

CHAPTER 4 – NEED AND ALTERNATIVES

4.1 Introduction

4.1.1 This chapter of the ES outlines the need for the Upgrade to Deephams Sewage Works. It provides a description of the main alternatives to the Upgrade that were studied by Thames Water and the main reasons for selection of the preferred option, taking into account the environmental effects.

4.2 Need for the Upgrade

4.2.1 The need for the Upgrade is driven by the requirements of a number of European Directives and this has been reflected in the details of the Environmental Permit set by the Environment Agency through the National Environment Programme. The strategic need for the project was confirmed by the inclusion of the Deephams Sewage Works Upgrade as a named project within the National Policy Statement for Waste Water (2012). Together, the National Environment Programme and the National Policy Statement for Waste Water provide requirements to:

- improve water quality within Salmons Brook and the River Lee;
- enable compliance with Directives, regulation and policy governing the discharge of treated wastewater effluent; and
- provide sufficient treatment capacity to meet population growth within the Deephams catchment and take account of climate change.

4.2.2 The tighter permit requirements, set out in paragraph 4.2.15 and **Table 4.1**, cannot be met by the current ageing sewage works infrastructure. Further enhanced treatment is therefore required to produce the quality of effluent required and to provide resilience. Additional storm tank capacity is also required under the environmental permit in order to improve the operation of the sewage works during storm events.

4.2.3 Improvements to water quality in Salmons Brook and the River Lee are driven by three key European Directives - the Water Framework Directive, the Urban Wastewater Treatment Directive and the Freshwater Fish Directive and these are described in more detail in the following sections.

4.2.4 The Upgrade also provides the opportunity to provide sewage treatment for North London that is 'fit for purpose', supports population growth in the catchment in line with the London Plan and is sustainable in the long term. The Upgrade will also deliver social and environmental benefits through a significant reduction in odour emissions from the sewage works. The need for odour reduction has been identified as the most important issue through public consultation. Further details on these additional benefits that the Upgrade will provide are covered in Chapter 15 – Odour, where the reduction in odour is described.

European Union Directives

Water Framework Directive (WFD)

4.2.5 The WFD (2000/60/EC) aims to protect and enhance the quality of the surface waters and groundwaters throughout Europe. Member states must aim to achieve good ecological and chemical status in inland and coastal waters. Three water bodies in the vicinity of Deephams, Salmons Brook, Pymmes Brook and River Lee

(from Tottenham Locks to the Tideway), currently fail to meet the water quality requirements of the WFD.

- 4.2.6 The current Thames River Basin Management Plan¹ classifies Salmons Brook and River Lee (Tottenham Locks to Tideway) water bodies as having poor status for dissolved oxygen. The River Lee (Tottenham Locks to Tideway) water body was also classified as moderate status for ammonia. Although both Salmons Brook and Pymmes Brook as a whole achieved high status for ammonia, Environment Agency monitoring data show that sample points downstream of Deephams Sewage Works fail to meet the water quality requirements of the WFD.

Urban Wastewater Treatment Directive

- 4.2.7 In July 1998 the River Lee and Lee Navigation were designated as a sensitive area (eutrophic) under the provisions of the Urban Waste Water Treatment Directive 1991 (91/271/EEC).
- 4.2.8 Eutrophic conditions cause excessive growth of algae and other plants that can affect aquatic biodiversity and overall water quality.
- 4.2.9 Whilst improvements have already been made further up the River Lee catchment that have reduced nutrient inputs, the River Lee and Lee Navigation remain eutrophic. The River Basin Management Plan identifies the London catchment as highly urbanised with its associated increased surface water run-off, as a significant contributory factor to the water quality issues. Discharges of effluent, storm flows and misconnections in the sewer network are other problems that have led to poor water quality. The Environment Agency therefore considers that there remains a need to reduce nutrient inputs from Deephams Sewage Works to the lower stretches of the River Lee.
- 4.2.10 In 2012, in response to a previous change in the current environmental permit, chemical dosing was installed in two places within the sewage works to remove phosphorus – in the primary settlement tanks and simultaneous dosing into the activated sludge aeration lanes. Further tertiary treatment using disc filters to control solids-related effluent phosphorus, iron and aluminium concentrations also assists in reducing nutrients in the final effluent. However, these measures are not considered to provide a long term solution because dosing increases the production of sewage sludge and has associated increases in operational cost.

Freshwater Fish Directive

- 4.2.11 The Fresh Water Fish Directive (2006/44/EC) was repealed by the WFD in December 2013. However, as the permit was issued by the Environment Agency in 2010, before the Fresh Water Fish Directive was repealed, it remains relevant to the need for the Upgrade.
- 4.2.12 In 2003, the stretch of the River Lee downstream of Deephams Sewage Works was designated as a cyprinid water (waters which support or become capable of supporting fish belonging to the cyprinids or other species such as pike, perch and eel) in accordance with the provisions of the Freshwater Fish Directive.
- 4.2.13 The Directive set physical and chemical water quality objectives for these types of waters, particularly in relation to ammonia to which fish are typically sensitive. These objectives are now incorporated within the WFD standards. The new environmental permit standard is designed to provide improvements to the River

¹ Water for life and livelihoods River Basin Management Plan Thames River Basin District Environment Agency (December 2009)

Lee and Lee Navigation downstream of Deephams Sewage Works in Tottenham and Walthamstow.

Environmental Permit Conditions

- 4.2.14 The requirements of these European Directives have therefore been reflected in the details of the new environmental permit. The new permit conditions were published by the Environment Agency in March 2010 and are set out in **Table 4.1**.
- 4.2.15 The total suspended solids, biochemical oxygen demand and ammonia-nitrogen elements of the permit must be met at the site by 1 March 2017. The stormwater elements – Flow to Full treatment (FTFT) and tank volume - must be met at the site by 31 March 2017. The other elements of the permit – phosphorus, total iron, total aluminium and dry weather flow – are already in place and are not affected by the Upgrade.

Table 4.1: Deephams Sewage Works Environmental Permit Conditions

		Concentration (mg/l)			
		TSS	BOD	NH ₃ -N	P
Effluent	95 percentile	10	5	1	1 (average)
	Upper tier	--	50	12 Summer 20 Winter	-
	Maximum Admissible Concentration	Total iron – 2500 microgrammes per litre Total aluminium – 1000 microgrammes per litre			
	Dry Weather Flow	232,656 cubic meters per day DWF (NEP)			
Storm	FTFT Consent	20,698 cubic metres per hour (to be exceeded before discharge)			
	Tank Volume	68 litres per head of population (the permit recognises that this figure is yet to be agreed)			

Note: TSS: Total Suspended Solids
BOD: Biochemical Oxygen Demand
NH₃-N: Ammonia-Nitrogen
P: Phosphorus
DWF: Dry weather flow
NEP: National Environment Programme
FTFT: Flows to Full Treatment

- 4.2.16 The storm tank capacity required will be agreed with the Environment Agency by 1 April 2016, following modelling of the sewer catchment. The Upgrade design includes the storm water capacity set out in the permit and, if it is confirmed that this is required by the Environment Agency, it will be delivered near the end of the Upgrade programme.
- 4.2.17 While short term measures may achieve some of the limits set in the new permit requirements, the age and condition of the primary and secondary treatment plant at the sewage works means they cannot be relied upon to meet the more stringent permit conditions from 2017, nor accommodate additional flows from population growth or climate change. The Upgrade of the sewage works is the only means that will enable it to treat sewage to a sufficiently high standard to meet the permit requirements, and to adapt to future treatment needs.

4.3 Consideration of Alternatives

4.3.1 As described in Chapter 2 – Approach to Assessment, Paragraph 2 of Schedule 4 of the EIA Regulations requires an ES to provide

‘An outline of the main alternatives studied by the applicant [...] and an indication of the main reasons for the choice made, taking into account the environmental effects.’

4.3.2 This is reflected in the Government’s Planning Practice Guidance² which states that:

‘Where alternative approaches to development have been considered, the Environmental Statement should include an outline of the main alternatives studied and the main reasons for the choice made, taking into account the environmental effects’

4.3.3 In addition, the Institute of Environmental Management and Assessment best practice guidelines³ recommend that practitioners commit to ensuring that an EIA refers to any development alternatives considered during the process and that the influences of such alternatives on the scheme are set out transparently. In particular, the guidelines encourage practitioners to consider:

- Alternative locations and scales of development;
- alternative site layouts and access arrangements;
- different approaches to scheme design; and
- alternative processes and alternative phasing of construction.

4.3.4 This section therefore sets out a summary of the alternatives that have been studied and the reasons behind the final selection of the scheme presented in Chapter 5 - Description of the Development.

4.3.5 A ‘do nothing’ approach would result in failure to meet the permit requirement and as such is not a realistic alternative, hence it was not considered.

4.3.6 The study of alternatives for the Upgrade project included both consideration of alternative sewage treatment technologies that could meet the new permit requirement as well as alternative sites. Subsequently, different designs and phases of construction were investigated before selecting the final preferred option. As different sewage treatment technologies require different areas of land take, combinations of site sizes and treatment technologies were also considered to ensure that as many options as possible had been covered.

4.3.7 To summarise the outcome of the alternatives study undertaken, the following sections are therefore set out in this chapter:

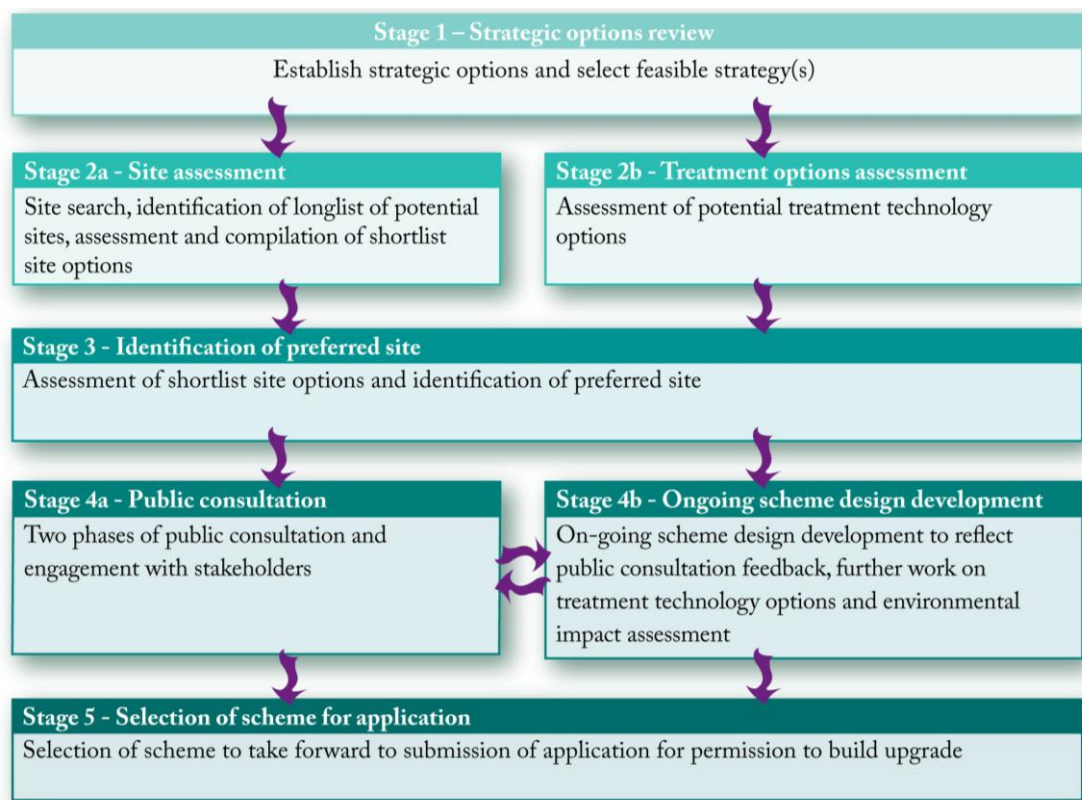
- Assessment methodology (including a description of the environmental criteria used in the selection process);
- Strategic options (Stage 1);
- Identification of sites (Stage 2a);
- Identification of technologies (Stage 2b);
- Identification of preferred site (Stage 3);
- Public consultation (Stage 4a);
- Selection of preferred site; and

² Planning Practice Guidance, Department for Communities and Local Government, 2014. Accessed at <http://planningguidance.planningportal.gov.uk/blog/guidance/environmental-impact-assessment/preparing-an-environmental-statement/>

³ Institute of Environmental Management and Assessment (2011) EIA Quality Mark: Commitments

- Early contractor involvement (Stage 4b).
- 4.3.8 The assessment process is illustrated in **Figure 4.1**.
- Assessment Methodology**
- 4.3.9 The methodology used in the assessment of alternatives was informed by internal technical discussion with the design, planning and environmental team and external consultation with specialist stakeholders through stakeholder forums and specific site selection workshops. An initial review of strategic options for meeting the need for the Upgrade was first undertaken, followed by an assessment of potential treatment options alongside potential development sites. A more detailed assessment of a shortlist of sites was then completed to select the preferred site. This process was consulted on at a first phase of public consultation in 2011.
- 4.3.10 Further scheme design and treatment option assessment work was then undertaken to confirm the feasibility of the preferred site and treatment technology options for the Upgrade.
- 4.3.11 The methodology allowed for the assessment of a range of strategies for meeting the need for the Upgrade. It allowed for the consideration of potential locations for new sewage treatment infrastructure, and treatment technology options to meet the requirements of the new environmental permit within funding, programme, treatment technology and physical site constraints.

Figure 4.1 Alternatives Assessment Methodology



Stage 1 – Strategic Options Review

- 4.3.12 Four strategic options were developed by the project team through informal workshops, and then discussed with stakeholders at a Stakeholder Forum. Each of the strategic options ensured that treatment of the sewage flows from the

Deephams catchment was maintained throughout. These four strategic options were:

- Strategic Option 1: reduce or remove enough of the incoming flow to Deephams Sewage Works to permit each of the existing three treatment streams to be turned off and upgraded in turn via:
 - i) Sub Option 1A: Reduction of flows at source;
 - ii) Sub Option 1B: Transfer of Deephams flows by pipeline to another existing sewage works;
 - iii) Sub-option 1C: Splitting Deephams catchment and transferring flows from part of the catchment to another existing sewage works; and
 - iv) Sub Option 1D: Splitting Deephams catchment and transferring flows from part of the catchment to a new sewage works.
- Strategic Option 2: combine various options from Strategic Option 1 to reduce or remove incoming flow to Deephams Sewage Works;
- Strategic Option 3: build part of a new sewage works on another site and transfer flows between the new plant and the existing Deephams Sewage Works for treatment; and
- Strategic Option 4: construct on Deephams Sewage Works.

4.3.13 Reducing flows at source through implementing off site Sustainable Drainage Systems (SuDs) was not considered to provide an economic alternative to the Upgrade. In addition, while SuDs would reduce the volume of wastewater reaching the sewage works, it would not reduce the pollution load to be treated at the works. This option was therefore discounted.

4.3.14 Transferring flows to other sewage works (sub options 1B, 1C and 1D) were discounted due to the need for new pipelines to be installed linking Deephams to the other sewage works (with associated environmental impacts such as the high carbon emissions associated with pumping and returning sewage between the sewage works). These options were also discounted as they would not be able to treat all of the flow required.

4.3.15 Strategic Option 2 considered the opportunity to combine the smaller options in Strategic Option 1 to reduce the flow arriving at Deephams Sewage Works and treat the remainder of the flow elsewhere. However, this option was discounted due to the cost and environmental impacts (such as high carbon emissions) outweighing that of a single site option.

4.3.16 Strategic Option 3 identified a number of alternative sites where it would be possible to build new primary, secondary and tertiary treatment facilities whilst retaining the inlet and discharge points at the existing Deephams Sewage Works. This option was therefore taken forward for further consideration.

4.3.17 Finally, the option to build the Upgrade on the existing Deephams Sewage Works site was considered. Although reliant upon the ability to maintain the current operation of the works whilst simultaneously developing new treatment streams, this option was considered feasible and taken forward to Stage 2 of the assessment process.

Site Assessment: Stage 2a

4.3.18 The conclusion of the Strategic Options review meant that the only options taken forward for consideration were to either provide an upgrade of the infrastructure at the existing Deephams Sewage Works site (Strategic Option 4), or at a new site whilst retaining the inlet and discharge point at the existing Deephams Sewage Works (Strategic Option 3). To enable these options to be considered alongside

one another to establish the most appropriate means of meeting the identified need, a long list of potential sites for the Upgrade, including the Deephams Sewage Works site, was prepared for further assessment. The detailed identification of sites is provided in the report '*Site Assessment: Stage 2a Report*' (June 2012) in **Appendix 4.1**.

- 4.3.19 This assessment included consideration of site size to ensure that options being considered genuinely had sufficient space to accommodate the minimum necessary development. Sites that did not have enough space could not be deemed to represent suitable site alternatives. Although the area required to construct a new treatment works is dependent on the choice of treatment technology and the differences in area requirements can be considerable, a minimum site size of 8 hectares was used as the basis for identifying possible new sites.
- 4.3.20 The site search area was determined by key criteria such as, irrespective of where the Upgrade was developed, the need to retain the main inlet and the preliminary treatment works (inlet screens and screenings handling plant, grit removal and storm tanks), on the existing Deephams Sewage Works site, together with the existing sludge treatment facilities. This is because these elements of the works do not require any significant upgrading to meet the new environmental permit requirements. It was also agreed with the Environment Agency⁴ that the discharge point for treated effluent would remain in the same location, from an outfall channel leading into Salmons Brook. On that basis, any off-site Upgrade would need to pump treated sewage from the existing site to the new site for full treatment, and then return treated effluent and sludge to Deephams Sewage Works.
- 4.3.21 The further the new site is from the existing sewage works, the greater the energy that would be needed to pump sewage and treated effluent between the two sites. The energy required for pumping increases both with distance from the Deephams Sewage Works and with increases in elevation from the existing site. Furthermore, the greater the distance from Deephams, the longer the tunnel or transfer pipeline required, and so the greater the construction, maintenance and associated environmental impacts.
- 4.3.22 An assumption was therefore made that where the required energy for the transfer of flows was greater than 20 per cent of the existing mains energy requirement for the current sewage works treatment processes, the high carbon emissions would not be acceptable and the option would be discounted.
- 4.3.23 Finally, only a small number of exclusion criteria were applied when seeking to identify potential sites, so that an appropriately wide list of potential sites was available for assessment at the long list stage. The only types of sites excluded from the search were those in residential use, cemeteries, schools and hospitals.
- 4.3.24 Potential sites within the site search area were then assessed against a matrix of defined property/legal, planning and environmental and engineering criteria. The environmental criteria used to select suitable sites included:
- are any heritage designations within 1km radius of the proposed site affected?
 - are any landscape/townscape designations affected?
 - are any nature conservation designations within 1km radius of the proposed site affected?
 - is Metropolitan open land / green belt affected?
 - are recreational sites or rights of way affected?

⁴ Email from Environment Agency London Team, to Thames Water, 7 June 2011

- are important clean water resources affected?
- 4.3.25 Red, Amber and Green classifications were used to highlight the potential significance of the different assessment criteria for each site, with red indicating significant constraints and/or project risks, and green indicating few constraints or risks.
- 4.3.26 The assessment resulted in twenty two potential sites being included on the long list, including the existing Deephams Sewage Works site; sites in existing industrial or employment use; and sites in use as formal or informal open space or for recreation. The twenty two long listed sites are shown in **Table 4.2** and within the wider search area in **Figure 4.2**.

Table 4.2: Long List of Potential Sites

Site Name	Area(ha)	Summary of identified use
1 Deephams Sewage Works	35	Existing sewage works site (inclusive of inlet works, storm tanks and sludge treatment areas)
2 Durants Park, Hertford Road	16	Public open space – park, including pitches, tennis courts and grassed areas
3 Brimsdown Industrial Estate (Jeffreys Road)	23	Mixed industrial and employment uses
4 Brimsdown Industrial Estate (East Duck Lees Lane)	13	Mixed industrial and employment uses
5 Woodall Road industrial area	9	Industrial estate and former gasholders site (Academy school proposed on part of the site)
6 Meridian Business Park (Morson Road)	14	Mixed industrial and employment uses
7 Elliots Field Allotments Aspen Way	8	Allotments
8 Jubilee Park	20	Public open space – park including sports pitches, ball courts, playgrounds and pitch and putt
9 Lee Valley Leisure Complex Golf Course (southern part)	23	Southern part of larger golf course, and campsite
10 Chingford Rugby Football Club and golf driving range	15	Sports pitches, rugby football club, driving range and adjoining car showroom and retail uses
11 Ardra Road North Industrial Area	21	Mixed employment uses
12 Pymmes Park	16	Public open space – sports pitches, woodland, open water and related uses
13 Montagu Industrial Estate	12	Mixed industrial and employment uses
14 Edmonton Eco Park	15	Edmonton Incinerator and adjoining industrial estate – mixed industrial and employment uses
15 Lower Hall	16	Thames Water operational land, partially used for construction & demolition waste management
16 Eley Industrial Estate	27	Mixed industrial and employment uses
17 Meridian Water East	19	Mixed industrial and employment uses. Part of Meridian Water Regeneration Allocation
18 Meridian Water Central	30	Retail and retail warehousing (Tesco, Ikea and others) and employment uses. Part of Meridian Water Regeneration Allocation
19 Brantwood Road	18	Mixed industrial and employment uses

Site Name	Area(ha)	Summary of identified use
Industrial Area		
20 Watermead Way Industrial Area	21	Mixed industrial and employment uses
21 Land at Walthamstow Avenue and Chingford Road	25	Retail (Sainsbury & Morrisons), open space (sports pitches), allotments, hotel and employment units
22 Tottenham Marshes (northern part)	18	Open space / common land and nature reserve in the Lee Valley Regional Park

4.3.27 Application of the assessment criteria to each of the sites listed above enabled those sites which had the greatest potential to deliver either Strategic Option 3 or 4 to be identified. The performance of each site against the selection criteria is set out in the Stage 2a report in **Appendix 4.1**, with the reasons why the site was subsequently shortlisted or rejected from further consideration.

4.3.28 The assessment concluded that the following sites performed best against the planning / property, engineering and environmental criteria:

- Site 1 – Deephams Sewage Works
- Site 6 – Meridian Business Park
- Site 9 – Lee Valley Leisure Complex Golf Course (Southern part)
- Site 11 – Ardra Road North Industrial Area
- Site 15 – Lower Hall

4.3.29 These sites were shortlisted and were taken forward for consideration alongside the identification of suitable technologies. The shortlisted sites are shown in **Figure 4.3.**

Identification of Technologies (Site Assessment Stage 2b)

4.3.30 The next step in the identification of a suitable site was consideration of the potential treatment technologies that could be used and their associated land use requirements.

4.3.31 A process similar to the identification of sites was carried out alongside the site assessment work to identify which technologies would be most appropriate for further assessment and to then provide a ‘mock’ design of how those technologies would work at the identified shortlist sites.

4.3.32 Firstly, a strategic preliminary engineering assessment of potentially viable treatment options identified was carried out to consider sewage treatment options against consistent factors that would affect their suitability for the Upgrade. A detailed description of the different treatment technologies that were considered is set out in the ‘*Treatment Options Assessment Stage 2b*’ report (June 2012) provided as **Appendix 4.2**, along with the results of the assessment.

- 4.3.33 For the primary stage treatment both conventional and lamella primary tanks were considered to have potential for use as part of the Upgrade. The secondary stage of treatment could be served by either Conventional Activated Sludge, Integrated Fixed-film Activated Sludge (IFAS), Biological Aerated Flooded Filter or Membrane Bioreactors technologies.
- 4.3.34 Given there were a range of options available for the secondary treatment stage a further assessment process was carried out for the four identified technologies. Each was aligned with an appropriate primary treatment configuration including chemical dosing into the primary treatment system for phosphorus removal and conventional final settlement and sand filter tertiary treatment (where needed to meet the new Environmental Permit conditions).
- 4.3.35 These options were then developed into a conceptual generic layout to facilitate estimates of capital costs, operating costs and the associated outline construction programmes. These layouts, costs and programmes were then evaluated for each of the four technologies against a standard set of criteria, included within **Appendix 4.2**. Each option was graded against those criteria to record areas of interest in the performance of the technology, whether these are potentially positive or negative.
- 4.3.36 As a result of the assessment, the secondary treatment options taken forward to be used as part of the process to identify the preferred site were:
- Conventional Activated Sludge for the treatment of the entire flow;
 - Integrated Fixed-film Activated Sludge for the treatment of the entire flow, or parts of the flow (IFAS could reduce the required footprint when compared to Conventional Activated Sludge treatment); and
 - Membrane Bio Reactor for the treatment of parts of the flow (there are concerns over experience of this technology on a Deephams Sewage Works scale, and on energy and cost grounds, however its use could reduce the area of land required when compared to Conventional Activated Sludge treatment).
- 4.3.37 At this stage, it was decided not to take Biological Aerated Flooded Filter forward in the assessment.

Identification of Preferred Site (Site Assessment Stage 3)

- 4.3.38 Once a list of shortlisted sites and suitable treatment technologies had been selected, a further assessment was completed in order to identify the preferred site. A detailed description of the assessment is provided in '*Identification of Preferred Site Stage 3 Report*' (June 2012) provided in **Appendix 4.3**.

Assessment of the Shortlisted Sites and Technologies

- 4.3.39 Preliminary design work on each of the shortlisted sites included the preparation of preliminary layouts showing the extent of the built development and the preparation of potential construction programmes. Due to their size or shape, some of the shortlisted sites were capable of only accommodating a single treatment technology option, whereas others could accommodate a number of treatment options.
- 4.3.40 The decision on the number of preliminary layouts that were prepared for each site took account of the extent to which different treatment options were considered likely to give rise to significantly different assessment results on the shortlisted sites that may affect the selection of a preferred site.
- 4.3.41 On the Deephams Sewage Works site, for example, different treatment technology options could result in different development areas being required, or construction programmes, as a result of the need to phase development alongside the existing

operational works. On other sites where there would not be a phasing requirement, the differences between treatment technology layouts and programmes, and the impacts potentially arising from them, was more limited.

- 4.3.42 The assessment of each alternative site, along with the reasons for the selection of the preferred site, is described in the following sections.

Site 6 Meridian Business Park: Outcomes of Assessment

- 4.3.43 Meridian Business Park contained in excess of twenty interested parties or employers and it was considered that as the site was in multiple ownership it would be necessary to acquire the land and relocate any existing uses before construction of the Upgrade could commence. Land acquisition costs and risks were therefore complex and could have potentially delayed commencement of construction or at worst frustrated the delivery of the Upgrade on the site. The site also comprised one of LBE's 'place shaping priority areas', and so development could have conflicted with the Council's aims to use the site to retain and promote employment locally.
- 4.3.44 Development on this site would introduce a new odour source into the Ponders End area, which would need to be controlled and mitigated to avoid odour impacts. The development would also be within close proximity of residential properties, a new Academy school and close to the Green Belt, Lee Valley Regional Park and the Lee Valley Leisure Complex Golf Course, on which particular impacts and habitat loss would occur during construction of the pipeline between the Business Park and Deephams Sewage Works.
- 4.3.45 Because of the size of the site, there would be limited space for any on site landscaping or other environmental mitigation likely to be required. The site would not be capable of being screened from views and flooding, nature conservation and other mitigation may have had to be provided off site. There would also be ongoing financial and carbon costs associated with pumping sewage, effluent and sludge during the operation of the upgraded works.

Site 9 Lee Valley Leisure Complex Golf Course (southern part): Outcomes of Assessment

- 4.3.46 The entire site is owned by the Lee Valley Regional Park Authority and is in active use as a golf course and camp site. It forms part of the wider Lee Valley Leisure Complex, including the regionally important athletics centre. Through meetings with Thames Water the Regional Park Authority confirmed that it would not make the land available for development and would strongly resist any attempts to acquire it.⁵
- 4.3.47 Given this position, there were considerable risks to the development of the site due to the acquisition process. The site was considered to not be readily available for the Upgrade.
- 4.3.48 The site is also within the Green Belt and Lee Valley Regional Park and it is in active open space/recreational use. The development of the Upgrade on this site would conflict with national, regional and local planning policy that seeks to prevent inappropriate development within the Green Belt, to protect the Regional Park and to prevent the loss of designated Open Space. The development also had similar potential environmental impacts to other sites but these were considered capable of being addressed through appropriate mitigation measures.

⁵ Meeting between Lee Valley Regional Park Authority and Thames Water 23 May 2011

Site 11 Ardra Road: Outcomes of Assessment

- 4.3.49 As with the Meridian Business Park, this site had multiple ownerships making it possible that complex land acquisition processes could delay or frustrate the delivery of the Upgrade. The site is also designated as Strategic Industrial Land and lies within one of LBE's 'place shaping priority areas', for which it is an important area of job opportunities. Use of the site for the proposed development would conflict with both of these designations.
- 4.3.50 The development of the Upgrade would be close to residential properties and close to the Green Belt and Lee Valley Regional Park. Parts of the site are at risk of flooding and mitigation would need to be provided either on or off site.
- 4.3.51 As the site lies immediately adjacent to the Deephams Sewage Works site, the transfer pipelines for sewage, treated effluent and sludge would only need to be short, incurring less additional financial costs and environmental impacts than the other shortlisted sites.

Site 15 Lower Hall: Outcomes of Assessment

- 4.3.52 Lower Hall is a site owned by Thames Water but leased to a waste contractor. As the site would not need to be acquired, and the Upgrade could be built in a single phase, Lower Hall was the option that could deliver the upgrade in the shortest timescale, subject to securing consents for the scheme.
- 4.3.53 However, the site is within the Green Belt and the Lee Valley Regional Park and development of the Upgrade on this site would therefore conflict with national, regional and local planning policy that seeks to prevent inappropriate development within the Green Belt and to protect the Regional Park. It would be necessary to justify why an exception to normal policies should be made in order to secure permission on this site. This would have to include consideration of the availability of alternative options including the options on the existing Deephams Sewage Works site.
- 4.3.54 The development of the Upgrade on this site would introduce a new odour source into the local area, which would need to be controlled and mitigated to avoid odour impacts. The site partly lies within flood zone 3 and so off site flood compensation storage would most likely be required through land purchase elsewhere. The size of the site would limit the land available for on site landscape or ecological mitigation, which would be required due to the loss of habitat within the Lea Valley Site of Metropolitan Importance for Nature Conservation and the open nature of the surrounding land.

4.4 Identification of the Preferred Site

- 4.4.1 As an established sewage treatment works, Deephams Sewage Works had considerable benefits as the land is already in Thames Water's ownership. Its continued use as a sewage works was an appropriate use for the site, and consistent with national, regional and local planning policies. All of the existing sewers within the catchment drained to the site and it contained the discharge point for treated effluent. Upgrading the existing works would take advantage of this existing infrastructure and avoid the need for costly pipeline transfers with associated environmental effects.
- 4.4.2 Providing the Upgrade at Deephams was considered to have some potential environmental impacts such as loss of habitat along the eastern boundary closest to the Lea Valley Site of Metropolitan Importance for Nature Conservation, and potential disturbance to the nearby Chingford Reservoirs Site of Special Scientific

Interest. Some potential impacts were also identified in relation to the proposed use of a nearby Thames Water site as a construction compound. The potential for dust, noise and odour impacts during construction was also identified in relation to nearby sensitive residential receptors.

- 4.4.3 However, mitigation measures and good site practice were considered capable of overcoming the potential impacts and the site had good access links that did not require construction traffic to use nearby residential roads. As sewage, effluent and sludge did not need to be transferred between two sites, there were also benefits in terms of lower carbon emissions associated with pumping. By using either Integrated Fixed-film Activated Sludge or Membrane Bio Reactor technology, it was also possible to reduce the footprint of the development within the site.
- 4.4.4 Redeveloping and upgrading the existing site was noted to be technically challenging as the existing works has to continue to function throughout construction and it was deemed there was a risk of not meeting the Environmental Permit date or not being able to maintain the existing permit conditions while the Upgrade was constructed.
- 4.4.5 As with all of the shortlisted sites, competitive tendering was seen as the most cost effective means for customers of identifying the detailed construction and design needed to overcome these challenges.
- 4.4.6 The development of the Upgrade on this site would be in compliance with planning policy. It would not involve the potential compulsory purchase of land, land acquisition costs and related risks to the timetable and delivery of the Upgrade. This meant that the use of the Deephams Sewage Works site had significant advantages over the other shortlisted sites.
- 4.4.7 Provided that the challenges of upgrading the existing site alongside the continued operation of the existing works could be met, it was concluded that the preferred site should therefore be the existing Deephams Sewage Works site.

Phase 1 Consultation (Site Assessment Stage 4a)

- 4.4.8 Following selection of the Deephams Sewage Works site as the preferred location for the Upgrade, the outcome of the studies were presented during the first phase of public consultation from 3 July 2012 to 24 October 2012. The Phase 1 Consultation process is explained in more detail in the planning supporting statement and accompanying Statement of Community Involvement.
- 4.4.9 The results of the consultation showed that whilst some community respondents were against the preferred option of developing the upgrade on the existing Deephams Sewage Works site, most responses showed clear support for the need to upgrade Deephams Sewage Works on site and to improve river water quality. Technical, stakeholder and community respondents raised concerns about the potential impacts of the upgrade on the local environment and local residents, particularly with respect to odour and other potential impacts, such as noise and traffic, during the construction and operation of the Upgrade. The need to deliver a significant reduction in odour emissions from the site, compared to existing levels, was the most often-stated issue to be addressed.
- 4.4.10 Analysis of the consultation responses therefore confirmed Thames Water's conclusion that the preferred site for delivering the Deephams Sewage Works Upgrade was the existing Deephams Sewage Works site.

Early Contractor Involvement & Selection (Stage 4b)

- 4.4.11 Following confirmation that the preferred site was the existing Deephams Sewage Works site, Thames Water shortlisted two design and build contractors to develop alternative designs for the Upgrade through a competitively tendered process from which one preferred contractor would be selected.
- 4.4.12 The documents prepared for the tender process set out the requirements for the design, construction and commissioning of the Upgrade on the existing sewage works site, alongside the requirement to work collaboratively with the project team to assist the production of the planning application required for the Upgrade.
- 4.4.13 The aim was to address planning and environmental impacts through design from the tender stage onwards and the tender documents therefore provided both contractors with a list of environmental issues that needed to be considered in the development of their bids. This list was based on preliminary identification of the likely sensitive environmental issues by the environmental and planning consultant team.
- 4.4.14 Environmental and sustainability criteria were used in the selection of the preferred contractor through a process which allowed the environmental team to challenge the two contractors' designs and make further improvements to the final submitted tender proposals. The successful contractor was appointed in December 2013 and the design for the Upgrade has since been developed iteratively with the project team.

Alternative Design

- 4.4.15 Thames Water considers that the proposed phasing and layout in the Upgrade planning application represents the most appropriate means of delivering the Upgrade.
- 4.4.16 However, the unsuccessful contractor provided an alternative design scheme which is illustrated in **Figure 4.4**. The alternative design would have involved a single phase of new construction work, involving the demolition of the existing wastewater Stream A and construction of two new treatment streams. The new treatment streams would have been predominantly on the existing Stream A footprint, but would have extended further to the north, east and west than the current treatment infrastructure. Although the alternative design would have concentrated sewage treatment infrastructure onto a smaller footprint on the site, this would have reduced the distance from the edge of the works to the residential properties in Picketts Lock Lane. Following construction of the two new treatment streams, existing Streams B and C would have been decommissioned and demolished, leaving a large area within the site available for future Thames Water use.
- 4.4.17 Combined consideration of engineering process issues, cost, innovation and sustainability were key to the decision not to proceed with the alternative design presented in **Figure 4.4**. The alternative design was considered to have greater potential for environmental impacts such as:
- More extensive ground disturbance as a result of the total removal of the existing tanks including their bases, providing potential for contaminated land and archaeological impacts and generating more Heavy Goods Vehicle movements;
 - closer proximity to residential properties on Picketts Lock Lane resulting in greater risk of construction impacts (such as noise, dust and air quality);
 - off site impacts and additional land take from the requirement for an off site storage compound on the adjacent Lower Hall site; and

- greater loss of trees and scrub along the northern boundary of the site.

Preferred Design

- 4.4.18 The preferred design submitted by the appointed contractor had several environmental advantages, both through re-using many of the existing structures and through careful design to reduce the impact on neighbouring sensitive receptors. There was also no need for an offsite construction compound, meaning that all the development was contained within the existing sewage works site boundary.
- 4.4.19 The preferred and alternative designs were presented at a second stage of public consultation from 18 February to 8 April 2014.
- 4.4.20 Feedback during Phase 2 public consultation (full details of which are provided in the Statement of Community Involvement) was generally in favour of the preferred design. Comments were received in support of the proposal to reuse the bases of the existing tanks and plans to allow for future expansion. Comments received also noted that the operations creating the greatest odour on site should be kept as far away from residents as possible. Feedback was also received on the level of odour control proposed as part of the Upgrade.
- 4.4.21 Although the preferred design was not substantially amended as a result of consultation, the amount of odour control was increased to take account of comments received during the public consultation. The preferred design includes covering and odour control of the inlet works, primary settlement tanks, anoxic zones of the aeration lanes, and the secondary sludge digesters. The process of considering odour mitigation options is described in Chapter 15 – Odour. The final design used for the purposes of the assessment is described in detail in Chapter 5 – Description of the Development.

