER DRAINAGE

6. SEWERAGE

6.1. Context

Scope

The elements of infrastructure covered in this section include physical assets associated with conveying and treating surface and foul water from the Waltham Forest area and discharging the treated effluent to watercourses. Sewerage infrastructure can be identified as follows: sewage treatment works; pumping stations; sewers; maintenance and control equipment; IT and buildings; and the proposed Thames Tideway Tunnel.51 Private drainage networks within individual sites (i.e. non-adopted drainage) have been omitted because sewer records are generally not available from private owners.

Waltham Forest’s Sewer System

The sewers in Waltham Forest are a combined sewer system. A combined sewer can be defined as a partially separated system for foul or sanitary drainage and surface water or storm-water run-off. The purpose of a sewer system is to remove all waste water, including rainwater from roofs and paved or impermeable surfaces, and convey it to treatment works.

A combined sewer has the advantage of providing a single network of pipes and is therefore cheaper to build. Historically most urban sewers were built as combined systems in the 19th and 20th centuries. During dry weather, all water entering the system is treated at a sewer treatment works, including rainwater, then the clean effluent is discharged to the river. However, during wet weather the volume of water entering the system is much higher because of the additional rainfall. The sewer may ‘surcharge’, which is when the flow is too high for the pipes to carry, resulting in sewage ‘backing up’ within the system causing sewer flooding. To relieve surcharging, the sewage is allowed to overflow into rivers via ‘combined sewer outfalls’ or CSOs. The disadvantage is that the mixed sewage, which contains untreated foul water as well as rainwater draining from roofs and roads, is allowed to discharge into the river.

51 The Thames Tideway Tunnel is a major investment project in London’s sewage infrastructure that is currently undergoing planning. Further detail is provided in Section 6.3 below.
6.2. Policy

The Core Strategy Issues and Options identifies that Waltham Forest faces specific environmental issues including surface water flooding. Sewerage infrastructure provision is also an essential part of Waltham Forest's flood defence strategy.

The key policy drivers behind sewerage infrastructure provision include providing for sanitation, prevention of sewer flooding; environmental improvements such as raising effluent quality standards from treatment works to protect rivers; providing new...
infrastructure to meet the demands of population growth and new office, retail and leisure development; and dealing with increased rainfall intensities due to climate change.

**Management Arrangements and Responsibilities**

Sewerage infrastructure in Waltham Forest is a combined surface and foul water system owned and operated by Thames Water. The Thames Water region includes not only Waltham Forest but also most of the Thames catchment area, from Warwickshire to Sussex and from Gloucestershire to Essex.

**Figure 6-1: Thames Water Region**

![Thames Water Region Map](image)


### 6.3. Baseline

**Existing Provision**

Thames Water own and operate 68,000 km of sewer, 800,000 manholes, 2,530 pumping stations and 349 sewage treatment works receiving 4.3 million cubic meters of sewage per day.\(^{52}\) The treatment plants serving Waltham Forest are Beckton and Deepham sewer treatment works. Existing assets require routine maintenance including sewage

\(^{52}\)It was not possible to obtain data from Thames Water specific to Waltham Forest. Contact was made with Thames Water, contacted by email on 13 August 2009 and by telephone on 26 August 2009.
treatment works, pumping stations, sludge treatment, sewers and ancillary equipment including maintenance and control equipment, IT and buildings.

Table 6-1 shows an estimate of total sewage produced in Waltham Forest based on data provided by Thames Water. As a comparison, the baseline volumes of sewage were calculated according to the standard industry procedure used to design adoptable sewers. The assessment does not consider surface water drainage.

Table 6-1: Baseline Sewage Flow Rates for Residential and Commercial Uses

<table>
<thead>
<tr>
<th>Type of Development</th>
<th>Volume of sewage (L/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>45.0M</td>
</tr>
<tr>
<td>Commercial (Office, Retail)</td>
<td>1.4M</td>
</tr>
<tr>
<td>Commercial (Industrial)</td>
<td>9.1M</td>
</tr>
<tr>
<td><strong>Total (Thames Water figures in brackets)</strong></td>
<td><strong>55.5M (71.7M)</strong></td>
</tr>
</tbody>
</table>


Committed and Planned Investment

Thames Water Five Year Plan

Thames Water own and fund improvements to the sewerage infrastructure in Waltham Forest and are solely responsible for providing sewerage infrastructure in Waltham Forest. New infrastructure is planned and funded in five-year cycles known as Asset Management Plans (AMPs).

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53 Thames Water treats 4.3M cubic metres per day for 13.5M customers in their region. This means that Thames Water receives approximately 319 L/day per customer at their sewer treatment works. In 2009, the baseline population of Waltham Forest is 224,788 (GLA, 2008). Using the rate of 319 L/day this means that Waltham Forest produces 71.7M L/day of sewage. It should be noted that in the context of Thames Water data customers do include Government and commercial organisations that may use particularly large quantities of water. Therefore the 319 L/day figure is not a per capita water figure to be applied to the expected additional population in Waltham Forest. In our assessment of Thames Water’s figures we have used the residential population as an approximation of the number of Thames Water customers.

54 The figures are illustrated in detail in Section 6.4: 200 L/day per person for residential development, 1.1 L/s per 10,000 sqm for commercial areas including offices and retail uses and 1.6 L/s per 10,000 sqm for industrial areas. Water Research Council (2006), Sewers for Adoption, 6th Edition.

55 The cost of planned maintenance and improvements to sewerage infrastructure up to 2026 was estimated based on a review of the Thames Water 5-year and 25-year investment plans. Beyond 2015 Thames Water have not yet made detailed investment plans other than the long term investment plans outlined here.

Across their entire area, current Thames Water maintenance expenditure is on average £1bn per year. Thames Water plan to invest a total of £6.5bn between 2010 and 2015 in both water supply and sewer services, and a total of £27bn over the next 25 years. Sewerage investment in 2010 to 2015 in the AMP 4 period will total £4.2bn.\(^{56}\)

In their Draft Five Year Plan 2010 to 2015 (AMP 5) Thames Water identifies possible measures to meet future expansion in levels of service provision through new infrastructure and improved existing infrastructure. At this stage, no detailed options have been made available. Possible measures to expand service provision are as follows:

- Upgrades to treatment works including sludge capacity
- Improving quality of treated effluent; monitoring
- Emergency measures; flooding; reduce CO\(_2\) emissions
- Thames Tideway Tunnel; improvements to Beckton treatment works
- New infrastructure to accommodate population growth
- Sewer flooding alleviation
- Odour reduction from treatment works.

**Thames Tideway Tunnel**

To address requirements for quality improvements, the proposed Thames Tideway Tunnel will capture and transport raw sewage that would otherwise discharge into the River Thames. Whilst the project is mainly driven by EU ecology legislation, it will also help to alleviate some of the flood risk due to sewers and surface water.

The Thames Tideway project comprises two new tunnels to substantially reduce the amount of untreated sewage discharged to the River Thames and its tributary the River Lee after heavy rainfall via CSOs. The Thames Tunnel is the larger of the two projects which will comprise a 32 km long tunnel under the Thames from the west of the city to Beckton treatment works although the precise route is yet to be determined. Construction is provisionally scheduled to start in 2012 and finish in 2020. At this stage Thames Water expect to submit a planning application in late 2011. The overflow of untreated sewage into the Thames is a legacy of the original design for London’s sewers and currently occurs around once per week. On average 32 million cubic metres is discharged every year and the situation is predicted to get worse due to expected population growth and more intense rain storms as the climate changes. Continuing urbanisation through paving over landscaped areas preventing rainfall from being soaked up by the ground is adding to the problem. The project will be entirely funded by Thames Water through revenue and has been allocated accordingly as shown in **Table 6-2**. As such Waltham Forest will be involved in the project when it reaches planning stage but it is not known at this stage whether Waltham Forest will make any direct financial contribution.

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\(^{56}\) Thames Water (2007), *Taking Care of Water – The Next 25 Years (2010-2035)*
Other Project Priorities

Following consultations between Thames Water and their customers, the highest priority in terms of the company’s investment will be to reduce sewer flooding within properties and to deal with odour nuisance caused by treatment works. While protecting the aquatic environment within watercourses is considered a priority, it should be noted that the proposed Thames Tideway Tunnel Project noted above has still not yet received planning permission and therefore may not be implemented in its current form.

Pro-rata Planned Investment Programme Costs for Waltham Forest

Table 6-2 shows planned capital investment in sewerage infrastructure within Waltham Forest, 2010-2055. The figures are for the whole Thames Water region. Thames Water was unable to provide figures for Waltham Forest since much of their investment is directed towards large-scale assets that serve areas greater than the study area. However, in order to overcome this, URS have calculated some approximate figures for Waltham Forest shown which were estimated based on equivalent population where relevant\(^57\).

\(^{57}\) Around 0.225m people live in Waltham Forest compared to a total population of 13.5m in the Thames Region (1.7% by population).
Table 6-2: Capital Investment in Sewers Infrastructure in Waltham Forest, 2006 – 2025

<table>
<thead>
<tr>
<th>Key Activity Projections</th>
<th>Estimated Waltham Forest Cost (Thames Water Region Cost in Brackets) 58</th>
</tr>
</thead>
<tbody>
<tr>
<td>New and renovated sewers</td>
<td>na</td>
</tr>
<tr>
<td>New and refurbished treatment works</td>
<td>na</td>
</tr>
<tr>
<td>New and refurbished pumping stations</td>
<td>na</td>
</tr>
<tr>
<td>Management and general costs</td>
<td>na</td>
</tr>
<tr>
<td>Thames Tideway Project (also includes the Lee tunnel)</td>
<td>na</td>
</tr>
<tr>
<td>Total</td>
<td>£20m (£1,200m)</td>
</tr>
</tbody>
</table>


Detailed investment information for the region is available for the period from 2010 to 2015 and more approximate costs are available for 2015 to 2020. Projects will be funded by revenue from Thames Water customers averaged over the whole Thames Water region. Long-term costs have been evaluated for the Thames Tideway project due for completion in 2020.

Assessment of Need/ Adequacy

Currently, sewerage infrastructure is close to capacity within Waltham Forest and as a result there is a significant risk of surface water flooding, especially in the centre and south east of the borough. There is a medium risk of sewer flooding in these areas due to the design of Waltham Forest's system as a combined sewer which means that rainwater mixes with foul sewage 61.

There are potential gaps in provision where insufficient sewerage infrastructure is available to support new development. Under the Water Industry Act, Thames Water

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58 Estimated Waltham Forest cost is based on population equivalent: Waltham Forest population is 0.225m; Thames Water Region population is 13.5m.

59 The cost total cost for Thames Tideway Tunnel is given; with the cost spread across two development phase periods reflecting the construction programme for the project. Consequently the cost has been spread evenly to calculate total expenditure.

60 Based on predicted total capital investment of £5,750m in 2020-2025 assuming 70% covers sewerage (the rest covers water supply), based on long term cost assessments; Thames Water (2007) Taking Care of Water – The Next 25 Years (2010-2035), p. 67.

61 North London Waste Plan (2008), North London Strategic Flood Risk Assessment (SFRA), Mouchel Group Limited.
have limited powers to prevent connection ahead of infrastructure upgrades, as developers have an automatic right to connect to the sewers system once their development has been granted planning permission. It is therefore recommended that the Council should engage with Thames Water to ensure that the proposed development is accounted for as part of any planned infrastructure improvement works.

6.4. Estimating Future Demand

Provision Standards

The provision standards that will be used to calculate the demand for new sewerage infrastructure arising from economic and population growth are based on the standard industry procedure used to design adoptable sewers as shown in Table 6-3.

Table 6-3: Sewerage Provision Standards

<table>
<thead>
<tr>
<th>Development</th>
<th>Provision Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>200 L/day per person</td>
</tr>
<tr>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Low water use (offices, retail)</td>
<td>1.1 L/s per 10,000 sq m</td>
</tr>
<tr>
<td>Intermediate water use</td>
<td>1.35 L/s per 10,000 sq m</td>
</tr>
<tr>
<td>High water use (industrial)</td>
<td>1.6 L/s per 10,000 sq m</td>
</tr>
</tbody>
</table>


Some of the commercial development in Waltham Forest is expected to be office and retail for which the water use is likely to be low and therefore a rate of 1.1 L/s per 10,000 sq m has been used in the calculations. In addition some industrial development is expected, for which a rate of 1.6 L/s per 10,000 sq m has been used.

The assessment is an approximation and makes a number of assumptions including:

- The volume of sewage treated per customer will remain the same in 2026
- The surface water flow is not considered
- The number of Thames Water customers increases at a constant rate from now until 2026

These factors are all unknown at this stage and the assessment is therefore based on the limited information currently available. However calculations using the two methods yield similar volumes of sewage for the period 2009-2026. URS is therefore confident that Thames Water are using a similar process to calculate the associated infrastructure requirements.

Issues/Future Trends

The factors driving sewerage infrastructure improvements include legal obligations, climate change and population growth:

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• Thames Water has legal obligations set at EU and national UK level to meet effluent quality targets.

• Population growth in recent years has increased pressure on treatment works, which increases the risk of breach in effluent quality targets.

• Currently, combined sewage overflows into the tidal reaches of the River Thames are an infringement of the EU Urban Wastewater Treatment Directive which has led to the proposed Thames Tideway scheme to intercept these outfalls.

• Finally, climate change will lead to increased rainfall intensities placing further pressure on the sewer system.

Without further investment, the existing sewers system would have insufficient capacity to cope with future development anticipated within Waltham Forest. The anticipated increase in rainfall intensity due to climate change is estimated to be 5% in the period up to 2025\(^63\). Extreme rainfall events are predicted to increase in frequency over the years requiring greater capacity in sewers. Hotter, drier summers will increase the demand for water and therefore also increase pressure on sewers. Investment in treatment works will be required to meet increasingly stringent water quality targets.

The projected residential and commercial growth in Waltham Forest will necessitate increased capacities of the network, treatment works and sludge disposal. Average household occupancy is anticipated to decrease, which is expected to result in an increase of per capita water use. However, metering of household water should counteract increased demand: meters will be installed in 28% of households by 2010 and 84% by 2025. The implementation of Sustainable Urban Drainage Systems (SUDS) in new developments will also be an important measure mitigating increased run-off from developed areas\(^64\).

In the future, new legislation will further increase quality standards, driving future investment in treatment works improvements, that Thames Water plan to address through the aforementioned Thames Tideway Tunnel.

In future years, existing assets will continue to require routine maintenance. The total length of sewers to be maintained by Thames Water across its entire area will increase from 68,000 to 108,000 km by 2015. In addition, investment is required to reduce sewer flooding and reduce odour from sewage treatment works. Cleaning and repairs will be increased in sewers where blockages are known to occur.

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\(^63\) DCLG (2007), Planning Policy Statement 25, Development and Flood Risk, Table B2

\(^64\) SUDS are designed to mimic the rainwater attenuation properties of a natural landscape and prevent large volumes of surface water runoff into the sewer system following intense rainstorms. SUDS can significantly reduce surface water or sewer flooding and methods suitable for urban environments are available such as porous paving and rainwater harvesting.
Table 6-4 presents a summary of the factors that may have an impact on the predicted investment plans.

**Table 6-4: Potential Factors Affecting Future Required Investment in Sewers in Waltham Forest**

<table>
<thead>
<tr>
<th>Customers</th>
<th>Assets</th>
<th>External Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographic changes: Increasingly mobile and/or transient population makes it difficult to predict demand for sewerage services</td>
<td>Innovations in treatment technology such as fuel cells</td>
<td>Extent of climate change may differ from predictions</td>
</tr>
<tr>
<td>Evolving public expectations regarding level of service, e.g. sewer flooding and river water quality</td>
<td>Efficiency improvements such as automated monitoring</td>
<td>Downturn in the economy will constrain investment; market forces will affect demand and price for sewage services</td>
</tr>
<tr>
<td>Adaptation to and tolerance of climate change impacts, e.g. increased water use in the summer months; if Greywater recycling becomes common place (i.e. rainwater harvesting for garden use and wc flushing) demand may be reduced</td>
<td>Development of smaller scale, localised solutions</td>
<td>Changing land use plans could alter existing / forecast drainage patterns</td>
</tr>
<tr>
<td></td>
<td>Resilience of assets to climate change impacts - degradation may be accelerated or capacity exceeded</td>
<td>Restructuring of the water industry to stimulate competition will affect investment plans</td>
</tr>
<tr>
<td></td>
<td>Pressure to cut carbon emissions</td>
<td>Tightening legislative and regulatory environment</td>
</tr>
</tbody>
</table>


### 6.5. Demand for Sewerage Infrastructure arising from Growth

Thames Water own and maintain the sewerage infrastructure in Waltham Forest and it is their responsibility to provide infrastructure improvements necessary to future development.

An increase in sewage flows could result in the need for additional infrastructure both at the local level – e.g. additional sewers serving new development and improvements to the local sewers network – and at the strategic level.

Using the same approach presented in Section 6.4 URS calculated the predicted future sewage volumes based on the rate of 319 L/day per customer calculated from Thames Water data. Based on this method the baseline sewage flow is 71.7M l/day as shown in Table 6-1, resulting in a cumulative sewer flow rates of 77.7M l/day and the higher growth scenario figure of 86.2M l/day\(^65\) respectively.

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\(^65\) This is equal to a 319 l/day consumption rate per customer multiplied by the total (inclusive of projected growth) 2026 residential population in Waltham Forest of 243,645 (lower growth scenario) or 270,303 (higher growth scenario).
Table 6-1 shows that based on Sewers for Adoption rates (Table 6-3) the baseline sewage flow is 55.5M l/day. Table 6-5 further illustrates the estimated flow rates resulting from new residential and commercial development by sub area up to 2026, totalling 3.9 M l/day for the lower growth scenario and 9.2M l/day for the higher growth scenario. According to the URS model therefore the cumulative sewer flow rates up to 2026 (inclusive of baseline flows) add to 59.4M l/day for the lower growth scenario and 64.7M l/day for the higher growth scenario.

In terms of the Thames Water and URS’ assessment, it is not possible to compare the figures shown in Table 6-5 with information from Thames Water. However, the total flows of 59.4M l/day and 64.7M l/day estimated through URS model are marginally less than the lower growth scenario figure of 77.7M l/day and the higher growth scenario figure of 86.2M l/day as estimated by applying Thames Water current flow rates. Therefore, this suggests that the assumptions used by Thames Water to inform their planned infrastructure investment to 2026 are likely to be more than adequate.

Table 6-5: Sewage Flow Rates in Waltham Forest’s Sub areas Type of Development, 2009 to 2026, '000

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>H</td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>Residential</td>
<td>355</td>
<td>566</td>
<td>196</td>
<td>1,317</td>
</tr>
<tr>
<td>Non-Residential</td>
<td>71</td>
<td>71</td>
<td>94</td>
<td>94</td>
</tr>
<tr>
<td>Total</td>
<td>426</td>
<td>637</td>
<td>290</td>
<td>1,412</td>
</tr>
<tr>
<td>Central Waltham Forest</td>
<td>Residential</td>
<td>599</td>
<td>599</td>
<td>750</td>
</tr>
<tr>
<td></td>
<td>Non-Residential</td>
<td>(137)</td>
<td>-137</td>
<td>(67)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>462</td>
<td>462</td>
<td>683</td>
</tr>
<tr>
<td>Blackhorse Lane</td>
<td>Residential</td>
<td>148</td>
<td>894</td>
<td>144</td>
</tr>
<tr>
<td></td>
<td>Non-Residential</td>
<td>27</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>174</td>
<td>921</td>
<td>172</td>
</tr>
<tr>
<td>Northern Waltham Forest</td>
<td>Residential</td>
<td>56</td>
<td>56</td>
<td>68</td>
</tr>
<tr>
<td></td>
<td>Non-Residential</td>
<td>(2)</td>
<td>-2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>54</td>
<td>54</td>
<td>68</td>
</tr>
<tr>
<td>Total</td>
<td>Residential</td>
<td>1,157</td>
<td>2,115</td>
<td>1,157</td>
</tr>
<tr>
<td></td>
<td>Non-Residential</td>
<td>(41)</td>
<td>-41</td>
<td>56</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>1,116</td>
<td>2,074</td>
<td>1,213</td>
</tr>
</tbody>
</table>

Source: URS calculations based on joint analysis by LB Waltham Forest and URS Corporation.

66 Commercial includes office, retail and industrial developments.
6.6. Resulting Sewerage Infrastructure Requirements

It has not been possible to identify the specific infrastructure requirements arising from growing sewage flow rates within this study. This is partly due to the lack of detailed baseline information on the adequacy of the network within Waltham Forest.

Furthermore, intensive modelling is necessary to accurately predict the impact of the estimated additional sewage flows on the sewerage network at both the local and strategic levels. The reason for this is that Thames Water classes information about the specific location of required improvements or expansions as confidential, so that the utility company alone is in the position to undertake a structured and detailed investigation to address the proposed developments in tandem with both climate change issues and the increasing maintenance requirements of an aging and under-capacity sewerage system.

**Phasing**

Sewerage infrastructure is planned and funded over five-yearly investment programmes. Currently Thames Water is undertaking Asset Management Plan 4 or AMP 4, due to end in 2010. AMP 5 will run from 2010 to 2015, followed by AMP 6 in 2015-2020 and AMP 7 in 2020-2025. The scope of this report extends to 2026 which is one year into the AMP 8 period of 2025-2030.

6.7. Funding

Thames Water are responsible for sewerage infrastructure provision in Waltham Forest. Across their entire area, current Thames Water maintenance expenditure is on average £1bn per year. Thames Water plans to invest a total of £6.5bn between 2010 and 2015 in both water supply and sewer services, and a total of £27bn over the next 25 years. Sewerage investment in 2010 to 2015 in the AMP 4 period will total £4.2bn.

**Local Infrastructure**

Expansions or improvements to local infrastructure will be funded as a result of direct negotiations between Thames Water and developers, so that it is not possible in this report to estimate the scale of resources available. Information from the Thames Water AMP 4\(^7\) shows that for the whole of the Thames Water region, Thames Water expect to develop a total of 151.5 km of new sewers, which will be funded through revenue plus additional fees paid by developers.

**Strategic Infrastructure**

Under the current planning regime, where there is insufficient sewer capacity and no improvements are programmed, it is the individual developer’s responsibility to negotiate with Thames Water as to what improvements are required and how they will be funded.

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This may result in the risk that an individual developer is not able to fund the necessary sewer upgrade, which may present a barrier to the development.

Investment in sewerage infrastructure will be subject to financial risk. Thames Water is a private company and the proposed £30bn investment needed to finance their investment plans will come from a range of capital markets, with the risk of an increasing cost of borrowing. Also, any major scheme will be subject to high risks that are common to large scale construction projects, albeit mitigated by OFWAT regulation of cost efficiency targets68.

6.8. Summary

Summary of Infrastructure Requirements Assessment

For the reasons identified in Section 6.3 to 6.5 it is not possible within this report to definitively conclude an assessment of specific infrastructure requirements for Waltham Forest between 2009 and 2026.

However, Thames Water has developed a plan for the entire region for which they are responsible, and the identified schemes are presented in Table 6-6 below.

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68 The scale of the proposed investment will exceed the capacity of any single debt market, therefore the company will require access to a wide range of capital markets. Large projects such as the Thames tunnel may require funding in alternative ways to better define and allocate risk, as these projects have a different risk profile to a standard capital programme. To regulate prices, Ofwat sets cost efficiency targets every five years and benefits of cost savings are hence shared with sewerage customers. In summary there is a risk that the costs of the proposed investment may increase due to both the cost of borrowing and due to the high risks involved in major construction projects, but these are controlled to an extent by Ofwat to protect consumers from excessive price increases.
Table 6-6: Summary of Infrastructure Requirements (Thames Water region)

<table>
<thead>
<tr>
<th>Infrastructure Item</th>
<th>Where &amp; Area</th>
<th>When (Trigger Point or Period)</th>
<th>Who to provide?</th>
<th>Funding Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewers to be renewed</td>
<td>121.6km 136.3km</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sewers to be renovated</td>
<td>79.5km 95.0km</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New sewers</td>
<td>36.8km 114.7km</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue plus additional fees paid by developers</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New/refurbished intermittent discharges (storm overflows)</td>
<td>47 41</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New/refurbished treatment works</td>
<td>77 90</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New/refurbished pumping stations</td>
<td>24 40</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offices, labs, depots, workshops</td>
<td>10,000m² 10,000m²</td>
<td>2010-2015 2015-2020</td>
<td>Thames Water</td>
<td>Thames Water revenue</td>
</tr>
<tr>
<td></td>
<td>Location not known</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


Recommendations

In light of the fact that it has not been possible to conclude specific infrastructure requirements arising from the projected residential and commercial growth in Waltham Forest, it is suggested that the following actions are pursued to meet the requirements on PPS12\(^{69}\) to properly plan for infrastructure to support the spatial development plans proposed.

Firstly, engagement with Thames Water would ensure that the sewerage network has adequate capacity to accommodate the anticipated residential and commercial growth, so as not to constrain development. As part of this the Council may consider commissioning

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a network impact assessment at a strategic level\textsuperscript{70}, addressing sewer flooding hotspots in the centre and south east of the borough should be addressed first.

Secondly routine maintenance operations to roads and paved areas are also a key opportunity for the Council to take preventative action and replace impermeable surfaces with permeable systems that will reduce the quantity of surface water runoff and hence mitigate flooding. Retro-fitting of SUDS should be implemented where feasible, e.g. on Council Estates and public realm open spaces. These measures would reduce surface water runoff to the combined sewer network, potentially significantly. Surface water input was not incorporated into the calculations because it is not known what extent of external surface area drains to the Thames Water network; detailed information on the Thames Water network (sewer size, length) is unknown; and the extent of current surface water attenuation and restricted discharge is unknown.

LB Waltham Forest should implement SUDS wherever possible and private developers should be encouraged to do so. It is assumed that the status quo in terms of sewage treatment is maintained. However, policy drivers such as the emerging Water and Flood Management Bill and the Code for Sustainable Homes, aim to promote SUDS which treat water close to the source before it enters the combined system, with the added benefit of minimising new infrastructure.

\textsuperscript{70} Thames Water is expected to charge the Council in the order of £50,000 to conduct such investigation, see also Section 7.7.
7. FLOOD RISK

7.1. Context

Waltham Forest’s Core Strategy Issues and Options recognises the need for development to support new or upgraded infrastructure, both on and off site, either to support the development or to mitigate its affects. The flood defence infrastructure is inclusive of the river flood defences and the sewerage network which protect against the dominant forms of flooding within Waltham Forest.

An area of flood risk is defined as the likelihood that the area will flood now or in the future. Flood risk can come from a variety of sources such as groundwater, sewer, surface water, fluvial (river), and tidal. Flood risk can be influenced by changes in watercourse conditions due to the effects of climate change or siltation. Structural or operational failure of flood defences or sewerage infrastructure can also result in flooding. Flood defences have been historically built within and along the banks of rivers, canals and reservoirs to protect developments from flood risk. Flood mitigation infrastructure can include attenuation basins and tanks, over sized sewers and sustainable urban drainage systems (SUDS).

The majority of the land within the LB Waltham Forest is located in Environment Agency (EA) Flood Zone 1. This indicates that these areas are located outside the risk of any 1 in 1000 year flood event. However areas to the west of the borough are within the floodplain of the River Lee and its associated watercourses the River Lee Navigation and the Eastern Flood Channel. Numerous tributaries to the River Lee such as the River Ching and the Dagenham Brook also pose risk of flooding to their local areas.

The dominant risk of flooding within the borough is fluvial flooding through the watercourses breaching their banks during extreme rainfall events. This flooding has been historically concentrated in the west of the borough.

There is a medium risk of flooding due to sewer and surface water flooding. This flooding is shown to be historically at its worse in the centre and south-east of the borough.

There are additional lesser flood risks to specific areas of the borough associated with the series of reservoirs located in the River Lee Valley. The consequences of flooding occurring from these reservoirs are severe but the risk is considered low due to enforced management measures.

Flood defences in Waltham Forest are maintained and upgraded by a variety of bodies including:

- Environment Agency (River Lee and other main watercourses)
- British Waterways (River Lee Navigation)
- Thames Water (Sewerage Infrastructure and Lee Valley Reservoirs)
7.2. Policy

There are a number of standards that provide guidance on flood risk and defence including: Planning Policy Statement 25 (PPS25): Development and Flood Risk; The London Plan; local authorities’ Strategic Flood Risk Assessment and local planning guidance (within the Unitary Development Plan or Local Development Framework). These standards are intended to help reduce the amount of surface water generated by proposed developments by requiring the implementation of SUDS and encouraging the implementation of flood resilient architecture.

Sir Michael Pitt reported in June 2008 his findings into the widespread UK flooding that occurred during the Summer of 2007. The Pitt report identified 92 separate proposals including measures such as that local authorities ensure developers make full contributions to the costs of building and maintaining necessary flood defences. Many of these recommendations have been carried forward into the Draft Flood and Water Management Bill that was issued for consultation between 21st April and 24th July 2009.

7.3. Baseline

Flood Risks and Flood Defences in Waltham Forest

The North London Strategic Flood Risk Assessment (SFRA) 71 identifies Waltham Forest’s potential sources of flood risk as being from fluvial, tidal, groundwater, sewer, surface water, canals and reservoirs. Each of these has been assigned a degree of risk as high, medium or low corresponding with the results determined in the SFRA, summarised in Table 7-1.

Table 7-1: Sources of Flooding and the Degree of Risk in LB Waltham Forest (in accordance with the findings of the SFRA)

<table>
<thead>
<tr>
<th>Sources of Flooding</th>
<th>Fluvial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater, Tidal, Canals and Reservoirs</td>
<td>Low</td>
</tr>
<tr>
<td>Sewer and Surface Water</td>
<td></td>
</tr>
</tbody>
</table>


Fluvial and Tidal Flooding

The River Lee is one of the largest tributaries to the River Thames and drains a large rural catchment to the north of London. The Lee River Valley forms the western boundary of the LB Waltham Forest.

The tidal limit of the River Lee was historically close to Lee Bridge Road near the southern boundary of the borough. The combination of the level of protection offered by the Thames Barrier and the local river flood defences meant that any extreme tidal water level would have to have been accompanied by a breach in the flood defences to cause severe flooding. Local flooding may have resulted due to tide locking of surface water outfalls. The works recently undertaken by British Waterways\(^7\) means that the tidal influence of the River Thames no longer extends into the borough. Hence fluvial flooding has been assessed as the more serious flood risk from rivers within the borough.

There was severe fluvial flooding in the Lee Valley in March 1947. This was spurred by a combination of snowmelt, large rainfall event and a high tide in the Thames estuary. Areas around the Warwick Reservoirs were flooded as shown on Figure 7-1.

Figure 7-1: Historical Fluvial Flooding in the River Lee Valley (1947)

\(^7\) Works have been undertaken as part of the preparation for the Olympics sites in 2007. Further information is presented in the next Section: Flood Risk Management, Canals.
This flood event led to the construction of the River Lee Flood Relief Channel (also referred to as the Eastern Flood Channel) that was opened in 1976. The Relief Channel nearly reached its capacity during events in 1987 and 1993. There was flooding from the Relief Channel in October 2000 at the Douglas Eyre Playing Fields and also further south at Walthamstow Marshes Nature Reserve.

There is high fluvial flood risk associated with tributaries to the River Lee such as the River Ching and the Dagenham Brook. These watercourses are not protected to the same standard as the River Lee and are known to flood during flood events with a lower frequency than the 1 in 100 year event. This positions areas adjacent to these tributaries within EA Flood Zone 3A and in some instances Flood Zone 3B (the functional floodplain).

**Groundwater Flooding**

For Waltham Forest, the SFRA reports low groundwater flooding concerns. To this end, Waltham Forest should continue to work with General Aquifer Research Development and Investigation Team (GARDIT)\(^\text{73}\) to mitigate the problem. GARDIT has been able to increase the groundwater abstraction in London by up to 50 million litres per day (ML/d), which has reduced the rate of groundwater rise considerably.

**Canals**

The River Lee Navigation is a man-made channel operated by British Waterways. The channel is located in the Lee Valley on the western side of the series of reservoirs. The channel runs partly along the border between Waltham Forest and other boroughs and partly within the adjacent London boroughs of Haringey and Enfield.

The River Lee Navigation is in some locations a part of the River Lee, whilst in other locations runs in parallel to the main river. Within Waltham Forest the channels are separate and are divided by a series of reservoirs (which are further discussed below). Commercial trade using the canal effectively ended in the 1980s and the main usage now is recreational. Flood risk associated with the River Lee Navigation Channel is classed as a low risk within the North London SFRA.

**Reservoirs**

There are thirteen reservoirs located within the River Lee valley. Reservoirs that are elevated above the surrounding area and contain a minimum of 25,000 cubic metres of water are subject to categorisation within the Reservoir Act 1975. Eleven of the Lee Valley reservoirs are subject to this categorisation. All reservoirs are the property of Thames Water.

Consequences of a flood deriving from this source have been assessed as severe to catastrophic (relating to a dam breach) as the surrounding and downstream areas would

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\(^{73}\) The Team was set up in 1992 by Thames Water Utilities, London Underground Limited and the Environment Agency (EA).
be inundated with water. However the risk of flooding from this source has been assessed as very low.

**Sewer and Surface Water Flooding**

The risk of sewerage and surface water flooding is considered to be medium in the borough.

This condition is due to the presence of combined foul and surface water sewers that characterises a significant amount of the sewerage in the borough. These sewers are at capacity during 1 in 1 year and 1 in 2 year storm events. Therefore, small storm events can cause extensive sewer flooding where surface water overwhelms the sewerage network. Surface water flooding then occurs when the excess surface water ponds or flows downhill as overland flow. Schemes included within the Thames Water planned network-wide improvements along with the proposed Thames Tideway Tunnel scheme will provide increased capacity in the sewerage network and provide sewerage overflow attenuation.

In addition, the topography to the north-east of the borough contributes to surface water flooding by overland flow off the higher land at Epping Forest. This occurs when the infiltration capacity of the land is beaten by high peak rainfall intensities and runoff discharges via land drainage to the lower surrounding residential areas.

**Flood Risk Management**

**Fluvial Flooding**

The River Lee catchment within the borough can be categorised as developed flood plain with built flood defences. The river experienced severe flooding in 1947 and since then the river has been heavily altered and protected. The development of several man-made channels has provided flood relief in the area by providing increased conveyance capacity through the catchment.

The Flood Relief Channel was designed to protect against events similar in severity to the 1947 event, which was believed to be approximately a 1 in 70 year event. This level of protection is below that now considered appropriate for new development. Furthermore the level of protection provided when this channel opened in 1976 has now been further reduced due to extensive development and urbanisation in the upper catchment.

The EA Flood Warning service provides protection to the properties in Flood Zones 3 and 2 along the River Lee valley. The EA aims to provide a 2 hour lead time warning of any flood events. Many of the tributaries of the Lee have fast response times due to their small urban catchments and underlying impermeable London clay.

The EA River Thames Catchment Flood Management Plan (January 2007) identifies the River Lee as a developed flood plain with built flood defences. The plan identifies maintaining the existing defences as the best way of managing the risk in this catchment. The EA proposes to use the natural floodplain for water retention wherever possible and for the redevelopment of urban areas to offset effects due to the onset of climate change.
Canals

It is the responsibility of British Waterways to ensure that no flooding occurs in the River Lee Navigation.

British Waterways has been involved in numerous works downstream of the borough on the River Lee and connected waterways in preparation for the sites for the 2012 Olympic and Paralympic Games. The construction of the 3 Mills Lock at the Prescott Channel in Bromley-by-Bow prevents the tidal influence of the River Thames extending any further north. These works have opened up the system of navigation channels in the area (including the Lee Navigation) to enable barge traffic to access the sites for the 2012 Olympic and Paralympic Games. The 3 Mills Lock scheme started on site in March 2007 and the lock opened for general river traffic in June 2009.

Sewer and Surface Water Flooding

Waltham Forest is under medium flood risk from sewers and surface water flooding from the combined foul and surface water sewerage network within the borough, which is under the authority of TW. The worst affected area is within the E17 postcode that comprises North Walthamstow. The Council is unable to determine where and when network improvements will be undertaken, as the precise locations for flooding schemes that will be addressed within the borough is classed as confidential information within TW's business plan.

However the Council is able to restrict the surface water runoff from new developments by requiring that all new development or redevelopment schemes coordinate with Thames Water as part of the planning application process and adhere to the Mayor of London’s Water Matters\textsuperscript{74}, Proposal 7. This proposal states that the London boroughs will require new developments (larger than 1,000 sqm or more than 10 dwellings) to manage their surface water runoff so that there is a 50 per cent reduction in the volume and flow rate of surface water runoff when compared to that of the undeveloped site at peak times.

London Plan Policy 4A.14 further states that; ‘developers should aim to achieve greenfield run-off from their site through incorporating rainwater harvesting and sustainable drainage’. However it is recognised that this target may not be achievable on large developments with 100% existing impermeable surfaces. This is due to the huge volumes of water generated from site run-off that would require storage or an alternative means of management at the development site. Coordination between the Council and Thames Water will help to ensure that proposed developments only discharge into the sewerage network flows that are consented by Thames Water based on local network capacity considerations.

\textsuperscript{74} Mayor of London (2007), Water Matters, the Mayor's Draft Water Strategy, Draft for consultation with the London Assembly and functional bodies, GLA.
**Committed and Planned Investment**

*Fluvial Flooding*

The EA have advised that they are examining the feasibility of a Flood Alleviation Scheme on the River Ching and that de-silting work is being carried out on the Dagenham Brook during the Summer of 2009. There are currently no other scheduled schemes that will increase the standard of flood protection in the borough.

Most of the EAs' budget is spent on dealing with flood risk from rivers and the coast. Consultants are appointed to assist the EA deliver their capital programme under an agreement known as the National Framework Agreement for Engineering and Environmental Consultancy Services (NEECA). The agreements run for four years and the NEECA2 framework expires in October 2009.

Flood mitigation funds are also available to all local authorities. Local authorities need to apply for funding under the Department for Environment, Food and Rural Affairs Flood and Coastal Defence Project Appraisal Guidance (DEFRA PAG): procedural guidance for operating authorities procedures.

The PAG applications must be submitted to validate the economic, social and environmental benefits of a flood alleviation scheme. A Project Appraisal Report (PAR) must be produced detailing the cost benefit ratios and the score obtained must be at or higher than the threshold set by the EA for any given year. The higher the score the greater the chances of securing funding. If funding is not secured in one year the project can be put back so that it becomes a priority for the following funding round. The PAG process has many levels depending on the magnitude of the job and the PAR reports produced vary in the level of detail needed to secure funding.

The EA’s current funding settlement from central Government for flood mitigation runs until March 2011. The EA has requested in June 2009 that spending on asset maintenance and construction must rise from the £570M allocated to the EA in 2010/11 to around £1.04bn by the year 2035 (before inflation is taken into account). This figure equates to an increase in asset construction and maintenance spending of around £20M per year and a total spend of £20bn over a 25 year period. The EA stated that this increase in funding is necessary to ensure that protection for the one in six homes now at risk of flooding in England is maintained. At August 2009 it is uncertain whether the requested additional funding will be secured by the EA in its entirety.

The EA’s preferred procedure is to maintain current levels of protection and to target properties classified as being at ‘significant’ risk of flooding where the benefits of doing so are at least double the costs. This provides the greatest net return on investment.

The estimated £20bn spending over 25 years assumes that the EA will not have to meet the costs of funding defences for future developments on flood plains. Instead it is assumed that developers will have to pay to defend such properties.
**Sewer and Surface Water Flooding**

Thames Water’s *Proposed Business Plan* for the AMP5 period (2010-2015)\(^{75}\) includes an allowance for flooding relief at 4,726 properties within the Thames Water region that have suffered from recurrent flooding. Within this total there will be 450 separate flooding schemes within the London boroughs\(^{76}\). The business plan will be approved by OFWAT in Autumn 2009.

The utility company funding cycle that Thames Water operates within dictates that funding for relief schemes for sewer flooding is addressed for the next AMP period solely.

Thames Water’s *Taking Care of Water*\(^{77}\) initiative looks at the long term 25 year forecast at a strategic level. This report states TW’s intention to eliminate high-risk internal flooding by identifying areas at risk of flooding and prevent the flooding before it occurs. This is programmed in tandem with adapting the sewerage system to cope with climate change. There are currently no specific proposals relating to Waltham Forest.

TW have stated that upgrades to Wastewater Treatment Works (WWTW) are classed as planned work and the scale of this work will be determined by planning information already within the public domain such as the Local Authority LDF documents. There are no WWTW within the boundary of the borough. Foul water sewer flows from the north of the catchment will flow to Deephams WWTW which is located within the London borough of Enfield and is located to the west of the William Girling Reservoir and the River Lee Navigation. The remainder and the majority of the foul flow from within the borough discharges to Beckton WWTW which is located within the London borough of Newham at the confluence of the River Thames and the Barking Creek.

Expansion works are planned to the Beckton WWTW within the Thames Water AMP5 Business Plan, notably in relation to the Thames Tideway tunnel schemes. The scope of the works within TW’s draft AMP5 plan are currently under negotiation with OFWAT therefore the proposals contained therein are unconfirmed pending the final determination to be agreed with the regulator in Autumn 2009.

TW has currently no defined schemes for strategic improvements to the sewerage network within the borough. Thames Water allocates their schemes based upon a number of factors such as cost benefit analysis and the degree of certainty that intended development will progress.

If upgrades are required to the sewerage network then property developers are liable to provide at least a proportion of the funding required.

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\(^{76}\) The available data does not break down the locations into individual London boroughs.

Assessment of Need/ Adequacy

Fluvial

The standard of flood defence offered by the River Lee within the borough is currently estimated to protect against a 1 in 70 year return period storm event. The lifespan of the current defences is estimated to extend to the year 2050.

The standard of protection offered by the River Ching is lower and in the Highams Park area close to the confluence with the River Lee the North London SFRA indicated that the surrounding area is within the 1 in 20 year return period floodplain. The SFRA estimated that 130 residential properties along the banks of the River Ching are within the EA Flood Zone 3B, the ‘functional floodplain’.

Sewer and Surface Water Flooding

Waltham Forest’s Highways department is responsible for 18,000 gully pots within the borough and their lateral connections. Each pot has a target inspection routine of once every two years. Slow running pots are typically left until a formal written complaint is received and then repairs will usually be actioned. Approximately twenty-five gullies are worked on annually. The repairs are typically a reconnection of the lateral pipe but on occasion necessitate the replacement of the gully pot.

British Gas and Thames Water (through their respective sub-contractors Skanska and Clancy Docwra) are undertaking wholesale renovation of their services in the borough throughout the Summer of 2009. This has lead to the dominant highway maintenance problem of damaged gully lateral connections that often occurs during the backfilling process after the installation of other services. Currently the borough is able to adequately assign responsibility for damage to the other companies responsible and they will pay for the subsequent repairs.

The borough’s annual drainage maintenance budget is approximately £25,000. This is currently adequate to undertake approximately 25 gully lateral repairs or gully replacements and other surface water drainage maintenance i.e. maintaining trash screens on culverts.

7.4. Estimating Future Demand

Policy Requirements

There are a variety of national, regional and sub-regional documents providing guidance on flood risk and defence including Planning Policy Statement 25 (PPS25): Development and Flood Risk, the London Plan and the North London Strategic Flood Risk Assessment.

The local planning guidance, Waltham Forest’s Unitary Development Plan (UDP) (First Review 2006), also provides guidance in Policy WPM18 – Flood Risk and Policy WPM 19 Surface Water Run-off, which state respectively:
'In areas at risk of flooding the council will need to be satisfied that development proposals would not result in an unacceptable increase in the risk of flooding to people, property and essential service provision.'

'Where new development would increase surface water run-off, the council will expect new development to utilise SUDS (Sustainable Urban Drainage Systems) wherever possible. Where such techniques are not incorporated, applicants should explain why they are not practicable.'

These standards should help reduce the amount of surface water generated by proposed developments by requiring the implementation of SUDS.78

The SFRA states that the emergency management plans and supporting inundation mapping recommended by the Pitt Review79 are likely to become a legal requirement from Summer 2010.80 Chapter 19 - Effective Management of Dams and Reservoirs of the Pitt Review states that reservoir undertakers may be legislated to prepare a flood plan setting out how they would control or mitigate the effects of flooding likely to result from the escape of water from both large and small reservoirs. The Lee Valley reservoirs are owned and operated by TW.

Sir Michael Pitt’s Review of the Summer 2007 floods stated that Local Surface Water Management Plans (SWMPs) as set out in PPS25 and co-ordinated by local authorities should provide the basis for managing all local flood risk (Recommendation 18). The roles to be adopted in the production of these documents by the Local Authorities, Utility Companies and EA will be further defined within the new Flood and Water Management Bill (2009).

**Future Trends**

The SFRA has identified the potential areas of inadequacy in the borough’s flood defences. The risk of flooding in these locations will be increased by climate change affects over the lifespan of the borough’s emerging Core Strategy.

The extensive fluvial flooding during the extreme event in 1947 led to extensive redevelopment of the River Lee in the decades that followed. The current standard of protection afforded by the River Lee flood defences is below the 1 in 100 return period

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78 The North London Strategic Flood Risk Assessment (SFRA) scored the potential usage of various SUDS measures within Waltham Forest against criteria relating to hydrological performance, land use characteristics and physical site features. The results showed that pervious pavements and green roofs were likely to be commonly appropriate for use, swales, on and off line storage tanks and ponds (attenuation or infiltration) would often be viable but certain infiltration methods would be inappropriate in the majority of developments (largely due to the need to guarantee a quantity of the discharge rate and the soil infiltration rates achievable within the borough).


80 Since the publication of the SFRA the Draft Flooding and Drainage Bill was issued for consultation between 21st April and 24th July 2009. It is unknown at this time what the final wording of the legislation will be and whose responsibility it will be to prepare inundation maps for large and small reservoirs.
storm event standard. However it is not likely that the EA will revisit and improve the standard of protection offered by the River Lee flood defences within the life-span of this study (i.e. prior to the year 2026). Instead the EA will look to relocate existing development outside of the flood plain wherever possible and return the banks and floodplain of the watercourse to a natural condition via individual development applications. The River Lee is currently heavily engineered i.e. contained within an artificial man-made channel section, often with vertical banks similar to those of a canal.

All the measures that are likely to be required to address flood defence and flood risk issues arising from climate change are made even more essential because of the projected growth in the borough.

7.5. Preparing for Growth

Infrastructure Needs

Coupled with climate change, residential and commercial growth are likely to result in increased flood risk. The expected levels, location and phasing of growth in Waltham Forest up to 2026 means that developments will be at risk of flooding.

Potential developments identified within the boroughs’ Housing Land Availability Assessment (Entec January 2008) include plots located within the floodplains of the River Lee and the River Ching. However flood defence initiatives are not triggered by any specific level of development.

The two growth scenarios examined do not impact on the analysis of fluvial flood risk arising from projected growth. This is due to the fact that the River Lee and associated channels currently have a specific conveyance capacity that is dictated by both the flow entering the borough from upstream and the quantity of run-off that is directed to the river from within the borough.

Under current and proposed legislation, the run-off from development sites must be attenuated at source. For greenfield development sites the run-off must be limited to greenfield values (i.e. no increase in run-off). For brownfield development sites the run-off must be reduced by a minimum of 50% of peak flow.

Hence the run-off to the River Lee and tributaries will not increase for either the lower growth or the higher growth scenario. The fluvial flood risk does not alter in proportion to the level of development within the borough.

Projected growth is expected to increase the need for both additional physical infrastructure to be delivered and further investigation to be conducted, so as to ensure that both the flood risk affecting future developments and arising from them can be adequately assessed and mitigated.

According to the Council’s growth trajectory the Southern Waltham Forest and Central Waltham Forest sub areas within the borough are expected to grow by 37,194 additional residents by the year 2026. The resulting increase in sewer base flow should be
addressed by the Council with Thames Water on a strategic level at the earliest possible time.

The Southern Waltham Forest sub-area, which is expected to host an additional 18,685 residents over the same planning period, will also require detailed investigation by the council in liaison with the EA to ensure that the flood risk deriving from the River Lee is managed appropriately.

In light of the above the Council can actively contribute to lessening flood risk in the future by:

- Requiring SUDS implementation on development sites wherever viable within the planning process. Maintenance costs to rest with the developers unless future developments hasten the process of adoption of SUDS by the local authorities.
- Ensuring surface water attenuation of minimum 50% of peak flows for brownfield redevelopment sites in accordance with the Mayor of London’s Water Matters Proposals. On site storage facilities to be maintained by the developers.
- Promoting the London Plan Policy 4A.14 target for developers to restrict surface water run-off from sites to greenfield run-off rates. This target may be more viable on smaller development sites.
- Maintaining and updating its drainage to address highway flooding from non-adopted drainage.
- Encourage water efficiency measures to reduce the volume of grey water from forthcoming developments that will be discharged into the sewerage network.
- Retrofit SUDS measures onto housing estates and open spaces under borough ownership. Section 106 agreements can specify contributions from developers to assist in the funding for these measures in areas with higher flood risk.

**Further Investigation and Analysis**

There are a number of actions that the Council should pursue to further the assessment of future flood defence requirements or to address and mitigate existing and future flood risks.

The Council should liaise with Thames Water to address sewer incapacity and flooding on a holistic catchment level. As Thames Water classes information about the specific location of required improvements or expansions as confidential, the Council should engage with Thames Water regarding the proposed areas identified for population growth for both the lower and higher growth scenarios. This would ensure that Thames Water undertakes a structured and detailed investigation to address the proposed developments in tandem with both climate change issues and the increasing maintenance requirements of an aging and under-capacity sewerage system.
In the future the Council could be required to consider all sources of flooding within a Surface Water Management Plan to be written in accordance with PPS25 and the Flooding and Drainage Bill (2009). The Surface Water Management Plan would form a crucial document in focusing attention on specific flood locations within the borough over the mid to long term planning period. Remedial capital works for the Council to consider can be identified through this document.

In anticipation of the emergency management plans and associated inundation mapping recommended by the Pitt Review becoming a statutory requirement within the emerging Flooding and Drainage Bill (2009), it is recommended that these documents be prepared for the thirteen Thames Water reservoirs within the River Lee Valley.

The Council is currently working on the first draft of the LB Waltham Forest Multi-Agency Flood Plan. This plan covers the requirement for a multi-agency response to a flood incident in the LB Waltham Forest. The development of such plan was agreed following the surface water flooding events throughout the UK in 2007 to tackle the specific and bespoke impacts and actions required in response to a flood incident.

7.6. Funding

A number of the infrastructure items and further analyses would require the LB Waltham Forest to set financial resources aside over the 2009-2026 planning period.

There have been a number of investigations into the flood risk relating to the River Lee due to its importance to the London 2012 Olympic and Paralympic Games81. The North London SFRA reported that the EA is concerned that there is insufficient land available for future flood alleviation schemes. The EA would be receptive to the concept of land swaps82 whereas more vulnerable uses are removed from the floodplain releasing more of the floodplain for use as storage. This concept can be applied through the planning process.

The River Lee and tributaries are heavily engineered watercourses and the EA will use its powers to promote the naturalisation of the banks through individual planning applications. The boroughs’ Housing Land Availability Assessment shows areas within the floodplain earmarked for residential development such as the area local to the A503 at the Blackhorse Road railway station. The council should use the redevelopment of this site and others within the Lee Valley to promote the concept of bank naturalisation and to provide floodplain storage83.

81 The reference documents include the North London SFRA, East London SFRA, Lower Lee SFRA and Olympic SFRA.

82 The aim of land swapping is to remove development that is classed as ‘highly vulnerable’ or ‘more vulnerable’ under PPS25 from the EA Flood Zone 3 and return the floodplain to it’s former natural state.

83 Bank naturalisation aims to remove highly engineered man-made channels from the watercourses and return the banks to their natural state. This is often undertaken in tandem with reinstating floodplain storage. The benefits include reduced flood risk to people and property and ecological enhancements.
The River Ching suffers from a significant flooding history with some of the worse hit areas in locations where future development is proposed. This is especially relevant to the development plots earmarked both to the east and the west of the A112 immediately to the north of the A406 which are in an area known to have suffered from flooding in 1947, 1991, 2000, 2002 and 2006.

The Thames CFMP (Catchment Flood Management Plan) suggests that whilst urban watercourses like the Ching experience rapid runoff, floodplain encroachment and modified channels, they still have sufficient river corridors to support a more sustainable approach. This can be achieved through implementing bank naturalisation and providing floodplain storage through the redevelopment process.

If addressed via the planning process, the aims of increasing flood storage and moving residential properties away from the highest risk areas should be achieved without a dedicated budget.

Since surface water and sewerage flooding are of medium risk in Waltham Forest, efforts to improve these conditions should be made. As noted, the combined foul and surface water sewerage network is under the authority of TW, so the Council is unable to determine where and when network improvements will be undertaken. A detailed investigation into the borough’s combined sewerage system by Thames Water would ensure that the proposed increases in population projected across the entire borough are addressed and strategic remedial measures to their network are identified. The Council should set aside the necessary funding to commission the investigation.

The borough can take preventative action when undertaking capital works to roads and paved areas by replacing impermeable surfaces with permeable systems (i.e. reservoir pavements) that will reduce the quantity of surface water runoff and hence mitigate flooding.

7.7. Summary

Summary of Infrastructure Requirements Assessment

Waltham Forests’ proposed housing growth identifies a projected residential growth of between 18,856 (lower growth scenario) and 45,515 (higher growth scenario) within the borough by 2026. The SFRA has identified the high risk of fluvial flooding deriving from the River Lee and its tributaries. Sewers and overland surface water flow has been identified as a source of medium flood risk. Other sources of flooding within the borough have been identified as low risk.

Recommendations

The EAs budget for flood mitigation works does not include any funding to support flood defences for future development on flood plains. The onus is on developers to pay for the protection of their sites. The EA will use its role as a statutory consultee within the planning process to encourage bank naturalisation and increased floodplain storage on the River Lee and its tributaries. The Council can support this process by implementing planning conditions to enforce such measures. This is particularly relevant to the River
Ching where substantial development is likely to occur in the Highams Park area and close to the site of the old Walthamstow Dogs Stadium.

The emerging *Flood and Water Management Bill* is anticipated to be passed as law in 2010. The current draft may be amended subject to public consultation and political influences. Presently the Bill intends to enforce SUDS by obliging developers to submit their intentions for managing runoff to a SUDS approval body before they can connect the final discharge to the sewerage undertaker. Under the proposed wording of the Bill the SUDS approval body would be the borough. Any developers not intending to implement SUDS on their sites would have to justify the reasoning behind such a decision. With the boroughs’ new power to enforce the introduction of SUDS, it is anticipated that huge reductions could be made in the volume and rate of peak runoff from brownfield developments.

It is anticipated that TW will need to make strategic upgrades to their sewerage network in order to accommodate an increased foul water baseflow corresponding to the growth projections for the borough to 2026. However Thames Water implements such upgrades reactively so it is difficult to foresee the scale of the improvements required. Under the Water Act 1991 Thames Water has the power to pass the cost of such improvements to the developers, either in their entirety and a proportion of the costs. The Council should consult with Thames Water regarding undertaking a study to establish the extent of the strategic improvements required within the borough.

TW are obliged to create Flood Inundation Maps relating to the Lee Valley reservoirs. Thames Water do not release information regarding flood zones from those reservoirs or strategic asset ownership for security reasons. However the borough should liaise with Thames Water to ensure that such maps have been created or are programmed under the remit of the *Flood and Water Management Bill*. 
PART C – WASTE

8. WASTE MANAGEMENT

8.1. Context

Approximately 2.5 million tonnes of waste (including municipal solid waste, commercial and industrial, construction, hazardous and agricultural waste) are produced every year across North London, which is enough to fill the Emirates Stadium twice over. In 2005/2006 North London generated just over 950,000 tonnes of municipal solid waste (a mix of residential and commercial waste), and 1.6 million tonnes of commercial and industrial waste (non-municipal). The decomposition of waste, which has been disposed of in a landfill site, produces greenhouse gases that may contribute to climate change and it is considered a waste of resources to bury potentially recyclable materials.

The traditional ways of managing waste (for example, exporting it to landfill sites outside London or incineration) are becoming increasingly unacceptable, both financially and environmentally. It is therefore essential that the approach to dealing with waste changes, taking more responsibility for dealing with it within London.

In the UK, local authorities have responsibilities for Municipal Solid Waste (MSW) collection and/or waste disposal for all households within their area. Therefore this report focuses on the management of this waste stream only.

Local authorities with these responsibilities are referred to as waste collection authorities and/or waste disposal authorities. Waste collection authorities are usually a district or borough council, which has responsibility for collecting municipal solid waste, whereas a waste disposal authority is a local authority (usually a county council), which is responsible for disposing of municipal solid waste. Unitary authorities are responsible for both the collection and disposal of municipal solid wastes.

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84 North London is considered to include the London boroughs of Camden, Barnet, Enfield, Islington, Hackney, Haringey and Waltham Forest


86 The Environment Agency defines Municipal solid waste (MSW) as:

Household waste and any commercial or industrial waste collected by the waste collection authority or its agents. It includes collected household waste, street cleaning and litter, bulky household and civic amenity waste, commercial and industrial waste collected by or on behalf of the authority under section 45 of the Environmental Protection Act 1990, waste from council premises, parks and gardens waste, beach cleaning waste and fly-tipping clearance.

In Greater London 21 of the local authorities have ‘pooled’ into four joint statutory waste disposal authorities, each of which is responsible for the disposal of wastes from collected by the waste collection authorities in their area. Waltham Forest is part of the North London Waste Authority (NLWA), together with the London boroughs of Barnet, Enfield, Islington, Hackney, Haringey and Camden. This section will therefore consider Waltham Forest’s future waste management needs in the wider context of the NLWA area.

The other joint statutory waste disposal authorities are:

- East London Waste Authority, which includes the London boroughs of Newham, Barking and Dagenham, Redbridge and Havering
- West London Waste Authority, which includes the London boroughs of Brent, Ealing, Harrow, Hillingdon, Hounslow and Richmond
- Western Riverside Waste Authority, which includes the London boroughs of Hammersmith and Fulham, Kensington and Chelsea, Lambeth and Wandsworth.

In addition, a number of London boroughs operate independently as both Waste Collection Authorities and Waste Disposal Authorities, including (but not limited to), the City of Westminster, the City of London and the London borough of Southwark in Central London.

67 The other joint statutory waste disposal authorities are:
8.2. Baseline

**Municipal Solid Waste Generation**

Municipal solid waste (MSW) is defined as household waste and any commercial or industrial waste ('trade waste') collected by the waste collection authority or its agents. It includes collected household waste, street cleaning and litter, bulky household and civic amenity waste, commercial and industrial waste collected by or on behalf of the authority under section 45 of the Environmental Protection Act 1990, waste from council premises, parks and gardens waste, beach cleaning waste and fly-tipping clearance.

Waltham Forest is part of the North London Waste Authority (NLWA) and was responsible for collecting approximately 118,900 tonnes of MSW in the 12 months up to March 2009.

The types of MSW generated in the LB Waltham Forest comprise approximately 74,800 tonnes of household waste, 15,600 tonnes of non-household waste (i.e. commercial and industrial waste collected by the Council) and 28,500 tonnes of recyclable waste streams (mainly generated by households). Approximately 62% of the recyclable waste streams were 'hard' recyclables such as plastic, glass and cans, whilst 38% comprised 'green' waste such as parks and gardens waste.

According to the NLWA, of the total MSW generated in North London, 18% is recycled, 35% is sent for energy recovery in Edmonton and 47% is disposed of to landfill. Comparisons with London as a whole, where 64% of MSW is disposed of to landfill, shows that North London is currently managing its waste higher up the waste hierarchy i.e. by recycling more and disposing of less to landfill. In 2007/8, Waltham Forest achieved a recycling rate of 29%, which is higher than the average rate reported for North London.

**Municipal Solid Waste Management**

**Municipal Solid Waste Streams**

NLWA informed URS that MSW collected from Waltham Forest is taken to the London Waste Ltd EcoPark site at Edmonton, which comprises a Waste Transfer Station (WTS), incinerator with energy recovery and in vessel composting facility (for the treatment of mixed garden and food waste). More information about the EcoPark can be found in the box below.

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88 Environment Agency, Your Waste Your Responsibility, Fact sheet on Treatment of Municipal Solid Waste
90 Telephone conversation with Verdant Group PLC, 14 July 2009
Household and commercial waste is segregated at the WTS and the recyclable fraction is transferred off site for recycling at a variety of sites; with the remainder either incinerated at Edmonton or disposed of to landfill in Cambridgeshire or Bedfordshire.

**Energy from Waste in North London**

Energy from Waste plants can treat residual waste, that is waste that is not separated for recycling purposes. They operate

“incineration processes in which the residual waste is subject to a combustion process at a temperature typically between 850°C and 1,000°C. (...) The process releases heat, a mixture of carbon dioxide and steam and produces ash. Other gases and pollutants generated during the process are removed before the gas is discharged. (...) Emissions from energy from waste plants are regulated by the Environment Agency and must comply with the standards set in the Waste Incineration Directive. (…) Energy from waste plants typically recover about 27 percent of the potential energy that is available. Some of this energy is used to run the plant and the remainder is exported to the national power supply.”


**LondonWaste EcoPark, Edmonton**

[http://www.londonwaste.co.uk/cms_images/general_content/londonwasteecopark_.jpg](http://www.londonwaste.co.uk/cms_images/general_content/londonwasteecopark_.jpg)

The EcoPark at Edmonton is a key waste facility in North London, owned and operated by LondonWaste.

The EcoPark operates within the waste hierarchy, offering the following waste management services:

- Recycling, including bulk recycling
- Composting
- Wood chipping
- Energy generation
- Waste disposal and transfer to landfill if no other option if viable.

The Edmonton EfW facility is based within the EcoPark and accepts a range of waste streams, including general waste (black bag waste), plastics e.g. tapes, media, discs (although a sample must be tested prior to acceptance), clothing and textiles, food waste and Japanese Knotweed, cannabis and wood (although this would have to broken into small pieces).

It does not accept green waste, electrical items, metal, oil or gas bottles or anything classed as hazardous or clinical.

All green waste (not containing meat products) is transferred from Edmonton to Cambridgeshire or Suffolk for windrow composting. The NLWA reported that in ‘dire circumstances’ all waste would be diverted to a WTS in Hendon, which is then transferred by rail to a landfill in Buckinghamshire.

No information was available to confirm the exact destination of all municipal solid waste streams generated in Waltham Forest, however the NLWA confirmed\(^9\) that all waste accepted by them was taken to the EcoPark at Edmonton for treatment or onward transfer. Table 8-1 below shows the destination of commingled recyclable waste streams currently being collected at the kerbside as part of a series of trials. The recyclable waste streams are first taken to a Materials Recovery Facility (MRF) for separation prior to being transferred to the sites listed in Table 8-1 below.

### Table 8-1: Waltham Forest Recyclable Waste Flow

<table>
<thead>
<tr>
<th>Material</th>
<th>Destination</th>
<th>Management Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass</td>
<td>Berryman, Dagenham</td>
<td>Crushed and made into new bottles or jars</td>
</tr>
<tr>
<td>Mixed cans</td>
<td>Edwards, Barking for sorting, then AMG Resources Ltd, Wales for recycling</td>
<td>Recycled into new cans</td>
</tr>
<tr>
<td>Paper and Cardboard</td>
<td>1. Newport Paper, Shropshire</td>
<td>Sorted and transported to make newsprint and cardboard</td>
</tr>
<tr>
<td></td>
<td>2. C&amp;C Storer, Potters Bar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Aylesford Newsprint, Kent</td>
<td></td>
</tr>
<tr>
<td>Mixed plastic bottles</td>
<td>1. Indigo Waste Services, Thetford, Norfolk</td>
<td>Recycled into new plastic products including clothing, guttering and bottles</td>
</tr>
<tr>
<td></td>
<td>2. J&amp;A Youngs, Derbyshire</td>
<td></td>
</tr>
<tr>
<td>Textiles and shoes</td>
<td>LM Barry, Stratford</td>
<td>Either cut up to make industrial cleaning cloths or transported for reuse in developing countries</td>
</tr>
<tr>
<td>Batteries</td>
<td>1. G&amp;P Batteries, Staffordshire</td>
<td>Shredded and components are recycled (e.g. gypsum) or treated (e.g. acid)</td>
</tr>
<tr>
<td></td>
<td>2. Crow Metals, Romford</td>
<td></td>
</tr>
<tr>
<td>Engine oil</td>
<td>1. Mallary Oils, Cambridge</td>
<td>Heavy metals extracted and the oil is reused as an industrial lubricant</td>
</tr>
<tr>
<td></td>
<td>2. Eco Oil, Newport</td>
<td></td>
</tr>
</tbody>
</table>

Source: Waltham Forest Website\(^91\) and LB Waltham Forest, Personal Communication\(^92\).\(^93\)

According to the NLWA\(^93\), if an MRF cannot accept the commingled recyclable waste delivered e.g. due to lack of capacity, the NLWA would take the recyclable waste to another MRF for processing, rather than transfer it to landfill. Similarly, the NLWA can transfer green waste to other composting facilities in Essex and Cambridgeshire if the in-vessel composting facility at Edmonton is at capacity. If the EfW facility at Edmonton

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\(^{92}\) E-mail from LB Waltham Forest, Waste Services, 13 August 2009

\(^{93}\) Telephone conversation with NLWA, 15 April 2009.
could not accept waste due to lack of capacity or significant maintenance work being carried out, the NLWA has less flexibility than with other waste streams. In this case waste would be transferred by road to landfill e.g. in Bedfordshire. However, the NLWA reported that this is very rare and it is more likely that the EfW facility would store the waste on site until it could be processed.

Waste Management Facilities in Waltham Forest

Current municipal solid waste management facilities located in Waltham Forest include:

- Three reuse and recycling centres at Kings Road, Chingford; South Access Road, Walthamstow and Gateway Road, Leyton
- 27 “Bring Banks” for glass, mixed cans and paper
- 14 waste management facilities holding Environmental Permits (previously referred to as Waste Management Licences)
- 88 waste management facilities holding Environmental Permit exemptions.

Waltham Forest Council’s Waste Management Services

Waltham Forest Council provides various waste management services for its municipal solid waste customers, and these are summarised in Table 8-2 below.

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Table 8-2: Municipal Solid Waste Management Services in Waltham Forest

<table>
<thead>
<tr>
<th>Management Method</th>
<th>Waste Stream</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly kerbside collection in black boxes</td>
<td>Compulsory recycling - paper, cardboard, glass bottles and jars, food and drink cans, plastic bottles, textiles, shoes, batteries and engine oil.</td>
<td>Compulsory Recycling does not apply to some flats (in blocks and above shops) that have shared refuse facilities.</td>
</tr>
<tr>
<td>Kerbside collection, with segregation at a MRF</td>
<td>Commingled recyclables trial - including glass, cans, foil, paper, cardboard and plastic bottles.</td>
<td>Currently being trialled across a number of areas within Waltham Forest</td>
</tr>
<tr>
<td>Fortnightly Collection of garden and food waste</td>
<td>Green garden waste and food waste</td>
<td></td>
</tr>
<tr>
<td>Residual household and trade waste</td>
<td>Non recyclable waste collected from all Households and from businesses with a Trade waste agreement</td>
<td></td>
</tr>
<tr>
<td>Council Recycling Centres (South Access Road, Kings Road and Leyton Road)</td>
<td>Various waste streams such as household-derived construction waste, bicycles, car batteries, cardboard, computers and printers, cooking oil, electrical items, engine oil, food/drink cans and foil, furniture in good condition, garden waste, gas bottles, glass bottles and jars, hardcore/rubble, household batteries, metal, mobile telephones, paper, plasterboard, plastic bottles, reusable paint, tetra paks, textiles and shoes, tools for reuse, white goods and wood.</td>
<td>There are 8 mini-recycling centres in Chingford, 7 in Walthamstow, 3 in Leytonstone and 4 in Leyton</td>
</tr>
<tr>
<td>Council Mini-Recycling Centres</td>
<td>Various waste streams such as glass, paper, cans and textiles</td>
<td></td>
</tr>
</tbody>
</table>

Source: Waltham Forest Website

Waltham Forest entered into a 5-year waste management partnership contract with Verdant Group PLC which commenced in April 2007 with a possible two year extension. Through this contract, Verdant undertakes Waltham Forest’s waste and recycling collections. This type of contract is widespread throughout the UK with waste

http://www.walthamforest.gov.uk/index/environment/rubbish-recycling/recycling/recycling-facilities.htm
management services offered to local authorities by a number of waste management companies.

Waltham Forest Council owns the Low Hall Depot which stores all of the vehicles for the vehicles utilised by Verdant under this contract. According to the Depot Manager90 there are currently no issues regarding space or capacity for RCVs at this depot should the number of RCVs required by Waltham Forest increase slightly in the future. However, Verdant reported that staff car parking at the depot is restricted, with cars frequently parked in spaces designated for RCVs.

As shown in Table 8-2 above, there are no large-scale waste management facilities in Waltham Forest, e.g. waste transfer stations, incinerators or municipal biological treatment (MBT) plants. However, Table 8-3 below shows the types of waste management facilities available to NLWA boroughs. These sites are not distributed evenly across the area.

The vast majority of strategic facilities (facilities accepting greater than 40,000 tonnes per annum) are located broadly at the eastern end of the North London area following the Lea Valley. Some of these sites can be used to manage more of North London’s waste in the future. For example, sites that currently bulk and transfer waste for landfilling could instead be used as facilities that recycle or recover energy from waste within North London.

The NLWA is the waste disposal authority for Waltham Forest and six other north London local authorities. It recovers its costs from its constituent authorities through a levy system for the disposal of household waste and a charge per tonne for the disposal of non household waste. The default system for the levy has recently changed and, following a transition period, the charge for household waste is now predominantly based on the tonnage of household waste each borough passes to the NLWA for disposal. The first year in which the levy system is entirely based on tonnage is 2009. This new system may provide more of an incentive for local authorities to reduce the volume of waste they generate.
Table 8-3: Waste Management Facilities Available to NLWA boroughs

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>No. Present in NLWA</th>
<th>Operating Capacity % (2007)</th>
<th>Example/Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste Transfer Station</td>
<td>28</td>
<td>50</td>
<td>Hendon Rail Transfer Station, Barnet. Receives approximately 200,000 tonnes/year from Barnet, Camden, Brent and Haringey. Compactor station, which transfers by train to landfill in Bucks. Operated by Waste Recycling Group.</td>
</tr>
<tr>
<td>Metal Recycling Sites</td>
<td>24</td>
<td>70-80</td>
<td>The location of the facilities is unknown at this stage.</td>
</tr>
<tr>
<td>Civic Amenity Sites</td>
<td>7</td>
<td>42</td>
<td>Hornsey Street, Islington, includes compactors and a recycling bulking facility. Capacity approximately 50,000 tonnes. Operated by London Waste Ltd. Transfers approximately 200,000 tonnes of residual waste to Edmonton incinerator or to landfill in Beds/Bucks per year.</td>
</tr>
<tr>
<td>Physical Treatment/Material Recycling Facilities (MRF)</td>
<td>7 (6 physical treatment and 1 MRF)</td>
<td>Assumed operating at 75% of licensed capacity of 25,000 tonnes</td>
<td>The location of the facilities is unknown at this stage.</td>
</tr>
<tr>
<td>Incinerator</td>
<td>1</td>
<td>93</td>
<td>Edmonton, Enfield</td>
</tr>
<tr>
<td>Composting Plant</td>
<td>1</td>
<td>98</td>
<td>The location of the facilities is unknown at this stage.</td>
</tr>
</tbody>
</table>


Committed and Planned Investment

The NLWA is in the process of procuring a new waste management contract with a commencement date of December 2014.

The NLWA has recently issued a North London Joint Waste Development Plan for consultation96, which is set to identify opportunities to provide additional waste management sites to meet waste management requirements up to 2020. However, this exercise will need to be informed by the results of the public consultation on the Issues and Options Report. The location of potential waste management sites will be the subject of further consultation as part of the production of the North London Waste Plan.

Assessment of Need/ Adequacy

As shown in Table 8-3, the physical treatment/Materials Recycling Facilities (MRF), metal recycling sites, energy from waste (incinerator) at Edmonton and composting plant used by the NLWA were operating between 70% and 98% capacity in 2007.

It is understood from the NLWA that LondonWaste Ltd has an obligation to treat as much waste as practicable by incineration with energy recovery or recycling, with the last option being disposal to landfill. However, if a recycling facility or the incinerator at Edmonton cannot accept a delivery of waste because it has reached full capacity, then waste is taken to one of the landfill sites used by the NLWA outside of London, e.g. in Cambridgeshire or Bedfordshire. At this stage no evidence was made available as to how often this happens, nor on the capacity that landfills used by the NLWA outside London are operating at. Therefore no conclusive comment on their available capacity can be made.

8.3. Estimating Future Demand

Policy Guidance

The drivers for changes in waste management practices are European and national Legislation which are translated into European and national targets and waste policies, as summarised in Table 8-4 below.

<table>
<thead>
<tr>
<th>Policy</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>The EU Landfill Directive⁹⁷</td>
<td>By 2010, the amount of biodegradable municipal waste going to landfill in Europe is to be reduced to 75% of the total produced in 1995</td>
</tr>
<tr>
<td>Waste Strategy for England 2007⁹⁸</td>
<td>National targets for re-use, recycling and composting of household waste of at least 40% by 2010, 45% by 2015 and 50% by 2020</td>
</tr>
<tr>
<td>The London Plan</td>
<td>Each London borough allocated a certain tonnage of MSW to be managed within the borough by 2020 (‘self-sufficiency targets’). Waltham Forest’s target is 264,000 tonnes by 2015 and 310,000 tonnes by 2020 (see text below).</td>
</tr>
</tbody>
</table>

Source: See footnotes

The London Plan also states that London boroughs should identify adequate provision for the scale of waste use identified in their development plan documents. Waltham Forest


must therefore find suitable sites for facilities to manage and process the MSW it has been allocated. This allocation or ‘apportionment’ has been set by the Mayor as a result of a study on the suitability of each borough to host waste sites.

The North London Waste Plan will consider how to manage all waste in the NLWA area up to 2020. It will identify sufficient sites to deal with this waste, potentially using a mix of facilities including recycling and composting, and using waste to produce energy. However, there may be potential implications for the implementation of the infrastructure as there may be difficulties in obtaining planning permission for some facilities. Final adoption of the Plan will take place in December 2010.

The LB Waltham Forest has used the Waste Strategy for England 2007 targets to develop a waste reduction campaign called “Your 40”99. The campaign includes a variety of trial schemes to increase recycling such as the collection of mixed (“commingled”) recyclables. The Council plans to introduce dual bins across the borough and, in 2010, increase the amount of plastics, which can be recycled. The Council is currently preparing a report that outlines the options to reach the 40% target. A representative from the Council reported that if the current level of recycling performance continues, the 40% target would not be achieved100.

**Future Trends**

As described above, the main driver for improved waste management is legislation at the European, national and local level. Technological advances, funding and investment are driven as a result of changes to these policies, for example the diversion of waste from landfill and increases in the numbers of recycling facilities.

Consultation for the North London Waste Plan in 2008101 highlighted the importance of Waltham Forest’s self sufficiency in waste management. Consultees were asked whether the Waltham Forest should identify just enough land to meet their apportionment or identify more land to manage waste, in order to further reduce the amount of waste being exported out of North London. The majority of respondents were in favour of making more sites available to manage even more of North London’s waste, i.e. to be as self-sufficient as possible. One of the reasons for this response was concern that other areas may be unwilling to treat North London’s waste.

### 8.4. Demand for Waste Management Facilities Arising from Growth

The London Plan states that the total MSW generated in Waltham Forest up to 2020 is as follows:

- 2010 – 183,000 tonnes per annum (tpa)

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99 [http://www.walthamforest.gov.uk/index/environment/rubbish-recycling/your40.htm](http://www.walthamforest.gov.uk/index/environment/rubbish-recycling/your40.htm)

100 E-mail from LB Waltham Forest, Waste Services, 13 August 2009.

- 2013 – 207,000 tpa
- 2015 – 224,000 tpa
- 2020 – 270,000 tpa\(^{102}\).

These estimates were firstly presented in the *London Plan Early Alterations*\(^{103}\) and have remained the same in the *London Plan 2008* issue. They are based on growth figures from the GLA *2006 Round Demographic Projections*\(^{104}\), and GLA, 2006 Office of National Statistics (ONS) Mid Year Estimates. The London Plan predictions on MSW generation in Waltham Forest have not been revised following the Early Alteration issue.

Based on Waltham Forest and URS analysis, in the lower growth scenario we project an additional 11,910 dwellings in the borough from 2009-2026. In the higher growth scenario however we estimate an additional 21,260 dwellings over the same planning period. These figures compare to the target of an additional 11,305 households projected in the London Plan\(^{105}\) over the same time period (2009-2026). Therefore the London Plan MSW generated estimates are potentially underestimating growth in waste generation in the borough. This is particularly the case should the higher growth scenario materialise, yielding an additional 88% over the London Plan target by 2026.

It should be noted that figures relating to the increase in commercial space/jobs were not available to be analysed from London Plan data, and therefore commercial waste arisings are not included in this comparison.

The *North London Waste Plan Issues and Options Report*\(^{106}\) states that both the Greater London Authority and the NLWA have estimated waste growth for Municipal Solid Waste for North London up to 2020. The Greater London Authority projection is based on 2% growth per annum up to 2020\(^{107}\).

The NLWA prediction is lower at approximately 1.4 million tonnes per year. The data from NLWA’s procurement model is based on applying a growth rate to 2006/07 data (actual 2006/07 data plus last quarter estimated). The growth rate is around 3% per annum,


\(^{104}\) Data Management and Analysis Group (2006), *DMAG Briefing 2006/32*, GLA.

\(^{105}\) Assuming that the housing development rate for 2006-2016 of 665 new homes per annum continues to 2026


\(^{107}\) No further information is available, Ibid. p.22.
decreasing to 2.5% growth per annum from 2011 to 2020, then decreasing to 0.7% thereafter108.

8.5. Resulting Waste Management Infrastructure Requirements

There are currently 68 waste facilities located across the NWLA area (see Table 8-3 above). However, these existing sites will not have sufficient capacity to meet all of North London’s future waste needs.

Location of Additional Waste Management Facilities

The NWLA boroughs have not to date identified suitable additional sites for managing North London’s waste, as this exercise will need to be informed by the results of the public consultation on both the Issues and Options Report and the North London Waste Plan itself.

The Mayor of London has identified broad locations suitable for new waste facilities as including existing waste facility sites, strategic employment locations and local employment areas. Three of the six locations identified are located in Waltham Forest. These are:

- Enfield/Waltham Forest Central Leaside Business Area Preferred Industrial Location (PIL)
- Waltham Forest Blackhorse Lane PIL
- Waltham Forest Lea Bridge Gateway PIL.

In 2008 the NLWA consulted on the suitability of these locations101.

Some respondents felt that the Mayor’s broad locations do provide a good starting point for identifying sites for new waste facilities. However, a large number of the respondents felt that they did not, either because these locations are not spread evenly across North London (i.e. they are too geographically concentrated in the north and east of the area covered by the Plan) or because of their opposition to one or more of the broad locations being used for waste facilities.

A significant number of respondents expressed a desire for an even geographic distribution of sites across the seven boroughs, possibly through having a larger number of small facilities. Having more even coverage was seen to be fairer and it was suggested that this would also result in fewer transport movements. The problem of the poor west-east transport links was highlighted.

108 ‘The data from NLWA’s procurement model is based on applying a growth rate to 2006/07 data (actual 2006/07 data plus last quarter estimated). The growth rate is 3% growth per annum, decreasing to 2.5% per annum in 2010 up to 2020, decreasing to 0.7% thereafter’, Ibid. p.22.
With regard to site-specific objections, most opposition was expressed to new facilities in the Blackhorse Lane area, the Edmonton area and the North London Business Park. A significant number of respondents expressed specific opposition to the use of the Blackhorse Lane area for new waste facilities because of potential negative impacts on residential amenity, health and the local transport network. In addition, the development of waste facilities in this area is seen by some to be incompatible with the current and proposed future regeneration of the area.

A significant number of the respondents referred to negative impacts from the existing Edmonton incinerator and wanted to avoid any expansion of this facility or the development of any similar facility in the area. In addition, the landowner of a number of sites in the Central Leaside and Brimsdown areas expressed opposition to the use of these sites for waste facilities due to perceived incompatibility with existing and proposed uses for the sites and surrounding areas.

A small number of additional potential sites were put forward by respondents and, in addition, a number of respondents highlighted the potential of incorporating waste facilities (such as combined heat and power systems) within new developments, particularly in areas which are the focus of large scale regeneration efforts.

During the consultation on the North London Waste Plan Issues and Options report in 2008, consultees were also asked about what they felt would be the best approach is for determining the number, size and distribution of new waste management facilities. Most respondents expressed support for a hybrid approach which is a combination of a centralised approach relying on a fewer number of large facilities and a de-centralised approach based on a larger number of smaller facilities. The use of smaller facilities was seen to be necessary in order particularly to:

- Achieve a more even (and fairer) geographic distribution across the seven boroughs
- Reduce the number of transport movements, particularly west-east
- Encourage people to have a closer association with waste and take more responsibility for it (such as through recycling and home composting)
- Ensure that facilities are accessible.

Future large developments may be required to include small waste management facilities. This will potentially address the fact that the existing and new housing stock will largely comprise of flats that will be unable to support an increase in home composting. However it is also recognised that there is likely to be a need for larger facilities because of economies of scale.

The Edmonton incinerator is nonetheless being considered as one of the potential sites for additional new waste facilities. However, decisions as to the use or otherwise of the existing Edmonton facility do not rest with the boroughs as waste planning authorities. The facility has a valid planning permission and is regulated by the Environment Agency. The NLWA is currently preparing to put in place new contracts and facilities for the
management of waste once the current contract with LondonWaste (the operators of the Edmonton facility) expires in 2014.

**Area Action Plans**

The NWLA boroughs have identified a number of areas for which Area Action Plans are currently being produced or are timetabled to be produced\(^{109}\). While many of the areas identified in the Plans may prove unsuitable for the inclusion of waste facilities, some may provide opportunities for the development of more integrated waste and resource parks (sometimes referred to as eco parks) or the integration of waste based renewable energy systems into mixed use developments.

**Phasing**

As shown in Table 8-3, several of the waste management facilities in North London are operating at over 70% capacity, including the incinerator at Edmonton (93%). Waltham Forest’s population and resulting MSW arisings are predicted to rise and therefore Waltham Forest, along with the other NLWA boroughs, have identified the need for additional waste management infrastructure and have started consulting on these issues.

One potential ‘trigger point’ for additional infrastructure is NLWA’s work to find an additional, neutral waste management facility as an alternative to the Edmonton incinerator, which is operated by Sita and London Waste. Another trigger is the need for all NLWA boroughs to meet the apportionment targets set in the London Plan.

### 8.6. Funding

Local Authorities can enter into long term fixed price contracts with private sector contractors to deliver services to specified performance standards\(^{110}\). Waste PFI schemes will help the UK meet the EU Landfill Directive diversion and recycling targets. They also encourage better partnership working between local authorities resulting in efficiency gains, more integrated waste management solutions and the benefits of economies of scale that flow from this and a more strategic approach to planning and procurement.

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\(^{109}\) An Area Action Plan is a development plan document focused upon a specific location or area, which provides a framework for development. It forms part of the Local Development Framework. Among the areas set to be subject to area action plans are:

- Barnet – Mill Hill East, Colindale
- Enfield – North East Enfield, Central Leeside, Enfield Town, North Circular
- Hackney – Dalston, Hackney Central, Hackney Wick
- Haringey – Central Leeside
- Islington – Finsbury Park, City Fringe/South Islington
- Waltham Forest – Leyton, Blackhorse Road, Walthamstow Town Centre.

\(^{110}\) For example, DEFRA was granted £280 million of funding through PFI credits in 2007/08, which will be available to help local authorities throughout the UK invest in sustainable waste management options. The PFI credits rose to £600 million in 2008/09 and £700 million in 2009/10 and 2010/11. Source: http://www.DEFRA.gov.uk/ENVIRONMENT/waste/localauth/funding/pfi/.
In the last couple of years, there has been an increase in the number of projects submitted to DEFRA for consideration for PFI credit support. With that increase has come an improvement in the environmental solutions being proposed. Most of the recently submitted projects have proposed long-term recycling and composting solutions in line with national targets in the Waste Strategy for England 2007; as well as diversion from landfill in excess of EU targets and ambitious waste minimisation proposals that aim to reduce waste growth to 0% per annum in the long term.

Funding is also available from other sources such as the Waste and Resources Action Programme. For Greater London in general additional funding is available from the London Waste and Recycling Fund, which has already funded: a green waste composting facility, improvements to civic amenity sites, recycling on estates, the proposed new Riverside Energy from Waste facility at Belvedere, and a planning application for an MBT plant located at Southwark.

Between 2005 and 2008, funding was also available through the Department of Environment, Food and Rural Affairs (DEFRA) via the Business Resource Efficiency and Waste (BREW) Programme. The programme was established to return to business £284 million of money raised over that period through the landfill tax escalator. The projects it funded included assisting the construction, manufacturing, retail, recycling and reprocessing industries to reduce waste and encourage recycling111.

Following this programme, a range of advice and support is now available to businesses and local authorities through Business Link112 and the Brew Centre113.

One potential significant change to the way waste is managed in Waltham Forest will be when the 25-year NLWA waste disposal contract ends in 2014. Regaining this contract will require significant investment from each of the seven North London Authorities and the DEFRA. The NLWA has applied for £25 million in PFI Credits from DEFRA for the purchase and use of land and facilities for waste management operations. The costs for the new contract have obviously not yet been ascertained and the amount that Waltham Forest will have to pay via the levy and charges has not yet been finalised, however the Council reported100 that it is likely to be a significant increase in the current contribution.

However, as discussed in the previous sub-section, the NLWA is currently looking for alternative waste disposal sites to those already provided and this process could cause a delay to obtaining funding. If the NLWA does not secure funding by 2014, this could cause significant problems for Waltham Forest and the other NWLA boroughs and may result in them failing to achieve their recycling targets, as the waste would likely be sent to landfill outside London.

111 http://www.DEFRA.gov.uk/environment/business/support/
112 http://www.businesslink.gov.uk/bdotg/action/layer?topicId=1079068363&r.s=t/l
113 http://www.lga.gov.uk/lga/core/page.do?pagId=1212811
8.7. Summary

Waltham Forest faces specific challenges in managing waste. Sites for the potential location of waste management facilities have been put forward by the Mayor of London, however these have not been confirmed. No decisions have been made regarding what type of waste management facility would be built in these locations, or their capacity, if they were to be approved.

For these reasons an assessment of infrastructure requirements associated with Waltham Forest’s future waste management can only be conducted with reference to North London wide facilities, which Waltham Forest will use. These include the EcoPark at Edmonton and various recycling sites and MRFs.

Only twice in the last two years has waste been turned away from a designated waste recycling/treatment/composting facility in the borough, once over the Christmas period due to lack of capacity, the other time when weather disrupted services. This indicates that the existing provision meets requirements but does not inform us of its ability to meet future demands.

No details were available from the Council regarding the remaining void space at the landfills used by the NLWA outside London and therefore no analysis can be made regarding any available capacity.

The London Plan sets a target of an additional 11,305 households in LB Waltham Forest from 2009 to 2026 and predicts that the amount of MSW generated in LB Waltham Forest in 2020 will be 270,000 tonnes per year. Based on Waltham Forest and URS analysis, in the lower growth scenario we project an additional 11,910 dwellings in the borough from 2009-2026. In the higher growth scenario however we estimate an additional 21,260 dwellings over the same planning period. These figures compare to the target of an additional 11,305 households projected in the London Plan over the same time period (2009-2026). Therefore the London Plan MSW generated estimates are potentially underestimating growth in waste generation in the borough, particularly should the higher growth scenario materialise, yielding an additional 88% over the London Plan target by 2026.

Waltham Forest should ensure that it follows the regulatory policy and guidance described above in Section 8.3. It should ensure that its partners (such as Verdant and the NLWA) assist the Council in achieving the authority’s objectives and targets, such as decreasing the volume of waste generated by each household.

It is considered likely that a key priority for Waltham Forest will be the new waste disposal contract currently being procured by the NLWA due to start in 2014. This will require funding from each of the London boroughs and DEFRA via PFI credits. Until this contract is agreed, the level of funding required from each authority and the level of service to be provided by the NLWA cannot be certain.

114 Assuming that the housing development rate for 2006-2016 of 665 new homes per annum continues to 2026
PART D – EMERGENCY SERVICES

9. POLICE

9.1. Context

The elements of police services covered in this section include Metropolitan Police and Safer Neighbourhoods Team (SNT) services in Waltham Forest.

Reducing levels of crime and anti-social behaviour and tackling the fear of crime are acknowledged in Waltham Forest’s Core Strategy Issues and Options Paper as being two key policy objectives that the Core Strategy needs to address. Designing out crime through the planning system is the key proposed methods to achieve these objectives.\(^\text{115}\)

The Metropolitan Police Asset Management Plan corroborates the importance placed on this issue by emphasising various crime and safety issues in the borough, including the high incidence of gun crime and robbery, the high prevalence of youth crime, and the scale of growth that the borough is expected to face in the immediate future through its location within the Thames Gateway and 2012 London Olympic and Paralympic Games area.\(^\text{116}\)

9.2. Policy

In its partnership plan, SafetyNet, Waltham Forest’s Community Safety Partnership emphasises the focus on community safety in Waltham Forest, by introducing actions to reduce crime and ensure safety in homes and the local community with a focus on tackling anti-social behaviour.\(^\text{117}\). In its approach to tackling crime, the following crime types were identified as being the most important: personal robbery, violence against the person, domestic violence, anti-social behaviour, gun crime, preventing violent extremism, hate crime, and burglary and motor vehicle crime. The Plan however does not include specific actions to address future needs stemming from Waltham Forest’s projected residential and commercial growth.

Policing Services and Management in Waltham Forest

Policing services in Waltham Forest are managed by the Metropolitan Police at a London-wide level and also at a local level by 20 Safer Neighbourhood Teams (SNT). The Metropolitan Police is also part of Waltham Forest’s Community Safety Partnership.

\(^\text{115}\) LB Waltham Forest (2009), *Core Strategy: Issues and Options Paper*


SafetyNet - ensuring a joined up approach to supporting community safety in the borough.

The work of the Metropolitan Police in turn is scrutinised and supported by an overseeing body, the Metropolitan Police Authority (MPA). The MPA has a strategic management role and is not responsible for day-to-day delivery of policing. It works closely with the Metropolitan Police and its partners to secure an efficient police service for London.

Waltham Forest’s Safer Neighbourhood Team was set up to provide local policing management in the borough. Each team of officers is dedicated to a specific local community’s safety. Each of Waltham Forest’s 20 Safer Neighbourhood Teams provides additional policing support dealing with day-to-day crime and disorder issues in the local community. The borough’s SNTs are dedicated local community teams that act as an additional policing team and unit and are organised on a common basis across London. They deal with day-to-day crime and disorder issues in the local community.

**Estate Management**

The MPA has overall responsibility for all Metropolitan Police buildings and facilities in London and recognises the vital role the estate plays in supporting the delivery of effective and efficient policing across the capital. The management of the Metropolitan Police estate is crucial to ensure an effective police service for London.

### 9.3. Baseline

**Existing Provision**

*The Metropolitan Police in Waltham Forest*

Table 9.1 shows the number of police stations, police officers, police staff and police community support officers (PCSO) in Waltham Forest.

**Table 9.1: Police Numbers in Waltham Forest as at the End of September 2008**

<table>
<thead>
<tr>
<th>No. of Police Stations</th>
<th>No of Police Officers</th>
<th>No. of Police Staff</th>
<th>PCSO Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>564</td>
<td>93</td>
<td>98</td>
</tr>
</tbody>
</table>


There are a total of five police stations serving Waltham Forest:

- Chingford Police Station
- Leyton Police Station

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118 A police officer is a member of the operational police force, police staff are involved within the police estate, whilst PCSOs support the police officers.
- Walthamstow Police Station
- Waltham House; and
- Walthamstow Town Centre Police Station.

*Waltham Forest’s Safer Neighbourhood Teams*

Additionally, there are 20 Safer Neighbourhoods Teams working in Waltham Forest assigned to the five police stations and at two other locations (see Table 9-2). Each Safer Neighbourhood Team consists of one sergeant, two constables, and three PCSOs.

**Table 9-2: Waltham Forest’s Safer Neighbourhood Teams by Location**

<table>
<thead>
<tr>
<th>Location</th>
<th>Safer Neighbourhood Team Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waltham House</td>
<td>Cann Hall</td>
</tr>
<tr>
<td></td>
<td>Cathall</td>
</tr>
<tr>
<td></td>
<td>Leytonstone Forest</td>
</tr>
<tr>
<td>Leyton Police Station</td>
<td>Grove Green</td>
</tr>
<tr>
<td></td>
<td>Leyton</td>
</tr>
<tr>
<td></td>
<td>Lea Bridge</td>
</tr>
<tr>
<td>Walthamstow Police Station</td>
<td>Higham Hill</td>
</tr>
<tr>
<td></td>
<td>William Morris</td>
</tr>
<tr>
<td></td>
<td>Wood Street</td>
</tr>
<tr>
<td></td>
<td>Hale End &amp; Higham Park</td>
</tr>
<tr>
<td>Uplands Patrol Base</td>
<td>Chapel End</td>
</tr>
<tr>
<td>The Market Safer Neighbourhoods Base</td>
<td>Hoe Street</td>
</tr>
<tr>
<td></td>
<td>Markhouse</td>
</tr>
<tr>
<td></td>
<td>High Street</td>
</tr>
<tr>
<td>Chingford Police Station</td>
<td>Valley</td>
</tr>
<tr>
<td></td>
<td>Larkswood</td>
</tr>
<tr>
<td></td>
<td>Hatch End</td>
</tr>
<tr>
<td></td>
<td>Chingford Green</td>
</tr>
<tr>
<td></td>
<td>Endlebury</td>
</tr>
</tbody>
</table>

*Source: Waltham Forest Asset Management Plan, Metropolitan Police Estate, 2007*

*Wider Metropolitan Context - Police numbers*

Police numbers in London have risen in recent years, from 25,400 police officers in 2000 to over 31,000 in 2007, along with almost 4,000 PCSOs, almost 2,000 special constables.
and 14,000 members of police staff. This growth has placed demands on existing policing buildings and facilities\(^{119}\).

**Committed and Planned Investment**

The *Metropolitan Police Asset Management Plan (AMP) Waltham Forest* is the Waltham Forest borough specific plan setting out the key vision of the Metropolitan Police and how it is translated into actions and initiatives of the borough.

According to the AMP, the Metropolitan Police estate is ageing, with approximately 40% of the buildings pre-dating 1935 and many being inappropriately located for today’s communities’ needs. Simply upgrading or renewing individual parts of the estate is not considered to be an option and there is an urgent need for major change\(^{120}\).

The plan illustrates plans to improve policing facilities in Waltham Forest so that they are suitable to meet the police's needs in the borough, namely:

- New custody provision - the development of specialised custody facilities grouping 20-40 cells in one location along with ancillary facilities such as interview rooms, consultation rooms and a search suite
- Improved patrol services - the development of one single patrol base accommodating the majority of operational police officers and resources for the borough in one main building\(^{121}\)
- Front counters - a better environment for the public - the provision of a front counter to allow a joined-up approach to improve customer services, and
- Better office accommodation - the reorganisation and improvement of back-office facilities to ensure a more efficient manner of working, organisation, and support for frontline officers.

The *Asset Management Plan Waltham Forest* makes reference to several key infrastructure programmes and projects for Waltham Forest’s police stations up to 2010. This information is presented in Table 9-3. The plan states however that no final decisions have been made on what improvements will be made to the police estate in the future

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\(^{119}\) Metropolitan Police Estate (2007), *Asset Management Plan Waltham Forest*. Consultation is ongoing with Waltham Forest’s Community Safety team and police to identify Waltham Forest’s specific information.

\(^{120}\) Metropolitan Police (2005), *Planning for the Future Police Estate*.

\(^{121}\) The Uplands Patrol Base in Waltham Forest is now fully operational, the borough being the first in London to accommodate such a facility at one location.
Table 9-3: List of Projects/Programmes for Police Provision in Waltham Forest

<table>
<thead>
<tr>
<th>Project/ Programme</th>
<th>Location</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>A new front counter at Walthamstow Police Station</td>
<td>Walthamstow</td>
<td>Metropolitan Police Authority</td>
</tr>
<tr>
<td>New Custody Centre</td>
<td>Unconfirmed – Hainault Road preferred</td>
<td>Metropolitan Police Authority</td>
</tr>
<tr>
<td>New Safer Neighbourhood bases</td>
<td>Unknown</td>
<td>Metropolitan Police Authority</td>
</tr>
<tr>
<td>New front counters</td>
<td>Unconfirmed</td>
<td>Metropolitan Police Authority</td>
</tr>
</tbody>
</table>


Assessment of Need/ Adequacy

As stated above, much of the Metropolitan Police estate in London is not considered to be appropriate for a modern police service. In Waltham Forest, Leyton and Walthamstow Police Stations are highlighted as not being able to adequately accommodate the latest IT and communications systems required to support 21st century police operations or to provide services accessible to all residents of the borough.

The Metropolitan Police highlight the need to modernise facilities in the borough, whilst ensuring that existing buildings are retained.

Furthermore, the Council is seeking to increase police presence in the borough, to help meet London average and police strength in borough of comparable crime profiles. Should its demands be met an additional 120 police officers could be introduced in the borough, with potentially associated spatial requirement\(^{122}\).

9.4. Demand for Police Services and Infrastructure Arising from Growth

There is no clear guidance available at either national or local level which would indicate how to translate an increase in development (residential and/ or commercial) into additional demand for police services, and thereby into demand for a new police station or SNT. Moreover, for various reasons it may be that this is neither a practical or sensible way to approach the question at hand.

Future Trends

Waltham Forest’s Asset Management Plan (AMP) highlights that one of the key objectives for the police estate in the borough is to provide accessible and friendly police

\(^{122}\) LB Waltham Forest website, [http://www.walthamforest.gov.uk/index/safety/backup.htm](http://www.walthamforest.gov.uk/index/safety/backup.htm), accessed 06/10/2009
facilities in the right locations, whilst ensuring excellent working conditions for police officers and staff to help them carry out their duties.

A patrol base has already been built at Uplands Business Park, which includes a space where all police officers for the borough are based. The AMP also pledges to bring about a consolidated police estate whereby we would see a shift from the current de-localised custody cells organisation to a centralised arrangement at a dedicated custody centre accommodating 20-40 cells (see above). The AMP also proposes the splitting of front counter facilities so that their functions can take place independently of each other. This will lead to increased feelings of security and a better service being provided. This shift in the mode of provision is considered beneficial to providing safer environments and space for the public.

Consultation with the MPA indicates that more accurate estimates of demand for police officers are based on the number of calls and the number of crimes within a borough. This is then translated into how many officers would be required to respond to that crime and how many would need to investigate the crime. The number of officers in an area tends to be higher if there is also hospital in the area\textsuperscript{123}. Quantitative forecasts for future police service requirements in Waltham Forest however were not available.

Population on the other hand is not the main basis on which additional officers requirements are forecast. Because of the great variation in demographic profile across boroughs, the MPA look at the projected population arising from large scale developments coming forward on a case by case basis. An assessment is made in terms of the need and level of policing to determine the demand for each ward and therefore within the boroughs\textsuperscript{124}.

The increase in Waltham Forest’s local population is likely to place demand for additional local policing services, so that the Safer Neighbourhood Team can be expected to increase in order to serve a larger population throughout the borough. This is likely to affect particularly the Blackhorse Lane sub-area of the borough, where only one Safer Neighbourhood Team is located.

9.5. Resulting Police Infrastructure Requirements

Police infrastructure improvements are assessed by the MPA without a direct consideration of new housing development plans. However, Section 9.3 shows that there are a number of pertinent improvements planned for the estate that are important to enable the Metropolitan Police deal effectively with a growing population.

With regard to phasing, The Metropolitan Police could not provide URS with any phasing of planning for new police provision because, as previously mentioned, the Met does not forecast the numbers of officers required in each local authority on a population basis.

\textsuperscript{123} Personal communication, London Metropolitan Police Authority. December 2008.

\textsuperscript{124} Ibid.
As previously mentioned, the Council is further seeking to increase the borough’s police
strength by an additional 120 officers. The process is however at the early stages, with
the Council gathering consensus among its communities\textsuperscript{125}. Therefore no specific
requirements can be identified at the time of writing.

9.6. Funding

The \textit{Policing London Business Plan}\textsuperscript{126} sets out central Government fund available to the
Metropolitan Police London. The fund has been extended to cover the period of 2008/09
to 2014/15 to allow efficient investment planning and the adoption of a longer-term
strategy. \textbf{Table 9-4} shows the proposed capital funding.

The capital funding is to support current initiatives such as the Safer Neighbourhoods
programme; renewal of IT infrastructure to ensure meets modern operational needs; and
renewal of assets such as police vehicles. However itemised spending by borough is not
available.

\begin{table}[h]
\centering
\caption{Capital Funding 2008/09 to 2014/15, £M}
\begin{tabular}{lccccccc}
\hline
\textbf{Funding Period} & \textbf{2008/09} & \textbf{2009/10} & \textbf{2010/11} & \textbf{2011/12} & \textbf{2012/13} & \textbf{2013/14} & \textbf{2014/15} \\
\hline
Proposed Capital Fund & 241.8 & 302 & 225.2 & 165.2 & 156.9 & 156.9 & 156.9 \\
\hline
\end{tabular}
\label{tab:capital_funding}
\end{table}


\textsuperscript{125} LB Waltham Forest website, \url{http://www.walthamforest.gov.uk/index/safety/backup.htm}, accessed 06/10/2009

\textsuperscript{126} Metropolitan Police Authority and Metropolitan Police Service (2007), \textit{Policing London Business Plan 2008-11}, Metropolitan Police Authority.
10. AMBULANCE

10.1. Context

The main London ambulance provider is the NHS London Ambulance Service (LAS) NHS Trust, which also manages the ambulance provision in Waltham Forest and provides free healthcare to all patients. It is a London-wide NHS Trust working closely with the police and fire services to prepare for large-scale or major incidents in London. Joint management between ambulance, fire and police services is carried out at a strategic level, and also Waltham Forest’s Community Safety Partnership (‘SafetyNet’) of which all three service-providers are part.

London Ambulance stations comprise main stations and satellite stations. Main stations include offices where managers and administrative staff are based, whilst satellite stations are smaller and act as a parking base for ambulances only. Ambulance stations are not located within hospitals; rather each ambulance station is a separate premise and does not fall under hospital estate. In the event of an incident the nearest available ambulance will be sent.

Ambulance Management

The London Ambulance Service operates in two areas, firstly Accident and Emergency (A&E) care commissioned by the individual PCTs for the population each of them caters for; secondly patient transport services (PTS), where the LAS wins contracts through competitive tendering. The London Ambulance Trust works closely with the police and fire services to prepare for large-scale or major incidents in London.

10.2. Baseline

Existing Provision

Ambulance stations comprise main stations and satellite stations. There are two main stations in Waltham Forest: one in the Southern Waltham Forest and one in the Central

127 Personal communication, External Relations, London Ambulance Service NHS Trust, 19/03/2009
128 Personal communication, Risk Information, London Ambulance Service NHS Trust, 08/01/2009
129 Personal communication, External Relations, London Ambulance Service NHS Trust, 19/03/2009
130 Services in this area include responding to emergency 999 calls, providing medical care to patients across London.
131 Services in this area include providing pre-arranged patient transport and finding of beds.
Waltham Forest sub-areas, as illustrated in Figure 10-1. No further detail on staff or other essential equipment was made available\textsuperscript{133}.

**Figure 10-1: Ambulance Stations within the borough of Waltham Forest**

Table 10-1 illustrates the number of incidents in Waltham Forest between January 2007 and December 2008.

<table>
<thead>
<tr>
<th></th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waltham Forest</td>
<td>27,189</td>
<td>28,940</td>
</tr>
</tbody>
</table>

**Source:** London Ambulance Trust 2009

**Table 10-1** illustrates the number of incidents in Waltham Forest between January 2007 and December 2008.

**Benchmarks**

The main driver of demand for ambulance services is the likelihood of incidents requiring ambulance intervention.

The demand for ambulance provision in the borough is forecast using historical incident data. The number of ambulances, the location of hospitals and how well the hospitals are served all have an impact on the performance and delivery of ambulance provision in the

\textsuperscript{133} Personal communication, External Relations, London Ambulance Service, 19/07/2009
boroughs. As it is hard to gather data particularly on London’s day-time and non-residential population, population is not directly used to forecast future ambulance needs in Waltham Forest\textsuperscript{134}.

**Committed and Planned Investment**

Consultation with the London Ambulance Trust has revealed that the current Estates Strategy is being reviewed so there are currently no formal plans available for ambulance provision and planned investment for the future\textsuperscript{135}.

Recent documents however highlight that the Trust has been rationalising its facilities portfolio by disposing of smaller sites. The Trust is also moving in the direction of integrated emergency and primary care provision, by pushing for PCTs to consider the opportunity of co-locating ambulance with primary healthcare services when developing any estate strategy.

The London Ambulance’s business plan up to 2015 highlights the planned growth of 600 ambulance staff members in the next six months across Greater London. The new ambulance staff will require new facilities. However, the distribution of the 600 additional staff members is unknown.

**Assessment of Need/ Adequacy**

The London Ambulance Service is under pressure from the increased number of 999 calls. Despite the current levels of demand, the service is continuing to reach more patients, more quickly than before\textsuperscript{136}.

Waltham Forest at present has adequate ambulance provision due to the two stations located in the borough and the support from surrounding boroughs.

10.3. Demand for Ambulance Services Infrastructure Arising from Growth

Due to reasons stated above it is not yet clear if it is appropriate or possible to model additional demand for ambulance services arising from the projected population and employment growth.

10.4. Resulting Ambulance Services Infrastructure Requirements

As development of the Ambulance Estate Management plan is currently on-going, and that there is no readily available basis for modelling demand for ambulance services, a

\textsuperscript{134} Personal communication, London Ambulance Service NHS Trust, 19/12/2008

\textsuperscript{135} Personal communication, London Ambulance Service NHS Trust, 23/12/2008

\textsuperscript{136} Personal communication, Operations, London Ambulance Service NHS Trust, December 2008
recommendation for future ambulance service requirements in Waltham Forest is not currently feasible\textsuperscript{137}.

10.5. Funding

London Ambulance Service is predominantly funded through annually approved NHS Service Level Agreements made with each of London’s PCTs. For patient transport services additional resources are available on a contractual basis from foundation trusts (secondary healthcare).

Whilst costed plans are being finalised as part of the review of the LAS Estate Strategy, the annual report states that one of the key areas of work over the 2006-2009 period was the reconfiguration of the estate\textsuperscript{138}. As part of this process the Trust has disposed of a significant number of sites; this process is expected to be completed in the 2008/09 financial year.

This rationalisation is in line with the Trust’s Strategic Plan\textsuperscript{139} which identifies opportunities for co-location of ambulance stations with PCT facilities, recommending early engagement between PCTs and LAS to ensure that the planning of new primary and secondary healthcare facilities considers such co-location opportunities.

The London Ambulance Service is conducting preparatory work to submit a foundation trust application\textsuperscript{140}. Should its submission be successful the Trust would have more flexibility in accessing financial resources on the private market, albeit always in line with principles of prudential borrowing.


\textsuperscript{138} NHS London (2009), Annual Service Plan.


\textsuperscript{140} NHS London (2009), Annual Service Plan.
11. FIRE

11.1. Context

This section examines the requirement for fire fighting services and stations.

11.2. Policy

The London Fire Safety Plan\(^{141}\) introduced new targets to measure the performance of London Fire crews in getting to emergency incidents. The Fire Brigade measures the percentage of occasions when first and second fire engines arrive at emergency incidents within set time thresholds, the first fire engine to reach an incident in five minutes on 65% of occasions and within eight minutes on 90% of occasions. These targets apply London-wide and all boroughs are performing well to reach them\(^{142}\). The London Fire Brigade are continuing to identify new ways to reach incidents more efficiently\(^{143}\), which suggests future demand is being considered.

Fire provision in Waltham Forest is managed at a London-wide level by the London Fire and Emergency Planning Authority (LFEPA) which runs the London Fire Brigade. The main duty of the LFEPA is to respond to fires and other emergencies, but in recent years its work has been increasingly directed to fire prevention and community safety\(^{144}\). The London Fire Brigade is also part of Waltham Forest’s Community Safety Partnership, SafetyNet.

11.3. Baseline

**Existing Provision**

Waltham Forest has a total of four fire stations. **Table 11-1** lists the four stations and their location, illustrating an even spread of fire service provision across Waltham Forest. A station ground, that is the neighbourhoods or area that the fire station is responsible for, may include parts of a neighbouring borough. This would mean that appliances from that station could be mobilised to attend to a fire in an adjoining borough, depending on the boundaries of the station ground.

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\(^{142}\) London Fire Brigade (2008), *Our Performance 2007/08*

\(^{143}\) Ibid.

\(^{144}\) Members of the Fire Authority are appointed by the Mayor of London. Eight are nominated from the London Assembly, seven are nominated from the London boroughs and two are Mayoral appointees. [http://www.london-fire.gov.uk/AboutUs.asp](http://www.london-fire.gov.uk/AboutUs.asp), accessed 23/07/2009.
Table 11-1: Fire Stations in Waltham Forest, 2007

<table>
<thead>
<tr>
<th>Fire Station</th>
<th>Station Ground (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chingford</td>
<td>11.1 km²</td>
</tr>
<tr>
<td>Leyton</td>
<td>6.3 km²</td>
</tr>
<tr>
<td>Leytonstone</td>
<td>11.5 km²</td>
</tr>
<tr>
<td>Walthamstow</td>
<td>13.3 km²</td>
</tr>
</tbody>
</table>


Tables 10-1 and 10-2 show that overall Walthamstow station responded to the highest number of operational incidents in 2006/07. Interestingly, the false alarm operation incidents constituted the largest proportion of all operational incidents responded to.

Table 11-2: Operational Incidents 2006/07 in LB Waltham Forest

<table>
<thead>
<tr>
<th>Operational Incident (2006/07)</th>
<th>Fire Station</th>
<th>All Fires</th>
<th>False Alarms</th>
<th>Road Traffic Collision</th>
<th>Other Special Service</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chingford</td>
<td>211</td>
<td>251</td>
<td>33</td>
<td>122</td>
<td>617</td>
</tr>
<tr>
<td></td>
<td>Leyton</td>
<td>206</td>
<td>270</td>
<td>34</td>
<td>166</td>
<td>676</td>
</tr>
<tr>
<td></td>
<td>Leytonstone</td>
<td>339</td>
<td>496</td>
<td>44</td>
<td>215</td>
<td>1,094</td>
</tr>
<tr>
<td></td>
<td>Walthamstow</td>
<td>409</td>
<td>593</td>
<td>49</td>
<td>270</td>
<td>1,321</td>
</tr>
</tbody>
</table>


Fire Incidence Activity in Waltham Forest by Ward

Figure 11-1 below shows a concentration of fire call-outs by ward in the west and southwest of the borough, and in the Blackhorse Lane sub-area in particular.
Figure 11-1: All Fires by Ward in Waltham Forest, 2007


**Figure 11-2** shows that there is a relatively high concentration of incidents requiring special services in the Southern Waltham Forest sub-area.

Figure 11-2: Special Services by Ward in Waltham Forest, 2007

Benchmarks

Quantitative forecasts for future fire management service requirements in Waltham Forest were not available. Consultation with the London Fire and Emergency Planning Authority indicated that estimated demand for fire services is based on the number of incidents that occur in a given borough\textsuperscript{145}. Because fire provision is not directly related to population, it is not possible to arrive at a provision standard that can be easily used to model resulting infrastructure needs arising from growth.

Committed and Planned Investment

The London Fire Brigade do not currently have plans to restructure Waltham Forest’s existing provision of fire stations meaning that the existing four stations are expected to remain in place\textsuperscript{146}. However, there is a focus on rebuilding and refurbishing the existing ones\textsuperscript{147}. Table 11-3 below shows the proposed initiatives for fire provision outlined in the Asset Management Plan 2008. The proposed improvements are part of a plan to update. The indicative costs shown in the table have been based on the average cost of recent refurbishment/replacement fire station, the new fire station safety standard, to meet changes in functional requirements for refurbishments\textsuperscript{148}.

Table 11-3: Proposed Initiatives in Waltham Forest and across London

<table>
<thead>
<tr>
<th>Proposed/Planned Initiative</th>
<th>Project Description</th>
<th>Indicative Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leytonstone Station</td>
<td>Redevelopment of station on existing site</td>
<td>TBC (Private Finance Initiative)</td>
</tr>
<tr>
<td>30 stations (across London)</td>
<td>Updated all 30 which are 60 years old</td>
<td>£130m</td>
</tr>
<tr>
<td>22 stations (across London)</td>
<td>Second round of updating as move from satisfactory to poor.</td>
<td>£90m</td>
</tr>
</tbody>
</table>


\textsuperscript{145} Personal communication, London Fire and Emergency Planning Authority 18/12/2008

\textsuperscript{146} Personal communication, Risk Information Manager, London Fire and Emergency Planning Authority Planning Authority, 24/07/2009

\textsuperscript{147} The London Fire and Emergency Planning Authority website states that newly refurbished stations will provide for mixed fire fighter accommodation and be capable of housing the latest fire fighting equipment. The Brigade aims to start advertising for a development partner in 2009 and start rebuilding in 2012/13 with the first new station operational in 2013/14. There is currently work underway on securing new sites for two of the stations in the PFI project. Site investigations are also underway for the existing sites. There will be no change in the number of fire fighters or the number of fire engines serving an area once a station is rebuilt.

\textsuperscript{148} London Fire Brigade (2008), Draft Asset Management Plan (Property).
Assessment of Need/ Adequacy

In terms of response times, at a borough level, Waltham Forest receives good attendance coverage with the first fire engine arriving on average in less than five minutes and twenty seconds\textsuperscript{149}.

The Asset Management Plan 2008\textsuperscript{150} outlines that there are currently 30 fire stations throughout London which are pre-1940 and therefore need to be updated. The document states that the figure is likely to significantly grow in the next 15 years as 22 more stations move from a satisfactory to a poor status due to their age profile\textsuperscript{151}.

It is difficult to access the adequacy (in quantifiable terms) of current or future fire station provision in the LB Waltham Forest level because fire stations and fire engines work across borough boundaries, particularly in large scale emergency situations\textsuperscript{152}.

There are no committed plans to expand Waltham Forest’s fire services provision, apart from the redevelopment of Leytonstone station.

11.4. Demand for Fire Management Infrastructure Arising from Growth

Demand for fire management for the forthcoming year is estimated based on historical data of the number of incidents attracting two or more fire engines in each area. There are on average approximately 160,000 calls across London each year, and this has remained the average despite the increased population in London\textsuperscript{153}.

Although population is not used directly to assess demand, the London Fire Brigades and the LFEPA are involved in discussions at the early stages of the planning process when new developments and major regeneration projects are put forward. Each new development is assessed in terms of the time it takes for fire services to reach them and the adequacy of fire safety measures; occasionally the scale of the scheme will require an assessment of the adequacy of available resources. Furthermore increases in the number of commercial buildings increases the number of false alarms, and therefore puts pressure on the fire service, but this is not perceived to be an issue in Waltham Forest.

\textsuperscript{149} Personal communication, Risk Information Manager, London Fire and Emergency Planning Authority, 24/07/2009

\textsuperscript{150} London Fire Brigade (2008), Draft Asset Management Plan (Property).

\textsuperscript{151} Ibid.

\textsuperscript{152} Personal communication, Risk Information Manager, London Fire and Emergency Planning Authority, 24/07/2009

\textsuperscript{153} Ibid.
11.5. Resulting Fire Management Infrastructure Requirements

As mentioned previously, the London Fire Brigade do not currently foresee any restructuring of Waltham Forests existing fire provision due to population growth.

11.6. Funding

The LFEPA rely on private finance initiatives (PFI) to improve its property estate by rebuilding up to ten fire stations that are in an operationally poor and/or in a poor property condition.
PART D – FINAL CONCLUSIONS

12. CONCLUSIONS

The infrastructure needs assessments carried out in the preceding chapters have arrived at a series of infrastructure recommendations for general utilities, foul and surface water drainage, waste management and emergency services infrastructure. It has not been possible in all cases to identify quantums of infrastructure requirement. An estimate of the additional demand for servicing arising from the projected residential and commercial growth has been made, however, for a range of valid reasons explained throughout this report, it has not been possible to translate the additional demand into specific requirements for physical infrastructure.

12.1. Existing Capacity

For the assessment of utilities and physical infrastructure it is a complex process to determine capacity in the existing system. Local planning authorities are often not directly responsible for the infrastructure items considered in this report such as water, electricity, sewerage and emergency services. The information is not developed with the 15-year LDF in mind but on a more short-term basis in five year plans and at spatial levels unrelated to administrative boundaries.

At a strategic level, the strict regulatory environment should ensure that sufficient capacity will be planned in the long-term, with projects such as the proposed desalination plant at Beckton ensuring new supplies of potable water and the proposed Thames Tideway tunnel adding capacity to the sewerage infrastructure of London. Information more pertinent to Waltham Forest is difficult to obtain. Research into publicly available material and personal consultations showed that there seems to be sufficient capacity in the current system to accommodate a degree of growth in the local gas network. The reported National Grid and BT position is that the capability is there to accept the predicted growth and therefore no shortfall is assumed to exist.

12.2. Resulting Requirements

To provide an indication of the scale of likely requirements URS have estimated the quantum of utilities infrastructure that could be required as a result of the scale of growth envisaged. It should be noted that the magnitude, limitations and the locations of these requirements are not identified at this stage. The estimated quantum of infrastructure required could thus be expected to include:

- For water: additional water mains and pumping stations (or at least upgraded pumping stations). As Thames Water is already planning for an additional reservoir and desalination plant, it can be expected that additional resources will be adequate to support the projected growth. The additional amount of clear water required would equate to a football pitch sized reservoir.
• For electricity: up to one additional primary substations, an upgrade to or establishment of one grid site (converting electricity typically from 132kV to 33kV), and up to 42 1MVA substations (i.e. secondary substation catering for local demand).

• For gas: the network is assumed to be functional and not to require uprating for the most part, with the exception of local reinforcement works that may be applicable. Assuming no capacity is available in the existing network the scale of projected demand would potentially translate into the need for one new pressure reducing stations (transforming the gas from medium pressure to low pressure).

• For sewerage: new and renovated sewers.

Figures 12-1 (lower growth) and 12-2 (higher growth) below summarise the infrastructure requirements for each type of infrastructure covered by this report required to support the potential population growth in Waltham Forest over the Core Strategy planning period.

Table 12-1 (lower growth) and 12-2 (higher growth) give the details of each type of infrastructure requirement, by type and phase, and also proposes the level of priority (1-4) of how critical the consultants consider the infrastructure item is to ensuring delivery of development in the borough in the context of the entire Strategic Infrastructure Plan:

- Priority level 1 – these are infrastructure items that enable basic functionality and cover utilities such as gas, electricity, sewerage and water

- Priority level 2 – these are infrastructure items that the Council has a current or upcoming legislative requirement to provide. This includes ensuring that all resident children have places at local schools; that waste is disposed of; that surface water run-off is reduced; and sustainable energy generation that will contribute to the achievement of zero carbon development (by 2016 for domestic and 2019 for non-domestic development)

- Priority level 3 – these items are considered critical to ensure that development is sustainable and include primary and secondary healthcare facilities, primary transport improvements necessary to overcome unacceptable levels of congestion, emergency services and telecommunications

- Priority level 4 – these items are considered very important for sustainable development and include burial space in the borough, community meeting spaces, places of worship, leisure facilities (child play space, open space, indoor leisure facilities, swimming pools, allotments, libraries), secondary transport improvements and employment brokerage space

The tables also set out where possible: when and where the infrastructure is required; who is responsible for delivery and funding; where the infrastructure is accounted for in the range of existing plans and investments strategies of the respective responsible agencies; and potential costs as identified by the provider and/or by URS. These
dimensions of the analysis inform and add detail to the assessment of infrastructure priority.

12.3. Next Steps

A key finding of this study has been that there is a lack of information and strategy formulation on the part of many infrastructure providers. This presents a serious risk to the delivery of sustainable growth and makes the formulation of a robust LDF which reflects future infrastructure requirements challenging. To tackle this problem we recommend presenting this report to GoL and CLG (and potentially other sponsor departments) and holding discussions with these organisations in order to raise awareness of, and seek solutions to, this issue.

- In light of the difficulties experienced consulting with the water, gas and electricity infrastructure providers we propose that the Council follow up on the channels of communication opened by the URS team and clarify future plans, timeframes, cost implications, delivery risks/opportunities with Thames Water, EDF and National Grid throughout the LDF process.

- Waltham Forest should progress its agenda to meet future energy demand through low carbon energy generation, i.e. inter- and cross-borough decentralised energy infrastructure provision. This should be combined with an intent to move to zero carbon energy generation predominantly by the utilisation of Energy from Waste (EfW) opportunities. An examples of this is the option to secure a waste derived fuel supply lot (60,000 tonnes of EfW fuel pellets to be made available each year under three lots from 2014 onwards, i.e. 20,000 tonnes per lot) produced by the North London Waste Authority (NLWA) and their licensed operator.

- Large scale biomass CHP plant operation should be investigated as part of the Area Action Plans being developed by the borough, particularly in the Southern Waltham Forest sub-area where industrial land use is predicted to grow, e.g. the Argall Industrial Estate/Rigg Approach. This provides an opportunity to support the energy centre space requirements and infrastructure distribution, offers a viable customer base for connection, has sustainable transport routes from Edmonton (EfW route) and Epping Forest (biomass route) using the Lea River and existing rail routes respectively, and is a more robust approach to mitigating air quality issues (i.e. it is more economically feasible to implement air quality mitigation plant for large scale schemes).

- Realising the implementation of decentralised energy networks and low carbon fuel solutions will require the establishment of new partnership management arrangements between Waltham Forest, the NLWA and energy suppliers, i.e. determining the feasibility of ESCos and the development of sustainability policies which create an expectation for developers to utilise low carbon fuel sources and to connect to sustainable utilities, where available and feasible.
In light of the problems over to identifying conclusively the infrastructure requirements that are likely to be associated to increasing demand for telecommunication services in Waltham Forest up to 2026, it is recommended that Waltham Forest Council maintains dialogue with telecommunication providers so as to co-ordinate the use of highway space and the ability to pre-install, if at all possible, duct runs that mitigate the need to re-excavate highway

The EA will use its role as a statutory consultee within the planning process to encourage bank naturalisation and increased floodplain storage on the River Lee and its tributaries. The Council can support this process by implementing planning conditions to enforce such measures. This is particularly relevant to the River Ching where substantial development is likely to occur in the Highams Park area and close to the site of the old Walthamstow Dogs Stadium

Presently the draft Flood and Water Management Bill is anticipated to be passed as law in 2010. The Bill intends to enforce SUDS by obliging developers to submit their intentions for managing runoff to a SUDS approval body before they can connect the final discharge to the sewerage undertaker. Under the proposed wording of the Bill the SUDS approval body would be the borough. Any developers not intending to implement SUDS on their sites would have to justify the reasoning behind such a decision. With the boroughs’ new power to enforce the introduction of SUDS, it is anticipated that significant reductions could be made in the volume and rate of peak runoff from brownfield developments. The borough should prepare to exercise these powers ahead of the passing of the new legislation.

It is anticipated that TW will need to make strategic upgrades to their sewerage network in order to accommodate an increased foul water baseflow corresponding to the growth projections for the borough to 2026. However Thames Water implements such upgrades reactively so it is difficult to foresee the scale of the improvements required. Under the Water Act 1991 Thames Water has the power to pass the cost of such improvements to the developers, either in their entirety and a proportion of the costs. The Council should consult with Thames Water regarding undertaking a study to establish the extent of the strategic improvements required within the borough.

TW are obliged to create Flood Inundation Maps relating to the Lee Valley reservoirs. Thames Water do not release information regarding flood zones from those reservoirs or strategic asset ownership for security reasons. However the borough should liaise with Thames Water to ensure that such maps have been created or are programmed under the remit of the Flood and Water Management Bill

See the Executive Summary for a discussion on the potential for the Council to use this research to inform the development of a Community Infrastructure Levy for LB Waltham Forest.
Figure 12-1: Summary of Utilities and Physical Infrastructure Requirements – Lower Growth

Summary Utilities and Physical Infrastructure Requirements Lower Growth Scenarios

**NORTHERN WALTHAM FOREST**

Infrastructure | Demand | Action | Requirement
--- | --- | --- | ---
Road | O.A.M.E |  |  
Utilities | 2.3kV PA | 300 M3/d |  
Other | 0.4 M3/d |  |  
Total |  |  |  

**BLACKHORSE LANE**

Infrastructure | Demand | Action | Requirement
--- | --- | --- | ---
Road | 9.2 M3/d |  |  
Utilities | 1.56kV AR | >900 M3/d |  
Other | 0.4 M3/d |  |  
Total |  |  |  

Infiltration mapping and emergency plan in the Lower Lea Valley

**CENTRAL WALTHAM FOREST**

Infrastructure | Demand | Action | Requirement
--- | --- | --- | ---
Road | 2.0 M3/d |  |  
Utilities | 15,980kV EA | 6,750 M3/d |  
Other | 2.1 M3/d |  |  
Total |  |  |  

New front counter at Walthamstow police station
Infiltration mapping and emergency plan in the Lower Lea Valley

**SOUTHERN WALTHAM FOREST**

Infrastructure | Demand | Action | Requirement
--- | --- | --- | ---
Road | 0.9 M3/d |  |  
Utilities | 2,400 kV AR | 1,800 M3/d |  
Other | 1.2 M3/d |  |  
Total |  |  |  

Potential new outfall centre at Harmill Road

Please note that unless otherwise stated the estimated need applies to both the lower and higher growth scenarios.

**LEGEND**

- London Underground Stations
- Railway Stations
- Road
- Green Spaces
- Lakes / Ponds / Reservoirs
- Further engagement or partnership working requirement
- Further detailed analysis required
- Infrastructure scheme or works required
- requirement
- Combined Heat and Power
- Main / Pipework / Cable
- Primary substation
- Secondary substation
- Pumping station

- Water
- Energy
- Demolition
- Flood risk
- Waste
- Police

Map showing utilities and physical infrastructure needs assessment.
Figure 12.2: Summary of Utilities and Physical Infrastructure Requirements - Higher Growth

Summary Utilities and Physical Infrastructure Requirements Higher Growth Scenarios

**NORTHERN WALTHAM FOREST**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Demand</th>
<th>Action</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>3.3 Ml/d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>2,339 kVA</td>
<td>700 kVA</td>
<td></td>
</tr>
<tr>
<td>Solid Waste</td>
<td>1.7 Ml/d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BLACKHORSE LANE**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Demand</th>
<th>Action</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1.3 Ml/d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>4,900 kWh</td>
<td>1,480 kWh</td>
<td></td>
</tr>
<tr>
<td>Solid Waste</td>
<td>1.7 Ml/d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CENTRAL WALTHAM FOREST**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Demand</th>
<th>Action</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>2.2 Ml/d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>9,041 kWh</td>
<td>3,000 kWh</td>
<td></td>
</tr>
<tr>
<td>Solid Waste</td>
<td>2.3 Ml/d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SOUTHERN WALTHAM FOREST**

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Demand</th>
<th>Action</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>1.9 Ml/d</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electricity</td>
<td>10,000 kWh</td>
<td>3,000 kWh</td>
<td></td>
</tr>
<tr>
<td>Solid Waste</td>
<td>9.4 Ml/d</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**LEGEND**

- London Underground Stations
- Railway Stations
- Railways
- Roads
- Green Spaces
- Lakes / Ponds / Reservoirs
- Action
- Further engagement or partnership working required
- Further detailed analysis required
- Infrastructure scheme or works required

**BOROUGH WIDE**

- Sewer flooding investigation
- Preparation of a Surface Water Management Plan
- Maintenance of highway drainage, with replacement of impermeable surfaces with permeable systems
- Implementation of SUDS and promotion of flood resistant architecture
- Use of additional waste management facilities and land integrated waste management facilities in new developments
- Delivery of new custody, staff and police station front counter
- Reforestation and reclamation of waste

---

Please note that unless otherwise stated the estimated need applies to both the lower and higher growth scenarios.
<table>
<thead>
<tr>
<th>Infrastructure Area</th>
<th>Infrastructure schemes and actions</th>
<th>Priority (1-4)</th>
<th>Rationale for inclusion / risk if not included</th>
<th>Drivers</th>
<th>Phasing</th>
<th>Location</th>
<th>Responsibility and Funding</th>
<th>Costs</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>Provision of 3.3 additional million l/day and related local and strategic infrastructure</td>
<td>1</td>
<td>Thames Water have identified a likely future deficit in supply of water in the London water resource zone to 2034, and strategic plans to address this are being formulated. However no clear, immediate plan for the Waltham Forest area is evident.</td>
<td>✓ ✓</td>
<td>M – L</td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Electricity, Gas, Telecoms</strong></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LB Waltham Forest to lobby utility providers and regulatory bodies to devise a strategic longer term planning approach to provision of required utilities, with a focus on Waltham Forest as an independent borough and as part of the wider London Resource Zone</td>
<td>1</td>
<td>Existing strategies of utilities companies are for short-term reactive works only. These works will not ensure the new demand for utilities stemming from additional growth is met.</td>
<td>✓ ✓</td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>Provision of 26.3 MVA to 2026 and related local and strategic infrastructure</td>
<td>1</td>
<td>Fundamental to the delivery of commercial and residential growth.</td>
<td>✓ ✓</td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td>Provision of 6.7 thousand m³/hr and related local infrastructure</td>
<td>1</td>
<td>Fundamental to the delivery of commercial and residential growth.</td>
<td>✓ ✓</td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
<td>Not available</td>
</tr>
<tr>
<td>Infrastructure Area</td>
<td>Infrastructure schemes and actions</td>
<td>Rationale for inclusion / risk if not included</td>
<td>Priority (1-4)</td>
<td>Drivers</td>
<td>Phasing</td>
<td>Location</td>
<td>Responsibility and Funding</td>
<td>Costs</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------</td>
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<td>---------</td>
<td>---------</td>
<td>----------------------------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
<td>Opportunity to implement decentralised energy infrastructure due to baseline and projected energy demand profile.</td>
<td>2</td>
<td>✓ ✓ ✓</td>
<td>Blackhorse Lane - where new development is most likely to occur</td>
<td>LPA / LDA / PPP</td>
<td>LDA / ESCo (PFI or PPP)</td>
<td>Land provision from currently owned stock / Expectation on developers to connect</td>
<td>Not available</td>
</tr>
<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
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<td>2</td>
<td>✓ ✓ ✓</td>
<td>Southern WF - Argyle Estate and other locations</td>
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<td>Not available</td>
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<td>Infrastructure Area</td>
<td>Infrastructure schemes and actions</td>
<td>Priority (1-4)</td>
<td>Rationale for inclusion / risk if not included</td>
<td>Drivers</td>
<td>Phasing</td>
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<td>Responsibility and Funding</td>
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<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
<td>2</td>
<td>Opportunity to implement decentralised energy infrastructure due to baseline and projected energy demand profile.</td>
<td>✓ ✓ ✓</td>
<td>S</td>
<td>Central WF - Possibly in Walthamstow town centre</td>
<td>LPA / LDA / PFI</td>
<td>£74m</td>
<td>Not available</td>
</tr>
<tr>
<td></td>
<td>The optimum CHP engine capacity proposed for the Central WF sub-area is 25.5MWe</td>
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<tr>
<td>Sewerage - Sewers</td>
<td>Provision for 3.9 million litres per day of sewer flows, and associated new and renovated sewers</td>
<td>1</td>
<td>The sewerage system is currently operating at full capacity. The system will not be able to cope with additional forecast development. Investment is also required to reduce sewer flooding.</td>
<td>✓ ✓</td>
<td>S – M – L</td>
<td>Thames Water (in association with the Regulator)</td>
<td>Thames Water</td>
<td>£74m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The sewerage system is currently operating at full capacity. The system will not be able to cope with additional forecast development.</td>
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<tr>
<td>Sewerage – Pumping Stations</td>
<td>New and refurbished pumping stations required</td>
<td>1</td>
<td>Improvements should be borough wide. Problem hotspots the centre and south east of the borough</td>
<td>✓ ✓</td>
<td>S - M</td>
<td>Thames Water (in association with the Regulator)</td>
<td>Thames Water</td>
<td>£4m</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The sewerage system if currently operating at full capacity. The system will not be able to cope with additional forecast development.</td>
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</table>

Shaded cells indicates providers' commitment.
<table>
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<th>Infrastructure Area</th>
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<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Surface and Foul Water Drainage (Drain maintenance and surface renewal / upgrades)</td>
<td>Maintenance of highway drainage, particularly repair of damaged gullies. Replace impermeable surfaces with permeable systems to reduce the quantity of surface water runoff and hence mitigate flooding</td>
<td>1</td>
<td>Help reduce the risk of surface water flooding</td>
<td>✓ ✓</td>
<td>S - M - L</td>
<td>Throughout the borough</td>
<td>LPA</td>
<td>LPA</td>
<td>Funding and commissioning the work</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Sewer flooding investigation</td>
<td>1</td>
<td>To ensure full understanding of the strategic impact of new development on the sewer system and therefore on the risk of sewer flooding</td>
<td>✓ ✓</td>
<td>S-M-L</td>
<td>Throughout the borough, particularly in the east and south.</td>
<td>LPA in association with Thames Water (and potentially the adjoining boroughs)</td>
<td>LPA</td>
<td>Commissioning the study to Thames Water</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of a Surface Water Management plan</td>
<td>1</td>
<td>Help the Council consider all potential sources of flood risk and identify remedial measures</td>
<td>✓ ✓</td>
<td>S - M - L</td>
<td>Throughout the borough</td>
<td>LPA</td>
<td>LPA</td>
<td>Preparation and funding</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of inundation mapping for the reservoirs in the River Lee Valley</td>
<td>1</td>
<td>Help understand the flood risk deriving from the reservoirs and identify mitigation/remedial measures</td>
<td>✓ ✓ ✓</td>
<td>S - M - L</td>
<td>Eastern of the borough</td>
<td>Environment Agency in liaison with Thames Water</td>
<td>Environment Agency/ Thames Water</td>
<td>Fully liaising with EA/TW throughout the process of creating these plans.</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of emergency management plans for the reservoirs in the River Lee</td>
<td>1</td>
<td>Manage the risk associated with a bank failure at the reservoirs</td>
<td>✓ ✓ ✓</td>
<td>S - M - L</td>
<td>Eastern of the borough</td>
<td>Environment Agency in liaison with Emergency Services</td>
<td>Environment Agency/ Emergency Services</td>
<td>Fully liaising with EA/Emergency Services throughout the process of creating these plans.</td>
</tr>
</tbody>
</table>
## Shaded cells indicates providers' commitment

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<th>Responsibility and Funding</th>
<th>Costs</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Foul and Surface Water Drainage (Flood risk related SUDS measures)</strong></td>
<td>Implementation of Sustainable Urban Drainage Systems (SUDS) and promotion of flood resistant architecture</td>
<td>1</td>
<td>Help alleviate sewer flowing</td>
<td>✓</td>
<td>✓</td>
<td>S – M – L</td>
<td>Improvements should be borough wide.</td>
<td>LPA</td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>Use of additional waste management facilities and land</td>
<td>1</td>
<td>Need to accommodate future waste needs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>M-L</td>
<td>Ideally within Waltham Forest, but due to spatial constraints - outside the borough, either in north London or outside London</td>
<td>NLWA</td>
</tr>
<tr>
<td><strong>Waste</strong></td>
<td>Inclusion of integrated waste management facilities within new developments</td>
<td>1</td>
<td>Need to accommodate future waste needs</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>M-L</td>
<td>Within the LB Waltham Forest</td>
<td>Private companies e.g. developer of a housing estate Private company e.g. developer of a housing estate</td>
</tr>
<tr>
<td>Infrastructure Area</td>
<td>Infrastructure schemes and actions</td>
<td>Priority (1-4)</td>
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<tr>
<td>Policy</td>
<td>Existing policy, replacement, upgrade, future demand for development.</td>
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<tr>
<td>Existing Infrastructure schemes and actions</td>
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<tr>
<td>When should the infrastructure items be delivered by?</td>
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<td>Where should the infrastructure item be delivered?</td>
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<td>Responsible Delivery Agency</td>
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<td>Responsible Funding Agency</td>
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<td>Role and responsibility of LBWF as the LPA</td>
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<td>Identified by URS / HUDU model</td>
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<tr>
<td>Delivery of new custody suite</td>
<td>Development of specialised custody facilities in one location along with ancillary facilities such as interview rooms, consultation rooms and a search suite</td>
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<td>Delivery of new police station front counters</td>
<td>Deliver a better environment for the public: the provision of a front counter to allow a joined-up approach to improve customer services</td>
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<td>Police</td>
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<tr>
<td>Modernisation and consolidation of estate providing better office accommodation</td>
<td>Deliver the reorganisation and improvement of back-office facilities to ensure a more efficient manner of working, organisation, and support for frontline officers.</td>
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<td>Fire</td>
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<td>Redevelopment of Leytonstone Fire Station on existing site</td>
<td>Redeveloped to ensure that the station is able to provide an adequate service and improve the existing facilities for the local community in the future</td>
<td>3</td>
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</table>

Source: URS / ISU analysis
### Table 12-2: Summary List of Utilities and Physical Infrastructure Requirements to 2026 – Higher Growth Scenario

<table>
<thead>
<tr>
<th>Infrastructure Area</th>
<th>Infrastructure schemes and actions</th>
<th>Priority (1-4)</th>
<th>Rationale for inclusion / risk if not included</th>
<th>Drivers</th>
<th>Phasing</th>
<th>Location</th>
<th>Responsibility and Funding</th>
<th>Costs</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water</strong></td>
<td>Provision of 7.6 additional million l/day and related local and strategic infrastructure</td>
<td>1</td>
<td>Thames Water have identified a likely future deficit in supply of water in the London water resource zone to 2034, and strategic plans to address this are being formulated. However no clear, immediate plan for the Waltham Forest area is evident.</td>
<td>✓</td>
<td>✓</td>
<td>M – L</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
</tr>
<tr>
<td></td>
<td><a href="mailto:info@walthamforest.gov.uk">LB Waltham Forest to lobby utility providers and regulatory bodies to devise a strategic longer term planning approach to provision of required utilities, with a focus on Waltham Forest as an independent borough and as part of the wider London Resource Zone</a></td>
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<tr>
<td><strong>Electricity, Gas, Telecoms</strong></td>
<td>Provision of 42.0 MVA to 2026 and related local and strategic infrastructure</td>
<td>1</td>
<td>Existing strategies of utilities companies are for short-term reactive works only. These works will not ensure the new demand for utilities stemming from additional growth is met.</td>
<td>✓</td>
<td></td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
</tr>
<tr>
<td><strong>Electricity</strong></td>
<td>Provision of 14.8 thousand m3/hr and related local infrastructure</td>
<td>1</td>
<td>Fundamental to the delivery of commercial and residential growth.</td>
<td>✓</td>
<td></td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
</tr>
<tr>
<td><strong>Gas</strong></td>
<td>Provision of 14.8 thousand m3/hr and related local infrastructure</td>
<td>1</td>
<td>Fundamental to the delivery of commercial and residential growth.</td>
<td>✓</td>
<td></td>
<td>borough wide</td>
<td>Regulator / Utility provider</td>
<td>Utility provider</td>
<td>Lobbying, / stakeholder consultation / assist with planning</td>
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<td>Infrastructur e Area</td>
<td>Infrastructure schemes and actions</td>
<td>Priority (1-4)</td>
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</tr>
<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
<td>2</td>
<td>Opportunity to implement decentralised energy infrastructure due to baseline and projected energy demand profile.</td>
<td>☑️ ☑️ ☑️</td>
<td>To be coordinated with Tottenham Hale</td>
<td>Blackhorse Lane - where new development is most likely to occur</td>
<td>LPA / LDA / PPP</td>
<td>LDA / ESCo (PFI or PPP)</td>
<td>Land provision from currently owned stock / Expectation on developers to connect</td>
</tr>
<tr>
<td></td>
<td>The optimum CHP engine capacity proposed for the Blackhorse Lane sub-area is 5.1MWe</td>
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<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
<td>2</td>
<td>Opportunity to implement decentralised energy infrastructure due to baseline and projected energy demand profile.</td>
<td>☑️ ☑️ ☑️</td>
<td>Opportunity for cross-border systems with the Olympic Park</td>
<td>Southern WF - Argyle Estate and other locations</td>
<td>LPA / LDA / PPP</td>
<td>LDA / ESCo (PFI or PPP)</td>
<td>Land provision from currently owned stock / Expectation on developers to connect</td>
</tr>
<tr>
<td></td>
<td>The optimum CHP engine capacity proposed for the Southern WF sub-area is 25.5MWe</td>
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</tr>
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</tr>
<tr>
<td>Decentralised Energy Systems</td>
<td>Provision of CHP plant systems to meet a proportion of the estimated total gas and electricity consumption (existing plus forecasted) up to 2026</td>
<td>2</td>
<td>Opportunity to implement decentralised energy infrastructure due to baseline and projected energy demand profile. If not included the risk is of a loss of opportunity to meet baseline and projected energy demand.</td>
<td>✓ ✓ ✓</td>
<td>S</td>
<td>Central WF - Possibly in Walthamstow town centre</td>
<td>LPA / LDA / PPP (PFI)</td>
<td>LDA / ESCo (PFI or PPP)</td>
<td>Land provision from currently owned stock / Expectation on developers to connect</td>
</tr>
<tr>
<td>Sewerage - Sewers</td>
<td>Provision for 9.2 million litres per day of sewer flows, and associated new and renovated sewers</td>
<td>1</td>
<td>The sewerage system is currently operating at full capacity. The system will not be able to cope with additional forecast development. Investment is also required to reduce sewer flooding.</td>
<td>✓ ✓</td>
<td>S – M - L</td>
<td>Improvements should be borough wide. Problem hotspots the centre and south east of the borough</td>
<td>Thames Water (in association with the Regulator)</td>
<td>Thames Water</td>
<td>Lobbying, assist with planning, in-kind resources where possible, technical expertise. Collect planning gain contributions to fund improvements.</td>
</tr>
<tr>
<td>Sewerage – Pumping Stations</td>
<td>New and refurbished pumping stations required</td>
<td>1</td>
<td>The sewerage system if currently operating at full capacity. The system will not be able to cope with additional forecast development.</td>
<td>✓ ✓</td>
<td>S-M</td>
<td>Improvements should be borough wide.</td>
<td>Thames Water (in association with the Regulator)</td>
<td>Thames Water</td>
<td>Lobbying, assist with planning, in-kind resources where possible, technical expertise. Collect planning gain contributions to fund improvements.</td>
</tr>
</tbody>
</table>

Identified by URS / HUDU model

Whilst Thames Water’s five and 25 years plans show that a capital investment plan is in place to address the renovation or expansion of the sewers system in the whole of the Thames Water region, the extent to which specific plans related to Waltham Forest have been finalised and funding committed is not clear. This applies to both pumping stations and sewer mains.

Costs identified are across the Thames Water Region at £243m.
<table>
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<tr>
<th>Infrastructure Area</th>
<th>Infrastructure schemes and actions</th>
<th>Priority (1-4)</th>
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<tr>
<td>Surface and Foul Water Drainage (Drainage maintenance and surface renewal / upgrades)</td>
<td>Maintenance of highway drainage, particularly repair of damaged gullies. Replace impermeable surfaces with permeable systems to reduce the quantity of surface water runoff and hence mitigate flooding</td>
<td>1</td>
<td>Help reduce the risk of surface water flooding</td>
<td>✔ ✔</td>
<td>S - M - L</td>
<td>Throughout the borough</td>
<td>LPA</td>
<td>LPA</td>
<td>Funding and commissioning the work</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Sewer flooding investigation</td>
<td>1</td>
<td>To ensure full understanding of the strategic impact of new development on the sewer system and therefore on the risk of sewer flooding</td>
<td>✔ ✔</td>
<td>S-M-L</td>
<td>Throughout the borough, particularly in the east and south.</td>
<td>LPA in association with Thames Water (and potentially the adjoining boroughs)</td>
<td>LPA</td>
<td>Commissioning the study to Thames Water</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of a Surface Water Management plan</td>
<td>1</td>
<td>Help the Council consider all potential sources of flood risk and identify remedial measures</td>
<td>✔ ✔</td>
<td>S - M - L</td>
<td>Throughout the borough</td>
<td>LPA</td>
<td>LPA</td>
<td>Preparation and funding</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of inundation mapping for the reservoirs in the River Lee Valley</td>
<td>1</td>
<td>Help understand the flood risk deriving from the reservoirs and identify mitigation/remedial measures</td>
<td>✔ ✔ ✔</td>
<td>S – M - L</td>
<td>Eastern of the borough</td>
<td>Environment Agency/ Thames Water</td>
<td>Environment Agency/ Thames Water</td>
<td>Fully liaising with EA/TW throughout the process of creating these plans.</td>
</tr>
<tr>
<td>Flood Risk</td>
<td>Preparation of emergency management plans for the reservoirs in the River Lee Valley</td>
<td>1</td>
<td>Manage the risk associated with a bank failure at the reservoirs</td>
<td>✔ ✔ ✔</td>
<td>S – M - L</td>
<td>Eastern of the borough</td>
<td>Environment Agency in liaison with Emergency Services</td>
<td>Environment Agency/ Emergency Services</td>
<td>Fully liaising with EA/Emergency Services throughout the process of creating these plans.</td>
</tr>
<tr>
<td>Infrastructure Area</td>
<td>Infrastructure schemes and actions</td>
<td>Priority (1-4)</td>
<td>Rationale for inclusion / risk if not included</td>
<td>Drivers</td>
<td>Phasing</td>
<td>Location</td>
<td>Responsibility and Funding</td>
<td>Costs</td>
<td>Notes</td>
</tr>
<tr>
<td>---------------------</td>
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</tr>
<tr>
<td>Foul and Surface Water Drainage (Flood risk related SUDS measures)</td>
<td>Implementation of Sustainable Urban Drainage Systems (SUDS) and promotion of flood resistant architecture</td>
<td>1</td>
<td>Help alleviate sewer flowing ✓ ✓ ✓</td>
<td>S – M - L</td>
<td>Improvements should be borough wide.</td>
<td>LPA</td>
<td>Implement through Development Control policies / Funding if it is the landowner</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>Use of additional waste management facilities and land</td>
<td>1</td>
<td>Need to accommodate future waste needs ✓ ✓ ✓</td>
<td>M-L</td>
<td>Ideally within Waltham Forest, but due to spatial constraints - outside the borough, either in north London or outside London</td>
<td>NLWA</td>
<td>Supply of relevant technical information to NLWA</td>
<td>Not available</td>
<td></td>
</tr>
<tr>
<td>Waste</td>
<td>Inclusion of integrated waste management facilities within new developments</td>
<td>1</td>
<td>Need to accommodate future waste needs ✓ ✓ ✓</td>
<td>M-L</td>
<td>Within the LB Waltham Forest</td>
<td>Private companies e.g. developer of a housing estate</td>
<td>Waltham Forest Council may require the inclusion of waste management facilities as part of planning conditions</td>
<td>Not available</td>
<td>The provider would be a private company e.g. a developer</td>
</tr>
<tr>
<td>Infrastructure Area</td>
<td>Infrastructure schemes and actions</td>
<td>Priority (1-4)</td>
<td>Rationale for inclusion / risk if not included</td>
<td>Drivers</td>
<td>Phasing</td>
<td>Location</td>
<td>Responsibility and Funding</td>
<td>Role and responsibility of LBWF as the LPA</td>
<td>Identified by URS / HUDU model</td>
</tr>
<tr>
<td>---------------------</td>
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</tr>
<tr>
<td>Delivery of new custody suite</td>
<td>Development of specialised custody facilities in one location along with ancillary facilities such as interview rooms, consultation rooms and a search suite</td>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>S-M</td>
<td>Hainault Road</td>
<td>Metropolitan Police</td>
<td>Developer</td>
<td>Securing S106 funding</td>
</tr>
<tr>
<td>Delivery of new police station front counters</td>
<td>Deliver a better environment for the public- the provision of a front counter to allow a joined-up approach to improve customer services</td>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>S-M-L</td>
<td>borough wide</td>
<td>Metropolitan Police</td>
<td>Metropolitan Police / Developer</td>
<td>Develop enabling land use planning policy</td>
</tr>
<tr>
<td>Delivery of new police station front counters</td>
<td>Deliver a better environment for the public- the provision of a front counter to allow a joined-up approach to improve customer services</td>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>S</td>
<td>Walthamstow Police Station</td>
<td>Metropolitan Police</td>
<td>Metropolitan Police / Developer</td>
<td>Develop enabling land use planning policy</td>
</tr>
<tr>
<td>Modernisation and consolidation of estate providing better office accommodation</td>
<td>Deliver the reorganisation and improvement of back-office facilities to ensure a more efficient manner of working, organisation, and support for frontline officers.</td>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>M-L</td>
<td>borough wide</td>
<td>Metropolitan Police</td>
<td>Metropolitan Police (capital receipts)</td>
<td>Assist the Metropolitan Police in implementing estate strategy</td>
</tr>
<tr>
<td>Fire</td>
<td>Redevelopment of Leytonstone Fire Station on existing site</td>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>S-M</td>
<td>Leytonstone Fire Station</td>
<td>London Fire Brigade (LFB)</td>
<td>Private Finance Initiative</td>
<td>Assist the LFB in locating a site for a temporary station for use by the LFB during the station redevelopment</td>
</tr>
</tbody>
</table>

Source: URS / ISU analysis
APPENDIX A – INFRASTRUCTURE MODEL ASSUMPTIONS
The assumptions listed in Table A.1 are employed in the URS Waltham Forest Infrastructure Model and have been developed in consultation with the service providers at Waltham Forest Council.

### Table A.1: Infrastructure Model Assumptions

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Water Demand</strong></td>
<td></td>
</tr>
<tr>
<td>Residential Development:</td>
<td>Thames Water estimate of current water use per resident.</td>
</tr>
<tr>
<td>160 L/Day per person</td>
<td>Thames Water currently assess that water usage per person will increase given the status quo; however, the impact of the Code for Sustainable Homes and other legislation may decrease this to a lower level.</td>
</tr>
<tr>
<td></td>
<td>Thames Water assess that current planning for 2021 onwards, based upon a reduction of 10l/person/day (i.e. 150l/person/day), remains a sensible approach.</td>
</tr>
<tr>
<td></td>
<td>It is however considered more cautious to adopt a conservative approach by adopting the current (higher) consumption figures, so as to estimate consumption under what should be effectively considered a worst case scenario.</td>
</tr>
<tr>
<td>Office, Retail and Industrial Development:</td>
<td>Based on Thames Water residential consumption target of 160l/day/per it is assumed that employees’ consumption in the workplace is typically limited to eight hours as opposed to the 16 hours generally considered for residential consumers.</td>
</tr>
<tr>
<td>80l/day per person</td>
<td></td>
</tr>
<tr>
<td><strong>Electricity Demand</strong></td>
<td></td>
</tr>
<tr>
<td>Residential Development:</td>
<td>All figures are typical utility company figures for both development design and strategic planning - please note that the strategic planning figures change with volume and the information is not published as it is commercially sensitive.</td>
</tr>
<tr>
<td>1.6 kVA per dwelling</td>
<td>Please note that the assessment of utility networks takes place at different levels and therefore what is pertinent for a local development is not necessarily the same assessment values utilised for strategic planning, given that master planning would assume wholly diversity factors. As an example, an electricity cable for a site of say 50no. houses will assume a design function of 2kVA for a GCH dwelling. Strategically, this figure will decrease as the planning gets more high level - so, for strategic local infrastructure, this figure would reduce to 1.6kVA; for strategic regional infrastructure, this would reduce to say 1kVA.</td>
</tr>
</tbody>
</table>
### Assumption Source

<table>
<thead>
<tr>
<th>Assumption</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Office Development:</strong></td>
<td>All figures are typical utility company figures for both development design and strategic planning - please note that the strategic planning figures change with volume and the information is not published as it is commercially sensitive. The considerations presented above on the different levels at which the assessment of utility networks take place also applies. For the commercial and industrial sector, there is a huge variance on what is likely to impact. A large B8 distribution unit may well use less energy than say an industrial unit that houses plastic injection moulding equipment. Likewise, a small urban office unit is not always likely to use air conditioning but a City office almost certainly will. The values included are typical utility company after diversity values than provide a basis for review but they will differ to those seen for individual buildings. Diversity makes an assumption that not all appliances in one building, or that of another, are used simultaneously.</td>
</tr>
<tr>
<td>0.08 kVA per sqm Net Internal Area</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>Retail Development:</strong></td>
<td>All figures are typical utility company figures for both development design and strategic planning - please note that the strategic planning figures change with volume and the information is not published as it is commercially sensitive. This is an average between design figures of 1.13, 0.79 and 0.51, for a low, medium and high density residential development respectively with gas central heating. Please note that the assessment of utility networks takes place at different levels and therefore what is pertinent for a local development is not necessarily the same assessment values utilised for strategic planning.</td>
</tr>
<tr>
<td>0.12 kVA per sqm Net Internal Area</td>
<td>Same as above</td>
</tr>
<tr>
<td><strong>Industrial Development:</strong></td>
<td>All figures are typical utility company figures for both development design and strategic planning.</td>
</tr>
<tr>
<td>0.04 kVA per sqm Net Internal Area</td>
<td>Same as above</td>
</tr>
</tbody>
</table>

**Gas Demand**

- **Residential Development:** 1 m³ per hour per dwelling

All figures are typical utility company figures for both development design and strategic planning. Given that master planning would assume wholly diversity factors. As an example, an electricity cable for a site of say 50no. houses will assume a design function of 2kVA for a GCH dwelling. Strategically, this figure will decrease as the planning gets more high level - so, for strategic local infrastructure, this figure would reduce to 1.6kVA; for strategic regional infrastructure, this would reduce to say 1kVA.
## Assumption Source

Office Development:

0 m³ per hour per sqm Net Internal Area

All figures are typical utility company figures for both development design and strategic planning - please note that the strategic planning figures change with volume and the information is not published as it is commercially sensitive.

The considerations presented above on the different levels at which the assessment of utility networks take place also applies. For the C&I sector, there is a huge variance on what is likely to impact. For example, a B8 distribution unit may or may not use space heating; likewise an industrial unit. Offices generally opt for air conditioning and if a gas central heating system is used, it typically is for smaller offices that equate to 1 no. or 2 no. domestic properties. The values included are typical utility company after diversity values than provide a basis for review but they will differ to those seen for individual buildings. Diversity makes an assumption that not all appliances in one building, or that of another, are used simultaneously.

Retail Development:

0.01 m³ per hour per sqm Net Internal Area

Same as above

Industrial Development:

0.05 m³ per hour per sqm Net Internal Area

Same as above

### Sewerage Flow Rates

Residential Development:

200 L/day per person


The assessment is an approximation and makes a number of assumptions including:

- The volume of sewage treated per customer will remain the same in 2026
- The surface water flow is not considered
- The number of Thames Water customers increases at a constant rate from now until 2026.

Office Development:

1.1 L/s per 10,000 sqm

Same as above.

A trade effluent of 0.5 for ‘normal’ (i.e. low water usage) industries is applied.

Retail Development:

1.1 L/s per 10,000 sqm

Same as above

A trade effluent of 0.5 for ‘normal’ (i.e. low water usage) industries is applied.

Industrial Development:

1.6 L/s per 10,000 sq m

Same as above

A trade effluent of 1 for ‘wet’ (i.e. high water usage) industries is applied.
APPENDIX B – ESTIMATING FUTURE ENERGY DEMANDS ASSUMPTIONS
As discussed in Section 4.6 as part of the Waltham Forest Climate Change Evidence Based Study Carbon Descent (formerly SEA/Renue) have undertaken a profiling analysis for each sub-area to determine the CHP plant capacities that would deliver optimal carbon dioxide emissions savings and demonstrate financial viability, taking account of the existing energy demand and the forecast growth in domestic and non-domestic development.

This Appendix discussed the assumptions adopted to arrive to the estimate of energy demand and CHP requirements associated with the projected residential and commercial growth in Waltham Forest between 2009 and 2026.

**Estimating Energy Demand**

In order to derive new build energy demands, the energy demands of Building Regulation compliant buildings have been scaled to the size of development in each sub-area. As Building Regulations are subject to change over the forecast period of 2009-2026, we have made assumptions regarding the evolution of Building Regulations over this time.

The roadmap for domestic buildings is well established, following the Code for Sustainable Homes toward zero carbon homes by 2016. For non-domestic buildings the pathway is less certain. The UK Green Buildings Council in their report to the CLG: Definition of zero carbon homes and non-domestic buildings, set out a zero carbon trajectory for non-domestic buildings as demonstrated in Table 1 below.

As discussed in Section 4.6 the modelling also accounts for the anticipated evolution in building regulations over the analysed period.

The new build and existing energy demands were combined to find the total energy demand by land use type for each sub-area in 2026. This was then used to generate load profiles for each sub-area using a library of standard load profiles contained within Carbon Descent’s CHP modelling tool. The thermal demand profiles are for a typical day in each month of the year, and the electricity demand profiles are for summer and winter operating conditions. Figures 1 and 2 below give a picture of the daily variation in heat and power demands for each sub-area, which allows the tool to predict the run time/operating period of the CHP engine and at what proportion of its maximum output its running in order to get the annual demands. Figure B-1 and Figure B-2 are graphical representations of the typical thermal and electricity demand profiles based on a general usage pattern and on each sub-area’s particular mix of uses.
Evaluating the Optimum CHP Engine Capacities

Having generated the load profiles in the manner described, they are loaded into Carbon Descent’s CHP software tool which uses them as a key input into the evaluation of CHP engine capacities for optimised carbon dioxide emissions savings and demonstrable financial viability. There is a large number of figures required for the evaluation of the CHP engine capacities, including technical data on a large range of CHP engines, the energy demands (as discussed above) and factors associated with the financial performance of a decentralised energy scheme.

The performance figures and costs of CHP engines (capital, maintenance) have been provided by manufacturers. Costs for networks have been based on per dwelling costs and per square metre connection costs for non-domestic buildings, taken from the EST Community Heating for Planners &

Figure B-1: Typical thermal demand profiles

![Figure B-1: Typical thermal demand profiles](image1)

Figure B-2: Typical electrical demand profiles

![Figure B-2: Typical electrical demand profiles](image2)
Developers report\textsuperscript{154}. Cash flow calculations require prices for input fuel, imports of top-up electricity and heat & electricity produced on site. These prices are set at 2.16p/kWh for natural gas, 4p/kWh for electricity produced and 8p/kWh for electricity imported. The price of heat is derived from the price of the natural gas fuel with a mark-up of 10\% for administration costs.

In order to model the lifetime costs, the inflation rate (3\%), discount rate (10\%) and scheme lifetime (25 years) must be accounted for. The length of the scheme also means that re-investment to replace an ageing engine is also factored in. This is modelled conservatively as being required after 13 years of operation, the cost of re-investment is the capital cost of the CHP engine alone (appropriately discounted) with an extended period of downtime where the CHP engine is not running during a replacement regime.

The CHP modelling tool requires the selection of a control strategy, i.e. following a baseline heat or power demand, maximum output at all times etc. The most environmentally sound strategy is to follow heat demand, otherwise heat is rejected lowering the overall system efficiency and wiping out almost all the benefits of CHP over conventional energy production systems. For this reason, a heat led control strategy has been applied throughout the modelling. Based on this parameter, the model compares the heat demand for each hour of the load profile to the heat output of each CHP engine under consideration. Provided the heat demand is greater than the minimum part load of the engine the energy produced will be added to the output profile of the engine. In this fashion the total annual output is built up by analysing the 12 average daily profiles for each month of the year.

As the energy production for each engine is determined, so too is the associated fuel demands, energy outputs and carbon dioxide emissions calculated. This allows a ranking to be developed based on preferred criteria, for example, if environmental performance is the primary objective then a ranking based on carbon dioxide emissions could be produced.

The objective was to select the optimum CHP engine capacity for each sub-area based on both net present value (NPV) and maximum carbon dioxide emissions savings, reflecting a 25 year. It was clear from the modelling that these two measures did not offer a comparative CHP engine capacity ranking. As a compromise solution, the cost per tonne of carbon dioxide saved (£/tonnekgCO\textsubscript{2}) over the lifetime of the scheme was calculated with the lowest cost used to select the optimum CHP engine capacity.

**Parameters**

- **CHP engine sizes**
  - Refers to the capacity of the CHP engine; kWe is the maximum electrical output, kWth is the maximum heat output and kWfuel is the fuel required at maximum output

- **CO2 savings**

\textsuperscript{154} Available online at www.localpower.org/documents/report\textsubscript{e}st\_communityheating.pdf
This is the emissions avoided by the CHP system as compared to a conventional energy supply

- NPV analysis
  - This is an expression of the value of the CHP scheme in current prices; upfront costs are not adjusted but ongoing cash flows are discounted over time
  - NPV per unit CO2 (lifetime)
    - This is the ratio of the NPV to the CO2 savings. The optimum CHP scheme for this study is that which offers the lowest cost per tonne of CO2 saved

- Energy inputs
  - The natural gas requirements of the CHP engine

- Energy outputs
  - The amount of heat and power produced by the engine

**CO2 emissions factors:**

- Gas: 0.206 kgCO2 per kWh
- Electricity: 0.422 kgCO2 per kWh
- Discount rate: 10%
- Inflation rate: 3%

**Energy prices:**

- Electricity sold: 4 p/kWh
- Electricity imported: 8 p/kWh
- Gas fuel: 2.16 p/kWh
- Heat sold: 2.4 p/kWh
- Scheme lifetime: 25 years