

CHAPTER 11 – HEALTH AND WELL-BEING

11.1 Introduction and Key Issues

11.1.1 This chapter of the ES considers likely health and well-being effects associated with the Upgrade during both its construction and operational phases. Any effects are likely to be greater at sensitive receptors close to the Site boundaries and adjacent to access routes.

11.1.2 The key issues to be considered are listed below:

- Odour emissions during construction and operation;
- changes to air quality from construction traffic emissions;
- creation of dust by construction activities, plant and machinery;
- noise and vibration associated with the construction and operational phases;
- changes in local traffic during construction;
- changes in local landscape and visual amenity during construction;
- changes in energy consumption and greenhouse gas emissions; and
- emissions from renewable energy generation plant such as combined heat and power (CHP) plant.

11.1.3 This chapter describes the policy context and legislation, assessment methodology and criteria used to evaluate the potential health and well-being effects of the Upgrade. The chapter draws on the assessment of key topic areas within this ES, which are set out in Section 11.5.

11.1.4 The potential direct and indirect health and well-being effects arising from the construction and operational phases of the Upgrade are addressed, with appropriate mitigation measures identified to prevent, reduce or offset the effects. The significance of the residual effects is then assessed.

11.2 Consultation

11.2.1 LBE was consulted on the methodology to be used for the health and well-being assessment at a meeting on 25 January 2013 and agreed that the NHS Healthy Urban Development Unit (HUDU) short form approach would be appropriate for the assessment.

11.2.2 A scoping opinion was received from LBE on 25 April 2014. The scoping opinion required details of the assessment methodology and significance criteria used to assess health and well-being effects to be demonstrated.

11.2.3 Consultation on the Upgrade, including aspects related to health and well-being such as odour and noise, has been undertaken through a series of Stakeholder forums (from 2011 – 2013) and through formal and informal public consultation.

11.2.4 An initial Phase 1 consultation was undertaken from July to October 2012 with Local Authorities, stakeholders and the public. This provided information on effects of the Upgrade, particularly relating to odour emissions at Deephams Sewage Works and the improvement that could be achieved by the Upgrade.

11.2.5 A Phase 2 public consultation was held from February to April 2014 on the proposed layout, design and construction of the Upgrade at Deephams Sewage Works. Further information on the proposed measures to reduce odour emissions, noise and dust and to control construction traffic was included in this consultation.

- 11.2.6 The Phase 2 consultation responses highlighted odour as the major concern for local residents, with residents and LBE identifying the impact of odour on their health and enjoyment of outdoor activities in the vicinity of the site and on the general amenity of the area surrounding the Site. Therefore, in this assessment, odour is a key consideration in determining effects of the Upgrade on health and well-being. Local residents also highlighted concerns about temporary construction related impacts (noise, traffic, dust) and these issues are also addressed.
- 11.2.7 North Middlesex University Hospital Trust and Barnet and Chase Farm Hospitals NHS Trust were consulted in spring 2014 to discuss the methodology of the assessment, any specific health related issues that are experienced by the population within the vicinity of the Deephams Site, and likely health related effects of the Upgrade.
- 11.2.8 North Middlesex University Hospital Trust responded to highlight concerns over the potential for construction traffic of the Upgrade to delay patients commuting to the hospital for appointments, and also the potential for asthma sufferers to be affected by dust generated by the construction of the Upgrade. Both issues are addressed in this assessment.
- 11.2.9 Barnet and Chase Farm Hospital NHS Trust was not able to respond.

11.3 Legislation and Planning Policy

National

- 11.3.1 The National Planning Policy Framework (NPPF) requires that local planning policy delivers development that provides for healthy and inclusive communities. Section 8: Promoting Healthy Communities sets out Government policy relevant to this assessment including issues such as:
- Ensure that communities have safe and accessible environments where the fear of crime does not undermine quality of life or community cohesion;
 - promote safe and accessible developments, containing clear and legible pedestrian routes, and high quality public space, which encourage the active and continual use of public areas;
 - ensure that the community has the social, recreational and cultural facilities and services it needs;
 - ensure that a sufficient choice of school places is available to meet the needs of existing and new communities;
 - ensure access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities; and
 - public rights of way should be protected and enhanced to provide better facilities to users.
- 11.3.2 In addition the 'National Policy Statement (NPS) for Waste Water¹' specifies requirements for inclusion within Environmental Statements. The requirements on health and well-being are stated in Section 3.10 of the NPS as follows:
- *'Waste water management has the potential to affect the health and well-being of the population. Adequate provision of waste water infrastructure is clearly beneficial to society and to our health as a whole. However, the possibility of some adverse effects cannot be discounted.'*

¹ National Policy Statement for Waste Water: A framework document for planning applications on nationally significant infrastructure projects. Defra, 2012

- *The direct impacts on health may include increased traffic, air pollution, dust, polluting water (toxicity and disease risks), hazardous waste and substances, noise, and increases in pests.*
- *New waste water infrastructure may also have indirect health impacts, for example if it in some positive or negative way affects access to key public services, employment, transport or use of open space and water for recreation and physical activity.*
- *These impacts may affect people simultaneously, so the applicant, the examining authority and the decision maker should consider the cumulative impact on health.*
- *The applicant should identify any significant adverse health impacts in the ES, and identify measures to avoid, reduce or compensate for these impacts as appropriate.'*

11.3.3 The Government's Planning Practice Guidance on health and well-being (published March 2014)² requires health and well-being to be considered in all planning matters, citing the built and natural environments as key drivers of health and well-being. Health and well-being are incorporated throughout the NPPF through the principles of sustainable development, and policies on transport, quality homes, good design, climate change and the natural environment.

Local

11.3.4 The best practice guidance: Health Issues in Planning (2007) for London outlines the link between how development is planned and delivered and the health of the communities that then inhabit them. The guidance sets out the wider determinants of health and well-being which should be considered in development proposals in Section 3.2³, these being:

- Good quality and affordable housing;
- transport issues;
- employment and skills training;
- education and early life;
- access to services;
- community safety;
- liveability, open space and public realm;
- air, water and noise quality;
- access to fresh food; and
- climate change.

11.3.5 The London Plan⁴ provides the strategic development plan for London, to which London Borough's local plans should conform. Chapter 3 of the London Plan sets out the objectives for achieving the health and well-being of the people of London, with the following policies of specific relevance to this assessment:

- Policy 3.2C - The impacts of major development proposals on the health and well-being of communities should be considered through the use of Health Impact Assessments (HIA).
- Policy 3.2D - New development should be designed, constructed and managed in ways that improve health and promote healthy lifestyles to help to reduce health inequalities.

² Department for Communities and Local Government,

³ Mayor of London (2007) Best Practice Guidance: Health Issues in Planning, page 22.

⁴ The London Plan Spatial Development Strategy for Greater London, July 2011 and The London Plan – Revised Early Minor Amendments, October 2013

- 11.3.6 The Enfield Plan - Core Strategy 2010 - 2025 sets out Enfield Council's policy on health and social care and wider health requirements in Core Policy 7:
- Defining short, medium and long term health infrastructure requirements.
 - setting objectives for improving health and well-being through more active lifestyles.
 - identifying opportunities for encouraging sport and activity through design.
 - requiring major developments to undertake a HIA.
- 11.3.7 The Core Strategy also sets out policy on wider topics that can impact upon health, and have relevance to the Upgrade, such as:
- Education in Core Policy 8, which aims to provide suitable education facilities for all ages, which contributes to the employability of future generations and thus the health and well-being of the local area.
 - Community cohesion in Core Policy 9, which highlights the need for accessibility and social cohesion to be improved wherever possible.
 - Public transport in Core Policies 25 and 26 which aims to provide safe, convenient and accessible routes for pedestrians, cyclists and other non-motorised modes of transport, and ensure that existing public transport levels can accommodate future development.
 - Pollution in Core Policy 32, which aims to reduce air, noise, water and light pollution, as well as contaminated land issues.
- 11.3.8 The Proposed Submission Development Management Document (DMD) (March 2013) was formally submitted to the Secretary of State for independent examination on 24th January 2014. While there are no specific policies on health and well-being in the DMD, the following policies related directly to other Chapters in the ES, are also relevant to health and well-being and have been used to guide the assessment:
- DMD 47: New, Roads, Access and Servicing
 - DMD 48: Transport Assessments
 - DMD 57: Responsible Sourcing of Materials, Waste Minimisation and Green Procurement
 - DMD 64: Pollution Control and Assessment
 - DMD 65: Air Quality
 - DMD 66: Land Contamination
 - DMD 68: Noise
 - DMD 74: Playing Pitches
 - DMD 81: Landscaping.
- 11.3.9 These policy considerations have informed, and are key considerations, of this HIA during both the construction and operational phase.
- 11.3.10 The Enfield Joint Health and Well-Being Strategy⁵ provides Enfield Health and Well-Being Board's strategy to mitigate against factors that adversely affect people's health and well-being and encourage activities and lifestyle choices that improve physical and mental health. The strategy produced five key priorities around which short, medium and long term actions for each priority. The five priorities are:
- Ensuring the best start in life;
 - Enabling people to be safe, independent and well and delivering high quality health and care services;

⁵ Enfield Health and Well-Being Board, 2014, Enfield Joint Health and Well-Being Strategy 2014-2019.

- Creating stronger, healthier communities;
- Narrowing the gap in healthy life expectancy; and
- Promoting healthy lifestyles and making healthy choices.

11.3.11 The priorities are broadly aligned with the topics identified by the methodology used in this assessment, as described in the following section.

11.4 Assessment Methodology

Impact Evaluation

- 11.4.1 For large scale development proposals such as strategic planning applications referred to the Mayor of London, it is recommended⁶ that assessment tools such as the Healthy Urban Development Unit (HUDU) Rapid Health Impact Assessment (HIA) Tool is used. The Mayor of London is being consulted on the Deephams Sewage Works Upgrade scheme, as it falls within the definition of a strategic application as a waste development occupying a site over one hectare. The HUDU Planning for Health Rapid HIA⁷ methodology was therefore used for this assessment.
- 11.4.2 The methodology was designed by NHS London to assess the impact of planning policies, proposals and projects on health and well-being. The methodology, which is generic and can be localised for specific use, draws on the relevant assessments in the ES (such as air quality, noise and vibration, flood risk, odour, etc) as sources of information for assessing the Upgrade against a range of health and well-being topics, as set out in **Table 11.1**.
- 11.4.3 For each topic a series of issues to be considered is set out, against which the Upgrade has been assessed. The issues cover both the positive and negative, direct and indirect effects of the development. The HUDU methodology expresses effects on health and well-being as positive, negative, neutral or uncertain. However, to maintain consistency with the way effects on other topics are reported in the ES, these terms have been replaced by 'beneficial', 'adverse' and 'negligible' in this assessment.
- 11.4.4 As the list of topics in **Table 11.1** is designed to cover a range of different planning proposals, an initial scoping exercise has been carried out to identify those relevant to the Upgrade. Unlike HIA for other developments such as new residential development, the upgrade of an existing sewage works does not require consideration of certain issues, for example health service provision or housing quality. Those issues which have therefore been scoped out of the assessment, and the reasons for this, are set out in **Table 11.1**.
- 11.5 The Upgrade has been assessed against those topics scoped in. The effects of the Upgrade considered are the residual (i.e. post mitigation) impacts reported in each individual topic assessment in other chapters of the ES. The mitigation measures are not repeated in the assessment tables, but reference is made to where they are described in other ES chapters where appropriate. The significance of effects on health and well-being has been evaluated as described in the next section.

⁶ NHS London Healthy Urban Development Unit, 2014, Healthy Urban Planning Checklist

⁷ NHS London Healthy Urban Development Unit, 2013, Planning for Health: Rapid Health Impact Assessment Matrix - Self-completion Form.

Table 11.1.Scoping of HUDU Checklist Topics for Healthy Sustainable Communities

Topics	Scoped In or Out of Assessment	Justification
<p>1. Housing Quality and Design</p> <ul style="list-style-type: none"> • Does the proposal seek to meet all the health and well-being credits contained in the Code for Sustainable Homes? • Does the proposal address the housing needs of older people, ie extra care housing, sheltered housing, lifetime homes and wheelchair accessible homes? • Does the proposal include homes that can be adapted to support independent living for older and disabled people? • Does the proposal promote good design through layout and orientation, meeting internal space standards? • Does the proposal include a range of housing types and sizes, including affordable housing responding to local housing needs? • Does the proposal contain homes that are highly energy efficient (eg a high SAP rating)? 	<p>All Scoped Out</p>	<p>The Upgrade involves no housing provision.</p>
<p>2. Access to Healthcare Services and Other Social Infrastructure</p> <ul style="list-style-type: none"> • Does the proposal retain or re-provide existing social infrastructure? • Does the proposal assess the demand for healthcare services and identify requirements and costs using the HUDU model? • Does the proposal provide for healthcare services either in the form of a financial contribution or in kind? • Does a health facility provided as part of the development match NHS requirements and plans? • Does the proposal assess the capacity, location and accessibility of other social infrastructure, eg 	<p>All Scoped Out</p>	<p>The Upgrade involves no healthcare or social infrastructure.</p>

Topics	Scoped In or Out of Assessment	Justification
<p>schools, social care and community facilities?</p> <ul style="list-style-type: none"> Does the proposal explore opportunities for shared community use and colocation of services? Does the proposal contribute to meeting primary, secondary and post 19 education needs? 		
<p>3. Access to Open Space and Nature</p> <ul style="list-style-type: none"> Does the proposal retain and enhance existing open and natural spaces? In areas of deficiency, does the proposal provide new open or natural space, or improve access to existing spaces? Does the proposal provide a range of play spaces for children and young people? Does the proposal provide links between open and natural spaces and the public realm? Are the open and natural spaces welcoming and safe and accessible for all? Does the proposal set out how new open space will be managed and maintained? 	All Scoped Out	No open space on the Site is accessible due to security requirements
<p>4. Air Quality, Noise and Neighbourhood Amenity</p> <ul style="list-style-type: none"> Does the proposal minimise construction impacts such as dust, noise, vibration and odours? Does the proposal minimise air pollution caused by traffic and energy facilities? Does the proposal minimise noise pollution caused by traffic and commercial uses? 	All Scoped In	<p>The assessment considers:</p> <ul style="list-style-type: none"> air quality dust noise and vibration odour traffic.
<p>5. Accessibility and Active Travel</p> <ul style="list-style-type: none"> Does the proposal prioritise and encourage walking (such as through shared spaces?) Does the proposal prioritise and encourage 	<p>Scoped In</p> <p>Scoped In</p>	<p>The assessment considers means of travel.</p> <p>The assessment considers means of travel.</p>

Topics	Scoped In or Out of Assessment	Justification
<p>cycling (for example by providing secure cycle parking, showers and cycle lanes)?</p> <ul style="list-style-type: none"> • Does the proposal connect public realm and internal routes to local and strategic cycle and walking networks? • Does the proposal include traffic management and calming measures to help reduce and minimise road injuries? • Is the proposal well connected to public transport, local services and facilities? • Does the proposal seek to reduce car use by reducing car parking provision, supported by the controlled parking zones, car clubs and travel plans measures? • Does the proposal allow people with mobility problems or a disability to access buildings and places? 	<p>Scoped Out</p> <p>Scoped Out</p> <p>Scoped In</p> <p>Scoped In</p> <p>Scoped In</p>	<p>The Site is not in the public realm and does not connect to it for security reasons.</p> <p>The Upgrade involves no works on or affecting the public highway.</p> <p>The assessment considers publictransport.</p> <p>The assessment considers reduced car use.</p> <p>The assessment considers disabled access.</p>
<p>6. Crime Reduction and Community Safety</p> <ul style="list-style-type: none"> • Does the proposal incorporate elements to help design out crime? • Does the proposal incorporate design techniques to help people feel secure and avoid creating 'gated communities'? • Does the proposal include attractive, multi-use public spaces and buildings? • Has engagement and consultation been carried out with the local community? 	<p>All Scoped Out</p>	<p>The Site is not in the public realm and does not connect to it for security reasons.</p> <p>Engagement has been undertaken as set out in Section 11.2</p>
<p>7. Access to Healthy Food</p> <ul style="list-style-type: none"> • Does the proposal facilitate the supply of local food, ie allotments, community farms and farmers' markets? • Is there a range of retail uses, including food stores and smaller affordable shops for social enterprises? 	<p>All Scoped Out</p>	<p>The Upgrade does not affect access to food.</p>

Topics	Scoped In or Out of Assessment	Justification
<ul style="list-style-type: none"> Does the proposal avoid contributing towards an over-concentration of hot food takeaways in the local area? 		
<p>8. Access to Work and Training</p> <ul style="list-style-type: none"> Does the proposal provide access to local employment and training opportunities, including temporary construction and permanent 'end-use' jobs? Does the proposal provide childcare facilities? Does the proposal include managed and affordable workspace for local businesses? Does the proposal include opportunities for work for local people via local procurement arrangements? 	<p>Scoped In</p> <p>Scoped Out</p> <p>Scoped Out</p> <p>Scoped In</p>	<p>The assessment considers local employment and training opportunities.</p> <p>The Site does not employ enough staff to justify and cannot be made available to share by others from off site due to security/health and safety. Not applicable.</p> <p>The assessment considers local employment and training opportunities.</p>
<p>9. Social Cohesion and Lifetime Neighbourhoods</p> <ul style="list-style-type: none"> Does the proposal connect with existing communities, i.e. layout and movement which avoids physical barriers and severance and land uses and spaces which encourage social interaction? Does the proposal include a mix of uses and a range of community facilities? Does the proposal provide opportunities for the voluntary and community sectors? Does the proposal address the principles of Lifetime Neighbourhoods? 	<p>Scoped Out</p> <p>Scoped Out</p> <p>Scoped In</p> <p>Scoped Out</p>	<p>The Site is not in the public realm and does not connect to it for security reasons.</p> <p>The Site is not in the public realm and does not connect to it for security reasons.</p> <p>The provision of an education facility is considered in the assessment.</p> <p>The Site is not in the public realm and does not connect to it for security reasons.</p>
<p>10. Minimising the Use of Resources</p> <ul style="list-style-type: none"> Does the proposal make best use of existing land? Does the proposal encourage recycling (including building materials)? Does the proposal incorporate sustainable design and construction techniques? 	<p>All Scoped In</p>	<p>Resource minimisation is considered in the assessment</p>
<p>11. Climate Change</p>	<p>All Scoped In</p>	<p>Climate change is considered in the assessment.</p>

Topics	Scoped In or Out of Assessment	Justification
<ul style="list-style-type: none">• Does the proposal incorporate renewable energy?• Does the proposal ensure that buildings and public spaces are designed to respond to winter and summer temperatures, i.e. ventilation, shading and landscaping.• Does the proposal maintain or enhance biodiversity?• Does the proposal incorporate sustainable urban drainage techniques?		

Significance of Impact

- 11.5.1 There is not currently a universally agreed formula for defining the significance of an impact on health. Instead professional judgement is required based on the magnitude, duration, frequency and geographical limit of the expected impact.
- 11.5.2 For this assessment, magnitude is assessed by considering the following:
- Scale of change to baseline (e.g. reduction in energy usage);
 - capacity for the local area to absorb changes;
 - opinion of local stakeholders about any changes (see Section 11.3: Consultation);
 - changes likely to exceed recognised standards (e.g. Air Quality Objectives (AQO)); and
 - potential for cumulative changes.
- 11.5.3 Duration is assessed by considering the following:
- The length of time changes are expected to last; and
 - the speed with which changes will take effect.
- 11.5.4 Frequency is assessed by considering the following:
- How often the change will happen.
- 11.5.5 Geographical limit is assessed by considering the following:
- Whether change is local, regional or national.
- 11.5.6 Consideration is given to each issue, using quantitative assessment information where available and professional judgement to identify whether changes caused by the Upgrade are likely to be significant in terms of health and well-being.
- 11.5.7 Data from quantitative assessments relevant to health and well-being have been taken from the relevant chapters within this ES. Quantitative data are available for the following assessments:
- Air quality assessed against relevant AQOs (Chapter 7 – Air Quality);
 - contaminated land assessed against relevant Soil Guideline Values and Gas Screening Values (Chapter 8 – Contaminated Land);
 - Assessment of flood risk and drainage impacts accounting for climate change and relevant return periods (Chapter 10 - Flood Risk);
 - noise assessed against 55 dB L_{Aeq} threshold for construction, and level above background for operation (Chapter 14 – Noise and Vibration);
 - vibration assessed against Peak Particle Velocity levels (Chapter 14 – Noise and Vibration);
 - odour assessed against exposure levels (Chapter 15 – Odour);
 - traffic assessed against daily and peak traffic flows (Chapter 16 – Transport).
- 11.5.8 For many of the quantitative assessments, including the air quality impact assessment and contaminated land assessment, there are proven links between elevated levels of pollutants and adverse health impacts in the exposed population. Toxicity data have been used to derive statutory objectives or guideline values which are set at levels below which risk to human health is not considered to be significant. It therefore follows from the assessments that if statutory objectives or guideline values are met, adverse health impacts will be negligible.
- 11.5.9 However, in the case of odour there are no statutory exposure limits nor any reference values set out in planning policy, and therefore no objectives or limit values can be defined below which health impacts would be negligible. However, as

stated in Chapter 15 - Odour, guidance issued by Defra⁸ and the Environment Agency⁹ provide indicative criteria for assessing odour. Since concern about odour levels was a major issue raised by local residents during the Phase 2 consultation, it is appropriate to consider potential impacts from odour upon health and well-being.

- 11.5.10 According to the Health Protection Agency¹⁰ the relationship between exposure to odour and health is not completely understood. A number of studies have demonstrated that odorous chemicals, present at levels which are not considered to be toxic or irritant, can still lead to health symptoms being reported in the exposed population. Although in some reported cases, reported health effects were associated with complaints about odour, there was little suggestion of a direct toxicological action.
- 11.5.11 The Health Protection Agency states that absolute odour concentrations of up to 5 ou_E/m³ are 'recognisable' but that at 5 ou_E/m³ the odour is described as 'faint' odour and at 10 ou_E/m³ the odour is said to be 'distinct'¹¹. The values for normal background odours such as traffic, grass cutting and plants, can range from 5 to 40 ou_E/m³ as absolute concentrations.
- 11.5.12 UK Water Industry Research states that at odour levels below 5 ou_E/m³ as the 98th percentile of hourly averages, complaints about odours from sewage works are unlikely. The majority of complaints about odour from Deephams Sewage works have come from an area exposed to > 5 ou_E/m³, although a few complaints were recorded from areas exposed to < 5 ou_E/m³. Chapter 15 - Odour shows areas exposed to 5 ou_E/m³ as well as 3 and 1.5 ou_E/m³, for comparison. A level of 3 ou_E/m³ as the 98th percentile of hourly averages is not generally considered sufficient to cause annoyance unless the odour is highly offensive in nature.
- 11.5.13 It should be noted that the absolute values cited by the Health Protection Agency are not comparable with the 98th percentile values quoted by UK Water Industry Research. Furthermore, none of the values quoted should be construed as representing a threshold for health effects; they are included here only to provide context for the assessment.

Limitations of Assessment

- 11.5.14 Limitations to the topic assessments which have been used inform the health and well-being assessment are specified in the relevant chapters of this ES.

11.6 Baseline

Introduction

- 11.6.1 This section presents the current baseline health and well-being conditions in relation to the topics scoped in from the HUDU Planning for Health Rapid HIA Toolkit.

Baseline Conditions

- 11.6.2 The baseline conditions in and around the Deephams Sewage Works Site are described in **Table 11.2** for each of the topics scoped into the assessment (see

⁸ Odour Guidance for Local Authorities, published by Defra, March 2010

⁹ IPPC H4 Technical Guidance Note "H4 Odour Management", published by the Environment Agency, March 2011

¹⁰ R Jarvis, J Richardson and E Dardamassis (2006) Sandon Dock: Investigation of odour complaints - are they a 'real' health issue? Chemical Hazards and Poisons Report, Issue 6. Didcot: Health Protection Agency.

¹¹ http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1309970436356

Table 11.1). A more detailed description of the Site layout and local features of interest is provided in Chapter 3 – Site and Surroundings.

Table 11.2. Baseline Conditions

Topics	Baseline Conditions
<p>4. Air Quality, Noise and Neighbourhood Amenity</p> <ul style="list-style-type: none"> • Does the proposal minimise construction impacts such as dust, noise, vibration and odours? • Does the proposal minimise air pollution caused by traffic and energy facilities? • Does the proposal minimise noise pollution caused by traffic and commercial uses? 	<p>Air Quality</p> <p>Chapter 7 – Air Quality reports that NO₂ levels at the nearest residential receptors to the Site at Hudson Way (40m from Site) are within the Air Quality Objective (AQO) for NO₂.</p> <p>Particulates (measured as PM₁₀ and PM_{2.5}) at the nearest automatic monitoring point to the Site, at Derby Road, are well within the corresponding AQO. Defra UK Background Air Pollution Maps¹² modelled data for 2013 predict maximum background PM₁₀ concentrations for the area of the Upgrade to be 53% of the AQO, and PM_{2.5} maximum background concentrations to be 59% of the EU limit value.</p> <p>In recent years SO₂ levels at Derby Road (nearest automatic monitoring point to the Site) have been within the SO₂ AQO.</p> <p>Noise and Vibration</p> <p>Chapter 14 – Noise and Vibration characterised the Site as having relatively low background noise levels, particularly at night.</p> <p>Odour</p> <p>Baseline modelling as part of the odour assessment (Chapter 15 - Odour) shows that for odour concentration bands of >1.5, >3 and >5 ou_E/m³ as the 98th percentile of hourly averages the number of properties within those contours would be 25,508, 7,458 and 2,608, respectively, lying in an area of 13.8 km², 6.0 km² or 3.2 km², respectively. The odour assessment identified the nearest sensitive residential receptors to the Site as the houses on Picketts Lock Lane adjacent to the northern Site boundary, and those off Hudson Way which runs parallel to the western Site boundary, all of which lie within the >5 ou_E/m³ concentration band.</p> <p>There is no public access to the Site nor any public rights of way within the boundary. Surrounding the Site are several public rights of way that provide off-road routes for pedestrian and cycling commuting and recreation such as the Pymmes Brook Trail, Lee Park Way and the Lee Valley Heritage Trail.</p> <p>The current operation of the Site has the potential to affect the enjoyment and uptake of healthy activity through odour emitted from the treatment process. The odour assessment (Chapter 15) provides the baseline exposure levels, which have been used in this assessment to determine the recreation and leisure facilities currently affected by odour. The following leisure and recreation facilities lie within the >5 ou_E/m³ odour concentration band and are most affected by odour:</p> <ul style="list-style-type: none"> • The Lee Valley Leisure Complex, comprising the Lee Valley Athletics Centre and Lee Valley Golf Course, Lee Valley Caravan and Camping Park, Picketts Lane Indoor Bowling Club, cinema and restaurants, 150m north of the Site • Montagu Recreation Ground 550m south west of the Site • Pymmes Brook Trail • Commuters on the National Cycle Route 1, which runs along the Lee Park Way • 'Informal' recreational facilities, such as the Lee Navigation 100m east of the Site and the Lee Park Way close to the eastern boundary of the Site.

¹² <http://laqm.defra.gov.uk/maps/maps2010.html>

Topics	Baseline Conditions
	<p>The following leisure and recreation facilities lie within the $>3 \text{ ou}_E/\text{m}^3$ odour concentration band and are less affected by odour:</p> <ul style="list-style-type: none"> • Cuckoo Hall recreation 1.1 km north west of the Site • Chelsfield Green 1.1 km north west of the Site • Chingford Hall Park 1.2km south east of the Site • Lee Valley playing fields 1.2km north east of the Site • Mansfield Park 1.4 km north east of the Site • Eldon Primary School 500m west of the Site • Nightingale Academy 650m north west of the Site. <p>The following leisure and recreation facilities lie within the $>1.5 \text{ ou}_E/\text{m}^3$ odour concentration band and are the least affected by odour:</p> <ul style="list-style-type: none"> • Craig Park recreational ground 1.5km south west of the Site • Rainham Doorstep Green 1.7km south west of the Site • Memorial Park 1.7km south east of the Site • Ridgeway Park 1.8km east of the Site • Kingfisher Hall Primary Academy 1.1km north west of the Site • Chingford Foundation School 1.9km north east of the Site. <p>Insect Nuisance</p> <p>Midges/mosquitoes were previously a problem at Deephams due to the design of the storm tanks allowing standing dirty water to collect at one end, providing a breeding ground. However, this has already been rectified through works carried out on Site in 2012/13 when the storm tanks were re-graded to ensure they drained properly. There have been no complaints related to insect nuisance at the Site since the re-grading works were completed.</p> <p>Landscape</p> <p>Chapter 13 – Landscape and Visual reports that nationally, the Northern Thames Basin National Character Area is characterised by large towns and outer London suburbs, transport infrastructure, mineral extraction and surface reservoirs, providing a highly modified landscape indicating a low susceptibility to change. At a regional level, the Lee Valley is characterised by a chain of reservoirs along the channelised course of the Lee Navigation, along with arterial transport corridors, residential and industrial development and some last remaining areas of open marshland several kilometers downstream of the reservoirs.</p> <p>The Site itself is built up and industrial in nature and the associated mid-20th century landscape pattern creates an eroded landscape character of low landscape value.</p> <p>Visual Amenity</p> <p>Chapter 13 – Landscape and Visual reports that views of the Site are confined to within approximately 1.5km of it, and there are no protected views in its vicinity, however locally important views have been identified at Mansfield Park and Ponders End. Visual receptors include local residents at Picketts Lock Lane and residents of Chingford, recreational users of Lee Valley Golf Course, Lee Valley Athletics Centre, Pymmes Brook Trail, Mansfield Park, commuters on the National Cycle Route 1 and Lee Park Way, and workers at the Ardra Industrial Estate.</p>
<p>5. Accessibility and Active Travel</p> <ul style="list-style-type: none"> • Does the proposal prioritise and encourage walking (such as through shared spaces?) • Does the proposal prioritise 	<p>Transport</p> <p>The Site is not accessible to the public.</p> <p>The Site is currently served by a comprehensive footway network and a number of on and off road cycle routes providing access to and from the Site to the local area and public transport options. Bus route W8</p>

Topics	Baseline Conditions
<p>and encourage cycling (for example by providing secure cycle parking, showers and cycle lanes)?</p> <ul style="list-style-type: none"> • Is the proposal well connected to public transport, local services and facilities? • Does the proposal seek to reduce car use by reducing car parking provision, supported by the controlled parking zones, car clubs and travel plans measures? • Does the proposal allow people with mobility problems or a disability to access buildings and places? 	<p>is accessible within 100m and route W192 within 400m of the Site. National Rail Services can be accessed at three stations (Ponders End, Angel Road and Edmonton Green) within 2km of the Site. The nearest London Underground station is Tottenham Hale station, 4km from the Site.</p>
<p>8. Access to Work and Training</p> <ul style="list-style-type: none"> • Does the proposal provide access to local employment and training opportunities, including temporary construction and permanent 'end-use' jobs? • workspace for local businesses? • Does the proposal include opportunities for work for local people via local procurement arrangements? 	<p>The Site currently employs 24 staff who operate on a shift basis such that during the day there are typically 13 or 14 staff on site and at least two staff at all other times.</p>
<p>9. Social Cohesion and Lifetime Neighbourhoods</p> <ul style="list-style-type: none"> • Does the proposal provide opportunities for the voluntary and community sectors? 	<p>The Site is not accessible to the public, and therefore does not contribute in a significant way to social cohesion through, for example, social interaction, leisure activities and local empowerment.</p> <p>With respect to health inequalities, the average life expectancy for a male in Enfield is 78.8 years, while female life expectancy is 82.7 years, both of which are slightly higher than the average across England, being 78.3 and 82.1 respectively. There is however a marked lowering in life expectancy of residents living in the east of Enfield who on average have a life expectancy 7.7 years lower than those living in the west¹³. Cardiovascular disease is the largest cause of death in Enfield, followed by cancer¹⁴.</p>
<p>10. Minimising the Use of Resources</p> <ul style="list-style-type: none"> • Does the proposal make best use of existing land? • Does the proposal encourage recycling (including building materials)? • Does the proposal incorporate sustainable design and construction techniques? 	<p>Contaminated Land</p> <p>Chapter 8 – Contaminated Land reports that the Site has been used a sewage works since the 1870s, before which it was farmland. The Site is overlain with made ground of variable thickness up to 5.8 m below ground level. The main body of the Site is occupied by primary settlement tanks, aeration tanks, final settlement tanks, and other related buildings, plant and equipment. The existing public health risk from contaminated land is considered to be very low. There is one hotspot of PAH contamination in soil which currently poses low risk to workers on site and negligible risk to the public beyond the Site boundary because it is at depth. The health risk from PAH is by direct contact and there is currently no pathway of exposure. There are small amounts of asbestos which pose low risk on site and negligible risk off-site because fibres are not currently being released to the</p>

¹³ London Health Needs Assessment Toolkit <http://hna.londonhp.nhs.uk/default.aspx>

¹⁴ Enfield Annual Public Health Report 2012

Topics	Baseline Conditions
	<p>air.</p> <p>Water Resources</p> <p>Deephams Sewage Works currently interacts with a number of surface watercourses. Treated effluent flows along the southern part of the Site in an open channel (outfall channel) before joining Salmons Brook to the south of the Site. Salmons Brook then flows into Pymmes Brook 1.4km downstream from the Site, and Pymmes Brook joins the River Lee at Tottenham Lock, 2.6km downstream of its confluence with Salmons Brook. A tributary of Enfield Ditch runs across the north of the Site, and can receive site runoff. The tributary joins the Enfield Ditch which runs southwards outside the eastern boundary of the Site.</p> <p>The Site is underlain by a shallow Secondary A Aquifer (River Terrace Deposits), a Deep Secondary A Aquifer (Lambeth Group and Thanet Sands) and a Deep Principal Aquifer (Seaford Chalk) with associated potable water supply abstractions within 1 km of the Site. The shallow aquifer is not abstracted locally for potable supply. The deep aquifers are protected by the London Clay formation. The thickness of the clay is typically 10 - 12 m across the site. A foundation risk assessment has been undertaken to ensure that any piling to below the base of the clay includes measures to prevent the creation of pathways for contaminants to migrate into the Principal Aquifer.</p> <p>Flood Risk</p> <p>The majority of the Site lies within Flood Zone 1 and as such has a 1 in 1,000 probability of flooding from rivers in a year. A small area of the Site in the south west lies within Flood Zone 3a, having a 1 in 100 probability of flooding from rivers.</p> <p>Waste</p> <p>Immediately prior to the commencement of the upgrade works there are not expected to be any construction waste arisings on the site. There will be operational waste arisings consisting of general domestic and commercial waste from the offices and workshops as well as sewage sludge cake which is transported off site for recycling to land.</p>
<p>11. Climate Change</p> <ul style="list-style-type: none"> • Does the proposal incorporate renewable energy? • Does the proposal ensure that buildings and public spaces are designed to respond to winter and summer temperatures, ie ventilation, shading and landscaping. • Does the proposal maintain or enhance biodiversity? • Does the proposal incorporate sustainable urban drainage techniques? 	<p>Energy</p> <p>The existing Site has an annual energy demand of approximately 64,000,000 kWh/year, 55% of which is electricity and 45% heat. This equates to annual carbon emissions of approximately 15,250 tCO₂. The existing Site generates approximately 27,439,000kWh/year of renewable energy (electricity and heat) on site from its current CHP plant, which is fuelled by methane from the sludge treatment process.</p>

11.7 Impact Assessment

Site Enabling, Demolition and Construction

Introduction

11.7.1 This section considers the potential impacts that Site enabling, demolition and construction activities might cause in relation to the relevant topics scoped into the

assessment from the HUDU checklist, as presented in Section 11.4. Assessments undertaken as part of the EIA, such as the odour, air quality, and noise and vibration assessments, have been used to identify the predicted impacts of the demolition and construction phase and assess their impact on health and well-being.

Predicted Impacts

- 11.7.2 Predicted construction impacts are identified in **Table 11.3** against each of the topics set out in column 1. The appraisal undertaken in column 2 considers the construction effects of the Upgrade for each of the topics, and provides details and evidence of predicted residual impacts, after the application of mitigation measures that will be implemented to avoid, reduce or remedy them (as these mitigation measures have already been defined in the relevant topic chapters of the ES). Column 3 indicates whether there is likely to be a beneficial, adverse or negligible residual impact on the health and well-being of the local residents and their environment.

Table 11.3. Construction Health Impact Assessment

Topics	Details/Evidence	Potential Health Impact
4. Air Quality, Noise and Neighbourhood Amenity		
<p>Does the proposal minimise construction impacts such as dust, noise, vibration and odours?</p>	<p>Air Quality Chapter 7 – Air Quality concluded that the dust created during the demolition and construction phases would pose low risk to human health and would be mitigated sufficiently through the measures set out in the Construction Environmental Management Plan to cause a negligible effect on local receptors. Measures such as monitoring wind direction and strength prior to engaging in construction activities that generate dust, covering skips and chutes, and use of dust-suppressed where possible will mitigate the risk of dust impacting on local asthma sufferers. Mitigation measures and monitoring for dust are set out in Chapter 7 - Air Quality.</p> <p>Noise Chapter 14 - Noise and Vibration concluded that construction vibration and traffic would have negligible effect on receptors, while construction noise would cause a moderate adverse impact at one residential property (Picketts Lock Cottage) for three months during autumn/winter 2015, but at all other times and for all other receptors impacts would be minor to negligible.</p> <p>Odour Odour from the Site can be detectable, depending on weather conditions, at a number of residential, sporting, leisure and recreational facilities in the Lee Valley, examples of which are listed in Table 11.2. This can discourage people from using these facilities for recreation and exercise. As set out in Chapter 15 – Odour, odour will be mitigated during demolition, tank cleaning and construction of the Upgrade through measures set out in the Odour Management Plan:</p> <ul style="list-style-type: none"> • Decommissioning / commissioning of plant will be phased to ensure that each individual stream is taken out of service and cleaned before the new replacement stream is constructed and brought into use. The works has been designed to ensure that sufficient capacity is available to meet this objective. As each replacement stream incorporates cover and odour control measures, and the new aeration lanes have a smaller footprint than the existing ones, odour emissions will progressively decrease as each stream is replaced; • as much sludge within existing primary settlement tanks will be removed as possible prior to draw down of the tanks, to minimise exposure of odorous sludge at the bottom of the tank; • removal and cleaning out of any residual material left in the tanks and associated channels will be conducted immediately after drawdown, and covers applied to any skips used if any residual material is to be dug out from the tanks or associated channels; 	<p>Negligible</p>

Topics	Details/Evidence	Potential Health Impact
	<ul style="list-style-type: none"> • new plant associated with the Upgrade (i.e. the new primary settlement tanks, flow to full treatment pumping station, mix tanks, feed channels, outlet channels, activated sludge plant distribution chamber, primary sludge storage tanks and anoxic zones of the secondary treatment plant) will be process commissioned with the covers in place and the primary settlement tanks/anoxic zones odour control unit operational; • the adequacy of the covers and air extraction systems to effectively contain and control odours will be confirmed prior to commissioning of new plant; and • the cleaning systems on the new storm tanks will be tested and made operational before receipt of stormwater. <p>The construction will be phased to install odour control plant as early as possible in the programme to ensure that progressive improvements in odour are achieved while the construction works are ongoing. Odour emissions from the existing works will continue during the construction phase, but there are unlikely to be any residual adverse effects from the Upgrade works.</p> <p>Landscape and Visual Amenity</p> <p>The construction impacts on landscape character, as assessed in Chapter 13 - Landscape and Visual, are expected to be of small scale and extent and thus only affect the Site and local character area in the short term before being addressed for the completed scheme through the Landscape Strategy, and as such as assessed as temporary moderate/minor adverse.</p> <p>The visual assessment found construction impact on the identified visual receptors will be locally moderate adverse and generally minor adverse.</p>	
<p>Does the proposal minimise air pollution caused by traffic and energy facilities?</p>	<p>Air Quality</p> <p>Chapter 7 – Air Quality concluded that construction traffic was also considered to cause negligible impact to NO₂, PM₁₀ and PM_{2.5}, contributing less than 1% of AQO limits at all receptors, including the nearest residential receptors at Hudson Way.</p> <p>The existing CHP plant is due to be replaced by new more efficient CHP engines early in the construction phase to maximise renewable energy generation and provide CO₂ reductions. Chapter 7 - Air Quality assessed that once installed and operational the new CHP engines would contribute a major beneficial impact to air quality in relation to human health, through more efficient energy generation and reduced emissions.</p>	<p>Beneficial</p>
<p>Does the proposal minimise noise pollution caused by traffic and commercial uses?</p>	<p>Noise</p> <p>As above, Chapter 14 - Noise and Vibration concluded that construction vibration and traffic would have negligible effect on receptors, while construction noise would cause a moderate adverse impact at one residential property (Picketts Lock Cottage) for three months in autumn/winter 2015, but at all other times and for all other receptors impacts would be minor adverse to negligible.</p>	<p>Negligible/Adverse</p>

Topics	Details/Evidence	Potential Health Impact
5. Accessibility and Active Travel		
Does the proposal prioritise and encourage walking (such as through shared spaces?)	<p>Construction traffic could potentially affect healthy lifestyles, so the Traffic Management Plan sets out routes to be used by HGVs which avoids the use of residential roads. The assessment of transport impacts in Chapter 16 - Transport Assessment shows that construction traffic would have a negligible impact on pedestrian amenity, in terms of severance, delay, and fear and intimidation, and hence would not be expected to adversely affect health and well-being.</p> <p>The Construction Travel Plan for the Upgrade promotes walking as a preferable means of construction staff commuting to and from Site during construction. The use of walking will be encouraged through the provision of facilities such as:</p> <ul style="list-style-type: none"> • good on-site lighting, lockers, showers and changing facilities • drying areas for clothes. <p>There is a comprehensive footway network around the Site ensuring that there is no obstruction to pedestrian movement to/from the Site to/from local facilities. On inspection, there are no deficiencies in the highway network as it relates to pedestrian access that would discourage or restrict the use of these modes as being a viable alternative to the car.</p>	Negligible
Does the proposal prioritise and encourage cycling (for example by providing secure cycle parking, showers and cycle lanes)?	<p>Construction traffic could potentially affect healthy lifestyles, so the Traffic Management Plan sets out routes to be used by HGVs which avoids the use of residential roads. The assessment of transport impacts in Chapter 16 - Transport Assessment shows that construction traffic would have a negligible impact on cycle amenity, in terms of severance, delay, and fear and intimidation, and hence would not be expected to adversely affect health and well-being.</p> <p>The Construction Travel Plan for the Upgrade promotes cycling as a preferable means of construction staff commuting to and from Site during construction. The use of cycling will be encouraged through the provision of facilities such as:</p> <ul style="list-style-type: none"> • a minimum of 20 secure, covered, lit cycle parking close to staff entrances with provision of additional stands should they be required • good on-site lighting, lockers, showers and changing facilities • drying areas for clothes. <p>There are a number of on and off road cycle routes in proximity to the Site including National Cycle Route 1 along Lee Park Way and a signed route to Angel Road Station and on to Tottenham Hale, which has secure cycle storage.</p> <p>On inspection, there are no deficiencies in the highway network as it relates to cycle access that would discourage or restrict the use of these modes as being a viable alternative to the car.</p>	Negligible
Is the proposal well connected to public transport, local services and facilities?	Chapter 16 - Transport concluded that there are no deficiencies in the public transport network or facilities that would discourage or restrict the use of these modes as being a viable alternative to the car for construction staff or existing operations staff accessing the Site.	Negligible

Topics	Details/Evidence	Potential Health Impact
	<p>The use of public transport is encouraged as part of the Construction Travel Plan, with information including, bus routes and bus/train timetables to be provided on staff notice boards.</p> <p>Within 100m of the Site, bus route W8 can be accessed. This route links Lee Valley Leisure Complex with Enfield including Edmonton Green and Bush Hill Park rail stations. Within 400m bus route 191 on Bounces Road links Edmonton Green train station to Enfield via Ponders End and Southbury Stations.</p> <p>The nearest direct access to London's Underground service (Tottenham Hale) is 2.0km south of the Site, and is accessible using bus route 192 from the bus stop at Zambezi drive 350m south west of the Site. However, route W8 interchanges with route 192 at Edmonton Green rail station. Edmonton Green Station is a 25 minute walk from the site. Tottenham Hale Underground station will also be linked to the Site via shuttle bus.</p> <p>National rail services can be accessed via a number of nearby stations, such as Ponders End Station some 2.0km north of the Site along Meridian Way, Angel Road Station approximately 1.5km south along Meridian Way and Edmonton Green approximately 1.5km east of the Site off the A1010 The Broadway. From these stations primary locations such as Cambridge, Waltham Cross, Stratford and London Liverpool Street can be reached, with intermediate stops serving other locations.</p> <p>On inspection, there are no deficiencies in the public transport network or facilities that would discourage or restrict the use of these modes as being a viable alternative to the car.</p> <p>Chapter 16 - Transport confirms that the Upgrade would cause only negligible impacts to local transport routes, during the construction phase. This includes routes such as the North Circular Road, Sterling Way and Angel Road that may have the potential to impact on the ability of patients of North Middlesex University Hospital to arrive for appointments in time. Negligible impact would be experienced by both the hospital and its patients from construction traffic. A Traffic Management Plan and Construction Travel Plan have been produced to manage traffic requirements, routing and movements during the construction phase.</p>	
<p>Does the proposal seek to reduce car use by reducing car parking provision, supported by the controlled parking zones, car clubs and travel plans measures?</p>	<p>Public transport, cycling and walking will be promoted as part of the Construction Travel Plan, with facilities for secure bike storage of at least 20 bicycles, clothes drying, showering and lockers being provided to encourage such modes of transport. Where travel by car is the best practical travel solution, car sharing will be encouraged with preferential parking available for those sharing over single occupancy cars.</p> <p>Further, the Upgrade has set a target to source at least 20% of the construction workforce during construction locally, which minimises the need to travel. There is an extensive residential catchment within 1-2km of the Site from which Site staff might be drawn, which would reduce travel need compared to a workforce sourced from further afield. However, being a trade-specific and contractor-specific project requiring specialist services, utilising the local available workforce might be challenging. Nevertheless, using qualified local contractors and workforce will be explored as part of the Local Employment Strategy.</p>	<p>Negligible</p>

Topics	Details/Evidence	Potential Health Impact
	Where possible, use of local suppliers of construction materials will be considered to reduce transportation and maintain a low carbon footprint.	
Does the proposal allow people with mobility problems or a disability to access buildings and places?	On site parking will include three disabled parking spaces positioned in prominent locations.	Negligible
8. Access to Work and Training		
Does the proposal provide access to local employment and training opportunities, including temporary construction and permanent 'end-use' jobs?	<p>The total construction workforce required will vary according to construction phase but is likely to peak at around 250. The target is to source at least 20% of the workforce during construction locally, which will create opportunities to employ people locally with existing skills and train others. Skills required to build the upgrade will be identified and a strategic approach to bringing on new talent will be put in place. The commitments made with respect to the Upgrade include:</p> <ul style="list-style-type: none"> • Community engagement to create interest in jobs; • Thames Water and AMK will promote their respective apprenticeship and graduate schemes through Enfield JOBSnet, Jobcentre Plus and through the local Councils; • two desk facilities will be provided in AMK site offices throughout the scheme for JOBSnet/Jobcentre Plus to facilitate liaison over local employment issues; • presentation to schools to engage young people with the construction sector; • AMK is already supporting Thames Water's educational programme; • work placements – offering work experience to local schools; • work trials – sector based work academies provide 6 weeks of skills training to provide pre-employment training, work experience and a job interview. These are targeted at those really deserving a new start; and • at least 2 full time local workers will come from the local offender rehabilitation scheme. <p>Investment will be made in the community in the long term by running apprentice schemes, Graduate schemes and local training to bring skills to the local workforce, with the potential for successful candidates to have the opportunity to work with the contractor at Deephams and/or other schemes. The construction workforce is likely to include 2-6 apprentices/trainees at any one time.</p>	Beneficial
Does the proposal include opportunities for work for local people via local procurement arrangements?	Optimised management of construction and operation will allow the project to support local economies and jobs while also creating better environmental solutions. The contractor has established relationships with local industries in the Deephams area, including the local scrap metal recycling company, to ensure any waste from the Site can be locally handled. It is also intended to use local companies to provide concrete batching. The Waste Harmony online waste trading scheme (see Chapter 17 - Waste) will be used to identify potential local users and providers of material for reuse.	Beneficial

Topics	Details/Evidence	Potential Health Impact
9. Social Cohesion and Lifetime Neighbourhoods		
Does the proposal provide opportunities for the voluntary and community sectors?	These opportunities are limited as there is no general public access to the Site and this position will not change. However, following a successful open day for the public in spring 2014 as one of the Phase 2 Consultation events, it is intended to hold additional open days during construction so that the public can see the Upgrade under construction. A number of previous visitors expressed interest in this opportunity.	Negligible
10. Minimising the Use of Resources		
Does the proposal make best use of existing land?	The Upgrade design significantly reduces construction time and impact, partly by maximising the re-use of existing site and structures and eliminating the need for new construction on previously un-built areas. It leaves space within the Site for expansion in future if this is needed to provide for further increases in flows or improvements in effluent quality.	Beneficial
Does the proposal encourage recycling (including building materials)?	<p>The Upgrade will make use of demolition material wherever possible in construction. The final settlement tanks and internal walls of other tanks will be demolished, generating recoverable concrete, all of which will be screened crushed on site to produce a secondary aggregate material that will be used in the construction works.</p> <p>It is intended to re-use all excavated materials as structural, general or landscape fill materials. Where materials from demolition cannot be reused on site they will be recycled off site, such as 400 tonnes of metal from the primary and final settlement tanks' scraper bridges and a further 50 tonnes of redundant metal penstocks, valves and pipework. Very small amounts of timber arising from the demolition will also be recovered and recycled, or disposed of at a licensed or permitted facility. Recycled or sustainable materials will be used where possible. All wood will be obtained from a certified sustainable source, such as Forest Stewardship Council. The Construction Environmental Management Plan identifies that there will be Supply Chain management and material control processes in place which will add transparency to the process.</p>	Negligible
Does the proposal incorporate sustainable design and construction techniques?	<p>As above, the design maximises the re-use of existing structures and eliminates the need for new construction on previously un-built areas. It leaves space within the Site for expansion in future if this is needed to provide for further increases in flows or effluent quality.</p> <p>This sustainable design approach also reduces the amount of excavation required and the quantities of new fill material that would otherwise need to be imported to site and thus reduces the duration of the construction programme.</p> <p>Reinforced concrete elements pre-fabricated off site, together with batched concrete from one of the four local batching plants, will be brought to Site by heavy goods vehicles.</p> <p>Waste minimisation is a key consideration of the Site Waste Management Plan for the construction phase of the Upgrade. The correct type and quantity of materials will be ordered and delivered</p>	Beneficial

Topics	Details/Evidence	Potential Health Impact
	<p>following the 'just in time' principle to avoid stockpiling of material on site, thus avoiding the risk of damage and deterioration of materials. Standard materials will be used wherever possible so that any potential excess materials can be used elsewhere on site. Requirements for packaging of materials will be reviewed wherever possible with manufacturers. The use of off site manufacturing will be maximised wherever possible. Where waste generation is unavoidable, materials will be reused on site where possible, or off site where suitable. Recycling rates will also be obtained from waste transfer stations, to ensure that the amount of waste sent to landfill is minimised as far as possible.</p>	
11. Climate Change		
<p>Does the proposal incorporate renewable energy?</p>	<p>The Upgrade incorporates an upgraded CHP plant early in the construction phase, consisting of new more efficient CHP engines which will maximise renewable energy generation and provide CO₂ reductions.</p> <p>The Construction Environmental Management Plan sets out measures to minimise energy use during construction. 'Switch it off' schemes and other energy saving campaigns will be implemented on site to encourage all personnel to consider their carbon footprint both at work and home. Use of car sharing and buses will be encouraged. Posters will be clearly displayed within the site offices to ensure all personnel are aware. This will also be covered within the site induction and regular toolbox talks held relating to the subject.</p>	<p>Beneficial</p>
<p>Does the proposal ensure that buildings and public spaces are designed to respond to winter and summer temperatures, ie ventilation, shading and landscaping.</p>	<p>Brown roofing will be included in the Upgrade and will assist with insulating some buildings from heat loss in winter and help to reduce microclimate effects during the summer months, as well as slowing run-off.</p>	<p>Negligible</p>
<p>Does the proposal maintain or enhance biodiversity?</p>	<p>Chapter 9 - Ecology concluded that the construction phase of the Upgrade would have a negligible impact on designated sites, a minor beneficial impact on habitats (species poor hedgerows and native semi-natural habitat enhancement), and a negligible impact on species with the exception of a temporary minor adverse impact to common breeding and wintering birds on the Site from noise disturbance. The provision of bird and bat boxes and new planting of hedgerows and trees and wildflower seeding around the site boundaries will provide enhancement.</p>	<p>Negligible/Beneficial</p>
<p>Does the proposal incorporate sustainable urban drainage techniques?</p>	<p>Following the principles of the SuDS hierarchy detailed in the London Plan¹⁵, it is proposed that the Upgrade includes brown roofs, rainwater harvesting, pervious paving and underground storage. Following the removal of Stream C, there will be an additional area of grassed, non-operational, permeable land. Surface water drainage from the remainder of the Site will be routed into the head of the works and flows attenuated through the treatment plant.</p>	<p>Beneficial</p>

¹⁵ The London Plan Spatial Development Strategy for Greater London, July 2011 and The London Plan – Revised Early Minor Amendments, October 2013

Mitigation Measures

- 11.7.3 Mitigation of construction phase impacts associated with transport, air quality, noise and vibration, odour, flood risk, landscape and visual amenity, waste and contaminated Land have been specified within those individual assessment chapters and are outlined in **Table 11.3** where relevant. No additional mitigation measures have been identified in relation to health and well-being.

Residual Impacts

- 11.7.4 Residual impacts of the construction phase would be:
- Negligible/beneficial effect on Air Quality, Noise and Neighbourhood Amenity resulting from reduced operational CHP emissions, as the new CHP engines are installed early in the construction phase.
 - beneficial effect on Access to Work and Training through the commitment to source 25% of the construction workforce locally and the opportunity for local businesses to supply construction material and equipment;
 - beneficial effect on Minimising the Use of Resources through providing the Upgrade on an existing sewage works site and incorporating sustainable design and construction techniques; and
 - beneficial effect on Climate Change through improved renewable energy provision, enhanced habitat provision and incorporation of SuDs measures into the design.
- 11.7.5 While there is a potential risk of increased odour emissions during tank cleaning and commissioning of new tanks during construction, this will be mitigated through the implementation of the Odour Management Plan. Covering and odour control of the inlet works will be scheduled as early as possible within the construction programme in order to reduce overall odour emissions from the Site during the construction phase. As construction proceeds, new covered and odour controlled plant (such as the primary settlement tanks and anoxic zones) will be installed in each new stream, and odour emissions will be progressively reduced as a result. During the construction phase, odour emissions should gradually become less than from the existing works, but may still be detectable on occasions by residents and users of recreational and leisure facilities near the Site. The overall effect on health and well-being is considered to be negligible.
- 11.7.6 The minor adverse impact to landscape and visual amenity, and temporary noise impacts are not considered likely to significantly affect residents' health and well-being in the local area, given the prevailing urban/industrial baseline conditions.

Monitoring

- 11.7.7 Monitoring will be undertaken to ensure that impacts are as predicted within the ES. If monitoring shows that impacts are above predicted levels, further mitigation measures will be implemented to protect the health and well-being of local residents. Feedback loops will be implemented through the Construction Environment Management Plan, specifying procedures that are to be followed once an impact has been identified, either by Site staff or members of the public, and identifying remedial actions and responsibilities of construction staff.
- 11.7.8 The Upgrade will register with the Considerate Constructors Code of Conduct. This requires the Site to clearly display posters and banners clearly showing all contact numbers, so that residents or other members of the public can contact and raise issues directly with the construction site staff using a dedicated 24 hour phone. Any issues will be logged and dealt with promptly, and the measures taken in response

will be communicated back to the member of the public who raised it, until it is satisfactorily resolved.

- 11.7.9 Having a well publicised process for the public to raise issues and to be kept informed about how and when the issue is resolved is vital to well-being, as a feeling of being unable to influence events, or have any control over activities affecting the local environment is stressful. The Considerate Constructors Code of Conduct addresses this, and when combined with the measures set out in the Construction Environmental Management Plan, should reduce the risk to the well-being of local residents from construction works at the Site.

Operation

Introduction

- 11.7.10 This section considers the potential impacts of the Upgrade's operation phase in relation to the topics identified by the HUDU checklist, as presented in Section 11.4. Assessments undertaken as part of this ES, for example, of air quality, odour, noise and vibration, have been used to describe the predicted impacts of the operational phase and assess their impact on health and well-being.

Predicted impacts

- 11.7.11 Predicted effects have been identified in **Table 11.4** against each of the topics set out in column 1. The appraisal undertaken in column 2 considers the operational effects of the Upgrade for each of the topics, and provides details and evidence of predicted residual impacts, after the application of mitigation measures that will be implemented to avoid, reduce or remedy them (as these mitigation measures have already been defined in the relevant topic chapters of the ES). Column 3 indicates whether there is likely to be a beneficial, adverse or negligible residual impact on the health and well-being of the local residents and their environment.

Table 11.4 Operational Health Impact Assessment

Topics	Details/Evidence	Potential Health Impact
4. Air Quality, Noise and Neighbourhood Amenity		
<p>Does the proposal minimise construction impacts such as dust, noise, vibration and odours?</p>	<p>Air Quality</p> <p>Chapter 7 – Air Quality found that the upgrading of the existing CHP plant with new engines will provide a negligible to moderate beneficial impact to annual mean and 99.8th percentile of 1-hour mean ground level NO₂ concentrations at local residential receptors. The new CHP plant will also result in an improvement in predicted 8-hour and 1-hour mean CO concentrations, with levels representing only 10% of Air Quality Objective (AQO) limits. Predicted short-term SO₂ concentrations are well within the relevant AQOs at all off-site locations. The Upgrade will result in a reduction in the process concentration at the majority of the identified receptors. Where an increase is predicted, the change in the concentration is less than 1% of the relevant air quality standard and therefore considered insignificant.</p> <p>Noise and Vibration</p> <p>Chapter 14 – Noise and Vibration concluded that operational noise and vibration impacts would not be significant, with noise levels from the new plant of the Upgrade providing negligible / minor adverse impact at a similar level to that experienced during baseline operation.</p> <p>Odour</p> <p>As reported in Chapter 15 - Odour, as a result of the Upgrade the total odour emissions from the works are predicted to fall by 85%, thus the Upgrade will significantly reduce the current level of odour exposure. The reduction in emissions is associated with the application of the odour mitigation measures that are designed into the scheme, comprising covering and treating odour from the primary settlement tanks, inlet works and anoxic zones; covering the secondary digesters and connecting them to the existing gas handling system; a reduction in surface area of the aeration lanes due to the use of IFAS; and improved operational control through the Odour Management Plan. As identified in the baseline section (11.5) the nearest sensitive residential odour receptors are those on Picketts Lock Lane, and those off Hudson Way, all of which currently lie within the existing >5 ou_E/m³ odour concentration band. These receptors will all experience a significant reduction in odour level, the number of properties within both the 3 - 5 and > 5 ou_E/m³ odour concentration bands falling by 99%. It is also therefore expected to significantly improve the recreational value provided by the Lee Valley Leisure Complex, consisting of Lee Valley Golf Course, Lee Valley Athletics Centre, Picketts Lock Indoor Bowls Club, cinema and restaurants, as well as the Lee Valley Caravan and Camping Park, and numerous PRoWs that provide off-road routes for pedestrian and cycling commuting and recreation within the vicinity of the Upgrade such as Pymmes Brook Trail, River Lee Navigation, Lee Park Way, National Cycle Route 1 and the Lee Valley Heritage Trail.</p> <p>The Lee Valley Leisure Complex and caravan and camping park are currently within an odour concentration band substantially in excess of 5 ou_E/m³. Following the Upgrade, they would lie in the 1.5 - 3 ou_E/m³ and < 1.5 ou_E/m³, odour concentration bands, respectively. These substantial</p>	<p>Beneficial</p>

Topics	Details/Evidence	Potential Health Impact
	<p>reductions in odour concentrations are likely to improve local conditions for people taking up outdoor activities in the area, as well as improving the quality of the recreational experience on offer, which support the aims of the Park Development Framework: area proposals for Lee Valley Regional Park.</p> <p>The following summarises the impacts identified in Chapter 15 - Odour with regard to the recreational and leisure facilities identified in the baseline assessment (Section 11.5).</p> <p>On completion of the Upgrade, the Montagu Recreation Ground, which currently lies within an odour concentration band substantially in excess of 5 ou_E/m³, would mostly lie outside the 1.5 ou_E/m³ odour concentration band and would be among the sites relatively unaffected by odour. The leisure and recreation facilities listed below, that currently lie within the >3 ou_E/m³ odour concentration band, would be within the <1.5 ou_E/m³ odour concentration band after the Upgrade, which would be classified as relatively unaffected by odour:</p> <ul style="list-style-type: none"> • Cuckoo Hall recreation ground 1.1 km north west of the Site • Chelsfield Green 1.1 km north west of the Site • Chingford Hall Park 1.2km south east of the Site • Lee Valley playing fields 1.2km north east of the Site • Mansfield Park 1.4 km north east of the Site • Eldon Primary School 500m west of the Site • Nightingale Academy 650m north west of the Site. <p>The leisure and recreation facilities listed below that currently lie within the >1.5 ou_E/m³ odour concentration band, would lie within the <1.5 ou_E/m³ odour concentration band following the Upgrade and would be classified as relatively unaffected by odour:</p> <ul style="list-style-type: none"> • Craig Park recreation ground 1.5km south west of the Site • Rainham Doorstep Green 1.7km south west of the Site • Memorial Park 1.7km south east of the Site • Ridgeway Park 1.8km east of the Site • Kingfisher Hall Primary Academy 1.1km north west of the Site • Chingford Foundation School 1.9km north east of the Site. <p>In summary the Upgrade will almost completely mitigate the effect of odour on 13 recreation and leisure facilities within the local area, and reduce the impact on the one other remaining facility (Montagu Recreation Ground).</p> <p>Insect Nuisance</p> <p>Midge/mosquito nuisance from the Site has been identified by residents during consultation on the Upgrade. Midges and mosquitoes breed in static water. This was previously a problem on site due</p>	

Topics	Details/Evidence	Potential Health Impact
	<p>to the design of the storm tanks allowing standing dirty water to collect at one end, providing a breeding ground. However, this has already been rectified through works carried out on site in 2012/13 when the storm tanks were re-graded to ensure they drained properly. There will be additional improvements made through the Upgrade, such as improved gravitational flow through the works, covered tanks (primary settlement tanks, inlet works and anoxic zones) and smaller surface area of the aeration lane because of the use of IFAS, all of which will reduce the potential for insect breeding.</p> <p>Landscape and Visual Impact</p> <p>Chapter 13 – Landscape and Visual concluded that the new buildings and structures of the Upgrade would be of similar character and dimensions to those already present on the Site. Creation of additional earth bunds along the northern boundary of the Site and additional planting specified in the Landscape Strategy will improve screening of the Site. The planting of replacement vegetation would mitigate the removal of trees and shrubs during the construction phase, and the landscape and visual amenity would improve as the planting matures over the following 5 -10 years. Once the upgraded sewage works has been in operation for 10 years or more, the impact will be beneficial.</p> <p>As described in the baseline section (11.5) the main health inequality in Enfield is the difference between the shorter life expectancy of residents of east Enfield compared to the longer life expectancies of those in the west of Enfield. The Upgrade is located in east Enfield, and will provide improvements in air quality and significant reductions in odour exposure. These changes are predicted to improve the amenity value of the local recreation and leisure facilities which may help to encourage uptake of activities to assist with healthy lifestyles. Life style changes have been identified by the Enfield Joint Health and Well-Being Strategy (2014) as a significant measure that could help avoid many potential early deaths.</p>	
<p>Does the proposal minimise air pollution caused by traffic and energy facilities?</p>	<p>Transport</p> <p>Chapter 16 - Transport confirmed that the Upgrade will not cause significant impacts during the operational phase. This is because traffic levels are expected to remain as at present and there will therefore be no increase in air pollution from transport.</p> <p>Air Quality</p> <p>As above, Chapter 7 – Air Quality found that the upgrading of the existing CHP plant with new engines will provide a negligible to moderate beneficial impact to annual mean and 99.8th percentile of 1-hour mean ground level NO₂ concentrations at local residential receptors. The new CHP plant will also result in an improvement in predicted 8-hour and 1-hour mean CO concentrations, with levels representing only 10% of Air Quality Objective (AQO) limits. Predicted short-term SO₂ concentrations are well within the relevant AQOs at all off-site locations. The Upgrade will result in a reduction in the process concentration at the majority of the identified receptors. Where an increase is predicted, the change in the concentration is less than 1% of the relevant air quality standard and therefore considered insignificant.</p>	<p>Beneficial</p>

Topics	Details/Evidence	Potential Health Impact
Does the proposal minimise noise pollution caused by traffic and commercial uses?	Chapter 14 – Noise and Vibration concluded that operational noise and vibration impacts would not be significant, with noise levels from the new plant of the Upgrade providing a negligible / minor adverse impact similar to that experienced during operation of the existing works.	Negligible
5. Accessibility and Active Travel		
Does the proposal prioritise and encourage walking (such as through shared spaces?)	<p>There is a comprehensive footway network around the Site ensuring that there is no obstruction to pedestrian movement to/from the Site to/from local facilities.</p> <p>For staff working at the sewage works, the Upgrade will provide new facilities to encourage access to the Site on foot or by bicycle such as:</p> <ul style="list-style-type: none"> • good on-site lighting, lockers, showers and changing facilities • drying areas for clothes. <p>On inspection, there are no deficiencies in the highway network as it relates to pedestrian access that would discourage or restrict the use of these modes as being a viable alternative to the car for operational site staff.</p>	
Does the proposal prioritise and encourage cycling (for example by providing secure cycle parking, showers and cycle lanes)?	<p>There are a number of on and off road cycle routes in proximity to the Site including a signed route to Angel Road Station and one to Tottenham Hale.</p> <p>For staff working at the sewage works, the Upgrade will provide new facilities to encourage access to the Site on foot or by bicycle such as:</p> <ul style="list-style-type: none"> • 20 secure, covered, lit cycle parking close to staff entrances with provision of additional stands should they be required • good on-site lighting, lockers, showers and changing facilities • drying areas for clothes. <p>On inspection, there are no deficiencies in the highway network as it relates to cycle access that would discourage or restrict the use of these modes as being a viable alternative to the car for operational site staff.</p>	Beneficial
Is the proposal well connected to public transport, local services and facilities?	<p>Chapter 16 - Transport concluded that there are no deficiencies in the public transport network or facilities that would discourage or restrict the use of these modes as being a viable alternative to the car for operational site staff.</p> <p>Within 100m of the Site, bus routes W8 can be accessed. This route links Lee Valley Leisure Centre with Enfield including Edmonton Green and Bush Hill Park rail stations. Within 400m route 191 on Bounces Road links Edmonton Green train station to Enfield via Ponders End and Southbury Stations.</p> <p>The nearest bus stop that provides direct access to London's Underground service is 2km south of the Site using bus route 92. However, route W8 interchanges with route 192 at Edmonton Green rail station. All the nearest stops serving the above routes as a minimum include shelters, flag post and bus cages.</p>	Negligible

Topics	Details/Evidence	Potential Health Impact
	<p>National rail services can be accessed via Ponders End Station some 2km north of the Site along Meridian Way, Angel Road Station approximately 1.5km south along Meridian Way and Edmonton Green approximately 1.5km east of the Site off the A1010 The Broadway. From these stations primary locations such as Cambridge, Waltham Cross, Stratford and London Liverpool Street can be reached, with intermediate stops serving other locations.</p> <p>On inspection, there are no deficiencies in the public transport network or facilities that would discourage or restrict the use of these modes as being a viable alternative to the car for operational site staff.</p>	
Does the proposal seek to reduce car use by reducing car parking provision, supported by the controlled parking zones, car clubs and travel plans measures?	During the operational phase operational Site staff will be maintained at existing levels. Where travel by car is required, car sharing will be encouraged with preferential parking available to those sharing, over single occupancy cars.	Negligible
Does the proposal allow people with mobility problems or a disability to access buildings and places?	On site parking will include three disabled parking spaces positioned in prominent locations.	Negligible
8. Access to Work and Training		
Does the proposal provide access to local employment and training opportunities, including temporary construction and permanent 'end-use' jobs?	<p>Where possible, employees trained as part of the construction phase will be employed by the contractor as part of their long term workforce. The skills gained will also allow trained employees to work in the construction sector for other employers.</p> <p>Thames Water will work closely with the local Councils to promote educational opportunities through the operation of the completed Deephams Sewage Works Upgrade. Thames Water will also promote their apprenticeship and graduate schemes through Enfield JOBSnet, Jobcentre Plus and through the local Councils.</p>	Beneficial
Does the proposal include opportunities for work for local people via local procurement arrangements?	<p>During the operational phase operational Site staff will be maintained at existing levels. The educational facility will be used for local training to allow people to train and work on site through an organised programme. The development of education and environmental awareness also extends to wider communities and young people. The Deephams Sewage Works and its educational facility will act to bring together and complement educational and demonstration activity in the Lee Valley, potentially leading to sufficiently skilled young people who could provide a pool of locally available employable resource. This could minimise future requirements for staff to travel in from outside the area.</p> <p>The Upgrade means that the current supply chain serving the works will be maintained in the long term, providing continuing opportunities for business</p>	Beneficial
9. Social Cohesion and Lifetime Neighbourhoods		
Does the proposal provide opportunities for the voluntary and community sectors?	The educational facility and trail will be used for educational visits and training for local schools and colleges. Through outreach to young people, the provision and use of the education facility will encourage environmental awareness in the wider community. The Site and its educational facility	Beneficial

Topics	Details/Evidence	Potential Health Impact
	<p>will act to bring together and complement educational and demonstration activity in the Lee Valley. Deephams will offer the opportunity to create a learning loop to demonstrate water recycling, renewable energy generation from sewage sludge, and can highlight other local sustainable processes such as renewable energy generation at the nearby Ecopark.</p>	
10. Minimising the Use of Resources		
<p>Does the proposal make best use of existing land?</p>	<p>The Upgrade design, through the re-use of existing site and structures, eliminates the need for new construction on previously un-built areas. It leaves space within the Site for expansion in future if this is needed to provide for further increases in flows or improvements in effluent quality.</p>	<p>Beneficial</p>
<p>Does the proposal encourage recycling (including building materials)?</p>	<p>Treated sewage sludge from the upgraded works will continue (as at present) to be recycled as a soil conditioner and organic fertiliser on farmland</p>	<p>Negligible</p>
<p>Does the proposal incorporate sustainable design and construction techniques?</p>	<p>The additional and modified treatment process required to meet improved regulatory requirements in water quality has the potential to increase energy consumption across the treatment process by nearly 5,000,000 kWh/year.</p> <p>However, Thames Water has taken the opportunity to review the process and energy consumption across the Site and implement technologies and measures to reduce energy consumption. Key measures that will be introduced to the Upgrade to minimise energy consumption include infrastructure that minimises requirement of energy such as gravity fed systems and deeper aeration basins to increase efficiency, use of highly efficient plant such as motors, diffusers and turbo-compressor blowers, and incorporation of real time control of denitrification and nitrification processes, which reduces excess aeration. Such efficiency measures will reduce overall energy demand by approximately 7,500,000 kWh/year, representing a 7% reduction in the baseline electricity consumption.</p> <p>The design minimises water demands in plant processes and associated buildings and includes water efficiency measures to meet best practice sustainability standards. The initiatives adopted by the contractor include:</p> <ul style="list-style-type: none"> • Development of the most efficient dewatering system; • clean out existing Site drainage to ensure efficiency; • liaise with Thames Water operations staff to develop a comprehensive plan for returning Site water to the head of the works; and • explore all avenues where water savings can be made from domestic use in Site offices through to construction activities. <p>The Deephams Upgrade will produce high quality effluent that will be suitable for non-potable applications on-site and in surrounding areas. The design integrates demonstration of water reuse,</p>	<p>Beneficial</p>

Topics	Details/Evidence	Potential Health Impact
	by using treated effluent from the plant for washdown activities and toilet flushing and rainwater harvested as part of the SuDs measures for irrigation on Site.	
11. Climate Change		
Does the proposal incorporate renewable energy?	The existing Site operates a CHP plant that generates heat and power from the biogas produced during the anaerobic digestion of sludge. The Upgrade will replace the existing CHP plant with new modern units that operate at higher efficiency, and are located closer to the anaerobic digestion plant allowing the existing, inefficient heat transfer system to be removed. The upgraded CHP plant will reduce the Site's requirement for grid power and supplementary fuel oil, reducing annual carbon emissions by approximately 8,500 tCO ₂ or a reduction existing annual emissions by 54% (kgCO ₂ /PE).	Beneficial
Does the proposal ensure that buildings and public spaces are designed to respond to winter and summer temperatures, ie ventilation, shading and landscaping.	<p>Brown roofs will be installed on the Flow to Full Treatment Pumping Station/Blower Station and the Surplus Activated Sludge /Return Activated Sludge pumping station. Rainwater will be harvested from the primary settlement tank covers and from the education facility roof for washdown and irrigation. These features will reduce runoff and flood risk, and also contribute to microclimate regulation.</p> <p>The Upgrade will increase both the storm tank capacity and the treatment capacity of the works, which increases its ability to cope with future extreme rainfall events and reduce the discharge of partially treated effluent during such events.</p> <p>The additional and modified treatment process required to meet improved regulatory requirements in water quality have the potential to increase energy consumption across the treatment process by nearly 5,000,000 kWh/year.</p> <p>However, Thames Water has taken the opportunity to review the process and energy consumption across the Site and implement technologies and measures to reduce energy consumption. Key measures that will be introduced by the Upgrade to minimise energy consumption include infrastructure that minimises requirement of energy such as gravity fed systems and deeper aeration basins to increase efficiency, use of highly efficient plant such as motors, diffusers and turbo-compressor blowers, and incorporation of real time control of denitrification and nitrification processes, which reduces excess aeration. Such efficiency measures will reduce overall energy demand by approximately 7,500,000 kWh/year, representing a 7% reduction in the baseline electricity consumption.</p>	Beneficial
Does the proposal maintain or enhance biodiversity?	Chapter 9 - Ecology concluded that the operational phase of the Upgrade would have a negligible/minor beneficial impact on designated sites and a negligible/minor beneficial impact on species. The Upgrade will improve effluent quality, which will benefit water quality and aquatic ecology in Salmons Brook and watercourses downstream.	Negligible/Beneficial

Topics	Details/Evidence	Potential Health Impact
Does the proposal incorporate sustainable urban drainage techniques?	<p>Following the principles of the SuDS hierarchy detailed in the London Plan¹⁶, it is proposed the Upgrade includes brown roofing, rainwater harvesting and pervious paving. After the removal of Stream C, there will be an additional area of grassed, non-operational, permeable land. The proposed layout and drainage plans for the Site, including SuDS, provide an improvement over the baseline. The drainage plan for the operational Site routes all remaining sources of surface water back the head of the works for attenuation through the plant. The Upgrade will help to reduce flood risk (a beneficial effect of major significance) during operation, because the design takes groundwater flooding into account and includes improvements to the surface water management on site. The (SuDS) measures incorporated into the Upgrade proposals will decrease rainwater run off rates from the site, in turn leading to a reduction in surface water flood risk on and downstream of the site.</p>	Beneficial

¹⁶ The London Plan Spatial Development Strategy for Greater London, July 2011 and The London Plan – Revised Early Minor Amendments, October 2013

Mitigation Measures

11.7.12 Mitigation for impacts has been specified within the relevant topic chapters in the ES and are outlined in Table 11.4 where relevant. No additional mitigation measures have been identified in relation to health and well-being.

Residual Impacts

11.7.13 Residual impacts of the operational phase will be:

- Beneficial effect on Air Quality, Noise and Neighbourhood Amenity through greatly reduced odour emissions facilitating improved conditions for exercise and recreation by residents and others in the local area.
- Negligible/Beneficial effect on Accessibility and Active Travel through promotion of walking, cycling and public transport as an alternative to car travel.
- Beneficial effect on Access to Work and Training through the use of the education facility and promotion of Thames Water's apprenticeship and graduate schemes within the local area.
- Beneficial effect on Social Cohesion and Lifetime Neighbourhoods through the education facility and trail provided at the Site.
- Beneficial effects on Resource Minimisation and Climate Change through the significant reduction in energy consumption and CO₂ emissions due to the more efficient design and treatment processes, and upgraded CHP plant.

Monitoring

11.7.14 The main focus of monitoring during the operational stage will be for odour. The monitoring requirements, as set out in the Odour Management Plan, will comprise:

- Continuous monitoring of hydrogen sulphide at the outlet of each odour control unit;
- routine inspection of each odour control unit to confirm proper operation; and
- regular (at least annual) independent assessment of odour abatement performance.

11.7.15 Any residents or others who have any concerns relating to the sewage works can contact the Thames Water Customer Centre. Complaints, concerns or queries will be logged and passed directly to local Operations (Process Manager and Team Manager) via e-mail. Thames Water Operations will then investigate the issue and take appropriate action.

11.8 Summary of Residual Impacts

11.8.1 A summary of residual impacts is provided in **Table 11.5**.

Table 11.5 Residual Impacts on Health and Well-Being

Phase	Residual Impact
Construction	
4. Air Quality, Noise and Neighbourhood Amenity	Negligible
5. Accessibility and Active Travel	Negligible
8. Access to Work and Training	Beneficial
9. Social Cohesion and Lifetime Neighbourhoods	Negligible
10. Minimising the Use of Resources	Beneficial
11. Climate Change	Beneficial
Operation	
4. Air Quality, Noise and Neighbourhood Amenity	Beneficial
5. Accessibility and Active Travel	Negligible/Beneficial
8. Access to Work and Training	Beneficial
9. Social Cohesion and Lifetime Neighbourhoods	Beneficial
10. Minimising the Use of Resources	Beneficial
11. Climate Change	Beneficial

11.9 Cumulative Effects Assessment

11.9.1 A review of potential new developments within a 5km radius of the Site was undertaken in Chapter 2 – Approach to Assessment. The potential for cumulative effects from these proposed developments in combination with those of the Upgrade was assessed in each of the individual topic chapters in the ES. The cumulative effects identified by each assessment that are relevant to health and well-being are summarised in **Table 11.6**, with the implications on health and well-being of people living and working in the area considered where cumulative effects are predicted.

Table 11.6 Cumulative Effects Summary

Assessment	Cumulative Scheme/Project	Cumulative Health and Well-Being Effect
Air Quality	<p>Construction</p> <p>No schemes within 350m to cause cumulative dust impact.</p> <p>The negligible and temporary traffic impact caused by the Upgrade is unlikely to result in a significant cumulative air quality impact in combination with traffic generated by other committed or proposed developments in the area.</p> <p>Operation</p> <p>The cumulative impact of the new CHP plant (due to be operational early in the construction phase) and proposed construction traffic is lower than the existing Site impacts at all of the sensitive receptor locations.</p>	None
Contaminated Land	<p>There are no additional plans or projects which are likely to have cumulative effects with the Upgrade. The contaminated land desk study and geo-environmental constraints reports searched for contaminated land data in a buffer zone of 500 m from the Site and found nothing of significance that would have any cumulative effects.</p>	None
Flood Risk	<p>Cumulative effects on water resources receptors are considered to be negligible</p>	None
Landscape and Visual Impact	<p>There are no similar developments under construction or proposed which are considered to result in significant cumulative landscape or visual effects.</p>	None
Noise and Vibration	<p>It is possible that should the construction phase of the upgrade coincide with that of the development of the Tower Transit Operations Ltd proposed bus depot on Picketts Lock Lane, that the predicted moderate adverse impact due to the Upgrade construction could increase to a major adverse impact. However, the bus depot construction includes the provision of an acoustic barrier to the west and north of the boundary of Picketts Lock Cottage. This would mitigate the cumulative effects and should ensure that the impact remains as moderate adverse.</p> <p>Consideration has been given to other construction schemes within the immediate vicinity of the Site and there are no other projects likely to have any cumulative effect on noise at the sensitive receptors around the Site.</p>	None
Odour	<p>No planned facilities with the potential to generate potentially significant odour emissions were identified.</p> <p>A sludge thermal hydrolysis plant (THP) may be proposed at the Deephams Site in the future. . The assessment of this (Chapter 15 - Odour) based on indicative THP proposals indicates that there is likely to be a slight decrease in odour emissions.</p>	Any further reduction in odour emissions would provide a beneficial cumulative impact on well-being and amenity.

Assessment	Cumulative Scheme/Project	Cumulative Health and Well-Being Effect
Transport	Considering a combination of factors such as construction vehicle routing, construction programming, construction periods and development location, with regard to the North London Reinforcement project and Tower Transit Operations Ltd proposed bus depot on Picketts Lock Lane, there are not anticipated to be any cumulative effects on transport.	None
Waste	There are no other construction projects identified in the vicinity of the Site that could generate significant cumulative impacts in terms of management of waste.	None
Water Resources	No potential cumulative effects on water resources from other developments have been identified,	None

11.9.2 Through consideration of the cumulative effects assessments summarised in **Table 11.6** above, it is concluded that there will be no significant cumulative effects on health and well-being by the Upgrade in combination with the other potential developments identified in Chapter 2 – Approach to Assessment.

11.10 Summary and Conclusion

11.10.1 A summary of health and well-being impacts identified during the assessment is given in **Table 11.7**.

Table 11.7 Summary of Impacts

Phase	Residual Impact
Construction	
4. Air Quality, Noise and Neighbourhood Amenity	Negligible
5. Accessibility and Active Travel	Negligible
8. Access to Work and Training	Beneficial
9. Social Cohesion and Lifetime Neighbourhoods	Negligible
10. Minimising the Use of Resources	Beneficial
11. Climate Change	Beneficial
Operation	
4. Air Quality, Noise and Neighbourhood Amenity	Beneficial
5. Accessibility and Active Travel	Negligible/Beneficial
8. Access to Work and Training	Beneficial
9. Social Cohesion and Lifetime Neighbourhoods	Beneficial
10. Minimising the Use of Resources	Beneficial
11. Climate Change	Beneficial

11.10.2 In summary, there is predicted to be a potentially negligible effect on Air Quality, Noise and Neighbourhood Amenity during the construction phase due to odour emissions continuing as at present (before plant covers and odour control units are progressively installed), and due to short term noise impacts and temporary

changes in landscape and visual amenity (before new planting is put in place and matures). As these are temporary and reversible effects within a prevailing urban/industrial baseline environment, they are not considered to constitute a significant impact. There will be a long term beneficial effect on Minimising the Use of Resources due to early installation of the new CHP engines and re-use of materials during the construction phase. The concerns raised by North Middlesex University Hospital Trust over traffic delays for patients and increased asthma related A&E admissions are both considered to be of negligible risk during construction, due to the negligible impacts from construction traffic and dust generation.

- 11.10.3 During operation, beneficial impacts on health and well-being are predicted. Key benefits provided by the Upgrade include greatly reduced odour exposure and reduced air quality emissions from the CHP plant. As highlighted by residents in the Phase 2 Consultation responses, this is likely to increase the recreational amenity of the area, providing health and well-being benefits through increased recreational activity. This complies with NPPF requirements for developments to encourage the use of high quality recreation and amenity facilities, and with NPS requirements to protect access to key public services, open space or recreation facilities.