Thames Tideway Tunnel
Thames Water Utilities Limited

Thames Water

Development Consent Order

Application Reference Number: WWO10001

Documents for Certification
September 2014

We, Lindsay Speed and Sarah Fairbrother hereby certify that this is a true copy of the environmental statement referred to in Article 61 (1) (f) of the Thames Water Utilities Limited (Thames Tideway Tunnel) Order 2014.

Lindsay Speed Sarah Fairbrother

September 2014

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

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Section 1: Introduction

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1 Introduction

1.1.1 This volume of the *Environmental Statement* of the Thames Tideway Tunnel project presents the results of the environmental impact assessment (EIA) of the proposed development at the Falconbrook Pumping Station site.

1.1.2 The proposal at this site is to intercept the existing Falconbrook Pumping Station combined sewer overflow (CSO), which currently discharges approximately 42 times a year. The total discharge volume is approximately 709,000m^3 in a typical year.

1.1.3 The site and environmental context are described in Section 2. The proposed development, comprising both the construction and operational phases, is described in Section 3. Those elements of the proposal for which development consent is sought are described followed by a description of the assumptions applied to the assessment of construction and operational effects. Finally in Section 3.6, the main alternatives which have been considered for this site are presented.

1.1.4 Sections 4 to 15 present the environmental assessments for each topic, which are presented alphabetically. The order of these topics and the structure of each assessment remains the same across different sites.

1.1.5 Figures and appendices for this site are appended separately (Vol 11 Falconbrook Pumping Station figures volume and Vol 11 Falconbrook Pumping Station appendices). In addition, there is a separate glossary and abbreviations document which explains technical terms used within this assessment.

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Section 2: Site context

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2 Site context

2.1.1 The proposed development site is located in the London Borough (LB) of Wandsworth. The site comprises two parts; a main site including the Thames Water Falconbrook Pumping Station and a disused public convenience, and the Falconbrook Pumping Station highway works site. The sites are defined by the limits of land to be acquired or used (LLAU) and cover an area of approximately 0.45 hectares for the main site and 0.1 hectares for the highway works site. The site context and location is indicated in Vol 11 Figure 2.1.1 (see separate volume of figures).

2.1.2 The main site is bounded to the north by the York Gardens Adventure Playground and to the east and southeast of the site by York Gardens and the York Gardens Library and Community Centre. York Road (A3205) forms the western boundary of the site. The highway works site is on a section of York Road on the northwestern boundary of York Gardens. Vol 11 Plate 2.1.1 below provides an aerial view of the site.

Vol 11 Plate 2.1.1 Falconbrook Pumping Station – aerial photograph

2.1.3 Within the site, it is almost entirely hardstanding and buildings, the majority of which comprise the operational Thames Water Pumping Station. The general pattern of existing land uses within and around the site is shown in Vol 11 Figure 2.1.2 (see separate volume of figures). The site context is illustrated in Vol 11 Plate 2.1.2 – Vol 11 Plate 2.1.5 below.

Vol 11 Plate 2.1.2 Falconbrook Pumping Station – York Road

Vol 11 Plate 2.1.3 Falconbrook Pumping Station – view looking towards Falconbrook Pumping Station from York Road

Vol 11 Plate 2.1.4 Falconbrook Pumping Station – view of Pennethorne House

Vol 11 Plate 2.1.5 Falconbrook Pumping Station – York Gardens Library and Community Centre

2.1.4 Existing access to Falconbrook Pumping Station is through York Gardens to the east. Access to the Transport for London Road Network through York Road (A3205) is via Lavender Road, Darien Road, Ingrave Street and Falcon Road. The closest railway station is Clapham Junction, located approximately 800m walking distance to the southeast of the site.

2.1.5 Environmental designations for the site and immediate surrounds are shown in Vol 11 Figure 2.1.3 (see separate volume of figures).

2.1.6 The site lies within the Wandsworth Air Quality Management Area (AQMA) declared for particulate matter (PM_{10}) and nitrogen dioxide (NO_2).

2.1.7 The site lies within the York Gardens Site of Importance for Nature Conservation (SINC) (Local importance) (see Vol 11 Plate 2.1.6) and is within 200m of the River Thames and Tidal Tributaries SINC (Metropolitan importance).

Vol 11 Plate 2.1.6 Falconbrook Pumping Station – York Gardens Site of Importance for Nature Conservation

2.1.8 There are no listed buildings within or adjacent to the site.

2.1.9 The site does not lie within and is not adjacent to a Conservation Area. However, the site does form part of the Wandsworth Archaeological Priority Area.

2.1.10 There are no tree preservation orders (TPOs) in effect within or adjacent to the site.

2.1.11 Land quality at the site is influenced by historical onsite and offsite activities, specifically; a former sewage pumping station building and electricity generation facilities and the current pumping station. The geology of the site consists of made ground, alluvium, river terrace deposits, London clay, Lambeth group and Thanet sand.

2.1.12 The site is located in Flood Zone 3a (1 in 100 year flood event) but is defended to the 1 in 1000 year flood level.

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Volume 11: Falconbrook Pumping Station site assessment

Section 3: Proposed development

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3 Proposed development

3.1 Overview

3.1.1 The Falconbrook Pumping Station site is a CSO site. The proposed development at Falconbrook Pumping Station would intercept the existing Falconbrook Pumping Station CSO. A CSO drop shaft would be constructed and from the base of the shaft there would be an underground connection tunnel which would join up with the main tunnel. There would also be a combined interception and valve chamber, and various other structures including culverts, pipes and ducts to modify, connect, control, ventilate and intercept flows from the CSO to the main tunnel.

3.1.2 The geographic extent of the proposals for which the development consent is sought is defined by the limits of land to be acquired or used (LLAU).

3.1.3 This section of the assessment provides a description of the proposed development. The defined project for which consent is sought is described in Section 3.2. In Section 3.3, assumptions are presented on how the development at this site is likely to be constructed and include the assumed programme and typical construction activities. Section 3.4 sets out operational assumptions in terms of operational structures and typical maintenance regime. These construction and operational assumptions underpin the assessment.

3.1.4 Other developments may become operational in advance of or during the Thames Tideway Tunnel project thereby changing the baseline conditions. In order to undertake an accurate assessment it is necessary to compare the predicted situation with the Thames Tideway Tunnel project in place with this future baseline conditions (‘base case’) (rather than comparing it with the current conditions). In addition, other developments may be under construction at the same time as construction or operation of the Thames Tideway Tunnel project and this could lead to cumulative effects. Information regarding schemes included in the base case and in the cumulative assessment is summarised in Section 3.5 with details included in Vol 11 Appendix N. The methodology for identifying these schemes is explained in Volume 2 Environmental assessment methodology. Finally, Section 3.6 describes any on-site alternatives considered.

3.2 Defined project

3.2.1 This section identifies only those elements of the proposals for which consent is sought and so those which can be regarded, subject to approval, as being ‘certain’ or nearly so (eg, indicative locations).

3.2.2 Vol 11 Table 3.2.1 below lists the plans and documents for which consent is sought and which have been assessed.

Vol 11 Table 3.2.1 Falconbrook Pumping Station – plans and documents defining the proposed development

Document / plan title	Status	Location
Proposed schedule of works	For approval	Schedule 1 of *The Draft Thames Water Utilities Limited (Thames Tideway Tunnel) Development Consent Order 201[ ] (Draft DCO)* (and extracts below)
Site works parameter plan	For approval	Vol 11 Falconbrook Pumping Station Figures – Section 1
Demolition and site clearance plan (sheets 1 and 2)	For approval	Vol 11 Falconbrook Pumping Station Figures – Section 1
Access plan	For approval	Vol 11 Falconbrook Pumping Station Figures – Section 1
Proposed landscape plan	Indicative (save for the layout of above-ground structures which is Illustrative)	Vol 11 Falconbrook Pumping Station Figures – Section 1
Kiosk, wall and valve chamber design intent	Indicative	Vol 11 Falconbrook Pumping Station Figures – Section 1
Design principles: generic	For approval	*Design Principles* report Section 3 (see Vol 1 Appendix B)
Design Principles: site specific principles (Falconbrook Pumping Station)	For approval	*Design Principles* report Section 4.8 (see Vol 1 Appendix B)
Code of Construction Practice Part A: general requirements	For approval	*CoCP* Part A (see Vol 1 Appendix A)
Code of Construction Practice Part B: Site specific requirements (Falconbrook Pumping Station)	For approval	*CoCP* Part B Falconbrook Pumping Station (see Vol 1 Appendix A)

Description of the proposed works

3.2.3 Schedule 1 to the *Draft DCO* describes the proposed works for which development consent is sought. The schedule describes the main tunnel, connection tunnels and also the works which would be required at each of the proposed sites within the project. This includes the works comprising the nationally significant infrastructure project and associated development (which are described in Part 1 of Schedule 1) and ancillary works (which are described in Part 2 of Schedule 1).

3.2.4 The following sections provide a description of the proposed works at this site under three headings: Nationally significant infrastructure project, Associated development and Ancillary works. The description of the proposed works has been taken from Schedule 1 to the *Draft DCO* and the codes given for the works are those given within that schedule.

3.2.5 In accordance with the *Draft DCO*, all distances, directions and lengths referred to are approximate. All distances for scheduled linear works referred to are measured along the centre line of the limit of deviation for that work. Internal diameters for tunnels and shafts are the approximate internal dimensions after the construction of a tunnel lining. Unless otherwise stated, depths are specified to invert level and are measured from the proposed final ground level.

Nationally significant infrastructure project

3.2.6 The proposed structures and works required at this site which comprise the nationally significant infrastructure project are as follows:

a. **Work No. 10a**: Falconbrook Pumping Station CSO drop shaft - A shaft with an internal diameter of 9 metres which extends 1 metre above the proposed ground level and which has a depth (to invert level) of 40 metres (measured from the top of Work No. 10a).

b. **Work No.10b**: Falconbrook connection tunnel - A tunnel between Falconbrook Pumping Station CSO drop shaft (Work No. 10a) and the main tunnel (west central) (Work No. 1b)

Associated development

3.2.7 The proposed structures and works required at this site which comprise associated development are as follows:

a. **Work No. 10c:** Falconbrook Pumping Station associated development - Works to intercept and divert flow from the Falconbrook Pumping Station CSO to the Falconbrook Pumping Station CSO drop shaft (Work No. 10a) and into the Falconbrook connection tunnel (Work No. 10b) including the following above and below ground works and structures:

   i demolition of existing screen house and disused public convenience to include the formation of new cover slabs on the existing substructure, demolition of boundary wall to Pumping Station and subsequent rebuilding, removal of existing railings between York Gardens and York Road, and demolition of advertising screen ii construction of an interception chamber, hydraulic structures, chambers with access covers and other structures including culverts, pipes and ducts to modify, connect, control, ventilate, de-aerate, and intercept flows.

iii construction of structures for air management plant and equipment including filters and ventilation columns and associated below ground ducts and chambers

iv construction of pits, chambers, ducts and pipes for cables, hydraulic pipelines, utility connections, utility diversions and drainage, including facilities for drainage attenuation

v relocation of existing Pumping Station vehicle access

vi relocation of bus stop (including provision of new layby)

vii construction of temporary accesses for construction from York Way and subsequent reinstatement to original layout

3.2.8 The maximum heights of above-ground structures which are for approval, as shown on the Site works parameter plan (see separate volume of figures – Section 1) are as follows:

a. valve chamber: 2.0m

b. ventilation column(s) serving the drop shaft: 8m (with minimum of 4m)

c. ventilation column(s) serving the interception chamber: 6m

d. ventilation structure(s): 3m.

3.2.9 In addition, further works are required at this site that constitutes associated development within the meaning of section 115(2) of the Act. These comprise:

a. establishment of temporary construction areas at each works site to include, as necessary, site hoardings/means of enclosure, demolition (including of existing walls, fences, planters, and other buildings and other above and below ground structures), provision of services, including telecommunications, water and power supplies (including substations) including means of enclosure, and ground preparation works including land remediation and groundwater de-watering

b. provision of welfare/office accommodation, workshops and stores, storage and handling areas, facilities for and equipment for processing of excavated materials, treatment enclosures and other temporary facilities, plant, cranes, machinery, temporary bridges and accesses, and any other temporary works required

c. in connection with Work Nos. 5, 6, [8] , 11, 12, 13, 14, 15, 16, 17, 19, [23], 24 [and 26] the provision of temporary moorings (including dolphins) and other equipment and facilities for temporary use by barges, pontoons and other floating structures and apparatus (including as necessary piling for support of such structures) for use in construction of those works, and works for the strengthening of river walls and other flood protection defences

d. temporary removal of coach and car parking bays and creation of temporary replacement coach and car-parking as required and temporary footpath diversions

e. restoration of temporary construction areas, works to restore and make safe temporary work sites and work areas, including (as necessary) removal of hardstanding areas, temporary structures and other temporary works and works to re-establish original ground levels

f. works to trees

g. works to create temporary or permanent landscaping, including drainage and flood compensation, means of enclosure, and reinstatement / replacement of, or construction of, boundary walls and fences including gates

h. formation of construction vehicle accesses and provision of temporary gated or other site accesses and other works to streets

i. diversions (both temporary and permanent) of existing traffic and pedestrian access routes and subsequent reinstatement of existing routes, and works to create permissive rights of way

j. modifications of existing accesses, railings and pedestrian accesses

k. provision of construction traffic signage

l. relocation of existing bus stops and provision of temporary bus lay-bys

m. construction of new permanent moorings and piers, including access brows, bank seats, gangways and means of access

n. permanent and temporary works for the benefit or protection of land or structures affected by the authorised project (including protective works to buildings and other structures, and works for the monitoring of buildings and structures)

o. temporary landing places, moorings or other means of accommodating vessels in the construction and/or maintenance of the authorised project

p. provision of buoys, beacons, fenders and other navigational warning or ship impact protection works

q. such other works as may be necessary or expedient for the purposes of or in connection with the construction of the authorised project which do not give rise to any materially new or materially different environmental effects from those assessed in the Environmental Statement

3.2.10 The works defined by bullets c, k, m, o and p in the above list are not considered likely to be applicable to the works proposed at this site. The references to groundwater de-watering in bullet a, removal of coach parking in bullet d and flood compensation areas in bullet g are also not considered to be relevant.

Ancillary works

3.2.11 These works are not ‘development’ as defined in section 32 of the Planning Act 2008, they do however form part of the Thames Tideway Tunnel project for which development consent will be sought and are included within Schedule 1 to the *Draft DCO.*

3.2.12 The following ancillary works are set out in Schedule 1 to the *Draft DCO*:

a. works within the existing sewers, chambers and culverts and other structures that comprise the existing sewerage network for the purposes of enabling the authorised project, including reconfiguring, modifying, altering, repairing, strengthening or reinstating the existing network

b. works within existing pumping stations including structural alterations to the interior fabric of the pumping station(s), works to reconfigure existing pipework, provision of new pipework, new penstock valves and associated equipment, modification of existing electrical, mechanical and control equipment, and installation or provision of new electrical, mechanical and control equipment

c. installation of electrical, mechanical and control equipment in other buildings and kiosks and modification to existing electrical, mechanical and control equipment in such buildings and kiosks

d. installation of pumps in chambers and buildings

e. works to trees and landscaping works not comprising development

f. works associated with monitoring of buildings and structures

g. provision of construction traffic signage

h. the relocation of boats/vessels

3.2.13 The works defined by bullet h in above list is not considered likely to be applicable to the works proposed at this site.

Design principles

3.2.14 The design principles for the project have been developed with stakeholders and set the parameters that must be met in the final detailed design of the above-ground structures and spaces associated with the project. The principles apply only to the operational phase of the project (ie, the permanent structures).

3.2.15 The generic principles include principles for the integration of functional components and also principles for heritage, in-river structures, landscape, lighting and site drainage.

3.2.16 The design principles form an integral part of the project and are assumed to be implemented within the design of the operational development. Where individual principles are relevant to a particular topic, this is indicated within the relevant assessments.

3.2.17 The *Design Principles* report is provided in Vol 1 Appendix B.

Site features and landscaping

3.2.18 Upon completion of the works, the Proposed landscape plan (see separate volume of figures – Section 1) shows the proposed reinstatement and landscape at this site, taking account of the design principles above. Elements shown in the proposed landscape plan (save for the layout of above-ground structures) are indicative and therefore have been assessed as part of the EIA for this site. The layout of the above-ground structures is illustrative, and has not been assessed.

3.2.19 The electrical and control equipment would be located within the existing pumping station building. The ventilation column(s) and ventilation structure would be located within the existing Falconbrook Pumping Station compound. The ventilation structure would include a brown roof.

3.2.20 The pumping station compound wall would be reinstated after construction. This would incorporate an opening to allow for visual connection during maintenance.

3.2.21 Existing gate access to the pumping station compound would be relocated to the southern facade of compound and a new public entrance provided to the site from York Road. The existing bus stop opposite York Gardens Public Library in York Road would be reinstated.

3.2.22 Planting would be provided around the pumping station compound. The area over the proposed drop shaft would not have soft landscaping to allow access to drop shaft.

3.2.23 There would be a single surface paving treatment to the new area, allowing for paving to continue to the York Garden Library and Community Centre entrance to integrate spaces.

Code of Construction Practice

3.2.24 All works would be undertaken in accordance with the *Code of Construction Practice (CoCP)*. The *CoCP* sets out a series of measures to protect the environment and limit disturbance from construction activities as far as reasonably practicable. These measures would be applied throughout the construction process at this site, and would be the responsibility of the contractor to implement. The *CoCP* is provided in Vol 1 Appendix A and comprises two parts, Part A and Part B. Part A presents measures which are applicable at all sites across the project and Part B defines measures which are only applicable at individual sites.

3.2.25 The *CoCP* forms an integral part of the project and all of the measures contained therein are assumed to be in place during the construction process described in Section 3.3 below. The measures are not described within the Section 3.3 although further details on the measures within the *CoCP* at Falconbrook Pumping Station are given within the relevant assessments.

3.3 Construction assumptions

3.3.1 This section describes the approach to construction which has been assumed for the purposes of the EIA. The construction programme, layouts and working methods are illustrative and do not form part of the project for which consent is sought.

3.3.2 Although the programme, layouts and working methods described are illustrative, they represent what is considered to be the likely approach, given the existing site constraints, the adjacent land uses and the construction requirements. This section describes the main activities with the focus on those that are relevant for the assessment of environmental effects.

3.3.3 The assumed construction programme is described first, followed by a description of typical construction activities.

3.3.4 It is also assumed that, where the appropriate powers do not form part of the Development Consent Order, further consents may be required before certain construction activities are progressed. These could include various consents issued by the Environment Agency (EA) (including flood defence consents, abstraction licenses and discharge consents) and the Port of London Authority (PLA) (including river works licenses) as appropriate.

Assumed construction programme and working hours

3.3.5 Construction at this site would be likely to commence in 2018 (Site Year 1 of construction) and be completed by 2020 (Site Year 3). The infrastructure at the site would only become operational in 2023 when the Thames Tideway Tunnel project as a whole becomes operational.

3.3.6 Construction at Falconbrook Pumping Station is anticipated to take approximately three years and would involve the following steps (with some overlaps):

a. Site Year 1 – Site setup (approximately three months)

b. Site Year 1 – Shaft construction (approximately six months)

c. Site Years 1 to 2 – Tunnelling (approximately six months)

d. Site Years 2 to 3 – Construction of other structures (approximately 12 months)

e. Site Year 3 – Completion of works and site restoration (approximately six months).

3.3.7 This site would operate to the standard and continuous working hours for various phases and activities as set out in the *CoCP Part A* and *Part B* (Section 4). Standard working hours would be applied to all of the above phases of construction work apart from elements of tunnelling as described below.

3.3.8 It has been assumed that continuous working hours would be required at this site during construction of the Falconbrook connection tunnel for a duration of approximately six months; however, this activity would be mainly below ground. It is noted that there would be periods of activity within this phase where continuous 24 hour working would not be required.

3.3.9 During these periods only those activities directly connected with the task would be permitted within the varied hours.

Typical construction activities

3.3.10 Vol 11 Table 3.3.1 identifies the construction phasing plans used for the assessment of construction effects. These plans have been prepared to illustrate possible site layouts for the principal construction phases and relevant activities.

Vol 11 Table 3.3.1 Falconbrook Pumping Station – construction phase plans

Plan title	Activities	Status	Location
Construction phases – phase 1	Site set up, shaft construction and tunnelling.	Illustrative	Vol 11 Falconbrook Pumping Station Figures – Section 1
Construction phases – phase 2	Construction of other structures.	Illustrative	Vol 11 Falconbrook Pumping Station Figures – Section 1

3.3.11 The methods, order and timing of the construction work outlined herewith are illustrative, but representative of a practical method to construct the works and suitable upon which to base the assessment.

3.3.12 The following construction activities are described:

a. site setup

b. drop shaft construction

c. tunnel construction

d. secondary lining

e. construction of other structures

f. completion of works and site restoration

g. excavated materials and waste

h. access and movement.

Site setup

3.3.13 Trees and localised landscaping along the western boundary with York Road would need to be removed in advance of these works.

3.3.14 Prior to any works commencing the site boundary would be established and secured. The boundary would be built to an appropriate height for the site. Welfare and office facilities would also be set up with utility and power connections installed.

3.3.15 Initial site works would also include traffic management, access works and utility diversions.

3.3.16 The extent of demolition and site clearance works are shown on the Demolition and site clearance drawing (see separate volume of figures – Section 1). The approach to any land remediation that might be required cannot be defined at this stage. However it is assumed that any remediation that is required would occur within the earliest phase of construction and that any associated lorry movements would be substantially lower than the subsequent peak during the main construction phases.

3.3.17 Plant and material storage areas, waste skips, excavated material handling facilities and delivery vehicle turning area would be established. Cranes concrete batching silos and plant, water tanks, mixing pans, compressors, air receivers, excavators and dumpers for excavated material handling are among the items of plant that would all be required on site.

3.3.18 Elements to be removed include:

a. disused public convenience

b. existing screening chamber superstructure within pumping station compound

c. temporary removal of boundary along with a limited area of trees and vegetation to form the access/egress points from York Road

d. existing southern and western pumping station boundary wall

e. advertising screen.

Shaft construction

3.3.19 The following methodology has been developed based on the assumption that the shaft will be constructed using sprayed concrete techniques but the final choice of construction method will be made by the contractor who may choose to use a different method.

3.3.20 A proportion of the shaft would be constructed through the former pumping station substructure in the west of the site. This will require localised demolition and break-out of the former sub-structure to enable shaft construction.

3.3.21 A piling rig would drive sheet piles through the over lying permeable ground to cut off any potential ground water ingress.

3.3.22 It is anticipated that the shaft construction would comprise excavating in approximate 1m increments and then using a sprayed concrete lining (SCL) to form the shaft walls. This process would be repeated until the required depth of shaft is reached.

3.3.23 The shaft would be excavated using a small tracked excavator loading excavated material into a shaft skip. The skips would then be hoisted by a crawler crane and excavated material deposited in the excavated materials handling area. A tracked excavator would load excavated material into rigid tipper lorries to transport material for disposal or re-use elsewhere in the project.

3.3.24 On completion of the SCL cycle, the pump and skips would be washed out into a wash out area located on site.

3.3.25 A steel bar reinforced portal would be incorporated within the shaft lining to accommodate construction of the connecting tunnel.

3.3.26 A steel reinforced concrete base plug would be formed at the base of the shaft.

3.3.27 The concrete for the shaft walls and base plug would be either batched on site or delivered by ready mix concrete lorries. Concrete would be transferred into the shaft by a truck mounted concrete pump.

3.3.28 As the shaft is excavated through the London Clay formation, no dewatering is anticipated. Any water entering the excavation from either the superficial deposits or from minor seepages through silt layers would be pumped to the sewer via appropriate settlement tanks.

3.3.29 The shaft secondary lining would be formed using *in situ* concrete. The shutter would be assembled at the bottom of the shaft, slowly and continuously winched up the shaft whilst setting steel reinforcement from a working platform and continuously pumping concrete.

3.3.30 It is anticipated that ground treatment to the gravels may be required to stem the flow of water around the partially demolished basement structure during the construction of the top of the shaft. Any ground water would be pumped to the Low Level Relief Sewer.

Tunnel works

3.3.31 To connect the drop shaft to the main tunnel, an approximately 3.2m internal diameter connection tunnel could be constructed using SCL techniques. The first approximately 37m of the connection tunnel will be of approximately 3.9m diameter to allow for horizontal de-aeration. The overall length will be approximately 257m.

3.3.32 The connection tunnel would be excavated in 1m increments before a sprayed concrete lining is applied to form the tunnel walls. Excavated material from the tunnel would be removed via the drop shaft and again be lifted to surface level using mobile crane.

3.3.33 The connection culvert from the interception chamber to the CSO drop shaft would be an approximately 3m internal diameter tunnel and would be constructed in SCL similar to the connection to the main tunnel. The CSO drop shaft would have a temporary deck installed at the appropriate level to construct the connection culvert using tunnelling techniques.

3.3.34 The connection tunnel and shaft would have a secondary reinforced concrete lining.

Secondary lining of connection tunnel and shaft

3.3.35 Secondary lining is an additional layer of concrete cast against the inside of the tunnel or shaft's primary concrete lining to improve the durability, water tightness and structural integrity.

3.3.36 For the purposes of assessment, it has been assumed that both the connection tunnel and drop shaft would have secondary linings.

3.3.37 It has been assumed that on completion of the tunnelling phase, a batching plant would be mobilised to site. The plant would service the secondary lining of the tunnel. Concrete would be batched on surface and pumped or skipped to the tunnel.

3.3.38 The secondary lining of the tunnel would be constructed by installing steel reinforcement, erecting a cylindrical shutter within a short length of tunnel and pumping concrete into the gap between the shutter and the primary lining. Once the concrete has hardened sufficiently, the shutters would be removed and erected in the next section of tunnel.

3.3.39 It is assumed that the lining of the shaft would be made of reinforced concrete placed inside the shaft's primary support. The steel reinforcement would be assembled in sections and a shutter would be used to cast the concrete against. The shutter would be assembled at the bottom of the shaft and sections of reinforcement installed and lining cast progressively up the shaft.

Construction of other structures

3.3.40 The internal layout of the CSO drop shaft, including concrete access platforms and the concrete vortex generator and drop tube would then be constructed.

3.3.41 An interception chamber, culvert and valve chamber would intercept the flows upstream of the existing pumping station.

3.3.42 After completion of any service diversions, the chamber to intercept the storm relief sewer would be constructed.

3.3.43 Due to ground conditions and depth, sheet or secant piles would be driven to construct the interception and valve chamber walls.

3.3.44 The interception chamber would be excavated and the base slab cast.

3.3.45 The walls of the interception chamber would be formed by *in situ* concrete techniques.

3.3.46 For flow interception, a weir and penstock control will need to be installed within the existing screen chamber in addition to level alteration within the storm relief sewers upstream of the screen chamber. In order to conduct works within the screen chamber it will be necessary to permanently remove the existing screens.

3.3.47 The below ground ventilation ducts from the CSO drop shaft and to the ventilation column and control equipment would be installed in shallow excavations.

3.3.48 The ventilation structure and columns will be located above-ground within the compound.

Completion of works and site restoration

3.3.49 On completion of the construction works the permanent works area would be finished in accordance with the landscaping requirements (see Section 3.2 and Proposed landscape plan [see separate volume of figures – Section 1]).

Excavated materials and waste

3.3.50 The construction activities described above and in particular the construction of the CSO drop shaft and the subsequent tunnelling would generate a large volume of excavated material which would require removal. This is estimated at 20,000 tonnes, the main elements of which would comprise approximately 15,600 tonnes of London Clay and 4,200 tonnes of made ground.

3.3.51 In addition, it is estimated that approximately 700 tonnes of construction waste would be generated including 600 tonnes of concrete.

3.3.52 Excavated materials and construction wastes would be exported from the site in accordance with the transport strategy (see Access and movement section below)

Access and movement

3.3.53 For the purposes of the assessment a single trip to or from the site is referred to as a 'movement', while two trips, one to and one from the site, are referred to as a single 'lorry'.

3.3.54 Peak vehicle movements would be associated with specific site activities. The highest lorry movements at the site would occur during connection tunnel construction when material would be removed from the site by road. The peak daily vehicle movements at this time, averaged over a one month period, would be 18 HGV lorries, equivalent to 36 movements per day. It is estimated that total vehicle numbers for this site would be in the order of 3,700 HGV lorries, equivalent to 7,400 movements over the construction period.

3.3.55 The site would have a new access and separate egress to York Road requiring modification to the existing footway and kerb. Both access/egress points would be constructed to provide sufficient turning width for in and outbound vehicles and would not require additional modifications along the westbound alignment of York Road. This new access would only be for the construction period and would be removed upon completion of the works.

3.3.56 The access gates for the work site would be set back from the rear of the York Road footway, such to provide sufficient space for vehicles to fully exit the carriageway. This would avoid construction vehicles waiting on the southbound carriageway of York Road.

3.3.57 Construction vehicles would access the site directly off the A3205 - York Road. This carriageway forms part of the Transport for London Route Network (TLRN).

3.3.58 The southbound bus stop immediately south of site would be temporarily relocated further to the south on York Road to avoid potential conflicts with construction vehicles egressing the site. In the event that the location to the south is not considered acceptable by Transport for London and LB Wandsworth, the highway works site to the north of the site has been identified as a potential location for the relocation of the bus stop and layby. The Environmental Statement has assessed the bus stop being relocated to the south.

3.3.59 A one-way system would be operated on-site with vehicles accessing the site via left turn off York Road and returning to York Road via a separate egress and a left turn onto York Road.

3.3.60 A *Traffic management plan* would be developed for the site, produced, coordinated and implemented by the contractor.

3.3.61 A *Draft Project Framework Travel Plan*, whcih accompanies the application, has been produced setting out the requirements and guidelines for the site-specific *Travel plans* to be developed by the contractor.

3.4 Operational assumptions

3.4.1 This section provides details of the assumptions which have been made for the operational phase for the purposes of the EIA. Unless otherwise also listed in Section 3.2, the details given are illustrative and do not form part of the project for which consent is sought.

3.4.2 The details given are considered to represent the likely approach, given the site constraints, the adjacent land uses and the operational requirements. This section describes only the main operational structures and activities with the focus on those that are relevant for the assessment of environmental effects.

3.4.3 The operational structures are described first, followed by the assumed maintenance regime.

3.4.4 Once operational the project would divert the majority of Falconbrook Pumping Station CSO discharges via the new CSO drop shaft and connection tunnel to the main tunnel and then via the Lee Tunnel for treatment at Beckton Sewage Treatment Works. The number of CSO discharges would be reduced from 42 spill events to approximately four spill events in a typical year. The total discharge volume would be reduced from approximately 709,000m^3 to 45,000m^3 per typical year.

Operational structures

3.4.5 For the purposes of the application for development consent (the ‘application’), each of the main operational structures is shown as being located within a defined zone, in which the structure would be located. The operational structures listed within the *Draft DCO* description in Section 3.2 along with the relevant plans, form part of the project for consent. The defined zones for the structures are shown on the Site works parameter plan (see separate volume of figures – Section 1).

3.4.6 The heights of the main ventilation columns, ventilation structure and valve chamber are defined and also form part of the project for consent (see Section 3.2). The following text provides additional clarification on the assumed form, purpose, function and working of these and other structures where this is considered helpful to the reader.

3.4.7 The assessment for each of the environmental topics has been based on the most appropriate dimensions and siting of the structures to ensure the assessment is robust. For example, the lower height for the ventilation column would typically generate higher odour impacts than a higher height and so the lower height limit has been modelled in the assessment. For other topics such as townscape, the upper height may be more important and has been assessed. The approach that has been adopted in this regard is explained within each topic assessment section, where necessary.

3.4.8 The approximate dimensions provided for underground structures are internal dimensions which are determined by the hydraulic requirements at particular sites.

3.4.9 Once constructed and operational the structures listed in the following sections would remain on site.

Shaft

3.4.10 The location, diameter and depth of drop shaft are described in Section 3.2. Existing ground level falls from west to east across the drop shaft location. The finished level of the shaft would be set above existing ground levels by approximately 1m to satisfy hydraulic requirements. Localised landscaping and re-grading would be employed to integrate levels across the site.

Chambers and culverts

3.4.11 The chambers and related culverts are defined in Section 3.2.

3.4.12 The interception chamber would be finished to existing ground levels. The valve chamber would be finished above existing ground levels within the pumping station compound boundary. The chamber would be integrated with the interception chamber. The above-ground sections of the structure would be appropriately clad to suit the wider landscaping plan. A tunnelled connection culvert would connect the interception chamber to the drop shaft.

Dry weather flow pumping station

3.4.13 The secondary dry weather (DWF) pumping station would be a rectangular chamber containing a wet well for a duty and standby pump set. The chamber would be located adjacent to both the existing inlet and the interception chamber. It would be approximately 18 metres deep and integrated into the interception and valve chamber listed above.

3.4.14 The pumping station would handle low level flows entering the main storm water pumping station close to the interception chamber. The purpose would be to reduce the deposition of water borne debris around the storm pumps. The existing DWF pumping set would operate less frequently.

Tunnel

3.4.15 At the base of the drop shaft there would be a horizontal de-aeration chamber feeding a connection tunnel to link to the main tunnel.

Air management structures

3.4.16 The heights and locations of above-ground air management structures, which comprise the ventilation columns and ventilation structure are defined in Section 3.2.

3.4.17 Air would enter the system (and treated air released) through a ventilation column adjacent to the ventilation structure within the pumping station compound boundary.

3.4.18 The ventilation structure would contain passive filters and would be located above-ground within the pumping station compound. The structure would allow air treatment in addition to pressure relief via lourvres set on the side of the structure within the compound.

3.4.19 The interception chamber and existing below-ground screening chamber would be vented by means of a separate vent column located within the pumping station compound.

3.4.20 Below-ground structures and duct work would connect the ventilation columns to the structures that they are ventilating. These would have ground level covers to allow access and inspection.

Electrical and control kiosk

3.4.21 Electrical and control equipment would be housed within the existing pumping station building.

Permanent restoration and landscaping

3.4.22 The indicative landscaping at this site is described in Section 3.2 and presented in the Proposed landscape plan (see separate volume of figures – Section 1).

3.4.23 The area around the drop shaft would be finished in hardstanding to allow crane access to the covers on the top of the shaft. This would provide an operational maintenance area, and also new permissive public realm. Right of access to the area would be reserved and temporary security fencing would be erected during maintenance periods.

3.4.24 The hardstanding arrangement that would be employed allows an area of land formerly made up of hardstanding to be returned to landscaped finish. The area within the pumping station compound would be returned to hardstanding to provide continued operational access.

3.4.25 Operational access to the Falconbrook Pumping Station site would continue to be from the east via York Gardens. The boundary wall of the existing pumping station would be reinstated upon completion of the works. The position of the existing gated access would be moved east by approximately 8m. The western site boundary perimeter along York Road would be reinstated and would include improved pedestrian access to York Gardens.

3.4.26 Planting to the perimeter of the pumping station compound would be incorporated to provide visual screening of the pumping station building. Planting would be of native deciduous trees and other shrubs that give seasonal variety.

3.4.27 The area adjacent to the CSO drop shaft and existing pumping station compound would be publicly accessible. New public realm lighting would be incorporated into the permanent works.

Typical maintenance regime

3.4.28 Support vehicles, including mobile cranes and HGVs, may need to undertake three to six monthly maintenance works to the drop shaft and interception chamber equipment. This would normally be carried out during normal working hours, although emergency access to the drop shaft may be required at any time.

3.4.29 There will also be regular (possibly monthly) visits to maintain the electrical control equipment.

3.4.30 Additionally, once every ten years, more significant maintenance work would be carried out. This would also be carried out in normal working hours. Vehicular requirements for these visits would include two mobile cranes and associated support vehicles and equipment.

3.4.31 A number of unplanned maintenance visits may also be required. It is anticipated that the operational requirements for these would be similar to that required for the three to six monthly visits.

3.5 Base case and cumulative development

3.5.1 The assessments undertaken for this site take account of other relevant development projects within the vicinity of the site which are under construction, permitted but not yet implemented or submitted but not yet determined. In order to identify the relevant developments for consideration, the Planning Inspectorate, local planning authorities, Greater London Authority and Transport for London have been consulted on the methodology (see Volume 2) and asked to assist in identifying and verifying the development projects included in the assessment. A schedule is provided in Vol 11 Appendix N of the resulting development projects, a description of what is proposed and assumptions on phasing. Longer term development projects may be included under both base case, with construction preceding that of the Thames Tideway Tunnel site, and cumulative with construction or operation occurring at the same time as a given Thames Tideway Tunnel site.

3.5.2 The development projects which have been included under base case, cumulative or both for the assessment of the proposed development at Falconbrook Pumping Station listed below. A map showing their location is included in Vol 11 Figure 3.5.1.

a. Battersea Reach

b. Townmead Road London

c. Imperial Wharf

d. Chelsea Creek.

3.6 On site alternatives

3.6.1 Project-wide and site selection alternatives are addressed in Volume 1 Section 3. This section describes on-site alternatives that have been considered and provides the main reasons why these alternatives (to the proposed approach) have not been adopted.

3.6.2 Vol 11 Table 3.6.1 below identifies those items for which alternatives have been considered, the alternatives and provides the main reasons why the alternatives were not taken forward.

Vol 11 Table 3.6.1 Falconbrook Pumping Station – on-site alternatives

Item	Alternatives considered	Main reasons that the alternative (given left) was not progressed
Ventilation column	Ventilation column located outside pumping station compound	To improve design of public accessible area the ventilation column was relocated to within the pumping station compound.
Area of public realm between Falconbrook Pumping Station and York Gardens Library and Community Centre	Reinstate as existing	To improve the existing appearance and use of the area for the benefit of the community, the existing area of public realm between the Falconbrook Pumping Station and York Gardens Library and Community Centre would be upgraded and enhanced.
Area around existing venturi building	Retain/reinstate as existing	Improvements to the appearance of the area surrounding the existing building was preferred to connect it with the finished design of the new permanent structures and public realm improvements.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 4: Air quality and odour

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January 2013

Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 11 Falconbrook Pumping Station site assessment

Section 4: Air quality and odour

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4 Air quality and odour

4.1 Introduction

4.1.1 This section presents the findings of the assessment of the likely significant air quality and odour effects of the proposed development at the Falconbrook Pumping Station site. The project-wide air quality effects are described in Volume 3 Project-wide effects assessment.

4.1.2 The proposed development has the potential to affect air quality and odour due to:

a. construction traffic on the roads leading to an increase in vehicle emissions (air quality)

b. emissions from construction plant (air quality)

c. construction-generated dust (air quality)

d. operation of the tunnel, resulting in air emissions (odour).

4.1.3 Each of these impacts is considered within the assessment. As a result the construction assessment for the Falconbrook Pumping Station site comprises three separate components: effects on local air quality from construction road traffic; effects on local air quality from construction plant; and effects from construction dust. The effects on local air quality from construction road traffic and construction plant are assessed together (within the same model) while construction dust is assessed separately. The operational assessment considers the potential for nuisance odour emissions from the operation of the tunnel. As set out in the *Scoping Report*, local air quality effects are not assessed during operation on the basis that the only relevant operational source of air pollutants would be from the infrequent visits of maintenance vehicles which would not result in a likely significant effect.

4.1.4 The assessment of air quality and odour presented in this section has considered the requirements of the National Policy Statement for Waste Water Sections 4.3 (odour), 4.11 (air quality and emissions) and 4.12 (dust). Further details of these requirements can be found in Volume 2 Environmental assessment methodology Section 4.3.

4.1.5 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures). Appendices supporting this site assessment are contained in Vol 11 Appendix B.

4.2 Proposed development relevant to air quality and odour

4.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to air quality and odour are set out below.

Construction

Construction road traffic

4.2.2 During the proposed construction period there would be construction traffic movements[i] in and out of the site.

4.2.3 The highest number of lorry movements in any one year at the Falconbrook Pumping Station site would occur during the Falconbrook connection tunnel drive works (Site Year 1 of construction). The average daily number of vehicle movements during the peak month would be approximately 36 movements per day.

4.2.4 The construction traffic routes, traffic management and access to the site are detailed in Section 12 of this volume.

4.2.5 Construction traffic is likely to affect local air quality as a result of increasing traffic and therefore emissions on the road network.

Construction plant

4.2.6 Construction plant is likely to affect local air quality from direct exhaust emissions associated with the use and movement of the plant around the site.

4.2.7 There are a number of items of plant to be used on site that may produce emissions that could affect local air quality. Examples of such plant are excavators, generators and dumper trucks.

4.2.8 Typical construction plant which would be used at the Falconbrook Pumping Station site in the peak construction year and associated emissions data are presented in Vol 11 Appendix B.3.

Construction dust

4.2.9 Activities with the potential to give rise to dust emissions from the proposed development during construction are as follows:

a. site preparation and establishment

b. demolition of existing infrastructure and buildings

c. materials handling and earthworks

d. construction traffic – from moving over unpaved ground and then tracking out mud and dirt onto the public highway (termed 'trackout' hereafter).

4.2.10 At the Falconbrook Pumping Station site there would be approximately 470m^3 of demolition material generated while the amount of material moved during the earthworks would be approximately 21,000 tonnes. The volume of building material used during construction would be approximately 5,200m^3.

[i] A movement is a construction vehicle moving either to or from the site.

Code of Construction Practice

4.2.11 Appropriate dust and emission control measures are included in the *Code of Construction Practice (CoCP)*[ii] (Section 7) in accordance with the London *Councils Best Practice Guidance* (Greater London Authority and London Councils, 2006)[1]. Measures incorporated into the *CoCP* (Section 7) to reduce air quality impacts include measures in relation to vehicle and plant emissions, measures to reduce dust formation and re-suspension, measures to control dust present and measures to reduce particulate emissions. These would be observed across all construction and demolition activities at the Falconbrook Pumping Station site.

4.2.12 The effective implementation of the *CoCP* (Section 7) measures is assumed within the assessment.

Operation

4.2.13 A ventilation structure would treat air released from the tunnel. The air would be treated by passing air through a carbon filter housed in an above ground housing within the pumping station compound before being released through air release louvres. Natural pressure during tunnel filling would allow air to pass passively without the need for fans. The capacity of the passive filter would be $0.5m^3/s$. The maximum air release rate during a typical year is expected to be less than $0.1m^3/s$, therefore all air in a typical year would be treated through the passive filter. No nuisance odours are therefore expected.

4.2.14 Air would be released from the louvres for about 15 hours in a typical year, all of which would have passed through the passive filter. For the remaining hours, no air would be released although air intake would occur as the tunnel is emptied.

Environmental design measures

4.2.15 A carbon filter would be included as part of the ventilation structure design and construction. The passive filter would remove odours by adsorption onto the filter. Full details of the Thames Tideway Tunnel project ventilation system can be found in the *Air Management Plan*.

4.3 Assessment methodology

Engagement

4.3.1 Vol 2 Section 4.2 documents the overall engagement which has been undertaken in preparing the *Environmental Statement*.

4.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of air quality and odour for this site has therefore drawn on the scoping response from the London Borough (LB) of Wandsworth and is based on professional judgement as well as experience of similar sites.

[ii] *CoCP* is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

4.3.3 Specific comments relevant to this site for the assessment of air quality and odour are presented here (Vol 11 Table 4.3.1).

Vol 11 Table 4.3.1 Air quality and odour – stakeholder engagement

Organisation	Comment	Response
(LB) of Wandsworth, April 2011	Agree monitoring locations with LB of Wandsworth	Locations agreed with LB of Wandsworth Environmental Health Officer.
(LB) of Wandsworth, March 2011	Odour complaints in the area should be considered	No odour complaints around Falconbrook Pumping Station site - confirmed by LB of Wandsworth Environmental Team Leader (Environmental Initiatives).

Baseline

4.3.4 The baseline methodology follows the methodology described in Vol 2 Section 4. There are no site specific variations for identifying baseline conditions for this site.

Construction

4.3.5 The assessment methodology for the construction phase follows that described in Vol 2 Section 4. There are no site specific variations for undertaking the construction assessment of this site.

4.3.6 Section 4.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could elevate construction dust nuisance effects within the assessment area (see para. 4.3.7 below). With regard to local air quality, the effect of all relevant traffic associated with Thames Tideway Tunnel project sites using the highway network in the vicinity of the site is taken into account the assessment as traffic data used for the assessment includes traffic associated with all Thames Tideway Tunnel project sites.

Construction assessment area

4.3.7 The assessment area for the local air quality assessment during construction covers a square area of 600m by 600m centred on the Falconbrook Pumping Station site. This assessment area has been used for the assessment of road transport, construction plant and construction dust and has been selected on the basis of professional judgement to ensure that the effects of the Falconbrook Pumping Station site are fully assessed. A distance of 200m is generally considered (Highways Agency, 2007)[2] sufficient to ensure that any significant effects are considered. The selected assessment area exceeds this considerably.

Construction assessment year

4.3.8 The peak construction year in terms of construction traffic movements (Site Year 1 of construction) has been used as the year of assessment for construction effects (construction road traffic, construction plant and construction dust) in which the development case (with Thames Tideway Tunnel project) has been assessed against the base case (without Thames Tideway Tunnel project) to identify likely significant effects of the Thames Tideway Tunnel project.

4.3.9 The assessment of construction effects also considers the extent to which the effects on local air quality would be likely to be materially different should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Other developments

4.3.10 There are no other new developments (see Vol 11 Appendix N) within the air quality assessment area (as stated in para. 4.3.5) that would be under construction or operational in the assessment year. Therefore there are none requiring consideration in the base case or in the cumulative effects assessment.

Operation

4.3.11 The odour assessment methodology for the operational phase follows that described in Vol 2 Section 4. There are no site specific variations for undertaking the operational assessment of this site.

4.3.12 Section 4.6 details the likely significant effects arising from the operation at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites that could give rise to additional effects on odour within the assessment area for this site and therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

Operational assessment area

4.3.13 Odour dispersion modelling has been carried out over an area of 400m by 350m centred on the Falconbrook Pumping Station site. The assessment area has been selected on professional judgement on the basis of it being considered the potential maximum extent of the impact area.

Operational assessment year

4.3.14 The assessment undertaken for a typical use year (as described in Vol 2) applies equally to all operational years. Therefore no specific year of operation has been assessed.

Other developments

4.3.15 There are no other new developments (see Vol 11 Appendix N) in the odour assessment area (as stated in para. 4.3.13) that would be under construction or operational in the assessment year. Therefore there are none requiring consideration in the base case or in the cumulative effects assessment

Assumptions and limitations

Assumptions

4.3.16 The general assumptions associated with this assessment are presented in Vol 2 Section 4.

Construction

4.3.17 The site specific assumptions in terms of model inputs for the local air quality dispersion modelling are set out in Vol 11 Appendix B.1.

Operation

4.3.18 The site specific assumptions in terms of the assumed capacity of the carbon filter and air release rate used for the odour dispersion modelling are described in paras. 4.2.13-4.2.15.

4.3.19 Odour dispersion modelling only includes emissions from the ventilation structure and does not take account of background concentrations due to other sources. Background odour concentrations in the area are assumed to be low as there have been only two complaints in the surrounding area over recent years (see para. 4.4.12) and seasonal spot measurements of hydrogen sulphide (H_2S) carried out in 2011/12 indicate that concentrations are typical of urban areas (Michigan Environmental Science Board, 2000)[3].

4.3.20 Following dispersion modelling, the maximum concentration predicted at any location beyond the site boundary has been reported, whether this is at a building where people could be exposed or on open land. As a reasonable worst case assumption, it has been assumed that this is a relevant receptor. This means that should the ventilation structure be moved within the identified parameter plan (see Site parameter plan, separate volume of figures – Section 1), the impact would not be worse than that reported in Section 4.6.

Limitations

4.3.21 The general limitations associated with this assessment are presented in Vol 2 Section 4.

Construction

4.3.22 As there are no PM_{10} monitoring sites located within the vicinity of the Falconbrook Pumping Station site, it has not been possible to verify PM_{10} modelling results[iii]. The adjustment factor derived for NO_X (from a comparison of modelled and monitored NO_X data) has therefore been applied to the PM_{10} modelling results.

Operation

4.3.23 There are no limitations specific to the odour assessment of this site.

[iii] Model verification refers to checks that are carried out on model performance at a local level. This involves the comparison of predicted (modelled) versus measured concentrations. Where there is a disparity between the predicted and the measured concentrations, the first step should always be to check the input data and model parameters in order to minimise the errors. If required, the second step would be to determine an appropriate adjustment factor that can be applied to the modelled traffic contribution.

4.4 Baseline conditions

4.4.1 The following section sets out the baseline conditions for air quality and odour within and around the site. Future baseline conditions (base case) are also described.

Current baseline

Local air quality

4.4.2 The current conditions with regard to local air quality are best established through long-term air quality monitoring.

4.4.3 As part of their duties under Part IV of the Environment Act 1995 (UK Government, 1995)[4], local authorities, especially in urban areas where air quality is a significant issue, undertake long-term air quality monitoring within their administrative areas.

4.4.4 There is one continuous monitoring station and one diffusion tube which collect data pertinent to the Falconbrook Pumping Station site and associated construction traffic routes, both of which monitor NO_2 and are operated by LB of Wandsworth. The location of these is shown in Vol 11 Figure 4.4.1 (see separate volume of figures). Monitoring data for these sites for the period 2007-2011 are contained in Vol 11 Table 4.4.1.

4.4.5 There are no PM_{10} measured data within 2.6km of the Falconbrook Pumping Station site.

Vol 11 Table 4.4.1 Air quality – measured NO_2 concentrations

Monitoring site	Site type	Annual mean (µg/m^3)					Number of exceedances of hourly standard				
		2011	2010	2009	2008	2007	2011	2010	2009	2008	2007
Continuous monitoring site											
Wandsworth Town Hall (WA2)	Urban background	**47***	**53**	**48**	**48**	**53**	0 (142)*	3	4	1	4
Diffusion tube monitoring sites											
Wandsworth Plain (W12 / W13)	Roadside	**60**	**63**	**69**	**73**	**73**	NM				

*Note: NM indicates not measured. Emboldened figures indicate an exceedance of the objective / limit value which is 40µg/m^3 for the annual mean and 200µg/m^3 for the hourly mean which can be exceeded 18 times per year. Codes in brackets represent monitoring site identifiers used in Vol 11 Figure 4.4.1 (see separate volume of figures). * Data capture of 70%, the figure in brackets for the hourly exceedances is the 99.8th percentile.*

4.4.6 The monitoring data at these sites show that the annual mean NO_2 objective / limit value was exceeded for both roadside and urban background sites over the last five years. The hourly mean NO_2 objective was not however exceeded in any of the five years at the Wandsworth Town Hall urban background site.

4.4.7 As a result of previous exceedances of air quality objectives, the LB of Wandsworth has declared the whole borough an AQMA for both NO_2 and PM_{10}.

4.4.8 In addition to the local authority monitoring, diffusion tube monitoring has been undertaken as part of the environmental impact assessment (EIA) to monitor NO_2 concentrations in the vicinity of the Falconbrook Pumping Station site. This monitoring comprises five diffusion tubes based at the locations identified in Vol 11 Table 4.4.2, The table shows a 2010 annual mean concentration (baseline year), which has been calculated from the measurements made between April 2011 and April 2012 at each of the sites. To calculate the 2010 annual mean NO_2 concentrations, the 2011/12 measurements are adjusted for bias using the co-located diffusion tubes and are then seasonally adjusted. Annual mean NO_2 concentrations, for the period covered by the diffusion tubes, and for the year 2010 have been collated from four nearby background continuous monitoring sites measuring NO_2 and with data capture rates greater than 90%. The average of the ratios between the period and annual means has been used to calculate the seasonal adjustment factor. To enable any bias to be corrected a triplicate site (comprising three diffusion tubes) was established at a continuous monitoring site in Putney (site PEFM4 – see Vol 7); for additional precision, a triplicate site was established at one of the monitoring sites (FPSM2); otherwise all the monitoring locations have single tubes.

Vol 11 Table 4.4.2 Air quality – additional monitoring locations

Monitoring site	Grid reference	Site type	2010 NO_2 annual mean (µg/m3)
Wynter Street (FPSM1)	526422, 175500	Kerbside	**68.0**
Hope Street (FPSM2)	526537, 175634	Roadside	**74.2**
Plough Road (FPSM3)	526642, 175738	Kerbside	**94.6**
York Road South (FPSM4)	526677, 175921	Kerbside	**62.6**
York Road North (FPSM5)	526780, 176063	Roadside	**69.6**

Note: Emboldened figures indicate an exceedance of the objective / limit value which is 40µg/m^3 for the annual mean.

4.4.9 All five sites recorded concentrations above the NO_2 annual mean standard of 40µg/m^3. The concentrations recorded during the monitoring are similar to those recorded during local authority monitoring at roadside sites and are typical of the high levels in London.

4.4.10 This monitoring has been used in conjunction with existing LB of Wandsworth monitoring to define the baseline situation and also to provide input to model verification.

4.4.11 In addition to monitoring data, an indication of baseline pollutant concentrations in the vicinity of the site has been obtained from the background data on the air quality section of the Defra website (Defra, 2012)[5]. Mapped background pollutant concentrations are available for each 1km by 1km grid square within every local authority's administrative area for the years 2008 to 2020. The background data relating to the Falconbrook Pumping Station site are given in Vol 11 Table 4.4.3 for 2010 (baseline year).

Vol 11 Table 4.4.3 Air quality – 2010 background pollutant concentrations

Pollutant*	2010
NO_2 (µg/m^3)	38.5
PM_{10} (µg/m^3)	21.9

** Annual mean for 1km grid square centred on 526500, 175500.*

Odour

4.4.12 The LB of Wandsworth has not received any odour complaints for the local area over recent years (LB of Wandsworth, 2011)[6]. Complaints in the Thames Water database were reviewed within an area of 500m radius of the zones identified for the proposed ventilation column. Only two complaints were identified since 2005, one relating to odour from the general sewerage system in 2010 and the other in 2009, relating to a local sewage pumping station.

4.4.13 Data gathering for the EIA included spot measurements of H_2S made near the site. The highest concentrations, up to 7.3µg/m^3, were measured on 1 December 2011 during calm conditions. These levels are typical of urban areas when a faint odour may be detectable on occasions (WHO, 2000)[7] [iv]. The monitoring results are summarised in Vol 11 Table 4.4.4 and the monitoring locations shown in Vol 11 Figure 4.4.2 (see separate volume of figures).

Vol 11 Table 4.4.4 Odour – measured H_2S concentrations

Location	Grid reference	Date	Time	H_2S concentration (µg/m^3)
Children Centre (FPSS1)	526692, 175902	28/08/11	12:44:10	0.0
		28/08/11	12:44:39	0.0
		30/10/11	11:35:49	5.0

[iv] The H_2S odour detection threshold is 7ug/m$_3$ which is the level at which 50% of the people on an odour panel who have been proven to have a good sense of smell can just detect the gas in laboratory controlled conditions.

Location	Grid reference	Date	Time	H_2S concentration (µg/m^3)
		30/10/11	11:36:19	0.0
		01/12/11	15:11:26	6.2
		01/12/11	15:12:39	6.7
Pennethorne House (FPSS2)	526763, 175868	28/08/11	12:39:10	0.0
		28/08/11	12:39:39	0.0
		30/10/11	11:32:54	0.0
		30/10/11	11:33:22	0.0
		01/12/11	15:04:10	7.3
		01/12/11	15:05:00	6.5
Newcomen Road / Ganley Court (FPSS3)	526787, 175802	28/08/11	12:37:18	0.0
		28/08/11	12:37:47	0.0
		30/10/11	11:31:34	5.0
		30/10/11	11:32:02	5.2
		01/12/11	15:02:00	7.0
		01/12/11	15:02:56	7.1
Community Centre (FPSS4)	526689, 175842	28/08/11	12:40:59	0.0
		28/08/11	12:41:29	4.2
		30/10/11	11:34:23	0.0
		30/10/11	11:34:52	0.0
		01/12/11	15:06:30	6.2
		01/12/11	15:07:21	5.7
Community Centre (FPSS5)	526663, 175843	28/08/11	12:42:19	0.0
		28/08/11	12:42:49	0.0
		01/12/11	15:08:18	5.4
		01/12/11	15:09:30	6.0
Meteorological conditions: 28/08/11 SW wind up to 2m/s, partially cloudy, rain on previous day. 30/10/11 SW wind at 0.5m/s, cloudy, last rain on 27/10/11. 01/12/11 calm, dry and cloudy.				

Receptors

4.4.14 As set out in Section 4.1 of this volume, and Vol 2 Section 4, the air quality assessment involves the selection of appropriate receptors, which are shown in Vol 11 Figure 4.4.3 (see separate volume of figures) and Vol 11

Table 4.3.1 for the Falconbrook Pumping Station site. All of these receptors are relevant, albeit with different levels of sensitivity to each of the elements of the air quality assessment. The sensitivity of identified receptors has been determined using the criteria detailed in Vol 2 Section 4.

Vol 11 Table 4.4.5 Air quality and odour – receptors

Receptors (relating to all identified emissions sources)	Approximate distance of modelled receptor from site boundary and direction from site	Receptor sensitivity		
		Air quality (construction traffic and construction plant)	Construction dust (on-site demolition and construction processes)	Odour (ventilation column)
Residential - Pennethorne House (FPSR7)	45m east	High (exposure relevant to annual mean, daily mean and hourly mean standards).	Medium	High
Residential - York Place (FPSR1)	57m west	High (exposure relevant to annual mean, daily mean and hourly mean standards).	Medium	High
Residential - Newcomen Road (FPSR10)	85m southeast	High (exposure relevant to annual mean, daily mean and hourly mean standards).	Medium	High
Commercial – 100, 110 and 112 York Road (FPSR12)	15m northwest	Low (exposure is relevant for the hourly mean standard only)	Medium	Medium
Commercial - York Road (FPSR2)	18m southwest	Low (exposure is relevant for the hourly mean standard only)	Medium	Medium
Commercial – Candle Shop (FPSR3)	20m west	Low (exposure is relevant for the hourly mean standard only).	Medium	Medium

Receptors (relating to all identified emissions sources)	Approximate distance of modelled receptor from site boundary and direction from site	Receptor sensitivity		
		Air quality (construction traffic and construction plant)	Construction dust (on-site demolition and construction processes)	Odour (ventilation column)
Educational - Thames Christian College School* (FPSR9)	115m east	High (exposure relevant to annual mean, daily mean and hourly mean standards).	Medium	High
Community - York Gardens Community Centre and Library (FPSR4)	Adjacent	Medium (exposure is relevant for the daily and hourly mean standard only).	Medium	Medium
Community – Doctor's Surgery, 20 Lavender Road (FPSR11)	71m east	Medium (exposure is relevant for the hourly mean standard only).	Medium	Medium
Recreational - Children's Centre and Adventure Playground (FPSR5)	Adjacent	Medium (exposure is relevant for the daily and hourly mean standard only).	Medium	Medium
Recreational - York Gardens (FPSR6)	Adjacent	Medium (exposure is relevant for the daily and hourly mean standard only)	Medium	Medium
Places of Worship - Battersea Chapel (FPSR8)	97m east	Medium (exposure is relevant for the hourly mean standard only)	Medium	Medium

** Closest part of school building modelled as receptor point.*

Construction base case

4.4.15 The base case conditions for the construction assessment year would be expected to change from the baseline conditions due to modifications to the sources of the air pollution in the intervening period.

4.4.16 For road vehicles, there would be an increase in the penetration of new Euro emissions standards (Defra, 2012)[8] to the London vehicle fleet between the current situation and Site Year 1 of construction. Euro standards define the acceptable exhaust emission limits for new vehicles sold in the EU. These standards are defined through a series of European Union directives staging the progressive introduction of increasingly stringent standards over time. The uptake of newer vehicles with improved emission controls should lead to a reduction in NO_2 and PM_{10} concentrations over time. These changes in fleet composition and the emissions are covered in this assessment.

4.4.17 Other emissions sources should also reduce due to local and national policies. Therefore, the non-road sources of the background concentrations used in the modelling have been reduced in line with Defra guidance LAQM.TG(09) (Defra, 2009)[9]. Background pollutant concentrations for Site Year 1 of construction (peak construction year) used in the modelling are shown in Vol 11 Table 4.4.6.

4.4.18 The background NO_2 and PM_{10} concentrations have been taken from the Defra mapped background data. The Defra mapping has been used for the NO_2 and PM_{10} background, as there are no suitable monitors within the relevant assessment area.

Vol 11 Table 4.4.6 Air quality – annual mean background pollutant concentrations

Pollutant	Baseline (2010)	Peak construction year (Site Year 1 of construction)
NO_2 ($\mu g/m^3$)*	34.3	26.2
PM_{10} ($\mu g/m^3$)*	21.7	19.9

** Taken from Defra mapped 1km grid square centred on 526500, 175500, adjusted to ensure local A roads are not double counted.*

Operational base case

4.4.19 Base case conditions have been assumed to be the same as baseline conditions with respect to background odour concentrations as no change in background odour concentrations is anticipated.

4.5 Construction effects assessment

Local air quality assessment

4.5.1 Construction effects on local air quality (comprising emissions from construction road traffic and construction plant) have been assessed following the modelling methodology set out in Vol 2 Section 4. This involves predicting NO_2 and PM_{10} concentrations in the baseline year (2010), and in the peak construction year (Site Year 1 of construction), without the proposed development (base case) and with the proposed development (development case). Predicted pollutant concentrations for the base case and development case can then be compared to determine the air quality impacts associated with the project and considering these in the context of statutory air quality objectives/limit values to determine, and the significance of effects at specified receptors (listed in Vol 11 Table 4.5.1).

4.5.2 The assessment has focussed on NO_2 and PM_{10} concentrations as these are the only pollutants whose air quality standards may be exceeded. From professional experience, emissions of other pollutants (eg, volatile organic compounds (VOCs)) are very unlikely to be significant and therefore do not need to be assessed.

4.5.3 A model verification exercise has been undertaken at the Falconbrook Pumping Station site in line with the Defra guidance LAQM.TG(09). This checks the model performance against measured concentrations, using the five monitoring sites established for this assessment (FPSM1 - FPSM5 – see Vol 11 Table 4.4.2). Further details regarding the verification process are included in Vol 11 Appendix B.1. The model adjustment factor derived from the verification process was applied to all model results (for both NO_2 and PM_{10}).

4.5.4 The model inputs for the local air quality assessment for the Falconbrook Pumping Station site are also detailed in Vol 11 Appendix B (B.2 and B.3). This includes road traffic data (comprising annual average daily traffic flows, heavy good vehicle proportions and speeds for each road link) and construction plant.

NO_2 concentrations

4.5.5 Predicted annual mean NO_2 concentrations for the modelled scenarios, are shown in Vol 11 Table 4.5.1. This table details the forecast NO_2 concentrations at specific sensitive receptors. Annual mean results are shown for all of the sensitive receptors but the receptors are divided into two groups depending on whether the annual mean objective/limit value applies or not. The annual mean criteria only apply at those receptors which could be occupied continually for a year (eg, residential properties). Exceedances of the hourly criteria are inferred from the annual mean concentration. Additionally, contour plots are provided (Vol 11 Figure 4.5.1 to Vol 11 Figure 4.5.3, see separate volume of figures) showing modelled concentrations for the baseline, base case and development case scenarios over the construction assessment area. A plot showing the change in NO_2 annual mean concentrations between the base and development cases (in the peak construction year) is also presented at Vol 11 Figure 4.5.4 (see separate volume of figures).

4.5.6 The modelled concentrations in Vol 11 Table 4.5.1 show that annual mean NO_2 levels are predicted to decrease between 2010 and the peak construction year with or without the Thames Tideway Tunnel project. This decrease is due to predicted reductions in background concentrations and improved vehicle engine technology. The results for the development case show increases over the base case at all modelled receptors due to the construction works at the Falconbrook Pumping Station site.

4.5.7 Exceedances of the annual mean criterion (40µg/m^3) are predicted for all of the receptors in the baseline year, at six receptors in the base case and at seven receptors in the development case. In line with LAQM.TG(09), modelled concentrations in the peak construction year above 60µg/m^3 are considered likely to exceed the hourly NO_2 air quality objective / limit value. This is predicted to occur at the York Road commercial (FPSR2) and Candle Shop (FPSR3) receptors in the peak construction year base and development cases and at York Gardens Community Centre and Library (FPSR4) in the development case.

Vol 11 Table 4.5.1 Air quality – predicted annual mean NO_2 concentrations

Receptor	Predicted annual mean NO_2 concentration (µg/m^3)			Change (µg/m^3) between base and dev cases	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
Receptors where the annual mean objective/limit value applies					
Pennethorne House residential (FPSR7)	**46.2**	34.4	35.4	1.0	Small
York Place residential (FPSR1)	**55.0**	**41.8**	**42.1**	0.4	Small
Newcomen Road residential (FPSR10)	**45.3**	34.1	34.4	0.3	Negligible
Thames Christian College School (FPSR9)	**43.8**	32.6	32.8	0.3	Negligible
Receptors where the annual mean objective/limit value does not apply					
100, 110 and 112 York Road (FPSR12) commercial	**71.2**	**51.3**	**52.1**	0.8	Small
York Road commercial (FPSR2)	**106.3**	**86.1**	**87.1**	1.0	Small
Candle Shop (FPSR3)	**102.7**	**83.2**	**84.0**	0.8	Small

Receptor	Predicted annual mean NO_2 concentration ($\mu g/m^3$)			Change ($\mu g/m^3$) between base and dev cases	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
York Gardens Community Centre and Library (FPSR4)	**73.1**	**56.9**	**60.7**	3.8	Medium
Doctor's Surgery, 20 Lavender Road (FPSR11)	**45.1**	34.0	34.5	0.5	Small
Children's Centre and Adventure Playground (FPSR5)	**58.6**	**43.6**	**46.1**	2.5	Medium
York Gardens (FPSR6)	**51.7**	39.0	**42.9**	3.9	Medium/ Large
Battersea Chapel (FPSR8)	**44.4**	33.2	33.4	0.2	Negligible

Note: Emboldened figures indicate an exceedance of the criteria which is 40µg/m³ for the annual mean. Changes in concentration at each receptor have been rounded to one decimal place.

4.5.8 The highest predicted increase in annual mean concentration as a result of the construction works at the Falconbrook Pumping Station site is 3.9µg/m³ which is predicted at York Gardens (FPSR6). However the annual mean objective / limit value (40µg/m³) does not apply here. The largest increase at a receptor of relevant exposure to the annual mean concentration is 1.0µg/m³ at Pennethorne House (FPSR7). This increase is described as small magnitude according to the criteria detailed in Vol 2 Section 4.

4.5.9 The significance of the effects at residential properties in York Place (FPSR1) and Pennethorne House (FPSR7), which have a high sensitivity to local air quality, is **minor adverse** (according to the criteria detailed in Vol 2). The significance of the effect at the York Gardens Community Centre and Library (FPSR4), which is a medium sensitivity receptor, is **moderate adverse** due to the predicted exceedance of the hourly objective and limit value. At one other medium sensitivity receptor, Children's Centre and Adventure Playground (FPSR5), the effect is **minor adverse**. The significance of the effect at the York Road commercial receptor (FPSR2) and Candle Shop (FPSR3), which are low sensitivity receptors, is **minor adverse** due to the predicted exceedance of the hourly objective and limit value. All other receptors are predicted to have a **negligible** effect from NO_2.

4.5.10 As described in Vol 2 Section 4, at receptors where significant impacts have been predicted solely with respect to the hourly NO_2 objective, based on the relationship between annual mean and 1-hour concentrations as described above, further modelling of hourly concentrations has been undertaken. Therefore, this modelling has been undertaken at York Gardens Community Centre and Library (FPSR4). The results of this modelling are shown in Vol 11 Table 4.5.2.

Vol 11 Table 4.5.2 Air quality - predicted hourly mean NO_2 concentrations

Receptor	Peak construction year base case	Peak construction year dev case	Change ($\mu g/m^3$)between base and dev cases
York Gardens Community Centre and Library (FPSR4)	**Predicted number of exceedances of the hourly mean NO_2 concentration**		
	3	5	2
	Predicted 99.8th percentile of hourly mean NO_2 concentrations ($\mu g/m^3$)		
	151.8	172.7	21.9
	Predicted maximum hourly mean NO_2 concentrations ($\mu g/m^3$)		
	239	299	60

4.5.11 The modelled concentrations in Vol 11 Table 4.5.2 show that the hourly mean NO_2 levels are predicted to increase over the base case at York Gardens Community Centre and Library (FPSR4) due to the construction works at the Falconbrook Pumping Station site. However, concentrations are shown to be within the hourly NO_2 objective / limit value ($200\mu g/m^3$) and within the allowable number of exceedances (18) in both the base and development cases. This means that the significance of the effect at the York Gardens Community Centre and Library (FPSR4) is therefore **negligible**. This also indicates that if other receptors identified as having a minor adverse effect were modelled as hourly concentrations, this may also result in a negligible effect at these receptors.

PM_{10} concentrations

4.5.12 Predicted annual mean PM_{10} concentrations for the modelled scenarios, taking account of emissions from construction road traffic and construction plant, are shown in Vol 11 Table 4.5.3. This table details the forecast PM_{10} concentrations at specific sensitive receptors. Additionally, contour plots are provided (Vol 11 Figure 4.5.5 to Vol 11 Figure 4.5.7, see separate volume of figures) showing modelled concentrations for the baseline, base case and development case scenarios over the construction assessment area. A plot showing the change in annual mean PM_{10} concentrations between the base and development cases (in the peak construction year) is also presented at Vol 11 Figure 4.5.8 (see separate volume of figures).

4.5.13 The modelled concentrations in Vol 11 Table 4.5.3 show that annual mean concentrations of PM_{10} are predicted to achieve the annual mean objective (40µg/m^3) and decrease between 2010 and the peak construction year with or without the Thames Tideway Tunnel project. This decrease is due to predicted reductions in background concentrations and improved vehicle engine technology. The predicted results for the development case show small increases over the base case at all modelled receptors due to construction activities at the Falconbrook Pumping Station site.

Vol 11 Table 4.5.3 Air quality – predicted annual mean PM_{10} concentrations

Receptor	Predicted annual mean PM_{10} concentration (µg/m^3)			Change (µg/m^3) between base and dev cases	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
Receptors where the annual mean objective/limit value applies					
Pennethorne House residential (FPSR7)	23.6	21.4	21.6	0.2	Negligible
York Place residential (FPSR1)	25.2	22.6	22.6	0.1	Negligible
Newcomen Road residential (FPSR10)	23.4	21.2	21.2	0.1	Negligible
Thames Christian College School (FPSR9)	23.1	21.0	21.1	0.0	Negligible
Receptors where the annual mean objective/limit value does not apply					
100, 110 and 112 York Road (FPSR12) commercial	30.0	26.1	26.2	0.1	Negligible
York Road commercial (FPSR2)	38.1	31.5	31.6	0.1	Negligible
Candle Shop (FPSR3)	37.3	31.0	31.1	0.2	Negligible

Receptor	Predicted annual mean PM_{10} concentration ($\mu g/m^3$)			Change ($\mu g/m^3$) between base and dev cases	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
York Gardens Community Centre and Library (FPSR4)	29.5	25.7	26.5	0.8	Small
Children's Centre and Adventure Playground (FPSR5)	26.4	23.7	24.2	0.4	Small
Doctor's Surgery, 20 Lavender Road (FPSR11)	23.4	21.2	21.3	0.1	Negligible
York Gardens (FPSR6)	24.6	22.1	22.8	0.6	Small
Battersea Chapel (FPSR8)	23.3	21.2	21.2	0.0	Negligible

Note: Changes in concentration at each receptor have been rounded to one decimal place.

4.5.14 The largest predicted increase in the annual mean concentration as a result of construction at the Falconbrook Pumping Station site is 0.8$\mu g/m^3$, predicted at York Gardens Community Centre and Library (FPSR4), however the annual mean objective does not apply here. The largest increase at a receptor of relevant exposure to the annual mean concentration is 0.2$\mu g/m^3$ at the residential properties at Pennethorne House (FPSR7). This change is described as negligible according to the criteria detailed in Vol 2 Section 4.

4.5.15 With no exceedances of the annual mean PM_{10} objective (40$\mu g/m^3$), the significance of the effects is **negligible** at all receptors**.**

4.5.16 With regard to the daily mean PM_{10} concentrations, Vol 11 Table 4.5.4 shows the predicted number exceedances of the daily PM_{10} standard (50$\mu g/m^3$) for each modelled scenario. The objective / limit value allows no more than 35 exceedances in a year.

4.5.17 The results in Vol 11 Table 4.5.4 show that the number of daily exceedances of PM_{10} is predicted to decrease between 2010 and the peak construction year with or without the Thames Tideway Tunnel project. This decrease is due to predicted reductions in background concentrations and improved vehicle engine technology. All of the receptors are predicted to have concentrations within the objective / limit value.

4.5.18 The predicted results for the development case show a maximum increase of two day per year with concentrations above 50µg/m^3 compared with the base case at York Gardens Community Centre and Library (FPSR4), which is classed as a medium increase.

4.5.19 As there are no exceedances of the daily standard at receptors where the daily objective applies, the effect is predicted to be **negligible** at all receptors.

Vol 11 Table 4.5.4 Air quality – predicted exceedances of the daily PM_{10} standard

Receptor	Predicted number of exceedances of the daily PM_{10} standard			Change between base and dev cases (days)	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
Receptors where the objective/limit value does apply					
Pennethorne House residential (FPSR7)	9	5	6	0	Negligible
York Place residential (FPSR1)	13	7	7	0	Negligible
Newcomen Road residential (FPSR10)	9	5	5	0	Negligible
Thames Christian College School (FPSR9)	8	5	5	0	Negligible
York Gardens Community Centre and Library (FPSR4)	26	14	16	2	Medium
Children's Centre and Adventure Playground (FPSR5)	16	10	10	1	Small
York Gardens (FPSR6)	12	7	8	1	Small
Receptors where the objective/limit value does not apply					
100, 110 and 112 York Road	28	15	16	0	Negligible

Receptor	Predicted number of exceedances of the daily PM_{10} standard			Change between base and dev cases (days)	Magnitude of impact
	2010 baseline	Peak construction year base case	Peak construction year dev case		
(FPSR12) commercial					
York Road commercial (FPSR2)	**67**	33	34	1	Small
Candle Shop (FPSR3)	**62**	31	32	1	Small
Doctor's Surgery, 20 Lavender Road (FPSR11)	9	5	5	0	Negligible
Battersea Chapel (FPSR8)	9	5	5	0	Negligible

Note: Changes at each receptor have been rounded to the nearest whole number.

Sensitivity test for programme delay

4.5.20 For the assessment of local air quality effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above for the existing and proposed receptors.

Construction dust

4.5.21 Construction dust would be generated from both on-site activities and from road vehicles accessing and servicing the site.

4.5.22 Dust sensitive receptors have been identified in the vicinity of the Falconbrook Pumping Station site in accordance with the criteria in Vol 2 Section 4, as described in Vol 11 Table 4.4.5. A summary of the approximate numbers of receptors in distance bands from the Falconbrook Pumping Station site is detailed in Vol 11 Table 4.5.5.

Vol 11 Table 4.5.5 Air quality – numbers of dust sensitive receptors

Buffer distance (m)	Number of receptors*	Receptor type
<20	Less than 10	Open space, Community Centre
20-50	Less than 10	Open space, shops, financial and professional services, restaurants and retail
50-100	100-500	Residential, open space, retail, financial and professional services, restaurants, offices and place of

Buffer distance (m)	Number of receptors*	Receptor type
		worship
100-350	More than 500	Residential, open space, retail, financial, professional services and school

** Buildings or locations that could be affected by nuisance dust.*

4.5.23 In line with the IAQM guidance (IAQM, 2012)[10], the site has been categorised using the criteria given in Vol 2 Section 4 to assess the likely impacts from demolition, earthworks, construction and trackout activities during construction and the likely effects of these activities on sensitive receptors close to the development.

4.5.24 The demolition for the Falconbrook Pumping Station site is classified as a ‘small’ dust emission class. This classification is based on the small size of the demolition volumes, which is considerably less than 20,000m^3. As the nearest receptor is within 20m from the construction site, this makes the risk category for demolition activities medium risk.

4.5.25 The earthworks have been assessed to be a ‘medium’ dust emission class as the size of the construction site is between 2,500m^2 and 10,000m^2 and the total material to be moved is below 100,000 tonnes. With the nearest receptor within 20m, the site is assessed to be high risk for earthworks.

4.5.26 The construction proposed for the Falconbrook Pumping Station site has a ‘medium’ dust emission class. Despite the small size of the building volumes, the ‘medium’ classification is based on the use of on-site concrete batching. The risk category for construction activities is therefore assessed to be high risk.

4.5.27 There would be 50-100m of unpaved haul roads on site, and the number of construction lorries per day would be 25-100 so the trackout dust emission class is classified as ‘medium’. The closest relevant receptor is within 20m of the affected roads. The risk category from trackout is therefore assessed to be medium risk.

4.5.28 The risk categories for the four activities are summarised in Vol 11 Table 4.5.6. This summary of these risks does not take into account the measures outlined in the *CoCP* (Section 7).

Vol 11 Table 4.5.6 Air quality – construction dust risks

Source	Dust soiling / PM_{10} effects
Demolition	Medium risk site
Earthworks	High risk site
Construction	High risk site
Trackout	Medium risk site

Note: without CoCP (Section 7) measures

4.5.29 On this basis, the development at the Falconbrook Pumping Station site is classified as a high risk site overall.

4.5.30 The receptor sensitivity (with respect to construction dust nuisance) is identified as medium for all receptors (as identified in Vol 11 Table 4.4.5). However, due to the duration of the works, the sensitivity of the area has been defined as 'high'.

4.5.31 With regard to the significance of effects, a high risk site with a high sensitivity of the area would result in a moderate adverse effect without control measures. When the measures outlined in the *CoCP* (Section 7) are applied, the significance of the effect would be reduced to **minor adverse** for receptors within 20m of the site boundary (in accordance with IAQM *guidance*). The significance of construction dust effects at receptors greater than 20m from the site boundary would be **negligible** with the *CoCP* (Section 7) measures. The significance of the effect for each receptor is summarised in Vol 11 Table 4.5.7.

Vol 11 Table 4.5.7 Air quality – significance of construction dust effects

Receptor	Significance of effect
York Place residential (FPSR1)	Negligible
Pennethorne House residential (FPSR7)	Negligible
Newcomen Road residential (FPSR10)	Negligible
100, 110 and 112 York Road (FPSR12) commercial	Minor adverse
York Road commercial (FPSR2)	Minor adverse
Candle Shop (FPSR3)	Minor adverse
Thames Christian College School (FPSR9)	Negligible
York Gardens Community Centre and Library (FPSR4)	Minor adverse
Doctor's Surgery, 20 Lavender Road (FPSR11)	Negligible
Children's Centre and Adventure Playground (FPSR5)	Minor adverse
York Gardens (FPSR6)	Minor adverse
Battersea Chapel (FPSR8)	Negligible

4.6 Operational effects assessment

4.6.1 The operational assessment has been undertaken in accordance with the modelling methodology set out in Vol 2 Section 4. Vol 11 Table 4.6.1 shows the predicted maximum ground level odour concentrations at the Falconbrook Pumping Station site. These are the highest concentrations that could occur at the worst affected ground level receptor at or near the site in a typical year. In accordance with the odour benchmark set by the Environment Agency, results are presented for the 98th percentile of hourly average concentrations in the year (or the 176th highest hourly concentration in the year) and the number of hours in a year with concentrations above $1.5ou_E/m^3$. Achieving the 98th percentile is considered to prevent nuisance and protect amenity. The number of hours with concentrations above $1.5ou_E/m^3$ gives an indication of the number of hours in a year that an odour might be detectable at the worst affected receptor. The Environment Agency benchmark permits 175 hours above $1.5ou_E/m^3$. The table also identifies the magnitude of the identified impacts in accordance with the criteria detailed in Vol 2 Section 4.

Vol 11 Table 4.6.1 Odour – impacts and magnitude - operation

Year	Maximum at ground level locations		Impact magnitude and justification
Typical	98th percentile (ou_E/m^3)	0	Negligible 98th percentile concentration is less than $1ou_E/m^3$
	No. of hours > $1.5ou_E/m^3$	0	

4.6.2 In Vol 11 Table 4.6.1 above, the 98th percentile is shown as zero as air would be released from the ventilation column for less than 2% (176 hours) of the year. This means that the odour benchmark would be achieved at all locations. This represents an impact of negligible magnitude.

4.6.3 The highest odour concentrations would occur within 10m of the ventilation column within the site boundary with concentrations reducing rapidly away from this area. There would be no hours with an odour concentration greater than $1.5ou_E/m^3$ beyond the site boundary. As such, there would be no detectable odour on an hourly basis beyond the site boundary. With a frequent use year (ie, a more rainy year than average), the situation would be the same with no detectable odour when considering hourly average concentrations beyond the site boundary.

4.6.4 With regard to the significance of effects given that the predicted odour concentrations at all locations would not exceed the 98th percentile criterion of $1.5ou_E/m^3$, it is considered that overall significance would be **negligible**. No significant effects are therefore predicted in relation to odour.

4.7 Cumulative effects assessment

Construction effects

4.7.1 As described in Section 4.3, there would not be any cumulative construction effects. Therefore the effects on air quality would remain as described in Section 4.5 above. This would also be the case if the programme for the Thames Tideway Tunnel project was delayed by approximately one year.

Operational effects

4.7.2 As described in Section 4.3, there would not be any cumulative operational effects. Therefore the effects on odour would remain as described in Section 4.6 above.

4.8 Mitigation

Construction

4.8.1 Control measures of relevance to air quality are embedded in the *CoCP* (Section 7) as summarised in Section 4.2. No mitigation is required because effects are not significant.

Operation

4.8.2 Based on the assessment results (which includes the environmental design measures detailed in para. 4.2.15) indicating that all effects would be negligible, no mitigation is required.

Monitoring

4.8.3 It is envisaged that an appropriate particulate monitoring regime would be agreed with the LB of Wandsworth prior to commencement of construction at the Falconbrook Pumping Station site.

4.9 Residual effects assessment

Construction effects

4.9.1 As no mitigation measures are required, the residual construction effects remain as described in Section 4.5. All residual effects are presented in Section 4.10.

Operational effects

4.9.2 As no mitigation measures are required, the residual construction effects remain as described in Section 4.6. All residual effects are presented in Section 4.10.

4.10 Assessment summary

Vol 11 Table 4.10.1 Air quality – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Residential - Pennethorne House (FPSR7)	Local air quality – effects from construction road traffic and plant emissions	Minor adverse	None	Minor adverse
	Effects from construction dust	Negligible	None	Negligible
Residential - York Place (FPSR1)	Local air quality – effects from construction road traffic and plant emissions	Minor adverse	None	Minor adverse
	Effects from construction dust	Negligible	None	Negligible
Residential - Newcomen Road (FPSR10)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Negligible	None	Negligible
Commercial – 100, 110 and 112 York Road (FPSR12)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Minor adverse	None	Minor adverse
Commercial - York Road (FPSR2)	Local air quality – effects from construction road traffic and plant emissions	Minor adverse	None	Minor adverse
	Effects from construction dust	Minor adverse	None	Minor adverse
Commercial – Candle Shop (FPSR3)	Local air quality – effects from construction road traffic and plant emissions	Minor adverse	None	Minor adverse
	Effects from construction dust	Minor adverse	None	Minor adverse
Educational - Thames Christian College School	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
(FPSR9)	Effects from construction dust	Negligible	None	Negligible
Community - York Gardens Community Centre and Library (FPSR4)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Minor adverse	None	Minor adverse
Community – Doctor's Surgery, 20 Lavender Road (FPSR11)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Negligible	None	Negligible
Recreational - Children's Centre and Adventure Playground (FPSR5)	Local air quality – effects from construction road traffic and plant emissions	Minor adverse	None	Minor adverse
	Effects from construction dust	Minor adverse	None	Minor adverse
Recreational - York Gardens (FPSR6)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Minor adverse	None	Minor adverse
Place of Worship - Battersea Chapel (FPSR8)	Local air quality – effects from construction road traffic and plant emissions	Negligible	None	Negligible
	Effects from construction dust	Negligible	None	Negligible

Vol 11 Table 4.10.2 Odour – summary of operational assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Residential - York Place (FPSR1)	Odour	Negligible	None	Negligible
Residential - Pennethorne House (FPSR7)		Negligible	None	Negligible
Residential - Newcomen Road (FPSR10)		Negligible	None	Negligible
Commercial – 100, 110 and 112 York Road (FPSR12)		Negligible	None	Negligible
Commercial - York Road (FPSR2)		Negligible	None	Negligible
Commercial – Candle Shop (FPSR3)		Negligible	None	Negligible
Educational - Thames Christian College School (FPSR9)		Negligible	None	Negligible
Community - York Gardens Community Centre and Library (FPSR4)		Negligible	None	Negligible
Recreational - Children's Centre and Adventure Playground (FPSR5)		Negligible	None	Negligible
Community – Doctor’s Surgery, 20 Lavender Road (FPSR11)		Negligible	None	Negligible
Recreational - York Gardens (FPSR6)		Negligible	None	Negligible
Place of Worship - Battersea Chapel (FPSR8)		Negligible	None	Negligible

References

[1] Greater London Authority and London Councils. *Best Practice Guidance: The Control of Dust and Emissions from Construction and Demolition* (November 2006).

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 5: Ecology - aquatic

APFP Regulations 2009: Regulation **5(2)(a)**

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January 2013

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Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 5: Ecology – aquatic

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5 Ecology – aquatic

5.1 Introduction

5.1.1 This section presents the findings of the assessment of the likely significant effects of the proposed development on aquatic ecology at the Falconbrook Pumping Station site.

5.1.2 Construction effects for aquatic ecology for this site have not been assessed. This is on the basis that there would be no in-river construction works associated with this site. Therefore no significant construction effects are considered likely and for this reason only information relating to operational effects on aquatic ecology are assessed.

5.1.3 There would also be no in-river operational works, however during operation the interception of the Falconbrook Pumping Station combined sewer overflow (CSO) would result in reduced discharges of untreated sewage into the tidal reaches of the River Thames (tidal Thames) at this location.

5.1.4 The presence of sewage in the aquatic environment has adverse effects on aquatic ecology receptors (habitats, mammals, fish, invertebrates and algae). In particular, discharges of untreated sewage effluent can result in low levels of dissolved oxygen (DO), which can cause mass fish mortalities known as hypoxia events. There are CSOs discharging at locations throughout the tidal Thames, including the reach upstream and downstream of Falconbrook Pumping Station CSO.

5.1.5 The tidal Thames comprises a dynamic environment, in which tidal action leads to dispersal of discharges. Therefore the effects of the operational Thames Tideway Tunnel project, which is designed to intercept the most problematic CSOs, would be most evident at a project-wide level. These effects are therefore reported in Volume 3 Project-wide effects assessment. This section assesses the localised effects at a site-specific level for the Falconbrook Pumping Station site.

5.1.6 The assessment of the likely significant effects of the project on aquatic ecology has considered the requirements of the National Policy Statement (NPS) for Waste Water (Defra, 2012)[1]. In line with these requirements, designations, species and habitats relevant to aquatic ecology are identified and measures incorporated into the proposed development described. Based on assessment findings, measures to address likely significant adverse effects are identified. Volume 2 Environmental assessment methodology Section 5 provides further details on the methodology.

5.1.7 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

5.2 Proposed development relevant to aquatic ecology

5.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to aquatic ecology are set out below.

Operation

5.2.2 Discharges from the Falconbrook Pumping Station CSO would be intercepted at the Falconbrook Pumping Station site as part of the project. Based on the base case (which includes permitted Thames Tideway sewage treatment works upgrades, and the Lee Tunnel scheme, as well as projected population increases) discharges, which have been modelled for 2012, during the Typical Year[i] from the Falconbrook Pumping Station CSO are anticipated to be 780,000m^3 per annum over a total of 42 discharge events (or spills) by 2021. The discharge is predicted to reduce to 45,000m^3 per annum over four discharge events once the Thames Tideway Tunnel project is operational. This represents an approximately 94% decrease in the volume of discharge as a result of the Thames Tideway Tunnel project.

5.3 Assessment methodology

Engagement

5.3.1 Volume 2 Environmental assessment methodology documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a potential site. The scope for the assessment of aquatic ecology for this site has therefore drawn on the scoping response from the LB of Wandsworth and is based on professional judgement as well as experience of similar sites. There were no site specific comments from consultees for this particular site relating to aquatic ecology.

Baseline

5.3.2 The baseline methodology follows the methodology described in Vol 2 Section 5. There are no site specific variations for identifying the baseline conditions for this site.

5.3.3 The assessment is based on survey and desk study data. For habitats, mammals, fish, invertebrates, and algae desk study data has been obtained for the whole of the tidal Thames. The data sets for fish, invertebrates and algae are based on fixed sampling locations at intervals through the tidal Thames. Sites as close to Falconbrook Pumping Station as possible have been selected. Details of the background and data sets are provided in Vol 2 Section 5.

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[i] The 'Typical Year' represents the most 'typical' 12 month period of rainfall observed between 1970 and 2011 and is represented by the period from October 1979 to September 1980.

5.3.4 Surveys for fish were undertaken during May 2011 at Intermediate Site 2, approximately 0.3km downstream of the Falconbrook Pumping Station CSO discharge point. Surveys for invertebrates were undertaken during May 2011, at Carnwath Road Riverside, approximately 0.35km upstream of Falconbrook Pumping Station CSO discharge point. During these surveys, the intertidal habitats present were recorded. As part of the project wide assessment, surveys for juvenile fish were also undertaken at five sampling locations within the River Thames six times between May and September 2011. The nearest sampling location to the site was at Putney Embankment Foreshore, approximately 2.5km upstream. Surveys for algae were undertaken at eight sampling locations in May 2012. The nearest sampling location to the site was at Putney Embankment Foreshore, approximately 2.5km upstream. The survey comprised sampling of algae along a vertical transect of the river wall.

Operation

5.3.5 The assessment methodology for the operation phase follows that described in Vol 2 Section 5. The assessment area is the zone which lies within a 100m radius of the existing CSO discharge point. There are two assessment years for operational effects; Year 1 and Year 6. Year 1 is the year that the Thames Tideway Tunnel project would be brought into operation. Year 6 provides sufficient time after operation commences to allow the longer term effects on aquatic ecology to be assessed. There are no site specific variations for undertaking the operational assessment of this site.

5.3.6 Section 5.6 details the likely significant effects arising from the operation at the Falconbrook Pumping Station site. The effects of the interception of all of the CSOs within the Thames Tideway Tunnel project on aquatic ecology receptors at a river-wide level are considered in Vol 3 Project-wide effects assessment.

5.3.7 Whilst the development at Imperial Wharf and Chelsea Creek comprise development within and adjacent to Chelsea Creek, because these schemes are removed from the location of the Falconbrook Pumping Station CSO discharge point, no change to the aquatic ecology baseline is considered likely. All other developments are in-land, do not comprise in-river development, development adjacent to the river or development discharging into the river and therefore would not affect the aquatic ecology baseline.

5.3.8 There are no schemes listed in the site development schedule (Vol 11 Appendix N) under construction during operation at the Falconbrook Pumping Station site. Thus there are no schemes that could lead to a cumulative impact. Therefore no cumulative impact assessment has been undertaken.

5.3.9 The assessment of operational effects also considers the extent to which the assessment findings would be likely to be materially different, should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Assumptions and limitations

5.3.10 The assumptions and limitations associated with this assessment are presented in Vol 2 Section 5. Assumptions and limitations specific to this site are outlined below.

Assumptions

5.3.11 There are no assumptions specific to the assessment of the Falconbrook Pumping Station site.

Limitations

5.3.12 There are no site specific limitations.

5.4 Baseline conditions

5.4.1 The following section sets out the baseline conditions for aquatic ecology within and around the site. Future baseline conditions (base case) are also described.

Current baseline

5.4.2 The following section sets out the existing baseline applicable to this site. The section begins with a discussion of any statutory (i.e. with a basis in law) or non-statutory (i.e. designated only through policy) sites designated for their nature conservation value. It then addresses habitats, followed by the species receptors associated with those habitats, namely mammals, fish, invertebrates and algae. This order is followed throughout the assessment sections.

Designations and habitats

5.4.3 This section sets out the designations and habitats applicable at the site specific level. Designations and habitats applicable at the project wide scale are assessed in Vol 3 Section 5.

5.4.4 The tidal Thames is part of the proposed Thames Estuary South East Marine Conservation Zone (MCZ no. 5), the details of which were submitted to Government in early 2012. If adopted, it will be designated as a national statutory site under the Marine and Coastal Access Act 2009. The purpose of MCZs is to protect the full range of nationally important biodiversity, as well as certain rare and threatened species and habitats. Species include smelt (*Osmerus eperlanus*), European eel (*Anguilla anguilla*) and tentacled lagoon worm (*Alkmaria romijnii*) (Balanced Seas, 2011)[2]. The tidal Thames offers important spawning and migratory habitat for smelt, and migratory habitat for European eel.

5.4.5 There are no other international or national statutory sites (i.e. Sites of Special Scientific Interest or Local Nature Reserves) designated for aquatic ecology within the assessment area.

5.4.6 The Falconbrook Pumping Station CSO discharges directly into the non-statutory River Thames and Tidal Tributaries Site of Importance for Nature Conservation (SINC Grade M)[ii]. The SINC is designated by the Greater London Authority (GLA) and adopted by all boroughs which border the River Thames. It recognises the range and quality of estuarine habitats including mudflat, shingle beach, reedbeds and the river channel. The SINC citation notes that over 120 species of fish have been recorded in the tidal Thames, though many of these are only occasional visitors. The more common species include dace (*Leuciscus leuciscus*), bream (*Abramis brama*) and roach (*Rutilus rutilus*) in the freshwater reaches (described in para. 5.4.8), and sand-smelt (*Atherina presbyter*), flounder (*Platichtyhys flesus*) and Dover sole (*Solea solea*) in the estuarine reaches. Important migratory species include Twaite shad (*Alosa fallax*), European eel, smelt, salmon (*Salmo salar*) and sea trout (*Salmo trutta*). A number of nationally rare snails occur, including the swollen spire snail *Mercuria confusa*, as well as an important assemblage of wetland and wading birds.

5.4.7 The tidal Thames is the subject of a Habitat Action Plan (HAP) within the Biodiversity Action Plan (BAP) (Thames Estuary Partnership Biodiversity Action Group, undated)[3], and the targets prescribed for this HAP are reflected in the City of London BAP (City of London, 2012)[4]. The tidal Thames HAP identifies a number of habitats and species which characterise the estuary, such as gravel foreshore, mudflat and saltmarsh. A number of these habitats and species, including mudflat, are also the subject of action plans under the UK BAP.

5.4.8 The river is divided into three zones within the tidal Thames HAP; freshwater, brackish and marine (Vol 3 Figure 5.4.1, see separate volume of figures). The brackish zone is equivalent to the category known as transitional waters or estuaries under the Water Framework Directive (WFD). Further details of the WFD river zone classifications can be found in Vol 3 Section 5.

5.4.9 The Falconbrook Pumping Station CSO discharge point is within the freshwater zone of the river, which means that the fish and invertebrate communities which occur within the river at this location consist of freshwater species and freshwater tolerant marine species. Invertebrate diversity is generally higher than in the brackish zone but species must be able to withstand some variations in salinity and a stressful environment. Stress is caused by the fluctuating tidal conditions, which means that flora and fauna have to be able to tolerate wide variations in their physical environment.

Evaluation of designations and habitats for Falconbrook Pumping Station

5.4.10 The value of the habitats for individual aquatic ecology receptors is described in the relevant baseline sections. For the purpose of this

[ii] SINC (Grade M) = Site of Importance for Nature Conservation (Grade III of Metropolitan importance)

assessment the habitats are considered to be of medium-high (metropolitan) value as part of the River Thames and Tidal Tributaries SINC (Grade M).

Marine mammals

5.4.11 Records compiled by the Zoological Society of London (ZSL) for 2003-2011 indicate that harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*) and various seal species (grey seal (*Halichoerus grypus*) and common seal (*Phoca vitulina*) migrate through the tidal Thames. No specific habitat of value for marine mammals is believed to occur within the vicinity of the site.

Evaluation of marine mammal community for Falconbrook Pumping Station

5.4.12 The CSO site is considered to be of low-medium (local) value for marine mammals due to the limited value of the habitats on site for them. There is no evidence of use as a haul out site by seals.

Fish

5.4.13 In general, tidal Thames fish populations are mobile and wide ranging. Although the abundance and diversity of fish at any one site may provide some indication of the habitat quality offered at that site, it is important to consider the data within the context of sites throughout the tidal Thames, since the factors influencing distribution are likely to be acting at this wider scale. To this end, the findings of the Thames Tideway Tunnel project site specific surveys, relevant juvenile fish surveys and Environment Agency (EA) background data are presented in this section and are used to inform the evaluation of the site. Effects at the project-wide scale are assessed in Vol 3 Section 5.

Baseline surveys

5.4.14 A single day survey was undertaken at 'Intermediate Site 2' which is approximately 0.3km downstream, during May 2011. The area covered by the survey is illustrated in Vol 11 Figure 5.4.1 (see separate volume of figures). Full details of the methodology and rationale for timing of surveys are presented in Vol 2 Section 5.

5.4.15 Fish are routinely categorised into four guilds according to their tolerance to salinity and habitat preference (Elliott and Hemingway, 2002[5]; Elliott and Taylor, 1989)[6] which can be defined as follows:

a. Freshwater – species which spend their complete lifecycle primarily in freshwater

b. Estuarine resident – species which remain in the estuary/transitional water for their complete lifecycle).

c. Diadromous – species which migrate through the estuary to spawn having spent most of their life at sea.

d. Marine juvenile – species which spawn at sea but spend part of their lifecycle in the estuary.

5.4.16 The range of species found constituted a single common bream, a single dace, 10 flounder and 13 roach. For the species such as roach, dace and bream which spawn in freshwater, the upper reaches of the tidal Thames provide feeding habitat for all age classes. The data from the survey at Intermediate Site 2 is shown in Vol 11 Table 5.4.1.

Vol 11 Table 5.4.1 Aquatic ecology – results of fish surveys at Intermediate Site 2

Common name	Scientific name	Number of individuals	Guild
Common bream	*Abramis brama*	1	Freshwater
Dace	*Leucicus leuciscus*	1	Freshwater
Flounder	*Platichthys flesus*	10	Estuarine resident
Roach	*Rutilus rutilus*	13	Freshwater

Juvenile fish surveys

5.4.17 The shallow river margins, which shift across the intertidal foreshore with the ebb and flood of the tides, provide an important migration route for juvenile fish along the estuarine corridor. The young of species such as eel (known as glass eels or elvers), flounder, dace and smelt rely upon access to these areas of lower water velocity to avoid being washed out by tides and to avoid predation by the larger fish that occur in deeper water. Young fish also feed predominantly amongst the intertidal habitat. Adult migrants of larger fish tend to use faster mid-channel routes.

5.4.18 Surveys for juvenile fish were undertaken as part of a suite of five sites sampled six times between May and September 2011 as part of the project-wide effects assessment (see Vol 11 Table 5.4.2). The nearest site surveyed to Falconbrook Pumping Station is at Putney Embankment Foreshore, approximately 2.5km upstream of the Falconbrook Pumping Station CSO discharge point. The findings are relevant to this site because it gives context to the assemblage of fish that may be expected to be found in this reach of the river. The site locations are presented in Vol 2 Figure 5.4.4 (see separate volume of figures). The aim of the surveys was to record juvenile fish migrations through the tidal Thames to inform a study of the hydraulic effects of the temporary and permanent structures on fish migration. The extent of the surveys and details of the methodology are presented in Vol 2 Section 5.

Vol 11 Table 5.4.2 Aquatic ecology – results of 2011 juvenile fish surveys at Putney Embankment Foreshore

Common name	Scientific name	Number of individuals					
		Survey 1 May	2 late May	3 June	4 July	5 Aug	6 Sept
Flounder	*Platichthys*	813	3698	1301	26	7	0

Common name	Scientific name	Number of individuals					
		Survey 1 May	2 late May	3 June	4 July	5 Aug	6 Sept
	flesus						
Smelt	*Osmerus eperlanus*	2	3	1	0	0	0
Eel	*Anguilla anguilla*	10	10	4	1	1	0
Common bream	*Abramis brama*	0	0	0	1	0	0
Dace	*Leuciscus leuciscus*	74	30	177	21	2	2
Roach	*Rutilus rutilus*	5	18	67	19	11	3
Perch	*Perca fluviatilis*	36	52	33	3	0	0
Goby	*Pomatoschi stus spp.*	1	0	5	283	851	995
Sea bass	*Dicentrarch us labrax*	0	0	97	72	67	28
Ten-spined stickleback	*Pungitius pungitius*	0	0	20	1	0	1
Three-spined stickleback	*Gasterosteu s aculeatus*	6	0	52	60	26	17
Barbel	*Barbus barbus*	0	0	1	0	0	0
Gudgeon	*Gobio gobio*	0	0	2	1	1	0
Stone loach	*Barbatula barbatula*	0	0	2	0	0	0
Sand smelt	*Atherina presbyter*	0	0	1	0	1	1
Chub	*Leuciscus cephalus*	0	0	0	0	0	1
Mullet	*Chelon labrosus*	0	0	0	0	0	14

5.4.19 Post-larval flounders dominated the catch from surveys one, two, and three, followed by dace and perch during surveys one and two, and dace and roach in survey three. Flounder were caught in the shallow littoral zone, indicating early springtime colonisation from marine spawning sites.

5.4.20 From surveys three to six, three-spined stickleback (*Gasterosteus aculeatus*) and sea bass (*Dicentrarchus labrax*) were numerous, whilst goby numbers increased considerably from survey four onwards, peaking at 995 individuals in survey six. Perch (*Perca fluviatilis*), roach and flounder declined over surveys four to six. This is likely to reflect seasonal changes in the use of the tidal Thames by freshwater species such as perch and roach. In the case of flounder, juvenile fish begin to migrate into deeper water as they grow, and were therefore absent from the shallow marginal habitats during the late summer and autumn.

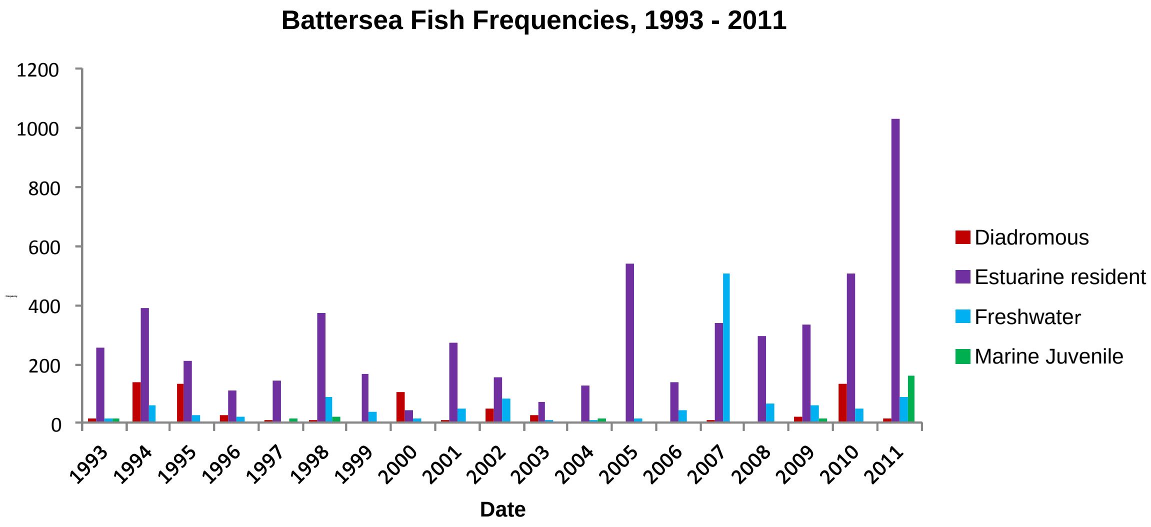
5.4.21 Smelt is a species listed under Section 41 of the Natural Environment and Rural Communities Act 2006 and is a priority UK BAP species. Colclough *et al* (Colclough *et al,* 2002)[7] have identified smelt spawning sites on gravel shores in the tidal Thames, including the zone into which the Falconbrook Pumping Station CSO discharges. The spawning period is March-April and thereafter smelt drift progressively downstream from spawning sites towards Greenwich. Catches may be expected along the tidal Thames. The site falls within the zone where tidal Thames smelt are thought to spawn, though the high sediment composition of the mudflats on the foreshore would render it less suitable than other locations for smelt spawning.

Environment Agency background data

5.4.22 The EA carry out annual surveys for fish within the tidal Thames using a variety of methods including trawling and seine netting, with data available over 19 years from 1992 to 2011. The nearest sampling site to the Falconbrook Pumping Station CSO is at Battersea, 1.7km downstream, where EA surveys have been carried out every year from 1993 to 2011.

5.4.23 Fifteen fish species are recorded for Battersea. These show fairly consistent catches in trawls but some indication of increasing seine-net catches in recent years. Catches are dominated by estuarine resident fish (see Vol 11 Plate 5.4.1) such as common goby, flounder and sand smelt, freshwater species including dace, common bream, perch and roach, and migratory species including eel and smelt. Other migratory species such as salmon and sea trout must pass through the area but are too infrequent to be detected by only one or two surveys per year. The high frequency of freshwater species recorded in 2007 may be as a result of very high rainfall during that year. High flows may have led to a greater number of freshwater fish being washed into the tidal Thames and lower salinity conditions which allowed them to survive. The survey results from Intermediate Site 2 match the EA data well, except for the absence of smelt; however, since the EA data only indicated small numbers of fish on each survey this absence from a single visit is unsurprising.

Vol 11 Plate 5.4.1 Aquatic ecology – long-term EA total fish catches from Battersea site



Water quality and current fish baseline

5.4.24 Prior to the 1960s, water quality in the tidal Thames was heavily degraded by raw sewage inputs caused by under-capacity of sewage treatment works (STWs). With the construction of new works (Wheeler, 1979)[8], there has been a progressive improvement of fish populations from the 1960s onwards. The ecology of the tidal Thames has undergone further improvement in recent decades, with some 125 fish species now recorded by the EA.

5.4.25 However, hypoxia events (see para. 5.1.4) arising from regular CSO spills and occasional discharges of untreated waste from STWs still occur. Discharges have the effect of depleting DO (measured in mg/l) by the biological breakdown of organic matter in the discharge. This is referred to as biochemical oxygen demand (BOD). Substantial fish mortalities begin to occur when DO levels drop beneath 4mg/l. An example of the effects of a hypoxia events occurred in June 2011, in which approximately 26,000 fish were killed across the tidal Thames assessment area, following a release of around 450,000 tonnes of untreated sewage. This incident is discussed in further detail in Vol 3 Section 5.

5.4.26 The Tideway Fish Risk Model (TFRM) was developed to evaluate DO standards for the tidal Thames (Turnpenny *et al.*, 2004)[9] as part of the Thames Tideway Strategic Study (TTSS). The DO standards for the tidal Thames comprise four threshold levels expressed as concentrations of DO in mg/l over specified tidal durations. Frequencies are set on the number of times per year each of these thresholds can be exceeded. Further details of the standards are presented in Vol 2 Section 14. Details of the TFRM are presented in Vol 2 Section 5 and Vol 2 Appendix C.3. The TFRM considers fish distribution and the effects of low DO conditions within defined 3km zones within the tidal Thames. The zones are based on those used by the EA's automated water quality monitoring system (AQMS), for which DO data are collected continuously.

5.4.27 The model uses known hypoxia tolerance thresholds for seven species of fish which are considered to represent the range of species which occur in the tidal Thames. The model is based on the assumption that for most species of fish populations will be sustainable provided hypoxia related mortality does not exceed 10% of the total population. The model considers both adult and juvenile fish (known as 'life stage cases'), since juveniles generally have a lower tolerance to hypoxia.

5.4.28 It is not possible to isolate the contribution of individual CSO discharges on hypoxia related fish mortalities in the tidal Thames. This is because the TFRM provides outputs at a population level. For example, DO conditions may be below a lethal threshold in one zone known to be used by a particular species of fish. However, provided conditions are above the threshold in other zones such that 90% of the population are unharmed then conditions are considered to be sustainable. The outputs are discussed in further detail in Vol 3 Section 5. However, TFRM results for the existing baseline suggest that a total of five of the seven species/life stage cases are expected to suffer unsustainable hypoxia related mortality in the tidal Thames each year. Given that the indicator species used in the model act as surrogates for a wider range of ecosystem components, other sensitive taxa are also likely to be unsustainable under this water quality regime.

Evaluation of fish community for Falconbrook Pumping Station

5.4.29 The habitat in the vicinity Falconbrook Pumping Station CSO discharge point is considered to be of medium-high (metropolitan) value for fish due to the fact that the site is a component of the migratory route of all resident tidal Thames fish populations and has records of smelt, a BAP species.

Invertebrates

5.4.30 Benthic invertebrates are used in the freshwater, estuarine and marine environments as biological indicators of water and sediment quality since their diversity, abundance and distribution reflects natural or man-made fluctuations in environmental conditions. Species diversity is influenced by factors such as substrate and salinity. However high species diversity (or numbers of species) at any given site generally indicates good water and/or sediment quality, whilst low diversity may indicate poor quality.

5.4.31 Invertebrate populations and particularly those which occur in the water column (pelagic) are influenced by conditions throughout the estuary. The strongest influences on invertebrate distribution and density tend to be physical factors such as salinity, and substrate type followed by water quality and local habitat conditions.

Baseline surveys

5.4.32 A single day survey was undertaken at Carnwath Road Riverside, approximately 0.35km upstream of the Falconbrook Pumping Station CSO discharge point during May 2011. The area covered by the survey is illustrated in Vol 10 Figure 5.4.1 (see separate volume of figures). Full details of the methodology are presented in Vol 2 Section 5. Two intertidal and two subtidal samples were taken.

5.4.33 The invertebrates collected during the May 2011 field surveys are presented in Vol 11 Table 5.4.3, below. The Community Conservation Index (CCI) score (Chadd and Extence, 2004)[10] has been used to identify species of nature conservation importance. CCI classifies many groups of invertebrates of inland waters according to their scarcity and conservation value in Great Britain and relates closely to the Red Data Book (RDB) (Bratton, 1991[11]; Shirt, 1987[12]) by attributing a score between 1 and 10. The higher the CCI score the more scarce the species and/or greater its conservation value.

Vol 11 Table 5.4.3 Aquatic ecology – invertebrate fauna sampled at Carnwath Road Riverside

Taxa	**CCI score**	**No. of individuals - subtidal samples**		**No. of individuals - intertidal samples**		
Sample numbers		**Air lift 1**	**Air lift 2**	**Kick sample**	**Sweep net 1**	**Sweep net 2**
Theodoxus fluviatilis	3	1	7	0	0	0
Potamopyrgus antipodarum	1	60	600	0	0	0
Radix balthica	1	1	1	0	0	0
Pisidium amnicum	1	1	0	0	0	0
Corbicula fluminea	-	0	9	0	0	0
Helobdella stagnalis	1	0	1	0	0	0
Polychaeta	-	0	1	0	30	0
Palaemon longirostris	5	0	0	0	0	2
Oligochaeta	-	250	600	5	250	1500
Erpobdella sp.	-	0	0	0	1	0
Erpobdella testacea	5	0	2	0	0	0
Gammarus sp	-	0	0	1	0	0
Gammarus zaddachi	1	0	2200	0	40	3
Number of taxa	**-**	**5**	**9**	**2**	**4**	**3**

5.4.34 Samples taken at Carnwath Road Riverside were characterised by a fauna dominated by pollution tolerant taxa, such as Oligochaeta, and the snail *Potamopyrgus antipodarum*, which were present in high abundances. The most pollution sensitive taxon *Theodoxus fluviatilis* was present in the subtidal samples and the moderately pollution sensitive *Gammarus zaddachi* was also present in high abundances in one of the subtidal samples.

5.4.35 Some significant differences appear between the intertidal and the subtidal samples, such as a higher diversity in the subtidal samples, the absence of *T. fluviatilis* (which is present in subtidal) from the intertidal samples, and the higher abundances of *G. zaddachi* in the subtidal samples. This is likely to be due to the fact that the intertidal habitat is highly disturbed and may be regularly dredged.

5.4.36 As at other sites, the taxa present are brackish species, with varying tolerance of different levels of salinity from estuarine to near freshwater. The invasive Asiatic clam (*Corbicula fluminea*) which can only tolerate high levels of salinity for a limited period (Aguirre and Poss, 1999)[13] was sampled at this site in one sample. None of the species present were of high nature conservation importance.

Environment Agency background data

5.4.37 Battersea has been regularly sampled by the EA since 2005 and it is the nearest regular EA sampling site for invertebrates. The EA samples are taken using a number of techniques, including cores and kick sampling in the intertidal and day grab and core samples in the subtidal.

5.4.38 A total of 50 taxa were recorded at Battersea over the seven year period in which samples were collected (2005-2011). The taxa Oligochaeta (worms), which thrives in organically polluted conditions, was relatively abundant, together with other pollution tolerant species such as the snail *P. antipodarum*. However, *G. zaddachi*, a moderately pollution-sensitive species was also highly abundant and *T. fluviatilis* (pollution sensitive river neritid) was present most years.

5.4.39 All of the taxa present are brackish species or animals that have a varying tolerance to different levels of salinity from estuarine to near freshwater. No obligate freshwater or marine animals were present. The occasionally brackish nature of the water is demonstrated by species such as *G. zaddachi* (a brackish species of shrimp, rather than its more commonly occurring freshwater homologue *Gammarus pulex*) and *Crangon crangon* (shrimps, typical of estuarine and brackish conditions).

5.4.40 In addition to the native *G. zaddachi*, the amphipod *Gammarus tigrinus*, of North American origin, was recorded at Battersea (one individual) in 2006. The species was not sampled at the Carnwath Road Riverside site sampling in 2010.

5.4.41 It is believed that this species of amphipod arrived in English waters via ballast water from ships. It lives in fresh and brackish waters and can expand rapidly, outcompeting local amphipods. However, based on available data, it appears to be much less abundant than the native *G. zaddachi* within the tidal Thames.

5.4.42 The zebra mussel *(Dreissena polymorpha) was* present in EA sampling at Battersea. It is a non native invasive species that can establish in densities that crowd-out native invertebrates. It also colonises shells of native species, reducing the ability of the 'host' to feed and burrow.

Water quality and current invertebrate baseline

5.4.43 The influence of water quality, and specifically CSO discharges has been investigated through statistical analysis of the EA invertebrate background data, Thames Tideway Tunnel project baseline data, and EA water quality data. Although it is not possible to isolate trends over time at a site specific level, a number of observations have been made to help identify the factors influencing invertebrate abundance and diversity. For example, certain species of Oligochaete worm, present at Carnwath Road Riverside and therefore at Falconbrook Pumping Station, are indicative of polluted conditions because they are able to tolerate the low DO conditions and multiply rapidly in the enriched sediments.

5.4.44 The analysis is described in further detail in Vol 3 Section 5. The following summary is relevant to the freshwater zone of the tidal Thames in which the Falconbrook Pumping Station CSO site is located.

5.4.45 The varying level of salinity and saline fluctuations appear to be a dominant factor determining the diversity and structure of benthic invertebrate assemblages. The analysis showed that, in general, samples in the freshwater zone were more diverse compared with samples taken in the brackish zone. This concurs with previous research into the invertebrate community of the tidal Thames and other estuaries, which show diversity decreasing downstream as the saline influence increases (Bailey-Brock *et al*., 2002)[14]. This is generally attributed to the fact that relatively few invertebrates are adapted to considerable fluctuations in salinity. Other factors such as poor water quality and lack of habitat diversity, particularly in central London, are also likely to contribute.

5.4.46 Redundancy analysis (RDA)[iii] was used to compare the invertebrate dataset with water quality data for the period between 1992 and 2011. The analysis demonstrated the importance of environmental variables in determining the invertebrate communities in the tidal Thames. It appears that dominance of either Gammaridae (sensitive to hypoxia) or Oligochaeta (more tolerant to hypoxia) is influenced by the DO concentrations and DO sags in the tidal Thames, although other factors such as habitat are also highly important. Other invertebrate taxa also appeared to be affected by poor water quality (low DO) and/or saline intrusion, notably the insect group (mayflies), while other groups (essentially Polychaete and Oligochaete worms) were shown to be tolerant of these conditions.

[iii] Redundancy analysis is a form of regression analysis which provides information on the influence of environmental variables on the composition/abundances of the invertebrate assemblages.

Evaluation of invertebrate community for Falconbrook Pumping Station

5.4.47 Falconbrook Pumping Station is considered to be of medium (borough) value due to the dominance of the invertebrate community by a limited range of pollution tolerant species. Only a single species of conservation importance (*A. lacustre*) was recorded in EA samples from Battersea, and it is ubiquitous within the tidal Thames.

Algae

5.4.48 Algae occurs in the tidal Thames both in the water column and growing on the river wall and associated structures. The range of species which occur in the tidal Thames reflect both salinity, habitat and environmental conditions. As well as their intrinsic value algal communities provide valuable habitat for invertebrates and juvenile fish. Algae are often used as an indicator of water quality, since nutrients associated with sewage promote the growth of certain species of algae. This assessment focuses on the algal communities which grow on the river wall and associated structures.

Baseline surveys

5.4.49 A single day survey was undertaken in May 2012 at Putney Embankment Foreshore, located approximately 2km upstream of Falconbrook Pumping Station. All records are shown in Vol 11 Table 5.4.4.

Vol 11 Table 5.4.4 Aquatic ecology – marine algae sampled at Putney Embankment Foreshore

Species	Survey observations	Species presence within the Thames Estuary
Blidingia minima	Occasionally present on river wall.	Widespread and abundant
Cladophora glomerata	Occasionally present on the river wall from high tide level to the base.	Widespread and abundant.
Rhizoclonium riparium	Dominant on the river wall from high tide level to the base.	Common in the estuary.
Ulva prolifera	Occasionally present on river wall.	Occurs throughout much of the estuary.
Vaucheria sp.	Occasionally present from high tide level to the base.	The *Vaucheria sp* recorded is most probably *Vaucheria compacta*, which occurs on the upper littoral levels on sea walls. Widespread in the tidal Thames.

Natural History Museum background data

5.4.50 Data was obtained from the Natural History Museum, London (NHM) that identifies records of marine algae received for the period from the early 1970s to 1999. Algae were recorded from a sampling location at Putney Bridge, approximately 2km upstream and the records all shown in Vol 11 Table 5.4.5.

Vol 11 Table 5.4.5 Aquatic ecology – marine algae sampled at Putney Bridge between early 1970s and 1999

Species	Observations
Blidingia marginata	Upper littoral and supra-littoral, and floating structure just above the water-line. Widespread and abundant.
Rhizoclonium riparium	Upper mid-littoral levels on sea walls and occasionally on floating structures above the water-line. Common in the estuary.
Blidingia minima	Upper littoral and supra-littoral, wood breakwaters and halophyte stems. Abundant in tidal Thames.
Urospora penicilliformis	Upper littoral on sea walls and floating structures just above the water line. Widespread in the tidal Thames.

Water quality and algal communities

5.4.51 Algae depend on the nutrients nitrate and phosphate for growth. Although these nutrients occur naturally in water bodies, they are also present in sewage. Discharges of untreated sewage can result in elevated levels of nutrients which can lead to excessive growth of algae. As these algae die and decompose they use up oxygen in the water resulting in hypoxia (para. 5.1.4). This process is known as eutrophication. Excessive levels of algae can disrupt other elements of the ecosystem by smothering them.

5.4.52 Studies of the pelagic algae (para. 5.4.48) of the tidal Thames to inform its classification for the WFD have concluded that the estuary is not eutrophic due to strong tidal flows (English Nature, 2001)[15]. However, historically poor water quality has had a considerable adverse influence on the algal communities of the tidal Thames and the loss of pollution sensitive species. Improvements in sewage treatment since the 1960s have led to a gradual process of recovery (Tittley, 2009)[16], although pollution tolerant species such as the green algal species still dominate the community.

Evaluation of algal community for Falconbrook Pumping Station

5.4.53 None of the species recorded in Vol 11 Table 5.4.5 have protected or notable status (e.g. RDB species or UK or local BAP species). The algal populations are therefore given low-medium (local) value as only limited records of widespread species occur from this location.

Aquatic ecology receptor values and sensitivities

5.4.54 Using the baseline set out in paras 5.4.1 to 5.4.53 the value accorded to each receptor considered in this assessment is set out in Vol 11 Table

5.4.6. The definitions of the receptor values and sensitivities used in this evaluation are set out in Vol 2 Section 5.

Vol 11 Table 5.4.6 Aquatic ecology – summary of receptors and their values/sensitivities at Falconbrook Pumping Station

Receptor	Value/sensitivity
Foreshore habitat (intertidal and subtidal)	Medium-high (metropolitan)
Marine mammals	Low-medium (local)
Fish	Medium-high (metropolitan)
Invertebrates	Medium (borough)
Algae	Low-medium (local)

Operational base case

5.4.55 The base case in Year 1 and Year 6 of operation would include the improvements at the five main sewage treatment works that discharge into the Thames Tideway (Mogden, Beckton, Crossness, Long Reach and Riverside), and the Lee Tunnel project. TFRM modelling (see Vol 3 Appendix C.3) shows that at a river wide level there will be significant reduction in the occurrence of mass or population level fish mortalities with these schemes (i.e. hypoxia events, which result in more than 10% mortality of fish populations). However, predictions for the base case show that, even with these schemes, unsustainable mortalities of salmon, the most sensitive species can be expected. Salmon is considered as acting as a surrogate for the more sensitive aspects of aquatic ecology, and thus taxa other than salmon may also be harmed under this condition. Further, catchment modelling also shows that the frequency, duration and volume of spills from the Falconbrook Pumping Station CSO will continue to rise due to population growth (spill volume and frequency as stated in para. 5.2.2: further details of the projected spills are presented in Section 14 of this volume). Therefore recovery due to water quality improvements will be suppressed at the Falconbrook Pumping Station CSO discharge point. As a result there are unlikely to be substantial changes in habitat quality at the site level and pollution sensitive fish species such as salmon will continue to be suppressed. Indeed, conditions in the immediate vicinity of the outfall may be more unfavourable for fish than the current baseline given the increase in frequency, volume and duration of CSO spills.

5.4.56 The invertebrate analysis demonstrates that more pollution sensitive groups such as shrimps (Gammaridae) are subject to significant fluctuations in abundances during low DO periods. With the improvements associated with the Lee Tunnel scheme and sewage treatment works upgrades at Mogden, these fluctuations are likely to be reduced. Whilst there may be minor changes, increases in abundance and diversity will however be limited by the fact that even with the Lee

Tunnel and STW improvements in place there are still predicted to be numerous failures of DO standards. Colonisation by DO sensitive taxa such as Corophiidae, Crangonidae and Gammaridae which would otherwise occur within the freshwater zone, including the Falconbrook Pumping Station CSO discharge point, would continue to be suppressed, and may also be less favourable than current baseline conditions because of the increased frequency volume and duration of CSO spills.

5.4.57 The recovery in algal communities that has taken place since the 1960s is expected to continue under the base case, however the baseline conditions are not anticipated to significantly change from that described in Section 5.4. No changes in marine mammals are anticipated as they are relatively insensitive to point source sewage discharges.

5.4.58 As detailed in para 5.3.7 there are no other known developments which would change the base case. Furthermore there is unlikely to be any further encroachment onto the River Thames foreshore for non-river dependent uses as this is restricted through *London Plan 2011* (Greater London Authority, 2012)[17] Policy 7.28 Restoration of the Blue Ribbon Network which states that development should ‘protect the value of the foreshore of the Thames and tidal rivers’. The EA’s *National Encroachment Policy for Tidal Rivers and Estuaries* (Environment Agency, 2005)[18] also presumes against developments riverward of the existing flood defences where these would, individually or cumulatively, change flows so that fisheries were affected or cause loss or damage to habitat. Therefore no change to current baseline from other developments is considered likely.

5.5 Construction effects assessment

5.5.1 As stated in para. 5.1.2, there would be no construction activities ‘in-river’ at this site therefore no significant effects on aquatic ecology are likely.

5.6 Operational effects assessment

5.6.1 This section presents the findings of the operational phase assessment. It outlines the operational impacts arising from the proposed development and the likely significant effects on aquatic ecology receptors.

Operational impacts

Increases in dissolved oxygen concentrations in the vicinity of the CSO

5.6.2 The projected Typical Year 94% decrease in the volume of discharges compared against the base case (see para.5.2.2) would result in improvements in DO concentrations at a local level and throughout the tidal Thames, and would contribute to a river-wide improvement arising from the project. The Thames Tideway Tunnel project improvements would ensure compliance with the DO standards described in para. 5.4.26. These improvements are assessed at a river-wide level in Vol 3 Section 5. The impact is considered to be medium positive due to the existing relative large number and volume of spills from the Falconbrook Pumping Station CSO, and impacts would be near certain and permanent.

Reduction in sediment nutrient levels

5.6.3 Elevated concentrations of nutrients (phosphate and nitrate) are likely to have accumulated in the sediments in proximity to the discharge point as a result of the faecal material and sewage derived litter discharged from the Falconbrook Pumping Station CSO. In addition to the directly toxic effects of elevated ammonia (particularly in low oxygen situations) increased nutrients in the sediment can reduce the natural limits on algal growth and enable more nitrogen/phosphate responsive species to outcompete other species reducing diversity. Interception of the Falconbrook Pumping Station CSO would lead to a gradual reduction in nutrient levels. The impact is considered to be low positive, probable and permanent.

Reduced levels of sewage derived litter

5.6.4 Sewage derived litter from the CSO can be expected to reduce by approximately 92%, from approximately 196t to approximately 14t, in the Typical Year with beneficial effects on aquatic ecology receptors.

5.6.5 This is considered to be a low positive impact and would be near certain and permanent.

Operational effects

5.6.6 The following section describes the effects of these impacts on aquatic ecology receptors based on the significance criteria set out in Vol 2 Section 2.3. Only those impacts which are considered relevant to each receptor are assessed, in accordance with the methodology presented in Vol 2 Section 5.

5.6.7 Unless stated the effects described below apply to both Year 1 of operation and Year 6 of operation.

Designations and habitats

Improvements in habitat quality through changes in water quality

5.6.8 The predicted increases in DO concentrations and reductions in organic material and sewage derived litter would result in localised improvements in habitat quality. This may be characterised by increased levels of photosynthesis by microscopic algae within the water column, termed primary production. These algae form the basis of the estuarine food chain, providing a food source for fish and invertebrates. The gradual breakdown and removal of sewage derived litter associated with the sewage discharge would contribute to the recovery. However, habitats per se are relatively insensitive to alterations in DO concentrations with reductions in sediment nutrient levels and sewage derived litter more important factors with regards to habitat quality improvements. Therefore the impact in this instance is considered to be of low positive magnitude, rather than medium positive. The effects are considered to **negligible** at Year 1 increasing to **minor beneficial** by Year 6, given the medium-high (metropolitan) value of the receptor and the low positive impact magnitude.

Marine mammals

Increase in the number and/or change in the distribution of marine mammals

5.6.9 No changes are anticipated on marine mammals as a result of the water quality improvements associated with interception of a single CSO. This is because they are relatively insensitive to point source sewage discharges. Improvements in habitat quality due to the reduction in sewage derived litter may make the habitat more favourable, although the factor determining its use by seals relates predominantly to the lack of disturbance rather than water quality. Combining the low positive magnitude of impact with the low-medium (local) value of the resource, the effects are considered **negligible** at both Year 1 and Year 6.

Fish

Reduction in the occurrence of dissolved oxygen related fish mortalities

5.6.10 Interception of the CSOs throughout the tidal Thames would result in far fewer hypoxia events. The TFRM has been used to predict the change in the number of hypoxia events, and the results are reported in Vol 3 Section 5. In summary, all tidal Thames fish populations would become sustainable (i.e., less than 10% mortality as a result of hypoxia (Turnpenny *et al.*, 2004)[19]), compared with the current baseline in which there is a greater than 10% mortality due to hypoxia for four key species (smelt, dace, flounder and common goby).

5.6.11 Interception of the Falconbrook Pumping Station CSO would contribute to tidal Thames-wide improvement, but would also result in improvements in the local area. Given that the impact is considered to be medium positive, and the value of the receptors is medium-high (metropolitan) the effect is thus considered to be **moderate beneficial**.

Increase in the distribution of pollution sensitive fish species

5.6.12 The tidal Thames currently supports a small number of rare fish species such as salmon, sea trout, twaite shad and river lamprey (*Lampetra fluviatilis*). A number of factors limit the colonisation of habitats by these species, including salinity, substrate type and current, but pollution is known to be a significant factor in determining colonisation (Maitland and Hatton-Ellis, 2003)[20]. Improving water and sediment quality would facilitate the spread of those pollution sensitive species which are currently being impeded by poor water and sediment quality.

5.6.13 Area data and bespoke project surveys have indicated no records of rare fish species in the vicinity of the Falconbrook Pumping Station discharge point and habitat quality at this site is limited by confinement of the river channel between vertical river walls, which limits the extent of intertidal habitat and leads to increased current velocities. Given that the impact is considered to be medium positive, and the value of the receptors is medium-high (metropolitan), the effect is thus considered to be **negligible** in the short term (Year 1), and **moderate beneficial** in the medium term (Year 6), since it would take time for fish species to colonise.

Improvement in the quality of foraging habitat

5.6.14 Intertidal habitat in the upper and middle tidal Thames is used by juvenile fish for foraging. For example, juvenile flounder, bass and smelt migrate to the tidal limit in spring and early summer and then migrate downstream in search of suitable foraging habitat. As habitat quality improves as described in para. 5.6.7, and the invertebrate community becomes more diverse (paras. 5.6.15 to 5.6.18) foraging opportunities for fish may increase. Given that the impact is considered to be medium positive, and the value of the receptors is medium-high (metropolitan), the effect is considered to be **negligible** in the short term (Year 1), increasing to **moderate beneficial** in Year 6 of operation as it would take time for communities to develop.

Invertebrates

Localised improvements in invertebrate diversity and abundance

5.6.15 Improvements in DO concentrations are likely to lead to an increase in the distribution of a range of species that are currently being suppressed by poor water quality conditions. Some of these improvements will occur under the base case due to the Lee Tunnel and STW upgrades. However, even with these improvements in place there are still predicted to be a number of occasions during an average year when DO standards would be breached. Colonisation by DO sensitive taxa such as Corophiidae, Crangonidae and Gammaridae which would otherwise occur within the freshwater zone would continue to be suppressed.

5.6.16 Full compliance with the standards is expected to enable colonisation by these DO sensitive taxa. In the localised areas around CSO discharges gradual reductions in organic material associated with sewage would also allow for a transition from invertebrate communities dominated by small numbers of species to a more diverse and balanced community. For example, pollution sensitive estuarine taxa such as Corophiidae, Crangonidae, Gammaridae, Sphaeromatidae, Nuculidae, Anthuridae, and Palaemonidae may be expected to increase in abundance.

5.6.17 Improvements in water quality could theoretically selectively enhance colonisation by invasive, non-native species. However, studies on mitten crabs, for example, have determined that the species is able to tolerate poor water quality, but that improvement of water quality does not necessarily lead to an increased distribution (Veilleux and de Lafontaine, 2007)[21].

5.6.18 Given that the impact is considered to be medium positive, and the value of the receptors is medium (borough), the effect is considered to be **negligible** at Year 1 and **minor beneficial** at Year 6 since it would take time for new species to colonise.

Increase in the distribution of pollution sensitive invertebrate species

5.6.19 The tidal Thames currently supports a small number of rare invertebrate species, such as swollen spire snail and tentacled lagoon worm. A number of factors limit the colonisation of habitats by these species, including salinity, substrate type and current, but pollution is known to be an important factor in determining colonisation. Improving water and sediment quality would facilitate the spread of those pollution sensitive species which are currently being impeded by poor water and sediment quality.

5.6.20 EA data and bespoke project surveys have indicated no records of rare invertebrate species present in the vicinity of the Falconbrook Pumping Station CSO (other than *A. lacustre* which as discussed although uncommon nationally is common in the tidal Thames). Habitat quality at this site is limited by a number of factors including the confinement of the river channel between vertical river walls. Given that the impact is considered to be medium positive, and the value of the receptors is medium (borough), the effect is thus considered to be **negligible** in Year 1, and **minor beneficial** in Year 6, as it would take time for species to colonise.

Algae

Changes in algal communities

5.6.21 The reduction in nutrient levels, both in the water column and the sediments in the vicinity of the discharge may cause local changes to the algal communities of the river wall. Whilst it is not possible to predict these changes precisely it is likely that the reduction in nutrients would contribute to the recovery of algal flora, with pollution sensitive species becoming a more common component of the community at the expense of more pollution tolerant species.

5.6.22 However, habitat availability would remain a key factor determining the diversity and abundance of algal communities and so the effects associated with the Thames Tideway Tunnel project are considered to be **negligible**, given the low-medium (local) value of the receptor and the low positive impact magnitude.

Sensitivity test for programme delay

5.6.23 For the assessment of effects on aquatic ecology during operation, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 5.6.1-5.6.22). This is because there are no developments in the site development schedule that would fall into the base case as a result of this delay and therefore the base case would remain as described in paras. 5.4.55-5.4.58.

5.7 Cumulative effects assessment

5.7.1 As described in Section 5.3, during the operational phase there are no schemes within the site development schedule that would have an impact on aquatic ecology receptors, and so no cumulative impacts with the proposed development would arise. Therefore the effects on aquatic ecology would remain as described in Section 5.6.

Sensitivity test for programme delay

5.7.2 In the event that the programme for the Thames Tideway Tunnel project is delayed by approximately one year, the cumulative effects assessment would remain unchanged. As described above in para. 5.7.1, there are no schemes anticipated to generate cumulative effects on aquatic ecology and this would remain the case with a programme delay of approximately one year.

5.8 Mitigation

5.8.1 No mitigation is required at Falconbrook Pumping Station since the effects on aquatic ecology receptors are associated only with the improvements in water quality arising from interception of the CSO.

5.8.2 A monitoring programme to measure the recovery of aquatic ecology receptors throughout the tidal Thames following interception of the CSO network would be implemented.

5.9 Residual effects assessment

Operational effects

5.9.1 As no mitigation measures are proposed, the residual operational effects remain as described in Section 5.6. All residual effects are presented in Section 5.10.

5.10 Assessment summary

Vol 11 Table 5.10.1 Aquatic ecology – summary of operational assessment

Receptor	Effect	Significance of effect		Mitigation	Significance of residual effect
		Year 1	Year 6		
Designations and habitats	Improvements in habitat quality through changes in water quality	Negligible	Minor beneficial	None	Minor beneficial
Marine mammals	Increase in the number and/or change in the distribution of marine mammals.	Negligible	Negligible	None	Negligible
Fish	Reduction in the occurrence of dissolved oxygen related fish mortalities.	Moderate beneficial	Moderate beneficial	None	Moderate beneficial
	Increase in the distribution of pollution sensitive fish species.	Negligible	Moderate beneficial	None	Moderate beneficial
	Improvement in the quality of foraging habitat	Negligible	Moderate beneficial	None	Moderate beneficial
Invertebrates	Localised improvements in invertebrate diversity and abundance.	Negligible	Minor beneficial	None	Minor beneficial
	Increase in the distribution of pollution sensitive invertebrate species.	Negligible	Minor beneficial	None	Minor beneficial
Algae	Changes in algal communities	Negligible	Negligible	None	Negligible

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

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Section 6: Ecology - terrestrial

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 6: Ecology – terrestrial

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6 Ecology – terrestrial

6.1 Introduction

6.1.1 This section presents the findings of the assessment of the likely significant effects of the proposed development on terrestrial ecology at the Falconbrook Pumping Station site. The main site and the highway works sites are considered in this assessment.

6.1.2 The proposed development has the potential to affect terrestrial ecology due to:

a. advance planting within York Gardens

b. vegetation clearance, and subsequent habitat creation and reinstatement

c. construction and site activities.

6.1.3 Operational effects for terrestrial ecology for this site have not been assessed. This is on the basis that permanent operational lighting is minimal and complies with the lighting design principles to minimise light spill, and maintenance works are limited to intermittent visits to site by maintenance personnel and vehicles. No significant operational effects are considered likely and for this reason only construction effects are assessed.

6.1.4 The following are not considered within the assessment:

a. contaminated runoff and atmospheric pollution as these would be controlled through the implementation of the *Code of Construction Practice* (*CoCP*)[i]

b. the presence of invasive plants listed on Schedule 9 of the Wildlife and Countryside Act 1981 (WCA 1981) as this would be managed in advance of site clearance. However, the baseline includes the results of the invasive plants survey (para. 6.4.17).

6.1.5 The assessment of the likely significant effects of the project on terrestrial ecology has considered the requirements of the *National Policy Statement (NPS) for Waste Water* (Defra, 2012)[1]. In line with these requirements, designations, species and habitats relevant to terrestrial ecology are identified and measures incorporated into the proposed development described. Based on assessment findings, measures to address likely significant adverse effects are identified. Vol 2 Section 6 provides further details on the methodology.

6.1.6 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

[i] The Code of Construction Practice (CoCP) is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

6.2 Proposed development relevant to terrestrial ecology

6.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to terrestrial ecology are set out below.

Construction

6.2.2 The following elements of the construction phase have the potential to affect terrestrial ecology receptors:

a. the removal of vegetation on site and demolition of buildings as a result of site clearance, and subsequent habitat creation and reinstatement

b. construction works throughout the construction phase that would create noise and vibration, such as the use of construction machinery and vehicles, demolition and the tunnel excavation. This includes noise and vibration for a limited period during 24 hour working

c. planting of trees and scrub in advance of vegetation removal

d. provision of bat boxes and habitat for invertebrates.

Code of Construction Practice

6.2.3 The *Code of Construction Practice* (*CoCP*) is formed of Part A covering measures to be applied at all sites and Part B covering site specific measures. The *CoCP* sets out the standards, procedures, and measures for managing and reducing construction effects. These measures would be implemented through a site specific *Construction environmental management plan* (*CEMP*), which would encompass an *Ecology and landscape management plan* (*ELMP*). The *ELMP* would include measures to protect and minimise impacts on sensitive ecological receptors such as designated sites, sensitive habitats (e.g. trees, scrub, watercourses, grassland), and notable species.

Part A

6.2.4 The *CoCP* Part A includes the following measures to reduce impacts on terrestrial ecology:

a. consultation with a suitably qualified ecologist in preparing the control measures within the *ELMP* and *CEMP*

b. a check of the site in advance of the works to identify any ecological constraints in addition to those discussed in this *Environmental Statement*

c. supervision of works by a suitably qualified ecologist

d. protection of trees

e. measures specific to bats such as the control of lighting, noise and vibration, and procedures to follow if a bat roost is present on site

f. measures to prevent harm to nesting birds and birds that are listed on Schedule 1 of the Wildlife and Countryside Act 1981 (WCA, 1981)

g. use of capped and cowled lighting that is directed away from sensitive ecological receptors

h. controls to minimise noise and vibration, including use of noise enclosures, careful plant selection and careful programming of works

i. controls for site drainage to minimise the potential for pollution of watercourses and contamination of sensitive habitats

j. controls to prevent spread of non-native invasive plants, where present.

Part B

6.2.5 There are no site specific measures contained in *CoCP* Part B (Section 11) for terrestrial ecology.

Environmental design measures

6.2.6 The following measures to minimise adverse effects or provide biodiversity enhancements have been incorporated into the project design:

a. advance planting of trees and scrub at the perimeter of the pumping station compound prior to site clearance and construction, which would be retained during operation

b. use of native deciduous trees and other robust, low-maintenance shrubs

c. where practicable, replacement of any trees removed, as close as possible to their existing position or within close proximity to the site

d. provision of bat boxes for a range of bat species at suitable locations in York Gardens

e. a brown roof on the ventilation structure

f. incorporation of areas of shaded, exposed earth to promote natural colonisation by terrestrial invertebrates.

6.3 Assessment methodology

Engagement

6.3.1 Vol 2 Environmental assessment methodology, documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. Specific comments relevant to this site for the assessment of terrestrial ecology are presented here in Vol 11 Table 6.3.1.

6.3.2 The *Scoping Report* was prepared before the Falconbrook Pumping Station site had been identified as a potential site. The scope for terrestrial ecology for this site has therefore drawn on the scoping response from the London Borough (LB) of Wandsworth, feedback from biodiversity workshops held with statutory stakeholders, and the phase two consultation exercise.

6.3.3 This site was presented at a Thames Tunnel Biodiversity Working Group Meeting in March 2011, which was attended by local planning authorities, including LB of Wandsworth. Further consultation on this site was undertaken at subsequent Thames Tunnel Biodiversity Working Group Meetings held in September 2011, and February and July 2012.

Vol 11 Table 6.3.1 Terrestrial ecology – stakeholder engagement

Organisation	Comment	Response
LB of Wandsworth (phase two consultation, February 2012)	York Gardens is a Site of Local Importance for Nature Conservation (SINC). As such the proposals for any new planting of trees and shrubs of native species are welcomed. An alternative (native species) is sought rather than the horse chestnut (*Aesculus hippocastanum*) currently being proposed as a large specimen tree.	The planting scheme has been developed in consultation with the LB of Wandsworth.
	All trees should be of southeast England provenance. Any herbaceous or shrub planting should seek to provide maximum value for biodiversity whether as foraging habitat or for nesting.	Native species or ecologically beneficial non-native species would be provided.

Baseline

6.3.4 The baseline methodology follows the methodology described in Vol 2 Section 6. In summary, the following baseline data has been reported in this assessment:

a. desk study

b. a Phase 1 Habitat Survey was undertaken on 26 November 2010

c. bat triggering (remote recording) surveys were undertaken over three nights between 12 and 14 July 2011

d. an invasive plants survey (species listed on Schedule 9 of the Wildlife and Countryside Act 1981) was undertaken on 2 September 2011.

Construction

6.3.5 The assessment methodology for the construction phase follows that described in Vol 2. There are no site specific variations for this site. All likely significant effects throughout the duration of the construction phase are assessed.

6.3.6 The term significance is used within this volume to refer to project significance levels from negligible to major effects (adverse and beneficial). Adverse moderate or major effects are considered to be significant and require mitigation. Negligible and minor effects are not considered significant and therefore do not require mitigation. These significance criteria and their relationship with levels of significance are based on the *Institute for Ecology and Environmental Management guidelines* (IEEM, 2006)[2] are given in Vol 2 Section 6.

6.3.7 No effects on habitats are predicted beyond 10m of the site boundary. Therefore, the assessment area comprises the site and adjacent land within 10m of the site boundary.

6.3.8 The assessment considers bats, breeding birds and invertebrates within 100m of the site. This is considered to be a sufficient distance within the context of the urban environment to ensure that any significant effects on species, for example from disturbance as a result of construction lighting and noise, are assessed.

6.3.9 Section 6.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on terrestrial ecology within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

6.3.10 No change to the base case conditions for terrestrial ecology is considered likely from the proposed developments listed in Vol 11 Appendix N that would be complete and operational at Site Year 1 of construction. This is either because the development provides a replacement for buildings and structures already present on the development sites, or due to the isolated location of these developments from the proposed development site, within the urban context.

6.3.11 No likely significant cumulative effects have been identified as a result of Blocks A, B, F and G of the Chelsea Creek development (see Vol 11 Appendix N), which would be under construction during the construction phase at the Falconbrook Pumping Station site, as these developments are isolated from the proposed development site within the urban context.

6.3.12 The assessment of construction effects considers the extent to which the assessment findings would be likely to be materially different, should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Assumptions and limitations

6.3.13 The assumptions and limitations associated with this assessment are presented in Vol 2 Section 6. Site specific assumptions and limitations are detailed below.

Assumptions

6.3.14 It is assumed for the purposes of this assessment that the current site management regime at the Falconbrook Pumping Station and within York Gardens will continue as at present.

Limitations

6.3.15 It was not possible to undertake a bat activity survey at dawn at this site due to safety constraints. A dawn activity survey has been used at Thames Tideway Tunnel project sites to determine the location of potential roosts on site and to assess the type of usage of the site for commuting or foraging bats. It was considered that the remote recording survey provided sufficient data to be able to determine the usage of the site by bats (Vol 11 Appendix D.1). Therefore, the absence of a dawn activity survey is not considered to limit the baseline results and the assessment of effects on bats and is therefore considered robust.

6.3.16 No other site-specific limitations have been identified.

6.4 Baseline conditions

6.4.1 The following section sets out the baseline conditions for terrestrial ecology receptors within and around the site, including their value. Future baseline conditions (base case) are also described. All figures referred to in this section are contained in the Vol 11 Falconbrook Pumping Station Figures (see separate volume of figures).

Current baseline

Designated sites

6.4.2 The following designated sites relevant to terrestrial ecology are within 250m of the site and are shown on Vol 11 Figure 6.4.1 (see separate volume of figures):

a. the site is within and adjacent to the York Gardens SINC (Grade L[ii]), which is a small park with amenity grassland, scattered trees and planted shrubs, providing habitat for common birds and invertebrates. This site is of low-medium (local) value

b. the River Thames Tidal Tributaries SINC (Grade M[iii]) is located 180m to the west of the proposed development site, comprising inter-tidal habitat and river channel. This designated site is included in the aquatic ecology assessment (see Section 5 of this volume) and is not considered further in this assessment.

Habitats

6.4.3 Habitats recorded within the survey area during the Phase 1 Habitat Survey are described in Vol 11 Table 6.4.1 below and shown on Vol 11 Figure 6.4.2 (see separate volume of figures).

Vol 11 Table 6.4.1 Terrestrial ecology – Phase 1 Habitat Survey

Habitat type	Habitat description
Hardstanding	The majority of the site comprises hardstanding for pedestrian and vehicle routes. Within the wider York Gardens there are pedestrian footpaths and a children's playground.
Buildings	Buildings within the survey area comprise a two storey pumping station building with a flat roof, and a single storey

[ii] SINC (Grade L) = Site of Importance for Nature Conservation (Grade I of Local importance)

[iii] SINC (Grade M) = Site of Importance for Nature Conservation (Grade III of Metropolitan importance)

Habitat type	Habitat description
	disused toilet block with a flat roof and protruding canopy. Also present within the survey area is a screening chamber, which comprises a two storey brick and concrete structure. The area around York Gardens comprises residential buildings.
Dense scrub	The western boundary of York Gardens and the site comprises dense scrub, particularly at the Falconbrook highway works site. There is also a small area of dense scrub to the southwest of the site in York Gardens.
Scattered trees	Scattered mature trees (coniferous and deciduous) are present within the dense scrub along the eastern boundary of York Gardens on and adjacent to the site. Scattered trees are also present within amenity grassland habitat on the eastern site boundary, at the location of the existing bus stop and within the wider York Gardens.
Tall ruderal vegetation	Native tall ruderal vegetation is present along the boundaries of the dense scrub habitat, within the boundary of the site in the north. A small area of tall ruderal vegetation is also present to the west of the main site comprising common plant species.
Amenity grassland	The majority of York Gardens comprises species poor amenity grassland.
Introduced shrub	Non-native introduced shrubs are present within a planting feature to the southeast of the site, within York Gardens.

6.4.4 The buildings and hardstanding have no intrinsic habitat value and are therefore considered to be of negligible value.

6.4.5 Vegetation along the eastern boundary of the site, at the location of the proposed bus stop, is part of a habitat corridor that provides connectivity of habitat along the boundary to York Gardens. This vegetation comprises mature scattered trees, scrub and tall ruderal vegetation. These habitats are considered to appreciably enrich the local biodiversity resource. Therefore, this habitat is considered to be of low-medium (local) value.

6.4.6 Scattered trees on and adjacent to the site include some mature trees, which have limited biodiversity value. These are considered to be individually of low (site) value.

6.4.7 The species-poor amenity grassland habitat on site is limited in extent, common and is easily recreated. It provides some limited value as a semi-natural habitat within an otherwise urban area. This habitat is of low (site) value.

Notable species

6.4.8 Survey results are set out in a notable species report, which is included in Vol 11 Appendix D.1. A summary of the results and an assessment of the value of species associated with the site are set out below.

Bats

6.4.9 The potential for bats to roost and forage within vegetation adjacent to the site, and to roost within buildings in close proximity to the site was identified during the Phase 1 Habitat Survey. Consequently, remote recording surveys were undertaken for bats.

6.4.10 All bats are European Protected Species (EPS) under the Conservation of Habitats and Species Regulations 2010. Seven of the 18 bat species that regularly occur in England are listed as priority species on the UK BAP. Nine bat species are listed on the London BAP including common pipistrelle (*Pipistrellus pipistrellus)* and soprano pipistrelle (*Pipistrellus pigmaeus)*. These two species were both recorded on site. Detailed survey results are provided in Vol 11 Appendix D.1 and on Vol 11 Figure 6.4.3 (see separate volume of figures).

6.4.11 The common pipistrelle bat is the UK's most common bat species, and is a widespread species in Greater London. Soprano pipistrelle bat is also widespread and common across Greater London but has a smaller UK population than the common pipistrelle (London Bat Group, 2012)[3,] (Harris et al, 1995)[4]. Both species are in decline mainly due to habitat loss.

6.4.12 During the remote recording surveys, the maximum number of common pipistrelle bat passes was 100, with two bat passes recorded within half an hour of dusk (28 and 29 minutes after sunset), when bats generally leave their roost sites to forage for the night. No bats were recorded within an hour of dawn, when bats typically return to their roost sites. The trees and buildings on site were considered to be sub-optimal for roosting bats. However, a roost is likely to be present in close proximity to the site, such as within residential properties to the west of York Road. The site is considered to provide a foraging resource for bats that are roosting in the wider area. Given the conservation status of common pipistrelle, that it is common relative to other UK bat species, it was recorded in moderate numbers, and the population is likely to be associated with at least one nearby roost, the common pipistrelle population associated with the site is considered to be of low-medium (local) value.

6.4.13 Only one soprano pipistrelle bat pass was recorded during the remote recording surveys on only one night. This bat pass was not recorded close to sunset or sunrise when bats generally leave and return to their roost sites. The survey results indicate that soprano pipistrelle bats occasionally visit the site and the wider York Gardens for foraging purposes. With consideration to the conservation status of soprano pipistrelle and that only a single bat pass was recorded, the soprano pipistrelle population associated with the site is considered to be of low (site) value.

Breeding birds

6.4.14 During the Phase 1 Habitat Survey, the trees, dense scrub and tall ruderal vegetation on and adjacent to the site were considered to provide a foraging and nesting resource for birds, although the quality of the habitat was considered to be sub-optimal to support a notable population or assemblage of species that would require a breeding bird survey to be undertaken.

6.4.15 Limited nesting or foraging opportunities for birds are present on the site itself. Birds are likely to nest in mature trees and dense scrub adjacent to the site. Birds that are likely to be nesting within vegetation on site and adjacent to the site are likely to comprise bird species common to the area, including some that are listed as London and UK BAP priority species. As the number of nests that the vegetation could support is considered to be small, the bird resource on and adjacent to the site is considered to be of low (site) value.

Other notable species

6.4.16 Vegetation on site is considered to be sub-optimal for a notable assemblage of invertebrate species, although some common species are likely to be present within the trees, scrub and tall ruderal vegetation on and adjacent to the site. Therefore, the invertebrate resource is considered to be of low (site) value.

Invasive plants

6.4.17 A survey for invasive plant species was undertaken at the Falconbrook Pumping Station site. No invasive plant species listed within Schedule 9 Part II of the Wildlife and Countryside Act 1981 (as amended) were recorded within or in the immediate vicinity of the proposed development site as shown on Vol 11 Figure 6.4.4 (see separate volume of figures). Invasive plants are therefore not considered further in this assessment.

Noise, vibration and lighting

6.4.18 As noise, vibration and lighting have the potential to disturb species on and adjacent to the site, baseline conditions are described here.

6.4.19 Traffic movements along York Road, adjacent to the west of the site, create noise and vibration within York Gardens. People walking through the park and children playing at the adjacent York Gardens Children's Playground currently generate noise.

6.4.20 The site and surrounding area is currently lit in the early evening and overnight by street lighting and by light spill from surrounding buildings.

Construction base case

6.4.21 Assuming management and use of the site will continue in its present form, conditions at the commencement of construction would be the same as existing baseline conditions.

6.4.22 The noise and vibration base case is described in detail in Section 9 of this volume. The base case for noise and vibration is anticipated to be similar to the current baseline. Lighting levels are anticipated to be the same as the current baseline.

6.5 Construction effects assessment

Construction impacts

Habitat clearance and creation

6.5.1 Advance planting of trees and scrub would be undertaken adjacent to the site, within York Gardens, to maintain foraging habitat for bats and birds during the construction period. Native or non-native ecologically beneficial tree and shrub planting would be undertaken within the low value amenity grassland areas.

6.5.2 There would be temporary loss of an area of scattered trees, dense scrub and tall ruderal vegetation from the western boundary of the Falconbrook Pumping Station (main site) and from the western boundary of York Gardens at the location of the proposed relocated bus stop (highway works site). These habitats would be replaced on site or as close as possible to their original location upon completion of works. Native or non-native ecologically beneficial tree and scrub vegetation would be planted. Retained trees would be protected through measures in the *CoCP* Part A (Section 11).

6.5.3 Habitat loss would affect birds that use the habitat for nesting and foraging birds, for invertebrates that shelter and forage within the vegetation and for bats that use the habitat for foraging and commuting.

6.5.4 Additional ephemeral short perennial habitat would be provided by the brown roof on the ventilation building of benefit to invertebrates, and foraging birds and bats.

6.5.5 Overall, there would be an overall gain in habitat area within York Gardens, and therefore a small increase in the available nesting and foraging resource for birds, foraging and commuting habitat for bats and shelter for invertebrates.

Movement, noise, vibration and lighting

6.5.6 Noise and vibration impacts are based on the data and assessment in Section 9 of this volume. Noise and vibration are likely to be higher than the ambient noise levels throughout construction, mainly during the day. The increase in noise and vibration is likely to cause disturbance to nesting and foraging birds.

6.5.7 Evening and 24 hour lighting during construction would be appreciably higher on site than current levels. Light levels on site and adjacent to the site are currently high. The horizontal and vertical light spill due to construction beyond those areas at ground level would be minimal due to control measures in the *CoCP* Part A (Section 4). Construction lighting would be directed away from dark vegetated areas around the park, which are currently used by bats for commuting and foraging. Therefore, the change in light levels is likely to be small. Although the change in light levels is small, lighting could cause disturbance to nesting birds adjacent to the site.

6.5.8 As no bat roosts have been identified immediately adjacent to the site, bats are only likely to be present within habitat adjacent to the site whilst foraging at night. Foraging bats are unlikely to be affected by the very small increases in noise and vibration levels, and movements of vehicles at night. The small change in light levels with control measures in the *CoCP* Part A (Section 4) is unlikely to result in disturbance to foraging bats adjacent to the site.

Construction effects

Designated sites

6.5.9 Although there would be a temporary reduction in the extent of the York Gardens SINC (Grade L), the overall structure and function of the site for wildlife, particularly with advanced planting within York Gardens, would not be significantly affected during the construction period. The reinstatement of some of the habitat removed during construction and the provision of advance planting would result in no significant effect on the structure, function and extent of the designated site in the long-term. Therefore, the effect on the integrity of the designated site is to be probable, **negligible** and not significant.

Habitats

6.5.10 There would be temporary loss of trees and scrub of low (site) and low-medium (local) value on the main site and highway works site. However, there would be provision of advanced planting along the boundary of the Falconbrook Pumping Station and a small area of ephemeral short perennial habitat would be provided on the brown roof resulting in an overall gain in habitat of low-medium (local) value. Therefore, the effect is considered to be probable, **moderate beneficial** and significant.

Species

Bats

6.5.11 Although foraging and commuting habitat for bats would be lost during construction, bats would be displaced to the areas of advance planting and alternative foraging habitat within York Gardens and the wider local area. With advance planting and the reinstatement of habitat, including the brown roof, there would be no overall loss of bat foraging habitat on and adjacent to the site in the long term. No perceptible change in bat populations is anticipated as a result of changes to the habitat within York Gardens. Therefore, the effect is considered to be probable, **negligible** and not significant.

6.5.12 The provision of bat boxes would be beneficial for bats although the significance of the effect on bats cannot be predicted with any level of certainty as the number, location and type of bat box is to be agreed with the local authority. Therefore, the significance of the effect on bats is considered to be probable, **negligible** and not significant.

Breeding birds

6.5.13 Birds are likely to be displaced due to the loss of nesting opportunities on both the main and highway works sites. Advance planting would ensure that habitat would be maintained for breeding birds during construction. Overall, the habitat resource for breeding birds would increase slightly after habitat reinstatement on site, including the brown roof. This would increase the number of nests of common bird species on site. As these species are common, this increase is unlikely to be perceptible against background population fluctuations. Therefore, this effect is considered to be probable, **negligible** and not significant.

6.5.14 Any birds adjacent to the site are likely to habituate to small changes in noise and vibration levels and disturbance from lighting would be minimal. Suitable habitat is available within the wider area, including areas of advance planting, and any birds displaced could move to these areas. Any change in populations would not be perceptible against background population fluctuations. Therefore, the effect on breeding birds of disturbance is considered to be probable, **negligible** and not significant**.**

Other notable species

6.5.15 There would be an increase in the availability of habitat for invertebrates within York Gardens in the long term due to the provision of ground treatments, which would incorporate areas of shaded, exposed earth to promote natural colonisation by terrestrial invertebrates and the reinstatement of habitat lost during construction, including the brown roof. The invertebrate resource may increase and be more diverse following completion of works, although the changes are not likely to be perceptible against background invertebrate population variations. Therefore, the effect is considered to be probable, **negligible** and not significant.

Sensitivity test for programme delay

6.5.16 For the assessment of effects on terrestrial ecology during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 6.5.1 - 6.5.15). This is because there are no developments in the site development schedule (see Vol 11 Appendix N) that would fall into the base case as a result of this delay and therefore the base case would remain as described in paras. 6.4.21 - 6.4.22.

6.6 Operational effects assessment

6.6.1 As stated in para. 6.1.3, operational activities are limited at this site and not likely to lead to significant operational effects.

6.7 Cumulative effects assessment

Construction effects

6.7.1 No likely significant cumulative effects on terrestrial ecology have been identified as a result of construction activities from those developments identified in para. 6.3.11. Therefore, the effects on terrestrial ecology would remain as described in Section 6.5.

Sensitivity test for programme delay

6.7.2 In the event that the programme for the Thames Tideway Tunnel project is delayed by approximately a year, the cumulative effects assessment would remain unchanged. As described above in para. 6.7.1, there are no schemes anticipated to generate cumulative effects on terrestrial ecology and this would remain the case with a programme delay of approximately one year.

6.8 Mitigation

6.8.1 All measures embedded in the design and the *CoCP* of relevance to terrestrial ecology are summarised in Section 6.2. As no significant adverse effects were identified in Section 6.5 at this site, no further mitigation measures are required.

6.9 Residual effects assessment

Construction effects

6.9.1 As no mitigation measures are proposed, the residual construction effects remain as described in Section 6.5. All residual effects are presented in Section 6.10.

6.10 Assessment summary

Vol 11 Table 6.10.1 Terrestrial ecology – construction assessment summary

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Designated sites				
York Gardens Site of Importance for Nature Conservation (Grade L)	No significant change to the integrity of the site as a result of the temporary reduction in extent, advance planting and reinstatement of habitat removed from the site.	Negligible	None	Negligible
Habitats				
Hardstanding, buildings, scattered trees, dense scrub, tall ruderal vegetation, ephemeral short perennial and introduced shrub.	Increase in habitat of low-medium (local) value due to advance planting and habitat reinstatement.	Moderate beneficial	None	Moderate beneficial
Species				
Bats	No change in bat populations as a result of temporary displacement of foraging bats from the site to the surrounding area due to habitat loss on site.	Negligible	None	Negligible
	No significant change in bat populations as a result of the provision of bat boxes.	Negligible	None	Negligible
Birds	No change in bird populations as a result of temporary habitat loss, advance planting and the provision of replacement planting.	Negligible	None	Negligible
	No change in bird populations as result of low	Negligible	None	Negligible

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
	levels of disturbance from noise, vibration and lighting.			
Invertebrates	No perceptible increase in invertebrate populations and diversity due to provision of habitat for invertebrates within York Gardens.	Negligible	None	Negligible

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Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 7: Historic environment

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7 Historic environment

7.1 Introduction

7.1.1 This section presents the findings of the assessment of the likely significant effects on the historic environment at the Falconbrook Pumping Station site. The historic environment is defined in para 4.10.2 of the *National Policy Statement for Waste Water* (Defra, 2012)[1] as including all aspects of the environment resulting from the interaction between people and places through time, including all surviving physical remains of past human activity, whether visible, buried or submerged, and landscaped and planted or managed flora. For the purposes of this assessment, heritage assets comprise below and above-ground archaeological remains, buildings, structures, monuments and heritage landscapes within and around the site. Effects during construction are assessed with effects on buried assets presented first, followed by above-ground assets.

7.1.2 Based on a review of the noise and vibration assessment (Section 9), it is concluded that there would be no significant noise or vibration effects during construction of operation requiring offsite mitigation to any listed building. Such effects are therefore not considered further in this assessment.

7.1.3 The operational phase would not involve any activities below-ground aside from maintenance confined within the tunnel infrastructure. Therefore an assessment has not been undertaken of operational effects on buried assets.

7.1.4 There are no buried or above-ground heritage assets within the assessment area whose settings would be significantly adversely affected. Both construction and operational effects for the historic character and setting of heritage assets for this site have therefore been scoped out of the assessment.

7.1.5 A separate but related assessment of effects on townscape character and visual amenity is included in Section 11 Townscape and visual.

7.1.6 An assessment of effects from ground movement resulting from the Thames Tideway Tunnel itself is covered in Volume 3 Project-wide Effects. No effects are predicted on historic receptors in the vicinity of this site, therefore no assessment of ground movement effects is presented.

7.1.7 The assessment of the historic environment effects of the project has considered the requirements of the *NPS*. As such the assessment covers designated and non-designated assets, and a description of the significance of each heritage asset affected by the proposed development. The assessment covers both above and below-ground assets. The effect of the proposed development on the significance of heritage assets is clearly detailed in line with the requirements of the *NPS*. The role of the design process in helping to minimise effects on the historic environment is explained, and where appropriate, mitigation is proposed. Volume 2

Environmental assessment methodology Section 7 provides further details on the methodology.

7.1.8 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

7.2 Proposed development relevant to the historic environment

7.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to the historic environment are set out below.

7.2.2 Unless otherwise indicated, 'the site' refers to the Falconbrook Pumping Station main site. A small highway works site to the north is referred to as the Falconbrook Pumping Station highway works site.

Construction

7.2.3 All below-ground works during construction are relevant to the assessment because they could potentially truncate or entirely remove any archaeological assets within the footprint of the works. These are described below.

7.2.4 The construction of the works compound during initial site set-up would be likely to entail preliminary site stripping, assumed for the purposes of this assessment to reach a depth of approximately 0.5 metres below-ground level (mbgl). Site hoarding would be erected, supported by timber posts in concrete foundations. Office, storage and welfare facilities and production plant would be constructed on foundations with a depth of approximately 1.0mbgl, as assumed for the purposes of this assessment. A crane base would have foundations approximately 1.0–1.5m deep (see Construction phases - phase 1, separate volume of figures - Section 1). Initial site set up would entail the diversion of existing services and the construction of new service trenches to a depth of 1.0–2.0mbgl. The existing modern disused toilet block and the southern and western sections of the modern pumping station boundary walls would be demolished (the boundary walls would be reinstated). Buried parts of the former pumping station basement structure would be removed (see Demolition and site clearance plan, separate volume of figures - Section 1).

7.2.5 The combined sewer overflow (CSO) drop shaft would be located partially within the footprint of the former pumping station basement (an area within which any archaeological remains will already have been removed). Other deep constructions, comprising the interception chamber, valve chamber and ventilation chamber and associated ventilation columns and structures, would be located partly or wholly within the footprint of the former pumping station substructure (see Site works parameter plan, separate volume of figures - Section 1).

7.2.6 A bus stop would be relocated to the north of the pumping station at the Falconbrook Pumping Station highway works site, entailing negligible ground disturbance (see Demolition and site clearance plan, separate volume of figures - Section 1). It is not considered further in this assessment.

Code of Construction Practice

7.2.7 Measures incorporated into the *Code of Construction Practice* (*CoCP*) Part A (Section 12) to protect heritage assets include:

a. The requirement for the contractor to prepare a site-specific *Heritage Management Plan* (HMP), indicating how the historic environment is to be protected. This may take form of both physical protection and working practices.

b. Protective measures, such as temporary support, hoardings, barriers, screening and buffer zones around heritage assets, and archaeological mitigation areas within and adjacent to worksites.

c. Advance assessment to inform the types of plant and working methods for use where heritage assets are close to worksites, or attached to structures that form parts of worksites.

d. Security procedures to prevent unauthorised access to heritage assets and archaeological investigations, and damage to or theft from them, including by the use of metal detectors.

e. Procedures in the event of the discovery of human remains.

f. Procedures under the Treasure Act Code of Conduct 1997, to address the discovery of any artefacts defined in the Treasure Act 1996.

7.2.8 The *Code of Construction Practice (CoCP)* is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

7.2.9 Site-specific measures concerning the historic environment in the *CoCP* Part B (Section 12) comprise the removal and storage of granite sets from the area adjacent to existing venturi structure and disused public convenience. These will be reinstated/reused as far as is practical.

7.2.10 All the measures detailed above form part of the proposed development subject to the assessment, and therefore impacts such as strike damage on heritage assets are considered unlikely to occur and are not assessed. However, site specific measures to mitigate effects on buried heritage, which would be detailed in *Site Specific Archaeological Written Scheme of Investigation (SSAWSI)*, in line with the *Overarching Archaeological Written Schemes of Investigation (OAWSI)* (Vol 2 Appendix E.2), would be subject to the findings of field evaluation, and are therefore reported as mitigation as detailed further in para 7.8.5.

7.3 Assessment methodology

Engagement

7.3.1 Volume 2 Environmental assessment methodology documents the overall engagement which has been undertaken in preparing the *Environmental Statement*.

7.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of historic environment for this site has therefore drawn on the scoping response from the LB Wandsworth and is based on professional judgement, as well as experience of similar sites.

7.3.3 Specific comments relevant to this site for the assessment of the historic environment are presented here. Throughout the environmental impact assessment (EIA) there has been regular liaison with English Heritage and other stakeholders. Vol 11 Table 7.3.1 below summarises the comments raised by consultees and how each comment has been addressed.

Vol 11 Table 7.3.1 Historic environment – consultation response

Organisation and date	Comment	Response
English Heritage phase two consultation response (February 2012)	Requested building recording of the former pumping station substructure.	The *Environmental Statement* includes investigation and recording of the former pumping station substructure as mitigation (see Section 7.8).
	English Heritage considered the prehistoric potential of this site to be of medium to high significance based on knowledge of the archaeology of the area in general.	Prehistoric potential of the site is considered to be low due to the extensive impact of the former pumping station basement (see Section 7.4).
	English Heritage considered that proactive observation and recording of site set-up works needed	A watching brief during site set-up works is included as part of the mitigation outlined in Section 7.8.

Baseline

7.3.4 The baseline methodology follows the methodology described in Vol 2. It should be noted that whilst most topics within the ES use the term 'value' to define the sensitivity of environmental receptors within the baseline, the historic environment assessment uses 'asset significance' as per the terminology used within the *NPS*. Distinction is made between the significance of the resource, i.e. asset significance, and the significance of the environmental effect throughout the following assessment.

7.3.5 Baseline conditions for above-ground and buried heritage assets are described within a 300m-radius area around the centre point of the site which is considered through professional judgement to be most appropriate to characterise the heritage potential of the site. There are occasional references to assets beyond the baseline area, for example the Saxon occupation at Althorpe Grove, approximately 925m to the north of the site, which contributes to current understanding of the site and its environs in the early medieval period.

7.3.6 Site visits were carried out in April and May 2011 to identify heritage assets on or adjacent to the site.

Construction

7.3.7 The assessment methodology for the construction phase follows that described in Vol 2. There are no site-specific variations for undertaking the construction assessment of this site.

7.3.8 In terms of physical effects on above-ground or buried assets, likely significant effects could arise throughout the construction phase. Effects arising from all stages of the construction period are therefore assessed. The construction assessment area for such effects is defined by the site boundary.

7.3.9 Section 7.5 details the likely significant effects arising from construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on the historic environment within the assessment area. Therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

7.3.10 Archaeological remains are a static resource, which have reached equilibrium with their environment and do not change (ie, decay or grow) unless their environment changes as a result of human or natural intervention. In terms of buried heritage assets or above-ground assets located within the site, none of the developments listed in the site development schedule (Vol 11 Appendix N) would affect assets within the site itself. Whilst the baseline within the baseline area beyond the site may change as a result of any archaeological excavation and recording carried out as part of a standard programme of mitigation for other developments, such information is unlikely to significantly change the current understanding of the historic environment of the site. Therefore any changes to the surrounding baseline would not affect the assessment and are not detailed further within the construction base case, which remains as per the baseline.

7.3.11 None of the schemes included in the site development schedule (Vol 11 Appendix N) would have a significant physical cumulative effect on buried or above-ground heritage assets within the site. This is because there are no assets common to the Falconbrook Pumping Station site and those schemes listed in the development schedule. Therefore no assessment of cumulative effects has been undertaken for physical effects on assets in the construction phase.

7.3.12 Should the programme for the Thames Tideway Tunnel project be delayed by approximately one year, this would lead to no change in the assessment findings, and is therefore not considered further in the assessment. As described above, whilst the baseline within the baseline area beyond the site may change as a result of any archaeological excavation and recording carried out as part of a standard programme of mitigation for other developments, such information is unlikely to significantly change the current understanding of the historic environment of the site. Therefore a delay to the Thames Tideway Tunnel project, with a consequent change in other schemes which may have been developed by the time of Thames Tideway Tunnel construction, would not lead to any change in the baseline and therefore no change in the assessment of effects on these assets.

Assumptions and limitations

7.3.13 The assumptions and limitations associated with this assessment are presented in Vol 2. Site-specific assumptions and limitations are detailed below.

Assumptions

7.3.14 The assessment of effects on buried heritage assets is based on the shaft and other below-ground structures being located anywhere within the zones identified on the Site works parameter plan (see separate volume of figures – Section 1) for these structures. For this site the assessment is not sensitive to variations in location within these zones because the desk-based assessment has not located any heritage assets of high significance within the site, which would warrant preservation *in situ*.

7.3.15 A number of assumptions have been made regarding the likely depth of temporary construction works (eg, site strip, footings for plant and accommodation), based on professional knowledge of construction projects. Whilst the precise nature of construction effects on buried heritage would vary if the depths varied, the mitigation proposed to address any effects would remain as stated, as would the residual effects. These assumptions are detailed in Section 7.2.

Limitations

7.3.16 A limitation of the assessment is that no intrusive archaeological investigation has been carried out on the site in the past and few investigations have been carried out in the baseline area around the site. Nevertheless the assessment is considered to be robust and in accordance with best practice.

7.4 Baseline conditions

7.4.1 The following section sets out the baseline conditions for the historic environment within and around the site. Future baseline conditions (base case), which would remain as per the baseline, are also described. The section comprises seven sub-sections:

a. a description of historic environment features within the 300m-radius baseline area

b. a description of statutorily designated assets within the site and baseline area. Locally designated assets and known burial grounds are included, where relevant, as described in Vol 2

c. a description of the site location, topography and geology

d. a summary of past archaeological investigation, providing an indication of how well the area is understood archaeologically

e. a chronological summary of the archaeological and historical background of the site and its environs

f. a statement of significance for buried heritage assets, including buried heritage setting, taking account of factors affecting survival

g. a statement of significance for above-ground assets within and around the site, describing the features which contribute to their significance.

Current baseline

Historic environment features

7.4.2 The historic environment features map (Vol 11 Figure 7.4.1, see separate volume of figures) shows the location of known above-ground and buried historic environment features within the 300m-radius baseline area around the site, compiled from the baseline sources set out in the methodology in Vol 2. These have been allocated a unique historic environment assessment reference number (HEA 1, 2, etc), which are listed in the gazetteer in Vol 11 Appendix E.1.

Designated assets

International and national statutory designations

7.4.3 The site and baseline area contain no nationally designated (statutorily protected) heritage assets, such as scheduled monuments, listed buildings, or registered parks and gardens. The significance of assets is described further in the ‘Statement of significance: above-ground heritage assets’ below, in paras. 7.4.30–7.4.35.

Local authority designations

7.4.4 The site does not lie within a conservation area. There are no locally listed buildings in the immediate vicinity (ie, within 100m of the site). The site lies within an archaeological priority area, which defines the potential of the historic and prehistoric floodplain of the Thames along Wandsworth riverside.

Known burial grounds

7.4.5 There are no known burial grounds within the site or adjacent to it.

Site location, topography and geology

7.4.6 The site lies approximately 200m to the east of the current course of the River Thames, and lies immediately to the south of the subterranean course of the Battersea Creek, formerly known as the Falcon Brook.

7.4.7 The site and immediate vicinity are flat, with street levels along York Road and in York Gardens at approximately 104.0m ATD (Above Tunnel Datum).

7.4.8 The northern part of the site overlies alluvium associated with the Falcon Brook, a small tributary of the Thames entering the Thames floodplain from the southeast. The southern part of the site overlies the Kempton Park river terrace (sand and gravel). In the central part of the site, and at the highway works site to the north, the gravel terrace is overlain with Brickearth (or Langley Silt Complex).

7.4.9 Where the Falcon Brook entered the Thames floodplain in the prehistoric period, in the area of the site, it eroded both the river terrace and the overlying Langley Silts backwards in an easterly direction. The Falcon Brook would have been brackish and tidal and is likely to have flooded the area throughout the late prehistoric period.

7.4.10 There is only one historic borehole record for the site itself. The one historic borehole on site recorded gravel from 98.91m ATD, peat deposits were recorded from 98.69m ATD and alluvial clays from 97.26m ATD. British Geological Survey boreholes in the wider baseline area revealed the presence of varying thicknesses of made ground (possibly modern but potentially containing archaeological remains). Two of the boreholes revealed made ground 3.8–4.7m thick, overlying terrace gravels at 99.8–100.6m ATD. Two boreholes revealed 2.6m of made ground overlying alluvium associated with the Falcon Brook Channel at 101.8m ATD, over terrace gravels at 101.0m ATD.

7.4.11 A borehole on the river terrace 160m to the south of the site revealed 3.2m of made ground lying directly on gravel terrace at 101.2m ATD. This borehole is likely to be indicative of levels of terrace gravels lying beneath the southern half of the site. The site topography and geology is discussed in more detail in Vol 11 Appendix E.2.

Past archaeological investigations

7.4.12 Seven past archaeological investigations have been carried out within the baseline area, although none within the site itself. The nearest investigations were at the Price’s Candles Factory, 60m to the west and southwest of the site, between 1991 and 2002 (HEA 2, 3, 5–7). These recorded a Bronze Age ditch, along with medieval and post-medieval remains of a former residence of the Archbishops of York, and later post-medieval industrial development.

7.4.13 An archaeological investigation 175m to the northwest (HEA 17), recorded a series of timber revetments dating from the 16th to the 18th century that would have supported the northern bank of the ‘Falcon Brook’, near the confluence of the main Thames channel. An archaeological investigation, 215m to the northeast (HEA 4), recorded a post-medieval well or cess pit. Further detail is included in Vol 11 Appendix E.3.

Archaeological and historical background of the site

7.4.14 The following section presents a chronological summary of the archaeological and historical background of the site. Further detail is included in Vol 11 Appendix E.4.

7.4.15 Throughout the prehistoric (700,000 BC–AD 43) and Roman (AD 43–410) periods, the Falcon Brook and Thames would have provided rich natural resources, with the nearby higher terrace providing a suitable location for settlement. The area became increasingly marshy with rising water levels. The northern part of the site was within or on the bank of the Falcon Brook, and prone to flooding, whilst the central and southern parts would have been dry land. During the Roman period, the site would have probably been within a rural landscape of open fields and scattered farmsteads. Evidence for prehistoric and Roman activity within the area is limited and little is known about the nature of human activity during these periods. The discovery of a Bronze Age ditch and Bronze Age pottery (HEA 5), 60m to the west of the site, indicate there was settlement in the area.

7.4.16 No evidence of early medieval (Saxon) period (AD 410–1066) activity has been recorded within the baseline area, and the site was probably open fields beside the Falcon Brook. The first known settlement of the area is during the later medieval period (AD 1066–1485), when the site probably lay within, or immediately outside, the medieval hamlet of Bridges. Little is known of this settlement, which probably took its name from a timber bridge on York Road over the Falcon Brook. Remains of a medieval manor house were recorded in the 1990s during archaeological investigations (HEA 5 and 7) on the opposite side of York Road, 60m to the west of the site.

7.4.17 Historic maps from the mid-18th century indicate that the site remained open fields until the mid to late 19th century. There is no mapped evidence of the Bridges settlement other than a group of buildings at the junction of York Place and York Road shown on Rocque's map of 1746 (Vol 11 Appendix E.5, Vol 11 Appendix Plate E.1), 75m to the southwest of the site.

7.4.18 By the mid to late 19th century, the site was built up with rows of terraced houses along an east-west aligned road called Creek Road. In 1905, a pumping station was constructed on the centre of the western part of the site, with a deep basement and culverts that linked it to the Victorian Bazalgette sewer located along the line of York Road to the west. Additional pumping machinery was added in 1913. During the 1960s the terraced housing on the site was cleared. In the 1970s, the original pumping station was demolished and the former basement presumably infilled. It was replaced by the existing Falconbrook Pumping Station, located immediately northeast of the original structure. At this time York Gardens was established.

7.4.19 The current pumping station comprises an early 1970s reinforced concrete framed building in the northern part of the site, a smaller two–storey structure to the south of this, and a single–storey concrete framed building along the eastern boundary of the site. A cobbled surface of granite sets is located immediately to the west of the pumping station, leading towards York Road. It appears to be aligned to a street layout that existed prior to the redevelopment of the area post 1945, and is probably an original street surface. Located in the southwestern corner of the site, over the footprint of the former pumping station building, is a small rectangular disused toilet block dating to the late 20th century.

Statement of significance: buried heritage assets on the site

Introduction

7.4.20 The following section discusses past impacts on the site which are likely to have compromised asset survival (generally from late 19th and 20th century developments, for example, building foundations), identified from historic maps, the site walkover surveys, and information on the likely depth of deposits.

7.4.21 In accordance with the *NPS*, *National Planning Policy Framework* (DCLG, 2012)[2] and *PPS5 Planning Practice Guide* (DCLG, 2012)[3] (which remains extant) and national planning policy guidance, this is followed by a statement on the likely potential for and significance of buried heritage assets within the site, derived from current understanding of the baseline conditions, past impacts, and professional judgement.

Factors affecting survival

7.4.22 Archaeological survival potential across the site is likely to be highly variable, with no survival potential beneath the existing and earlier pumping station buildings, and fragmentary survival potential elsewhere. Remains within and beneath the alluvial deposits in the northwestern part of the site, and at the alluvial/gravel interface in the central and southern parts of the site, are likely to be intact. Archaeological remains potentially lie, directly below the modern made ground. Factors which may have compromised archaeological survival include:

a. The deep basement of the existing pumping station in the northeastern part of the site would have removed any archaeological remains within its footprint.

b. The deep basement of the earlier 1905 pumping station in the centre of the western part of the site, extended to a depth of 7.5m below-ground level. Its construction will have entirely removed any earlier archaeological remains from within its footprint. Remains of the pumping station itself are considered to be a heritage asset.

c. The construction of foundations of mid- to late-19th century building foundations across the site, and in particular any cellars, is likely to have partially removed earlier archaeological remains from within their footprint. Remains of the foundations themselves are considered as a part of the archaeological record.

d. Existing utilities trenches which are known to cross the site will typically have removed archaeological remains to a depth of approximately 1.0–1.5mbgl, but potentially up to 2.0mbgl for sewage pipe trenches. Deeper, earlier, remains at the bottom of the alluvium and at the alluvial/gravel interface will have remained intact beneath this truncation.

Asset potential and significance

7.4.23 The following statement of asset significance takes into account the levels of natural geology and the level and nature of later disturbance and truncation. Much of the site has been truncated by 19th and 20th century activity and the survival of any archaeological remains pre-dating the 19th century would be fragmentary.

Palaeoenvironment

7.4.24 The site has a moderate potential to contain palaeoenvironmental remains. The northern edge of the site is located partly on the alluvial floodplain at the confluence of the Thames and an ancient tributary, the Falcon Brook. Palaeoenvironmental remains may be preserved within deep alluvial sediments. Such remains would potentially be of low asset significance, derived from their evidential value.

Prehistoric

7.4.25 The site has low potential to contain prehistoric remains. The location of the site on well-drained and fertile gravels beside the Falcon Brook would have been conducive to early settlement and farming. A Bronze Age ditch and pottery was identified during an archaeological excavation 60m to the west of the site, the significance of which is uncertain, but no remains of this date were uncovered in other nearby investigations. Fragmentary remains of prehistoric cut features would be of medium significance, derived from their evidential value. Isolated residual prehistoric finds would be of low asset significance.

Roman

7.4.26 The site has low potential to contain Roman remains. Evidence for Roman activity in the baseline area is limited to an isolated chance find of a Roman coin found 180m to the south of the site. The site was probably open fields throughout this period. Isolated artefacts would be of low asset significance, derived from the evidential value of such remains.

Early medieval

7.4.27 The site has a low potential to contain early medieval remains. The site was located some distance from the known settlements. No evidence or finds of this date has been recorded within the baseline area. In all likelihood it lay within open fields. Isolated artefacts remains would be of low asset significance, if present. This would be derived from the low evidential value of such remains.

Later medieval

7.4.28 The site has a moderate potential to contain later medieval remains. The site possibly lay within, or immediately outside a small medieval settlement, beside a wooden bridge across the Falcon Brook, and at the side of a road. Evidence of footings of buildings, rubbish and cess pits would be of medium asset significance. Isolated finds on the periphery of the settlement would be of low asset significance. The significance would be derived from the evidential and historical value of the remains.

Post-medieval

7.4.29 The site has a high potential to contain post-medieval remains, in the form of the foundations and culverts of the original Falconbrook Pumping Station, constructed in 1905 in the southwestern/central part of the site, and also foundations and cellars of mid-19th century terraced housing. Such remains would be of low asset significance, derived from their historical and evidential value.

Statement of significance: above-ground heritage assets

Introduction

7.4.30 In accordance with the *National Policy Statement for Waste Water* and the associated guidance, the following section provides a statement of the likely significance of heritage assets based on professional and expert judgement. The significance of assets is a reflection of their value or importance, derived from their perceived historical, evidential, aesthetic and communal value. These terms are defined in Vol 2.

Within the site

7.4.31 The buildings within the site, including the existing pumping station, are dated to the mid to late 20th century and have no heritage significance. They are therefore not considered further in this assessment.

7.4.32 The cobbled granite surface located to the west of the existing pumping station probably dates to the 19th century and is of negligible heritage significance.

Within the baseline area

7.4.33 York Gardens lies immediately to the southeast of the site. The gardens are not a designated heritage asset and do not lie, within a conservation area. The gardens are of no heritage value, and are not considered further.

7.4.34 The building at 100–112 York Road, opposite the site, was originally part of the Price's Candle factory. This is a mid to late 19th-century industrial building complex and is considered to be of medium heritage asset significance (Museum of London Archaeology, 2011)[4].

7.4.35 There would be no physical effects on these assets as a result of the proposed development. Measures incorporated into the *CoCP* Part A (Section 12) would protect against accidental strike damage. These assets are therefore not considered further in this assessment.

Construction base case

7.4.36 As described in para. 7.3.10 no developments identified within the site development schedule would lead to any loss of or change in the buried of above-ground heritage assets within the site. The base case for assessing construction effects within the site would therefore be the same as the baseline.

7.5 Construction effects assessment

Buried heritage assets

7.5.1 Effects of construction works are described in the following section in the sequence in which they would occur, with the individual impacts from each phase described. The effects on heritage assets are summarised in Section 7.10, by chronological period.

Site set-up

7.5.2 Works carried out as part of the initial site set-up, for example, demolition work (including localised impacts to the former early 20th century pumping station), the construction of the works compound, the diversion of existing services, and footings for temporary offices, welfare, plant, a crane base and fencing, would potentially truncate post-medieval remains of low asset significance. The magnitude of impact would be medium as asset significance would be reduced, and these works would result in a **minor adverse** effect.

Construction of the CSO drop shaft, deep culverts and chambers

7.5.3 A number of deep constructions are proposed, comprising the CSO drop shaft, interception chamber, ventilation chamber, valve chamber, ventilation columns and structure, and a connection culvert between the CSO drop shaft and interception chamber.

7.5.4 Within the zones within which the structures would be located, where these fall within the footprint of the former early 20th century pumping station basement, any earlier archaeological remains will already have been removed. Deep constructions in this area would have a high magnitude of impact on the buried remains of the former pumping station, of low asset significance. This would result in a **minor adverse** effect.

7.5.5 Where the works partly or wholly extend outside the former basement, their excavation would be sufficiently deep to entirely remove any surviving archaeological remains present from within their footprint, reducing the significance of any affected assets to negligible. This would constitute a high magnitude of impact for these assets.

7.5.6 The environmental effect would vary depending upon the significance of the assets removed, as detailed below:

a. The site has a moderate potential for palaeoenvironmental remains of low asset significance. The removal of such remains would comprise a **minor adverse** effect.

b. There is a low potential for isolated prehistoric, Roman, early and later medieval finds of low asset significance. The removal of such remains would constitute a **minor adverse** effect.

c. There is a low potential for fragmentary prehistoric features of medium asset significance. The removal of such remains would constitute a **moderate adverse** effect.

d. The site has a moderate potential to contain evidence of later medieval settlement activity, of medium asset significance. The removal of such remains would comprise a **moderate adverse** effect.

e. There is a high potential for post-medieval remains of low asset significance, in the form of the footings and possibly cellars of terraced houses, and the foundations and culverts associated with the 1905 pumping station. If such remains are removed this would constitute a **minor adverse** effect.

7.5.7 The Falconbrook connection tunnel between the CSO drop shaft and the main tunnel would have no impact on archaeological remains as it would be bored well below the level of any archaeological remains.

Above-ground heritage assets

7.5.8 The mid-19th century or later cobbled surface to the west of the pumping station within the site is considered to be of negligible heritage significance. This would be removed and stored during site preparation, and subsequently reused/reinstated where possible. This would comprise a temporary high magnitude of impact, resulting in a **negligible** effect.

7.6 Operational effects assessment

7.6.1 As detailed in Section 7.1, operational effects on the historic environment have not been assessed for Falconbrook Pumping Station site.

7.7 Cumulative effects assessment

7.7.1 As detailed in para. 7.3.11 none of the schemes identified in the site development schedule (Vol 11 Appendix N) within 1km of the site would give rise to cumulative effects. Therefore no assessment of cumulative effects has been undertaken.

7.8 Mitigation

7.8.1 As per the *NPS*, (para 4.10.19), a documentary record of a heritage asset is not as valuable as retaining the heritage asset, and it should not be a factor in the decision as to whether or not development consent is given. Nevertheless, it is the most appropriate form of mitigation available and in EIA terms serves to reduce the significance of the adverse effect, as has been agreed with English Heritage.

Buried heritage assets

7.8.2 Based on this assessment, no heritage assets of high significance are anticipated that would merit a mitigation strategy of permanent preservation *in situ*. It is therefore considered that the minor to moderate adverse environmental effects of the proposed development could be successfully mitigated by a suitable programme of archaeological investigation before and/or during construction, to achieve preservation by record (through advancing understanding of asset significance).

7.8.3 Mitigation requirements would be informed by selective site based assessment. This could include a variety of techniques, such as archaeological monitoring of geotechnical investigations, geoarchaeological deposit modelling, archaeological test pits and trial trenches. This evaluation would enable a more targeted and precise mitigation strategy to be developed for the site in advance of construction. Both evaluation and mitigation would be carried out in accordance with a scope of works *(Site Specific Archaeological Written Scheme of Investigation [SSAWSI])*, as detailed in para 7.8.5 below.

7.8.4 Subject to the findings of any subsequent field evaluation prior to the start of construction, mitigation of the adverse effects upon archaeological remains within the site could include the following:

a. An archaeological watching brief during site preparation and construction to mitigate impacts upon remains of low asset significance, arising from service diversions and foundations for offices and welfare.

b. Archaeological excavation and recording of archaeological remains within the footprint of deep constructions (ie, CSO drop shaft, valve chamber, interception chamber, etc). If the alluvium is particularly deep in this area of the site, mitigation of the impacts of deeper constructions on palaeoenvironmental and prehistoric remains would only become feasible following the insertion of the perimeter walls/shaft segments of each construction (the shaft, the chambers etc). Targeted archaeological investigation would proceed as the ground within the perimeter walls/shaft segments is excavated downwards.

7.8.5 Both evaluation and mitigation would be carried out in accordance with a scope of works (*SSAWSI)*, based on the principles in the *Overarching Archaeological Written Scheme of Investigation (OAWSI)*, to ensure that the scope and method of fieldwork are appropriate. The *SSAWSI* would be submitted in accordance with the application for development consent (the ‘application’) requirement.

Above-ground heritage assets

7.8.6 In terms of above-ground heritage assets, as no adverse effects have been identified, no mitigation is required.

7.9 Residual effects assessment

Construction effects

Buried heritage assets

7.9.1 With the mitigation described above in place, the residual construction effects on buried heritage assets would be **negligible**. All residual effects are presented in Section 7.10.

Above-ground heritage assets

7.9.2 As no mitigation measures are proposed, the residual effects remain as described in para. 7.5.8. All residual effects are presented in Section 7.10.

7.10 Assessment summary

Vol 11 Table 7.10.1 Historic environment – summary of construction assessment

Receptor (Heritage asset)	Effect	Significance of effect	Mitigation	Significance of residual effect
Buried heritage assets				
Moderate potential for palaeoenvironmental remains (Low asset significance)	Assets removed by the construction of CSO drop shaft, culverts and chambers where impacts would be outside the footprint of the former pumping station basement. Asset significance reduced to negligible	Minor adverse	Environmental sampling during preliminary site-based field evaluation and/or during any subsequent archaeological investigation.	Negligible
Low potential for isolated, residual prehistoric, Roman, early and later medieval finds (Low asset significance)	Assets removed by the construction of CSO drop shaft, culverts and chambers where impacts would be outside the footprint of the former pumping station basement. Asset significance reduced to negligible	Minor adverse	Preliminary site-based field evaluation, followed if necessary by an archaeological watching brief, to achieve preservation by record.	Negligible
Low potential for fragmentary prehistoric features (Medium asset significance)	Assets removed by the construction of CSO drop shaft, culverts and chambers where impacts would be outside the footprint of the former pumping station basement. Asset significance reduced to negligible	Moderate adverse	Preliminary site-based field evaluation, followed if necessary by an archaeological watching brief, to achieve preservation by record.	Negligible
Moderate potential for later medieval settlement remains	Assets removed by the construction of CSO drop shaft, culverts and chambers where impacts would be, outside the	Moderate adverse	Preliminary site-based field evaluation, followed if necessary by targeted	Negligible

Receptor (Heritage asset)	Effect	Significance of effect	Mitigation	Significance of residual effect
(Medium asset significance)	footprint of the former pumping station basement. Asset significance reduced to negligible		archaeological excavation and/or an archaeological watching brief, to achieve preservation by record.	
High potential for buried 19th century remains, including the footings of previous houses, and the 1905 pumping station deep basement foundations and culverts. (Low asset significance)	Assets removed by the construction of CSO drop shaft, culverts and chambers Asset significance reduced to negligible	Minor adverse	Preliminary site-based field evaluation, followed if necessary by targeted archaeological excavation and/or an archaeological watching brief, to achieve preservation by record.	Negligible
	Assets removed by site set-up Asset significance reduced to negligible	Minor adverse	Preliminary site-based field evaluation, followed if necessary by targeted archaeological excavation and/or an archaeological watching brief, to achieve preservation by record.	Negligible
Above-ground heritage assets				
Cobbled mid-19th century road surface to the west of the pumping station within the site (Negligible asset significance)	Removal during site set up, stored and where possible reinstated/reused.	Negligible	None	Negligible

References

[1] Department of Environment, Food and Rural Affairs*. National Policy Statement for Waste Water* (2012)

[2] Communities and Local Government*. National Planning Policy Framework* (March 2012)

[3] Department of Communities and Local Government, English Heritage & Department for Culture, Media and Sport*. PPS5 Planning for the Historic Environment: Historic Environment Planning Practice Guide* (March 2010)

[4] Museum of London Archaeology. *100 York Road , London SW11, Built Heritage Assessment.* (2011).

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

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Environmental Statement

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Section 8: Land quality

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8 Land quality

8.1 Introduction

8.1.1 This section presents the findings of the assessment of the likely significant land quality effects of the proposed development at the Falconbrook Pumping Station site (this includes the Falconbrook Pumping Station highway site).

8.1.2 The scope of the land quality assessment is to:

a. describe the condition of the site in terms of contaminant history and likely presence and magnitude of soil/sediment and liquid contamination (such as groundwater or perched water within the Made Ground), in addition to unexploded ordnance (UXO) and the presence of Japanese Knotweed, an invasive plant species which can be regarded as a soil contaminant.

b. describe and assess the impacts and significant effects of the interaction between these contaminants and the built environment, human and environmental receptors as a result of construction of the proposed development (taking into account any embedded measures).

8.1.3 There are a number of interfaces between land quality and other topic sections as summarised below:

a. Section 13 Water resources – groundwater assesses the likely significant effects to water resources from soil, perched water and groundwater contamination. The land quality assessment considers potential risks to human health receptors (eg, construction workers) from contaminated perched water and groundwater, including free phase[i] contamination.

b. Section 4 Air quality and odour assesses the likely significant effects to the air quality during the construction and operation of the site. The land quality assessment considers potential risks from, for example, the generation of dust and soil vapour from exposed ground and soils during construction.

c. Section 14 Water resources – surface water assesses potential impacts and effects to controlled waters from land contamination (eg contaminated run-off) and use of contaminating substances during construction. No further assessment is made in the land quality section.

[ii] Free phase contamination – hydrocarbons that form a discrete layer within groundwater, either floating on the groundwater surface or at the base of a groundwater body.

8.1.4 Operational land quality effects for this site have not been assessed. This is on the basis of the embedded measures adopted during the construction and operational phases (refer to Section 8.2 of this volume and Vol 2 Section 8.6). No significant operational effects are considered likely and for this reason, only information relating to construction is presented in the assessment of effects in land quality.

8.1.5 The assessment of the likely significant effects of the project on land quality has considered the requirements of the National Policy Statement for Waste Water (Defra, 2012)[1] section 4.8. The risk posed by construction on previously developed land is addressed in the following assessment and through measures embedded in the *Code of construction practice* (*CoCP*) (further details can be found in Vol 2 Section 8.3). The *CoCP* is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B)

8.1.6 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

8.2 Proposed development relevant to land quality

8.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to land quality are set out below.

Construction

8.2.2 The elements of the proposed development relevant to land quality would consist of the following:

a. demolition of existing screen house and toilet block

b. construction of pits, chambers, ducts and pipes for cables, pipes, utility connections and diversions and drainage

c. combined sewer overflow (CSO) drop shaft, the invert of which would be located at a depth of approximately 40m below ground level (bgl)

d. Falconbrook connection tunnel from the Falconbrook Pumping Station CSO drop shaft and the main tunnel

e. construction of air management plant and equipment including and ventilation columns, ducts and chambers

f. construction of an interception chamber, CSO overflow, culverts, valve chambers and other hydraulic structures and secondary dry weather flow (DWF) pumping station.

8.2.3 The above works would involve extensive below ground construction, resulting in the excavation and removal of material, including Made Ground and natural soils below.

8.2.4 In addition to the above, there would also be a minor amount of highway work located on York Road.

8.2.5 An area would also be required within the site for construction logistics, such as materials handling and storage areas, segment storage, site welfare facilities and offices (as shown in Falconbrook Pumping Station site construction plans - see separate volume of figures).

Code of Construction Practice

8.2.6 The embedded design measures relevant to land quality at the site are set out in Section 9 of the *CoCP* and are summarised below. Reference should be made to the *CoCP* Part A for full details.

8.2.7 There are no site specific *CoCP* measures which are relevant to this land quality assessment.

8.2.8 Land quality issues would be managed in close liaison with the local authority, London Borough (LB) of Wandsworth and the Environment Agency (EA) prior to and during construction.

Pre-construction

8.2.9 The proposed development has been characterised and assessed with respect to land quality through the application of the following steps (which are dictated by the regulatory framework outlined in Section 9 of the *CoCP*):

a. completion of a desk study which includes a review of available information sources (see Vol 11 Appendix F.1) and production of an initial conceptual site model

b. undertaking of specialist site surveys, such as Japanese Knotweed and UXO, which to date has included a site-specific desk study for part of the Falconbrook Pumping Station site to inform ground investigation work (see Vol 11 Appendix F.3.)

8.2.10 In addition to the above, land quality will continue to be assessed via the following measures:

a. preparation of a preliminary risk assessment, design of a ground investigation rationale and ground investigation survey which would include construction of exploratory test holes (such as boreholes), collection of soil and water samples for laboratory chemical testing and environmental monitoring (such as soil gas and soil vapour). A phased approach would be applied to ground investigation, with additional, detailed phases of investigation implemented as necessary to supplement, target and refine the findings and conclusions of the earlier assessments

b. site-specific land quality risk assessments would identify the need for specific remediation measures. Where necessary, the risk assessment would also be used to provide re-use criteria for soil material to be permanently placed at the site.

8.2.11 Where the site-specific land quality risk assessment identifies the need, a site-specific remediation strategy would be produced and implemented, including:

a. remedial options appraisal (as required)

b. details of the remediation strategy and methodology

c. methodology for decommissioning and removal of structures, such as underground storage tanks, if and where encountered

d. details of validation requirements to document the successful clean-up works.

Construction

8.2.12 Health and safety measures for the protection of construction workers with respect to land quality issues would include:

a. the provision of adequate training for all construction site workers to recognise and appropriately respond to potential land quality issues

b. site welfare facilities and where appropriate, decontamination units (ie, dirty in, clean out welfare units)

c. use of standard construction site personal protective equipment (PPE) (eg, high visibility clothing, safety boots, hard hat, safety glasses gloves and respiratory equipment)

d. robust emergency procedures (eg, with respect to UXO, previously unidentified contamination or structures), which are periodically reviewed. In the event of previously unidentified conditions being encountered, works would be suspended, the work area evacuated and specialist advice obtained. Where appropriate, additional risk assessments would be undertaken and additional control measures implemented prior to any works recommencing.

8.2.13 During construction, effective material management procedures, such as the storage and handling of excavated soils, fuels and other chemicals (as detailed further in the surface water section of the *CoCP*), would be implemented. Excavated materials with the potential to be contaminated would be removed from site as soon as practicable. Site control measures would be implemented to reduce dust (see air quality section of the *CoCP*) and the spread of mud by vehicles (see public access, the highway and river transport section of the *CoCP*).

8.2.14 Environmental monitoring, would include the following measures:

a. on-site watching brief during potentially high risk activities and an on call watching brief for all other activities. Specialist watching brief may include: UXO; contaminated land; health and safety/occupational health; and ecological (for invasive species, such as Japanese Knotweed)

b. dust and air/vapour monitoring (see *CoCP* Section 9 for further details). Where appropriate, this would include a combination of on-site and boundary monitoring.

8.3 Assessment methodology

Engagement

8.3.1 Volume 2 Environmental assessment methodology documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. Specific comments relevant to this site for the assessment of land quality are presented here.

8.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of land quality for this site has therefore drawn on the scoping response from the LB of Wandsworth in relation to other sites and is based on professional judgement as well as experience of similar sites.

8.3.3 The LB of Wandsworth was specifically consulted with respect to any land quality data they hold at the site and surrounding area. A review of this data as well as the response is presented in Vol 11 Appendix F.1 and Vol 11 Appendix F.2.

Baseline

8.3.4 The baseline methodology follows the methodology described in Vol 2. There are no site-specific variations for identifying the baseline conditions for this site.

Construction

8.3.5 The assessment methodology for the construction phase follows that described in Vol 2. There are no site-specific variations for undertaking the construction assessment of this site.

8.3.6 The construction assessment area considered for the assessment of land quality includes the limits of land to be acquired or used (LLAU) plus an additional 250m buffer area. This assessment area has been selected in order to take account of any off-site sources that could impact on the land quality of the site as well as any nearby sensitive receptors.

8.3.7 The construction assessment has been undertaken for Site Year 1 of the construction phase.

8.3.8 The base case and cumulative assessment in Site Year 1 of construction take into account the schemes described in Vol 11 Appendix N. The baseline will not change between the base case year and Site Year 1 of construction (2018) as there are no proposed developments within the 250m buffer area. In addition there are no proposed developments expected to commence during Site Year 1 of construction and as a result there will be no cumulative effects on land quality.

8.3.9 There are no proposed developments expected to commence during Site Year 1 of construction and as a result there would be no cumulative effects on land quality.

8.3.10 Section 8.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on land quality within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

Development of conceptual model

8.3.11 The assessment of land quality effects is based on the development of a source-pathway-receptor (SPR) conceptual model. This model aims to understand the presence and significance of potentially complete pollutant linkages.

8.3.12 The SPR conceptual model is based on guidance given in CLR11: *Model procedures for the management of land contamination* (EA, 2004)[2]. This type of assessment specifically relates to risk assessment and management of land contamination and has been used to inform the environmental impact assessment (EIA) which seeks to identify the likely significant effects of the proposed development.

8.3.13 The impact assessment considers the anticipated level of contamination likely during Site Year 1 of construction using the categories of receptor sensitivity and impact magnitude described in Vol 2 Section 8.4 and Vol 2 Section 8.5 respectively.

8.3.14 The significance of effects has been determined using the generic matrix given in Vol 2 Section 3.7. A description of the significance criteria is presented in Vol 2 Section 8.5.

8.3.15 The methodology for undertaking both source-pathway-receptor analysis and the impact assessment is provided in Vol 2 Section 8.

Assumptions and limitations

8.3.16 The assumptions and limitations associated with this assessment are presented in Vol 2. Assumptions and limitations specific to the site are detailed below.

Assumptions

8.3.17 It is assumed that the LLAU would have been affected by the legacy of industrial use and that contamination may be present. The assessment has assumed that a cover of Made Ground is present across the site.

8.3.18 The approach to remediation cannot be defined at this stage due to a lack of data. It is therefore assumed that some contamination would still remain on-site at the time construction commences (either because no pre-commencement remediation is deemed necessary or that following remediation of the construction area some contamination remains on the wider site).

8.3.19 The site is expected to be underlain at depth by low permeability Lambeth Group deposits. Therefore it has been assumed that any potential contamination (if any) is likely to be restricted to the overlying shallow deposits (ie, Made Ground and River Terrace Deposits).

Limitations

8.3.20 No access to Falconbrook Pumping Station was available at the time of the walkover survey. This site could however be viewed from the site perimeter and publicly accessible areas.

8.3.21 There is no site-specific data on soil or groundwater quality within the LLAU. It is however, considered that there is sufficient information currently available to provide a robust assessment.

8.4 Baseline conditions

8.4.1 The following section sets out the baseline conditions for land quality within and around the site. Future baseline conditions (base case) are also described.

Current baseline

Introduction

8.4.2 A full list of the data sets drawn upon in this assessment is presented in Vol 2.

8.4.3 A baseline report is presented in Vol 11 Appendix F.1 which details the data obtained for this site and identifies the contamination sources that may have affected the site. In addition to Vol 11 Appendix F, this section should also be read in conjunction with Vol 11 Figure F.1.1, Vol 11 Figure F.1.2 and Vol 11 Figure F.1.3 (see separate volume of figures).

Summary of baseline conditions

Geology

8.4.4 The site is thought underlain by a cover of Made Ground (potentiality extending to approximately 2.6m bgl). This is expected to be underlain (in turn) by Alluvium, River Terrace Deposits, Harwich Formation and the Lambeth Group (see Vol 11 Appendix F.1, Vol 11 Table F.3 for the full geological succession).

Contamination

8.4.5 The site is currently and has historically been used as a sewage pumping station and electricity substation. During redevelopment of the pumping station between 1950 and 1970, a basement was backfilled with a quantity of fill material. The composition/quality of the fill is unknown.

8.4.6 The area to the north and west of the site has also been subject to a number of commercial and light industrial works throughout the twentieth century. This has included: a number of unspecified works, a candle works, sugar/saccharine works and a garage.

8.4.7 No site-specific contamination data is available for the site. On the basis of the reviewed information, it is reasonable to assume that soil contamination may be present beneath the site which would be associated with poor quality Made Ground soils from cycles of redevelopment and local point sources of contamination (such as electrical transformers).

8.4.8 Commonly this would include, but not be limited to, elevated levels of metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), fuel and oil hydrocarbons, cyanide, sulphates, asbestos, volatile organic compounds (VOCs) and pathogens. These contaminants may be present in soil, soil vapour and groundwater (including perched water) and may be hazardous to human health (eg as irritants, carcinogens or by their volatile or flammable properties) depending on the potential concentration of the substance, groundwater or surface water contaminants, and in the case of sulphates, risk to concrete structures.

UXO

8.4.9 A desk based assessment for UXO threat was undertaken by 6 Alpha Associates Limited at the Falconbrook Pumping Station site (see Vol 11 Appendix F.3). The assessment covered two areas within the Falconbrook Pumping Station site: Area A (main site) and Area B (highway works site, identified in the report as the secondary work area). The report reviews information sources such as the Ministry of Defence (MoD), Public Records Office and the Port of London Authority (PLA).

8.4.10 The report identifies that no high explosive bomb strikes were recorded within Areas A or B or their buffered site boundary. Bomb damage was not recorded within the areas themselves but was recorded within the buffered site boundary. The report further states that both areas have had significant redevelopment work and as a result it is possible that UXO items would have been removed during this work.

8.4.11 Taking into account the findings of this study and the known extent of the proposed works, it was considered that there is an overall low/medium threat from UXO within both the main site and the highway works site.

Summary of receptors

8.4.12 The receptors identified at this site from the baseline survey (see Vol 11 Appendix F.1) and their corresponding sensitivity following the criteria set out in Vol 2 are as follows:

a. construction workers: low sensitivity for general above ground site workers such as staff in site offices or delivery drivers and high sensitivity for those site workers involved in below ground excavation works and associated activities

b. adjacent land-users: residential land-users and children’s centre users (high sensitivity) recreational users within York Gardens and playground (medium), adjacent light industrial, commercial community centre and library land-users (low sensitivity)

c. built environment: existing waste water infrastructure at the Falconbrook Pumping Station and adjacent residential, light industrial/commercial, community centre, children’s centre and library buildings (low sensitivity)

Construction base case

8.4.13 For land quality, the assessment of construction effects is based on the conditions which are likely to be experienced in Site Year 1 of construction (base case).

8.5 Construction effects assessment

Construction assessment case

8.5.1 The embedded requirement for a risk assessment and potential remediation of land contamination that forms part of the proposed development (refer to the *CoCP* Section 9 and summary presented in Section 8.2) mean that the land quality of the site may be different to that described in Section 8.4.

8.5.2 Where deemed necessary, problematic or gross contamination, which may substantially hinder the construction programme or which cannot be adequately dealt with in a controlled manner during construction, would have been remediated prior to the commencement of the main construction works (such as the main tunnel shaft, main tunnel construction works and in other areas of proposed excavation, where necessary).

8.5.3 Since the approach to remediation cannot be defined at this stage, it is assumed that some contamination would remain. Therefore some contamination is considered to be present for the purposes of this assessment.

8.5.4 Unless there are any immediate (as yet unknown) unacceptable risks elsewhere (for instance off-site migration of mobile free phase hydrocarbons or vapour risk to adjacent properties), remediation in areas away from planned intrusive construction works would not take place prior to construction.

Development of conceptual model

Interactions between source-pathway-receptor

8.5.5 The following section outlines how the contamination sources summarised in paras. 8.4.5 to 8.4.11 may interact with the receptors identified during the construction phase (see para.8.4.12) following the application of the embedded measures (see Section 8.2).

8.5.6 The main land quality SPR interactions are considered to be from the exposure of potential contamination to:

a. construction workers (receptor) via dermal contact, ingestion, inhalation of dust and soil vapours/soil gas and direct contact

b. adjacent land-users, including members of the public (receptor) via off-site migration of soil vapour (by diffusion or due to wind) and wind-blown dust contaminant pathways as well as accidental UXO detonation

c. the built environment (on and off-site receptors) via the accidental detonation of previously unidentified UXO.

8.5.7 The SPR interactions are summarised in Vol 11 Table 8.5.1. For simplicity the various sources identified have been grouped together into the different phases which they may be found (ie, solid, liquid, and gaseous), as these interact with receptors in a similar manner.

Vol 11 Table 8.5.1 Land quality – source-pathway-receptor summary (construction)

Receptors / Generic sources	Construction workers	Adjacent land-users	Built environment
Contaminated soils	Inhalation, dermal contact, ingestion	Wind -blown dust, vapour migration and subsequent inhalation and ingestion	N/A
Contaminated groundwater or liquids	Inhalation, dermal contact, ingestion	N/A	N/A
Soil gases/vapours	Inhalation	Vapour migration and subsequent inhalation	N/A
UXO	UXO detonation	UXO detonation	UXO detonation

N/A= Not applicable

Impacts and effects

8.5.8 The following section discusses the potential impacts and likely significant effects on receptors as a result of the land quality conditions at the site.

8.5.9 The assessment focuses on those linkages between sources, pathways and receptors that could generate significant effects and is based on available information and professional judgement.

Construction workers

8.5.10 A number of embedded measures set out in the *CoCP* Section 9 are designed to effectively manage any potential land quality impacts to construction workers associated with the construction phase of the proposed development (measures are summarised in Section 8.2).

Contamination

8.5.11 The management of contamination at the site is a two stage process, the first stage comprises the assessment, quantification and if necessary the removal of the main contamination sources which could impact upon construction worker health.

8.5.12 The second stage comprises safe methods of work and management of contamination during construction, assuming either that some contaminated soils could remain, or previously unidentified contamination be found during the main construction works.

8.5.13 Both of these stages include measures such as site-specific risk assessments, watching brief, safe methods of work, use of PPE and mitigation from a specialist contractor who is experienced at managing such risks.

8.5.14 With these measures in place, the overall magnitude of the impact to construction workers (both below and above ground) is assessed to be negligible.

8.5.15 This would result in a **negligible** effect on above ground construction workers and a **minor adverse** effect on those involved in intensive below ground works (although the effect is defined as minor adverse, it is considered unlikely that the effects would occur).

UXO

8.5.16 The management of UXO risk comprises advice from a specialist contractor who is experienced at managing such risks. This would include an initial assessment of UXO being present at the site (such as that already undertaken) and a proportional response to this risk. With a low to medium site such as Falconbrook Pumping Station, this is likely to include of site-specific risk assessments, safe methods of work/tool box talks and emergency response procedure as well as a UXO watching brief as excavations progress.

8.5.17 These measures are successfully utilised in major construction schemes within London on regular basis. Therefore with these measures in place, the overall magnitude of the impact to construction workers (both below and above ground) is assessed to be negligible.

8.5.18 This would result in a **negligible** effect on above ground construction workers and a **minor adverse** effect on those involved in intensive below ground works (although the effect is defined as minor adverse, it is considered unlikely that the effects would occur).

Adjacent land-users

Contamination

8.5.19 Impacts on adjacent land-users could occur via excavation and exposure of previously unidentified contaminated soils. This contamination could then migrate onto neighbouring sites. The pathways via which the contamination could migrate are: wind-blown dust and vapour diffusion.

8.5.20 A number of embedded measures set out in the *CoCP* Section 9, as summarised in Section 8.2 are designed to effectively manage any land quality impacts to the adjacent land-users associated with the construction phase of the proposed development.

8.5.21 These measures include:

a. the damping down of excavations, storage of potentially contaminated soils in secure (covered) areas, wheel washes at site entrance and the maintenance, construction and cleaning of hardstanding

b. dust and air/vapour monitoring to provide a check that volatile contamination or construction dusts do not significantly affect adjacent land users. Where appropriate, this would include a combination of on-site and boundary monitoring, which would provide either real time measurements or collect samples for subsequent analysis. For further detail and guidance reference should be made to the *CoCP* Section 9.

8.5.22 With these measures in place the overall magnitude of the impact to all adjacent land-users is assessed to be negligible.

8.5.23 Based on the assessed impact magnitude and receptor sensitivity, it is considered that the proposed development would result in a **negligible** effect on the adjacent light industrial, commercial, community centre and library, York Gardens and associated playground land-users and a **minor adverse** effect on the adjacent residential and children's centre land-users (although the effect is defined as minor adverse, it is considered unlikely that the effect would occur).

UXO

8.5.24 Impacts on adjacent land-users could occur via accidental detonation of UXO during below ground works. The embedded measures are set out in the *CoCP* Section 9, such as the use of specialised UXO contractors offering site-specific advice and where necessary on-site monitoring. These measures are designed to effectively manage any impacts to the adjacent land-users associated with the construction phase of the proposed development.

8.5.25 With these measures in place the overall magnitude of the impact to all adjacent land-users is assessed to be negligible.

8.5.26 Based on the assessed impact magnitude and receptor sensitivity, it is considered that the proposed development would result in a **negligible** effect on the adjacent light industrial, commercial, community centre and library, York Gardens and associated playground land-users and a **minor adverse** effect on the adjacent residential and children's centre land-users (although the effect is defined as minor adverse, it is considered unlikely that the effect would occur).

Built environment

8.5.27 Impacts from existing land quality relate to the accidental detonation of UXO during preliminary surveys or main construction works.

8.5.28 A number of embedded design measures set out in the *CoCP* Section 9, as summarised in Section 8.2, are designed to effectively manage any land quality impacts (eg, from UXO) to the built environment associated with the construction phase of the proposed development.

8.5.29 With these measures in place, the overall magnitude of the impact to the built environment is assessed to be negligible.

8.5.30 Based on the assessed impact magnitude and receptor sensitivity, it is considered that the proposed development would result in a **negligible** effect on the existing waste water infrastructure at Falconbrook Pumping Station and adjacent residential, light industrial/commercial, community centre, children's centre and library buildings.

8.6 Operational effects assessment

8.6.1 Operational effects have not been assessed for land quality (see para. 8.1.4).

8.7 Cumulative effects assessment

8.7.1 As described in Section 8.3 there are no schemes in Vol 11 Appendix N which meet the project criteria for inclusion in the cumulative assessment. Therefore no assessment of cumulative effects has been undertaken.

8.8 Mitigation

8.8.1 The assessment presented above does not identify the need for mitigation during construction, over and above those measures set out in the *CoCP* Section 9. No further mitigation, enhancement or monitoring is required.

8.9 Residual effects assessment

8.9.1 As no mitigation measures are proposed, the residual construction effects remain as described in Section 8.5. All residual effects are presented in Section 8.10.

8.10 Assessment summary

Vol 11 Table 8.10.1 Land quality – summary of construction assessment

Receptor (sensitivity)	Effect	Significance of effect	Mitigation	Significance of residual effect
Construction workers – general above ground site staff (Low)	Health effects from exposure to contaminated soils, liquids, soil gases/ vapours	Negligible	None	Negligible
	Health effects from detonation of UXO	Negligible	None	Negligible
Construction workers – below ground site staff (High)	Health effects from exposure to contaminated soils, liquids, soil gases/ vapours	Minor adverse	None	Minor adverse*
	Health effects from detonation of UXO	Minor adverse	None	Minor adverse*
Adjacent land-users, adjacent commercial/light industrial, community centre and library land-users (Low)	Health effects from exposure to wind-blown dust or vapours	Negligible	None	Negligible
	Health effects from detonation of UXO	Negligible	None	Negligible
Adjacent land-users, recreational users such as those within York Gardens and associated playground (Medium)	Health effects from exposure to wind-blown dust or vapours	Negligible	None	Negligible
	Health effects from detonation of UXO	Negligible	None	Negligible
Adjacent land-users, residential and children's centre land-users (High)	Health effects from exposure to wind-blown dust or vapours	Minor adverse	None	Minor adverse*
	Health effects from detonation of UXO	Minor adverse	None	Minor adverse*

Receptor (sensitivity)	Effect	Significance of effect	Mitigation	Significance of residual effect
Built environment – existing waste water infrastructure at the Falconbrook Pumping Station and adjacent residential, light industrial/commercial, community centre, children's centre and library buildings (Low)	Damage to structures from detonation of UXO	Negligible	None	Negligible

** Although the effect is minor adverse, it is considered unlikely that the effect would occur.*

References

[1] Defra. *National Policy Statement for Waste Water* (2012).

[2] Environment Agency. *Model procedures for the management of land contamination: Contaminated Land Report 11* (2004).

Thames Tideway Tunnel
Thames Water Utilities Limited

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Section 9: Noise and vibration

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9 Noise and vibration

9.1 Introduction

9.1.1 This section presents the findings of the assessment of the likely significant effects on noise and vibration at Falconbrook Pumping Station.

9.1.2 The proposed development has the potential to affect noise and vibration levels at receptors due to:

a. construction site activities (noise and vibration)

b. construction traffic on roads outside the site (noise)

c. operation of the proposed development (noise and vibration).

9.1.3 Each of these is considered within the assessment.

9.1.4 The tunnel drive for the main tunnel does not run beneath this location. Groundborne noise and vibration from the tunnelling activities associated with the main tunnel, long connection tunnels and the Falconbrook short connection tunnel are considered in Vol 3 Project-wide effects assessment.

9.1.5 There are no river services in the vicinity of the Falconbrook Pumping Station site and it is not proposed to use the river to transport materials at this site; therefore, effects as a result of river-based construction traffic are not considered at this site.

9.1.6 The assessment of noise and vibration presented in this section has considered the requirements of the National Policy Statement for Waste Water Section 4.9 (noise and vibration) (Defra, 2012)[1]. Further details of these requirements can be found in Vol 2 Environmental assessment methodology Section 9.3.

9.1.7 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate Volume (Vol 11 Falconbrook Pumping Station figures).

9.2 Proposed development relevant to noise and vibration

9.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to noise and vibration are set out below.

Construction

Construction traffic

9.2.2 The delivery and removal of all material would be by road. Estimated vehicle numbers are presented in Vol 11 Sections 3.3 and Vol12.2.

Construction activities

9.2.3 Vol 11 Section 3.3 sets out the assumed construction duration and programme for the Falconbrook Pumping Station site.

9.2.4 The construction works at this location would involve the following activities that have the potential to affect noise and vibration levels in the vicinity of the site:

a. utility diversions

b. hoarding and site setup

c. demolition

d. piling

e. shaft construction and excavation

f. connection tunnel construction

g. shaft secondary lining

h. interception chambers and culvert works

i. landscaping (including construction and fit-out of permanent facility).

9.2.5 Further detail on the plant used in these construction stages is given in Vol 11 Appendix G.

9.2.6 Working hours have been subject to consultation with the local authority. As part of the *Code of Construction Practice (CoCP)* requirements, Section 61 consents would be agreed with the local authority to confirm methodologies. Construction activities would be carried out during the following periods, as identified in the *CoCP*:

a. standard hours (08.00-18.00 weekdays and 08.00-13.00 Saturdays)

b. continuous working (24 hours a day, 7 days a week) for construction of the short connection tunnel from the shaft to the main tunnel. This would be carried out over a period of approximately six months.

Code of Construction Practice

9.2.7 The CoCP is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

9.2.8 The CoCP Part A (Sections 4.3 and 6.4) specifies the use of best practicable means (BPM) to reduce noise and vibration effects. Generic measures include:

a. careful selection of construction plant, construction methods and programming.

b. equipment would be suitably sited so as to minimise noise impact on sensitive receptors.

c. use of site enclosures, and temporary stockpiles to provide acoustic screening

d. choice of routes and programming for the transportation of construction materials, excavated material and personnel to and from the site

e. careful programming so that activities which may generate significant noise would be planned with regard to local occupants and sensitive receptors

f. hoarding would be of a height and extent to achieve appropriate noise attenuation.

9.2.9 Site specific measures incorporated into the *CoCP Part B* (Sections 4 and 6) to reduce noise and vibration effects would comprise:

a. the use of surface cranes would be minimised during connection tunnel works outside of standard working hours. This would involve the stockpiling of materials/ equipment at the bottom of the shaft for use during the evening and night for removal during standard working hours. In addition the work would utilise measures to reduce noise including the use of electric gantry cranes, gas/electric fork lift and measures to reduce noise from skip movements and unloading

b. the site layout and hoarding design would take into account the York Gardens Adventure Playground to the north of the site with regards to noise attenuation and screening

c. Increasing the height of the hoarding adjacent to the York Gardens Library and Community Centre, and along the boundary with the York Gardens Adventure Playground to 3.6m

Operation

9.2.10 A ventilation structure would be constructed to contain plant and filter equipment and to house the ventilation columns. The operational plant installed would have the potential to create noise impacts, and these are considered in the assessment.

9.2.11 During tunnel filling events, water would descend via a vortex structure through the drop shaft to the connection tunnel below. The potential for noise generated by this movement of water through the shaft has been assessed.

Environmental design measures

9.2.12 The operational plant associated with the surface structures would incorporate environmental design measures to control noise emission to the nearest sensitive receptors to acceptable noise limits as defined by London Borough (LB) of Wandsworth (see para. 9.3.18). The environmental design measures have considered the following noise sources:

a. hydraulic plant for penstock operation (pumps, motors)

b. uninterruptible power supply (UPS) plant

9.2.13 In considering the noise from the above items, the sound insulation of the housing for the equipment has been taken into consideration.

9.2.14 The design of the drop shaft would control the descent of water by channelling the flow around the internal face of a vortex drop tube within the drop shaft, rather than allowing the water to free fall. The vortex design allows large volumes of water to descend with less noise generation than a falling cascade design.

9.3 Assessment methodology

Engagement

9.3.1 Vol 2 Environmental assessment methodology documents the overall engagement which has been undertaken in preparing the ES. Specific comments relevant to this site for the assessment of noise and vibration are presented here.

9.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of noise and vibration for this site has therefore drawn on the scoping response from the LB of Wandsworth and is based on professional judgement as well as experience of similar sites

9.3.3 The survey methodology and monitoring locations were agreed with LB of Wandsworth. The limits for plant noise from the operation of the site were obtained from LB of Wandsworth (see para. 9.3.18).

9.3.4 Additional consultation on the survey methodology was undertaken with LB of Wandsworth with regards to the need for continuous monitoring locations. For this site it was agreed that representative data could be obtained by leaving an unattended continuous monitoring kit securely within Falconbrook Pumping Station overnight for a typical weekday and weekend.

9.3.5 Written confirmation on the survey methodology was received from the LB of Wandsworth in June 2011.

9.3.6 Specific comments relevant to this site for the assessment of noise and vibration are presented in Vol 11 Table 9.3.1. No other site specific comments were received from stakeholders at scoping or other consultation phases.

Vol 11 Table 9.3.1 Noise and vibration – consultation comments

Organisation	Comment	Response
LB of Wandsworth, phase two response, February 2011	This site replaces the earlier proposal for a CSO site on Bridges Court Car Park. The revised site is located on the Falconbrook Pumping Station site and partly in York Gardens. The site is required for approximately 3 years. If this site is required, the Council would insist that nuisance and disruption are kept to a minimum and that	The effects of noise and vibration from the development are presented in this section. The *CoCP* contains a number of measures which have been introduced specifically to this site in order to ensure that the disruption due to noise and vibration are

Organisation	Comment	Response
	an improved public space is subsequently provided in York Gardens.	kept to a minimum.

Baseline

9.3.7 The baseline methodology follows the methodology provided in Vol 2 Section 9. There are no site specific variations for this site.

9.3.8 As described in Vol 2 Section 9, the significance of noise effects at residential receptors is based on the predicted impact and other factors, such as, the construction noise level relative to the significance threshold, and the numbers and types of receptors affected.

Construction

9.3.9 The assessment methodology for the construction phase follows that described in Vol 2 Section 9. There are no site specific variations for undertaking the construction assessment of this site.

9.3.10 Section 9.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on noise and vibration within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

9.3.11 The construction noise and vibration assessment has considered the effects across the whole duration of the construction phase (Site Years 1 to 3) and the worst-case exposure levels are reported. The proposed development has been assessed against the base case (without the Thames Tideway Tunnel project).

9.3.12 Of the schemes outlined in the site development schedule (see Vol 11 Appendix N), there are no developments considered relevant to the construction assessment base case, as they are all located outside of the 300m assessment area and therefore not included in the assessment.

9.3.13 There are no schemes considered relevant to the cumulative construction assessment as all schemes identified in Vol 11 Appendix N are either assumed to be complete and operational by Site Year 1 of construction or are located outside of the 300m assessment area.

9.3.14 Traffic flows on construction traffic routes have been examined to determine if there are any routes where there is the potential for traffic noise changes of 1dB(A) or more. This is according to the flow, speed or composition change criteria specified in Vol 2 Section 9. The results show that there are no traffic changes on the road network associated with this site which meet the relevant criteria. This is discussed further in the assessment section from para. 9.5.31.

9.3.15 The assessment of construction effects also considers the extent to which the effects on noise and vibration would be likely to be materially different should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Construction assessment area

9.3.16 As described in Vol 2 the assessment area considers unscreened receptors up to a maximum of 300m from the site boundary, based on professional judgement of the likelihood of significant effects. The assessment primarily concentrates on those receptors closest to the site which would generally be most affected, rather than those further away which would be well screened by intervening buildings. Effects at more distant receptors beyond those closest to the site have been considered where necessary by reference to the impacts determined at the primary (closest) receptors.

Operation

9.3.17 The operational phase assessment methodology follows the methodology provided in Vol 2 Section 9. Site specific variations to this methodology are set out below.

9.3.18 For this site, LB of Wandsworth requires that for residential receptors, noise emissions from this type of source are designed to meet a rating level (as defined in BS4142 [British Standards Institution, 1997][2]) which is 10dB(A) below the typical background noise level over the operational period of the plant at 1m from the facade of the nearest residential receptor.

9.3.19 The operational assessment year is taken to be Year 1 of operation.

9.3.20 Section 9.6 details the likely significant effects arising from the operation of the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel sites which could give rise to additional effects on noise and vibration within the assessment area for this site, therefore no other Thames Tideway Tunnel sites are considered in this assessment.

9.3.21 Of the schemes outlined in the site development schedule (Vol 11 Appendix N), there are no developments considered relevant to the operational assessment base case, as they are all located outside of the 300m assessment area and therefore not included in the assessment.

9.3.22 There are no developments relevant to the operational cumulative assessment, because due to their use, none are expected to generate significant noise or vibration levels during their operation.

9.3.23 Based on the traffic flow, speed or composition change criteria specified in the methodology given in Vol 2 Section 9, there are no routes where potential for operational traffic noise effects would occur.

9.3.24 The assessment of operational effects also considers the extent to which the effects on noise and vibration would be likely to be materially different should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Operational assessment area

9.3.25 Operational effects are considered up to 300m from the site boundary, although the focus is on the closest receptors.

Assumptions and limitations

9.3.26 The generic assumptions and limitations associated with this assessment are presented in Vol 2 Section 9. The site specific assumptions are presented in the following section. There are no site specific limitations for this site.

Assumptions

9.3.27 The working hours assumed for the assessment are as described in para. 9.2.6.

Limitations

9.3.28 There are no limitations associated with this site-specific noise and vibration assessment.

9.4 Baseline conditions

9.4.1 The following section sets out the baseline conditions for noise and vibration within and around the site. Future baseline conditions (base case) are also described.

Current baseline

9.4.2 The current baseline noise conditions are as described in the baseline survey. The specific details of this survey, such as the measurement times, locations measured, results and local conditions are described in Vol 11 Appendix G. Vol 11 Table 9.4.1 below shows that the noise levels for the daytime period fall within a relatively small range, the noise levels being heavily influenced by traffic noise from York Road and local roads in the vicinity.

Receptors

9.4.3 This section describes the setting and receptor characteristics of the site for the purposes of this assessment.

9.4.4 The closest noise and vibration sensitive receptors selected for the noise and vibration assessment are identified in Vol 11 Table 9.4.1 below (and shown in plan view in Vol 11 Figure 9.4.1, see separate Volume of figures). These were selected as they are representative of the range of noise climates where sensitive receptors are situated around the site. The approximate number of residential properties affected at each location (where known) is indicated in Vol 11 Table 9.4.2.

9.4.5 The nearest residences to the site are at Pennethorne House. Residences at Arthur Newton House on Lavender Road and on York Road have also been assessed. The non-residential sensitive receptors included in the assessment are York Gardens Library and Community Centre, the Children's Centre and Adventure Playground (One O'clock Club) and a doctor's surgery at 20 Lavender Road. All receptors are within the LB of Wandsworth.

9.4.6 Beyond these closest receptors there are other residential and non-residential locations, which are screened from the site by intervening buildings or are located further from the site than the buildings included in the assessment. These have not been assessed.

Receptor sensitivity

9.4.7 The noise and vibration sensitive receptors have been assessed according to their sensitivity, using the methodology outlined in Vol 2 Section 2.3. The sensitivities of all assessed receptors are presented in Vol 11 Table 9.4.1.

Vol 11 Table 9.4.1 Noise and vibration – sensitive receptors and noise levels

Ref	Receptor addresses	Sensitivity	Local authority	Measured average ambient noise level, day/ evening/ night, dBL_{Aeq}	Noise survey location
FP1	Pennethorne House (residential)	High	LBW	66/58/47	FPS03
FP2	Arthur Newton House (residential)	High	LBW	66/58/47	FPR03
FP3	York Gardens Library and Community Centre	Medium	LBW	65/60/54	FPS02*
FP4	Candle Maker (commercial)	Medium	LBW	70/65/59	FPS02**
FP5	Children's Centre and Adventure Playground (play centre)	Medium	LBW	65/60/54	FPS02
FP6	20 Lavender Road (surgery)	High	LBW	66/58/47	FPS03
FP7	Candlemakers Apartments (residential)	High	LBW	70/65/59	FPS02**

**Location PWH8X Noise LT1 (see Vol 11 Appendix G) has not been used in the assessment because whilst it is closer to the receptor location the measurement location was fully screened to York Road which is the main noise source in the area, whereas the receptors are not. The use of FPS02 is considered appropriate as it is a similar distance from York Road and is unscreened as at receptors FP3 and FP5.*
***Measured level corrected for distance to York Way.*

9.4.8 The baseline noise level is considered representative of the relevant receptor. Consideration has been given to the distance of the measurement location to the receptor, the orientation of the primarily affected façade and location of the controlling noise source(s).

9.4.9 The criteria for determining the significance of noise effects at residences from construction sources are partly dependent upon the existing ambient noise levels. From the ambient noise levels measured during the baseline survey, the assessment category and assessment noise threshold levels for the residential receptors near the Falconbrook Pumping Station site are as shown in Vol 11 Table 9.5.2. As described in the assessment methodology, this follows the method as defined in Vol 2 Section 9.5.

9.4.10 The assessment of significance at non-residential receptors is made according to the construction noise level relative to the ambient noise level (see Vol 11 Table 9.5.2) using the impact criteria described in Vol 2 Section 9.5 (where appropriate) and other factors described in Vol 2 Section 9.

Vol 11 Table 9.4.2 Noise – residential receptors and assessment categories

Ref	Noise sensitive receptor (No. of dwellings)	Ambient noise level, rounded to nearest 5dBLAeq* day/ evening/ night	Assessment category* day/ evening/ night	Impact criterion threshold level*, day, $dBL_{Aeq\ 10hour}$/ evening $dBL_{Aeq\ 1hour}$/ night, $dBL_{Aeq\ 1hour}$
FP1	Pennethorne House (residential)	65/60/45	B/C/B	70/65/50
FP2	Arthur Newton House (residential)	65/60/45	B/C/B	70/65/50
FP7	Candlemakers Apartments (residential)	70/65/59	C/C/C**	75/65/59

** From 'ABC' method – BS5228:2009[3]*
***Where the ambient noise level is greater than category C levels the ambient noise level shall be used as the significance criterion threshold.*

Construction base case

9.4.11 The construction base case taking into account the schemes described in Section 9.3 would include the 100 York Road development. It is assumed that the development would be complete and operational by Site Year 1 of construction.

9.4.12 The noise levels, as measured during the baseline noise survey in 2011, are assumed for the base case. However, there is the potential for variations to occur in the ambient noise levels between 2011 and the base case year. If the noise levels were to vary, it is likely that they would increase compared to the measured data from 2011 due to natural traffic growth. The estimated traffic increases for the construction base case in Site Year 1 are such that noise levels would be expected to increase by less than 1dB(A) from those measured in 2011. The assessment based on data from 2011 therefore presents a worst case assessment.

9.4.13 It is considered that there are no other circumstances at this location that would cause the baseline noise levels at the receptor locations to change significantly between 2011 and Year 1 of construction.

9.4.14 No existing or future major sources of vibration have been identified and therefore it is considered that vibration levels are unlikely to change between the present time and the base case.

Operational base case

9.4.15 The base case in Year 1 of operation taking into account the schemes described in Section 9.3 would be similar to that set out in the construction base case. The complete and operational 100 York Road development has been included as a receptor in the assessment.

9.4.16 The base case in Year 1 of operation has been estimated from traffic flow expectations for Year 1 of the operational phase as a result of natural growth and new development in the vicinity. The estimated traffic increases for the operational base case in Year 1 of operation are such that noise levels would be expected to increase by less than 1dB(A) from those measured in 2011.

9.5 Construction effects assessment

Noise

9.5.1 The results of the assessment of construction noise are presented in Vol 11 Table 9.5.1 and Vol 11 Table 9.5.2. The tables show the range of predicted construction noise levels during the entire period of the works and a typical monthly construction noise level. The typical monthly level is the most frequently occurring monthly noise level during the works. The tables also show the total number of months across all construction stages that the noise level would be likely to exceed the impact criterion threshold level indicating potential significance. The final columns in the tables show the worst-case excess above the impact criterion together with the duration of the worst-case noise level. In cases when the impact criterion is exceeded (as marked by an asterisk in Vol 11 Table 9.5.1 further assessment of the likely noise ingress to the interior of the building has been carried out to more precisely estimate the resulting noise impact on the occupants. The noise ingress would depend on the degree of façade noise insulation of the particular buildings which is considered in further detail in these cases.

9.5.2 To illustrate the predicted variation in construction noise levels at each receptor position across the duration of the construction phase, Vol 11 Appendix G Plates G.5 to G.11 show the estimated noise levels plotted month-by-month over the duration of the works. The appendix also lists the construction plant and operations assumed for the calculations. The predicted impacts at each representative receptor location are described below.

Impacts at residential receptors

9.5.3 The results for residential receptors are shown below.

Vol 11 Table 9.5.1 Noise – impacts at residential receptors (high sensitivity)

Ref/ receptor[a] (No. of noise sensitive properties)	ABC impact criterion threshold level (potential significance for residential), dBL_{Aeq}[b]	Range of construction noise levels, dBL_{Aeq}[c,d]	Typical[e] monthly construction noise levels, dBL_{Aeq}	Magnitude		
				Total duration above criterion for all works, months	Worst-case excess above criterion, dBL_{Aeq}[f] (*further assessment undertaken for excess above criterion)	Duration of worst-case excess above criterion, months
FP1/ Penntho-rne House (128)	70	57 – 70 (day)	68	0	0	0
	65	54 – 54 (eve)	54	0	-11	0
	50	49 – 49 (night)	49	0	-1	0
FP2/ Arthur Newton (36)	70	55 – 67 (day)	64	0	-3	0
	65	52 – 52 (eve)	52	0	-13	0
	50	47 – 47 (night)	47	0	-3	0
FP7/ Candle-makers Apartments	75	54 – 68 (day)	62	0	-7	0
	65	47 – 47 (eve)	47	0	-18	0
	59	42 – 42 (night)	42	0	-17	0

[a] *Floors subject to highest noise level assessed – not necessarily the highest floor level*

[b] *The potential significance threshold is based on the ambient noise level as defined in Vol 2*

[c] *Construction noise only, excludes ambient noise. Refer to Vol 2 Section 9.5*

[d] *Noise level includes correction for façade acoustic reflection*

[e] *Most frequently occurring monthly construction noise level during works*

[f] *Positive value indicates exceedance, negative value indicates noise below criterion*

Pennethorne House (FP1)

9.5.4 Pennethorne House is a nine storey residential building located 45m from the site boundary. The upper floors would have a view of the majority of the worksite. The predicted noise levels at these dwellings due to construction activities are shown in Vol 11 Table 9.5.1

9.5.5 The typical daytime noise level (most frequently occurring monthly level) is 68dBL_{Aeq}. The activity expected to cause the worst-case noise level of 70dBL_{Aeq} would occur during the site establishment and demolition works.

9.5.6 During the evening and night-time, the construction of the connection tunnel is expected to cause the worst-case noise levels of 54dBL_{Aeq} and 49dBL_{Aeq} respectively.

9.5.7 The construction noise levels are not estimated to exceed the potential significance criteria for a residential receptor at any time during the day, evening or night. The effect is therefore assessed as **not significant**.

9.5.8 Other than those assessed there are no other residential properties in the vicinity of this receptor that are close enough to be subject to significant adverse effects.

Arthur Newton House (FP2)

9.5.9 Arthur Newton House is a three storey residential building located 75m from the site boundary. The upper floors would have a view of the majority of the worksite. The predicted noise levels at these dwellings due to construction activities are shown in Vol 11 Table 9.5.1

9.5.10 The typical daytime noise level (most frequently occurring monthly level) is 64dBL_{Aeq}. The site establishment and demolition works are expected to cause the worst-case noise level of 67dBL_{Aeq} for 1 month.

9.5.11 During the evening and night-time, the construction of the connection tunnel is expected to cause the worst-case noise levels of 52dBL_{Aeq} and 47dBL_{Aeq} respectively.

9.5.12 The construction noise levels are not estimated to exceed the ABC potential significance criteria for a residential receptor at any time during the day, evening or night. The effect is therefore assessed as **not significant**.

9.5.13 Other than those assessed there are no other residential properties in the vicinity of this receptor that are close enough to be subject to significant adverse effects.

Candlemakers Apartments (FP7)

9.5.14 Candlemakers Apartments is a residential building located approximately 15m from the site boundary. The upper floors would have a view of the majority of the worksite. The predicted noise levels at these dwellings due to construction activities are shown in Vol 11 Table 9.5.1

9.5.15 The typical daytime noise level (most frequently occurring monthly level) is 62dBL_{Aeq}. The site establishment and demolition works are expected to cause the worst-case noise level of 68dBL_{Aeq} for 1 month.

9.5.16 During the evening and night-time, the construction of the connection tunnel is expected to cause the worst-case noise levels of 47dBL_{Aeq} and 42dBL_{Aeq} respectively.

9.5.17 The construction noise levels are not estimated to exceed the potential significance criteria for a residential receptor at any time during the day, evening or night. The effect is therefore assessed as **not significant**.

9.5.18 Other than those assessed there are no other residential properties in the vicinity of this receptor that are close enough to be subject to significant adverse effects.

Impacts at non-residential receptors

9.5.19 The results for non-residential receptors are shown below.

Vol 11 Table 9.5.2 Noise – impacts at non-residential receptors

Ref/receptor	Receptor sensitivity[a]	Range of construction noise levels, dBL_{Aeq}[b,c,d]	Ambient baseline noise level, dBL_{Aeq}[d]	Typical[e] monthly construction noise levels, dBL_{Aeq}	Magnitude	
					Total duration above ambient for all works, months	Worst-case excess above ambient, dBL_{Aeq}
FP3/ York Gardens Library and Community Centre	Medium	59 – 71 (day)	65	66	31	+6
FP4 Candle Maker (commercial)	Medium	51 – 74 (day)	70	60	1	+4
FP5/ Children's Centre and Adventure Playground (One O'clock Club)	Medium	47 – 68 (day)	65	58	1	+3
FP6/ 20 Lavender Road Surgery	High	45 – 60 (day)	66	55	0	-6

[a] Assumed typical façade transmission loss and appropriate internal noise guidelines

[b] Floors subject to highest level assessed – not necessarily the highest floor level

[c] Construction noise only, excludes ambient noise. Refer to Vol 2

[d] Noise level includes correction for façade acoustic reflection unless receptor position is an open outdoor space (eg park)

[e] *Most frequently occurring monthly construction noise level during works*

York Gardens Library and Community Centre (FP3)

9.5.20 York Gardens Library and Community Centre is a single storey building located approximately 5m from the site boundary. The building would be screened from the worksite by the site hoarding.

9.5.21 The typical daytime noise level (most frequently occurring monthly level) is 66dBL_{Aeq}.The worst-case daytime noise level is shown in Vol 11 Table 9.5.2 at the closest part of the building and would occur during the site establishment, demolition and construction of the shaft. The noise level is 71dBL_{Aeq} during the daytime for one month which is greater than the current ambient noise level for the daytime period. The most frequently occurring noise level of 66dBL_{Aeq} would be just 1dB above the ambient noise level.

9.5.22 Although the worst case noise level could be noticeable inside the building, the increase in average noise levels inside the building is not expected to exceed guideline noise levels for library or general office use based on typical noise insulation for a façade of this type. Hence, the increase in noise levels here is not likely to cause disturbance to occupants. This is therefore assessed as **not significant**.

Candle Maker (FP4)

9.5.23 The Candle Maker at 100 York Road (Candle Store) is located at a distance of approximately 15m from the site boundary and is fully screened from the site by the site hoarding.

9.5.24 The typical daytime noise levels (most frequently occurring monthly level) is 60dBL_{Aeq}. The worst-case daytime noise level is shown in Vol 11 Table 9.5.2 at the closest part of the building and would occur during the site establishment, demolition and construction of the shaft. The noise level is 74dBL_{Aeq} during the daytime for one month which is greater than the current ambient noise level for the respective period. The most frequently occurring noise level of 60dBL_{Aeq} would be 10dB below the ambient noise level, which is relatively high alongside the main road.

9.5.25 The worst case noise level could be noticeable inside the building for one month, but would not be expected to be excessive for retail and commercial use, based on typical noise insulation for a façade of this type. Hence, the increase in noise levels here is not likely to cause disturbance to occupants. This is therefore assessed as **not significant**.

Children’s Centre and Adventure Playground (One O’clock Club) (FP5)

9.5.26 The Children’s Centre and Adventure Playground (One O’clock Club) is located almost adjacent to the site boundary and would be fully screened from the site by the site hoarding, existing pumping station building and site cabins.

9.5.27 The typical daytime noise levels (most frequently occurring monthly level) is 58dBL_{Aeq}. The worst-case daytime noise level is shown in Vol 11 Table

9.5.2 would occur during the site establishment, demolition and construction of the shaft. The noise level is 68dBL_{Aeq} during the daytime for one month which is greater than the current ambient noise level for the daytime period. The most frequently occurring noise level would be 7dB below the ambient noise level.

9.5.28 Although the worst case noise level could be noticeable inside the building for one month, the increase in average noise levels inside the building is not expected to exceed guideline noise levels for office use, or be excessive for indoor play activities, based on typical noise insulation for a façade of this type. Other than the worst case month, the average noise levels would be well below ambient noise levels for all other periods of the construction. Hence, construction noise is not likely to cause disturbance to occupants. This is therefore assessed as **not significant**.

20 Lavender Road Surgery (FP6)

9.5.29 The Doctor's Surgery at 20 Lavender Road is located at a distance of 75m from the site boundary and is fully screened from the site by the site hoarding.

9.5.30 The typical daytime noise level (most frequently occurring monthly level) is 55dBL_{Aeq}. The worst-case daytime noise level shown in Vol 11 Table 9.5.2 would occur during the site establishment, demolition and construction of the shaft. The noise level is 60dBL_{Aeq} during the daytime for one month which is 6dB lower than the current ambient noise level for the respective period. Therefore, construction noise at this receptor is considered to be **not significant**.

Road-based construction traffic

9.5.31 The location of the site at Falconbrook Pumping Station provides direct access to the major road network through London. The construction programme would result in varying traffic generation over a period of three years. During the peak construction period the traffic generation on York Road, the link adjacent to the site, is forecast to average 18 heavy vehicles (HGVs) per day, equivalent to 36 movements per day for two months.

9.5.32 The major road links adjacent to and leading to the site are York Road, Battersea Park Road, Latchmere Road, Battersea Bridge Road and Falcon Road. Vehicles would not use other roads such as Plough Road.

9.5.33 A flow change of about 25% is required to cause a change in noise level of 1dB and by 100% to cause a change of 3dB, which is considered to be the minimum change perceptible to the human ear. Additionally, a change in HGV composition of 5% is also considered to cause a change in noise level of approximately 1dB.

9.5.34 The traffic modelling shows that the 18hr Annual Average Weekday Traffic (AAWT) flow on the link adjacent to the site, York Road, is currently over 39,000 vehicles per day (vpd), with average speeds of 27 mph (43 kph) and 6.4% HGVs. The total number of HGVs is therefore approximately 2,500 per day.

9.5.35 The section of York Road to the South of the Falconbrook Pumping Station site currently has the highest 18hr flow, with over 39,000 vpd and 5.7% HGVs. The 18hr flows on other roads are varied, with relatively high flows on York Road, ranging from approximately 37,000 to 39,000 vpd, and relatively lower flows on other roads, generally ranging from approximately 10,000 to 25,000 vpd. Falcon Road has a much lower flow of approximately 3,000 vpd. The HGV percentage on the links is also varied, ranging from 3.4% on Latchmere Road to 16.2% on the section of York Road to the north east of the site.

9.5.36 The modelling of construction traffic on these links shows that the highest percentage increase in total flow due to construction traffic would potentially occur on Latchmere Road. The current flow is just under 16,000. The average daily number of construction HGV movements on this link during the peak month of construction is 36 and the daily number of worker cars and office/operational light vehicles is 3, with the number of cars and light vehicles consistent across the construction period. This represents a percentage increase in flow of less than 0.5%.

9.5.37 Additionally, the modelling of the construction traffic on these links shows that the highest increase in HGV composition would also occur on Latchmere Road. The average daily number of construction HGVs on this link during the peak month of construction is 36, which, taking into account the number of worker cars and office/operational light vehicles, represents an increase in HGV composition of less than 0.3%.

9.5.38 Therefore, the percentage flow change and change in HGV percentage do not meet the criteria for causing even a 1dB change in noise level. As the percentage flow change and change in HGV percentage criteria are not met on the link where such changes were expected to be greatest, the additional numbers of HGVs would not cause any change to the traffic noise levels. Traffic noise change is therefore assessed as **not significant**.

Vibration

9.5.39 The assessment of construction vibration considers events which have the potential to cause human disturbance, or damage to buildings and structures. The assessments of human disturbance and effects on building structures are carried out separately using different parameters.

9.5.40 The assessment has been conducted using the methodology defined in Vol 2 Section 9.

9.5.41 The assessment of human disturbance due to construction vibration impacts at neighbouring receptors has been assessed using the predicted estimated Vibration Dose Value (eVDV). The results from the assessment are presented in Vol 11 Table 9.5.3.

Vol 11 Table 9.5.3 Vibration – impact and magnitude of human response to vibration impacts

Ref	Receptor	Impact (highest predicted eVDV across all activities, $m/s^{1.75}$)*	Value/ sensitivity	Magnitude
FP1	Pennethorne House	<0.2	High	Below Low probability of adverse comment - No impact
FP2	Arthur Newton House	<0.2	High	Below Low probability of adverse comment - No impact
FP7	Candlemakers Apartments	<0.3	High	Low probability of adverse comment - No impact
FP3	York Gardens Library and Community Centre	<1.0	Medium	Adverse comment possible - Impact
FP4	Candle Maker (commercial)	<0.4	Medium	Low probability of adverse comment - No impact
FP5	Children's Centre and Adventure Playground (One O'clock Club)	<0.2	Medium	Below Low probability of adverse comment - No impact
FP6	20 Lavender Road Surgery	<0.1	High	Below Low probability of adverse comment - No impact

**Most affected floor*

9.5.42 The predicted eVDV levels at Pennethorne House, Arthur Newton House, Candlemakers Apartments, Candle Makers (commercial), Children's Centre and Adventure Playground (One o'clock Club) and the 20 Lavender Road Surgery all fall within or below the 'Low probability of adverse comment' band for residences, as described in Vol 2 Section 9 and therefore significant effects are not anticipated at these locations.

9.5.43 The predicted eVDV levels at York Gardens Library and Community Centre fall within the 'Adverse comment possible' band for offices, as described in Vol 2 Section 9. The activity which results in this level (vibro-piling) occurs for less than two weeks during the commencement of the shaft construction and therefore a significant effect is not anticipated at this for this level of impact and duration.

9.5.44 The assessment of potential construction vibration effects at adjacent buildings/structures has been assessed using the predicted Peak Particle Velocity (PPV), according to the criteria given in Vol 2 Section 9. The results of the assessment of construction vibration are presented in Vol 11 Table 9.5.4.

Vol 11 Table 9.5.4 Vibration – building vibration impacts and their magnitudes

Ref	Receptor	Impact (highest predicted PPV across all activities, mm/s)	Value/ sensitivity	Magnitude
FP1	Pennethorne House	<0.3	High	Below threshold of potential cosmetic damage – No impact
FP2	Arthur Newton House	<0.3	High	Below threshold of potential cosmetic damage – No impact
FP7	Candlemakers Apartments	<1.0	High	Below threshold of potential cosmetic damage – No impact
FP3	York Gardens Library and Community Centre	<2.5	Medium	Below threshold of potential cosmetic damage – No impact
FP4	Candle Maker (commercial)	<1.0	Medium	Below threshold of potential cosmetic damage – No impact
FP5	Children's Centre and Adventure Playground (One O'clock Club)	<0.3	Medium	Below threshold of potential cosmetic damage –

Ref	Receptor	Impact (highest predicted PPV across all activities, mm/s)	Value/ sensitivity	Magnitude
				No impact
FP6	20 Lavender Road Surgery	<0.3	High	Below threshold of potential cosmetic damage – No impact

9.5.45 The vibration levels reported here are well below the levels likely to cause cosmetic building damage according to the criteria described in Vol 2 Section 9.

9.5.46 Vibration effects are assessed are **not significant** to any receptors.

Sensitivity test for programme delay

9.5.47 For the assessment of noise and vibration effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above for the existing and proposed receptors. Based on the site development schedule (see Vol 11 Appendix N), there would be no new receptors, within the assessment area, requiring assessment as a result of a one year delay.

9.6 Operational effects assessment

Impacts from potential noise and vibration sources

9.6.1 The following section describes the potential noise and vibration effects from various sources identified for the assessment.

Noise from operational plant at above ground structures

9.6.2 A passive system is to be installed at Falconbrook Pumping Station and therefore there is no requirement to install active ventilation equipment at this location. Plant which has been included in this section is as described in para 9.2.12. The prediction method and assumptions are described in Vol 2 Section 9.

9.6.3 The appropriate emission limits are shown below in Vol 11 Table 9.6.1 based on local authority requirements to ensure that no adverse effects would occur. As there is no active ventilation plant for the drop shaft to generate noise at this site, these limits would only apply to any minor plant equipment. It is not planned to include any cooling fans for the kiosks but if detailed design showed this to be necessary, these small wall-mounted units would be controlled to meet the criteria in Vol 11 Table 9.6.1.

However, it should be noted that any such small fans would be expected to have a relatively low noise emission (approximately 45dB(A) at 3m).

9.6.4 There would be a pump to maintain hydraulic pressure in the hydraulic pipe-work and rams for the penstocks although the noise emission would be short and infrequent. It is expected that this would produce a whirring noise about once a week with a duration of 30 seconds to 2 minutes depending on the size of the penstock and hydraulic system. The plant would be operated for testing purposes once every three months. The power pack, pump and motor would be located within the kiosk and would be shielded with an acoustic surround if necessary to meet the requirements in Vol 11 Table 9.6.1.

9.6.5 Vol 11 Table 9.6.1 shows, for each receptor, that the estimated plant noise level is below the local authority limit or is less than ambient levels for residential and non-residential receptors respectively.

Vol 11 Table 9.6.1 Noise – operational airborne noise impacts

Ref	Receptor	Lowest baseline noise level	Impact	Value/ sensitivity	Magnitude
FP1	Pennethorne House	37dB$L_{A90,}$ 15 minutes	Plant noise emission rating level at receptor less than 27dB$L_{Ar,Tr}$	High	Plant noise level below local authority limit*,– no adverse impact
FP2	Arthur Newton House	37dB$L_{A90,}$ 15 minutes	Plant noise emission rating level at receptor less than 27dB$L_{Ar,Tr}$	High	Plant noise level below local authority limit*,– no adverse impact
FP7	Candle-makers Apartments	49dB$L_{A90,}$ 15 minutes	Plant noise emission rating level at receptor less than 39dB$L_{Ar,Tr}$	High	Plant noise level below local authority limit*,– no adverse impact
FP3	York Gardens Library and Community Centre	65dB$L_{Aeq,}$ 1 hour	Plant noise emission level at receptor less than 65dB$L_{Aeq.}$	Medium	Plant noise level below ambient daytime level – no adverse

Ref	Receptor	Lowest baseline noise level	Impact	Value/ sensitivity	Magnitude
					impact
FP4	Candle Maker (commercial)	70 $dBL_{Aeq,\ 1\ hour}$	Plant noise emission level at receptor less than 70$dBL_{Aeq.}$	Medium	Plant noise level below ambient daytime level – no adverse impact
FP5	Children's Centre and Adventure Playground (One O'clock Club)	65$dBL_{Aeq,\ 1\ hour}$	Plant noise emission level at receptor less than 65$dBL_{Aeq.}$	Medium	Plant noise level below ambient daytime level – no adverse impact
FP6	20 Lavender Road Surgery	66$dBL_{Aeq,\ 1\ hour}$	Plant noise emission level at receptor less than 66$dBL_{Aeq.}$	High	Plant noise level below ambient daytime level – no adverse impact

* *Limit referred to is that identified for the Local Authority in which the receptor is located (see para.9.3.20).*

9.6.6 The results given above in Vol 11 Table 9.6.1 show that there are no adverse impacts and the effects of plant noise at these emission levels is assessed as **not significant**. In the case of the residential receptors, this is based on compliance with the project requirement to prevent disturbance according to local authority criteria. For the non-residential receptors the noise levels are controlled to below ambient noise levels and therefore considered to result in a **not significant** effect.

Noise and vibration from tunnel filling

9.6.7 Measurements taken during storm and non-storm events at operational drop structures in the United States, equivalent to those being considered for the Thames Tideway Tunnel project, have been used to inform the assessment of noise and vibration during tunnel filling events. These studies (Jain, SC and Kennedy, JF, 1983)[4], are described in Vol 2 Section 9. The highest noise level measured on a mesh grille directly over a similar drop shaft, during this study was 61dBL_{Aeq} during a severe storm event.

9.6.8 These events are not typical and only occur during severe rain storms. At Falconbrook Pumping Station, the drop shaft would be enclosed and any noise at the surface would be attenuated by the structure or the carbon filters and vent building. At the surface the noise level would be approximately 46dB$L_{Aeq,}$ which is less than the prevailing ambient noise level at this site.

9.6.9 The highest peak particle velocity (PPV) measured directly at the existing drop shaft sites used in the case study as described in Vol 2 Section 9 was 0.034mm/s. These measured PPV values are well below the levels for vibration to be just perceptible, according to the criterion given in Vol 2 Section 9. Similarly, the levels are well below the transient and continuous vibration guideline criterion for building damage.

9.6.10 The noise and vibration from tunnel filling events would occur only occasionally during heavy rainfall events and, in any case, is predicted to be not perceptible/less that the ambient noise level at the receptors. Therefore this is assessed as **not significant**.

Operational maintenance

9.6.11 As part of the operation of the tunnel, there would need to be routine but infrequent maintenance carried out at the site. Two cranes would be required for ten yearly shaft inspections. This would be carried out during normal working hours, using equipment which is likely to increase ambient noise levels. Given the infrequency of this operation, it is considered that a significant noise effect would not occur.

9.6.12 Routine inspections, lasting approximately half a day, would occur every three to six months and would not require heavy plant. As this would be carried out during the daytime with minimal noisy equipment operating over short periods of time, it is considered that further assessment of noise generated by this activity is not required.

9.6.13 As no impacts have been identified from the operation of the site, this is assessed as **not significant**.

Noise from operational traffic

9.6.14 Additional traffic associated with operation of the site would be limited to vehicles used by maintenance and inspection workers. This is likely to be a number of light commercial vehicle used during routine inspection visits every three to six months and shaft inspections approximately every ten years.

9.6.15 As a proportion of the existing traffic on the road network these vehicles would not contribute to the traffic noise level and the noise effects of these movements are assessed as **not significant**.

Sensitivity test for programme delay

9.6.16 For the assessment of noise and vibration effects during operation, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above for the existing and proposed receptors as the operational effects of the Thames Tideway Tunnel are considered to be not significant. Based on the site development schedule (see Vol 11 Appendix N), there would be no new receptors, within the assessment area, requiring assessment as a result of a one year delay.

9.7 Cumulative effects assessment

Construction effects

9.7.1 None of the projects described in Section 9.3 are considered relevant to the construction cumulative assessment at Falconbrook Pumping Station. This is because all schemes are either assumed to be complete and operational by Site Year 1 of construction or are located outside of the 300m assessment area. As such, no cumulative construction noise or vibration effects are identified. This would also be the case if the programme for the Thames Tideway Tunnel project was delayed by approximately one year.

Operational effects

9.7.2 None of the projects described in Section 9.3 are considered relevant to the operational cumulative assessment at Falconbrook Pumping Station as, due to their use, they are not expected to generate significant noise or vibration levels during their operation. As such, no cumulative operational noise or vibration effects are identified. This would also be the case if the programme for the Thames Tideway Tunnel project was delayed by approximately one year.

9.8 Mitigation and compensation

Construction

9.8.1 The above assessment has concluded that there are not likely to be any significant adverse effects during the construction phase that would require mitigation.

Operation

9.8.2 The above assessment has concluded that there are not likely to be any significant adverse effects during the operational phase that would require mitigation.

Monitoring

9.8.3 Monitoring of construction noise would be carried out as described in the *CoCP*. It is not anticipated that there would be any need for monitoring of operational noise.

9.9 Residual effects assessment

Construction effects

9.9.1 As no further mitigation measures are proposed beyond the measures set out in the *CoCP*, the residual construction effects remain as presented in Section 9.5.

Operational effects

9.9.2 As no mitigation measures are proposed, the residual operational effects remain as presented in Section 9.6.

9.10 Assessment summary

Vol 11 Table 9.10.1 Noise – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Surface construction noise				
FP1 - Pennethorne House	Noise	Not significant	None	Not significant
FP2 - Arthur Newton House	Noise	Not significant	None	Not significant
FP7 – Candlemakers Apartments	Noise	Not significant	None	Not significant
FP3 - York Gardens Library and Community Centre	Noise	Not significant	None	Not significant
FP4 – Candle Maker (commercial)	Noise	Not significant	None	Not significant
FP5 - Children's Centre and Adventure Playground (One O'clock Club)	Noise	Not significant	None	Not significant
FP6 - 20 Lavender Road Surgery	Noise	Not significant	None	Not significant
Road-based construction traffic				
Residential and non-residential properties adjacent to the proposed vehicle route	Noise	Not significant	None	Not significant

Vol 11 Table 9.10.2 Vibration – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
FP1 - Pennethorne House	Vibration	Not significant	None	Not significant
FP2 - Arthur Newton House	Vibration	Not significant	None	Not significant
FP7 – Candlemakers Apartments	Vibration	Not significant	None	Not significant
FP3 - York Gardens Library and Community Centre	Vibration	Not significant	None	Not significant
FP4 – Candle Maker (commercial)	Vibration	Not significant	None	Not significant
FP5 - Children's Centre and Adventure Playground (One O'clock Club)	Vibration	Not significant	None	Not significant
FP6 - 20 Lavender Road Surgery	Vibration	Not significant	None	Not significant

Vol 11 Table 9.10.3 Noise – summary of operational assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
FP1 - Pennethorne House	Noise	Not significant	None	Not significant
FP2 - Arthur Newton House	Noise	Not significant	None	Not significant
FP7 – Candlemakers Apartments	Noise	Not significant	None	Not significant
FP3 - York Gardens Library and Community Centre	Noise	Not significant	None	Not significant
FP4 – Candle Maker (commercial)	Noise	Not significant	None	Not significant
FP5 - Children's Centre and Adventure Playground (One O'clock Club)	Noise	Not significant	None	Not significant
FP6 - 20 Lavender Road Surgery	Noise	Not significant	None	Not significant

Vol 11 Table 9.10.4 Vibration – summary of operational assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
FP1 - Pennethorne House	Vibration	Not significant	None	Not significant
FP2 - Arthur Newton House	Vibration	Not significant	None	Not significant
FP7 – Candlemakers Apartments	Vibration	Not significant	None	Not significant
FP3 - York Gardens Library and Community Centre	Vibration	Not significant	None	Not significant
FP4 - Candle Maker (commercial)	Vibration	Not significant	None	Not significant
FP5 - Children's Centre and Adventure	Vibration	Not significant	None	Not significant

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Playground (One O’clock Club)				
FP6 - 20 Lavender Road Surgery	Vibration	Not significant	None	Not significant

References

[1] Defra. National Policy Statement for Waste Water (2012) Available at: http://www.defra.gov.uk/publications/files/pb13709-waste-water-nps.pdf. Accessed November 2012

[2] British Standards Institution, BS 4142 *Method for rating industrial noise affecting mixed residential and industrial areas,* British Standards Institution (1997).

[3] British Standards Institution, *BS 5228 Code of Practice for Noise and Vibration Control on Open Construction Sites* (2009)

[4] Jain, SC and Kennedy, JF. *Vortex-Flow Drop Structures for the Milwaukee Metropolitan Sewerage District Inline Storage System*. Iowa Institute of Hydraulic Research. IIHR Report No 264 (Jul 1983).

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 10: Socio-economics

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Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 10: Socio-economics

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10 Socio-economics

10.1 Introduction

10.1.1 This section presents the findings of the assessment of the likely significant socio-economic effects of the proposed development at the Falconbrook Pumping Station site (main site). At this site, effects during construction are considered on users of the community facilities located within York Gardens, users of York Gardens itself, and nearby potentially sensitive businesses and residents. Effects on users of York Gardens are also considered during the operational phase.

10.1.2 The likely significant project-wide socio-economic effects, including employment generation, stimulation of industry, and leisure and recreation related effects on users of the River Thames are described in Volume 3 Project-wide effects assessment.

10.1.3 The assessment of socio-economics presented in this section has considered the requirements of the National Policy Statement for Waste Water Sections 4.8 (land use) and 4.15 (socio-economic) (Defra, 2012)[1]. Further details of these requirements can be found in Volume 2 Environmental assessment methodology Section 10.3.

10.1.4 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

10.1.5 This assessment has drawn on the findings of the air quality and odour, noise and vibration and townscape and visual assessments (Sections 4, 9 and 11 respectively within this volume).

10.2 Proposed development relevant to socio-economics

10.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to socio-economics are set out below.

Construction

10.2.2 The construction site encompasses the existing Falconbrook Pumping Station, a disused toilet block and surrounding hardstanding area and a portion of the pavement on the eastern side of York Road. The land which the construction site falls within is owned by Thames Water, however it is partially publicly accessible from within York Gardens. Falconbrook Pumping Station would remain operational during and after the construction phase.

10.2.3 Works at the construction site are expected to last approximately three years. See Section 3.3 of this volume for further details of the construction working hours.

10.2.4 Construction related activities, including traffic and lorry movements, could result in amenity effects (caused by air quality impacts, construction dust, noise, vibration, and visual impacts) being experienced by a range of sensitive socio-economic receptors in proximity to the proposed activities (refer to Volume 2 Environmental assessment methodology for further information on the amenity assessment methodology).

Direct employment creation on site

10.2.5 Construction is expected to require a maximum workforce of approximately 40 workers at any one time. The number and type of workers is shown in Vol 11 Table 10.2.1.

Vol 11 Table 10.2.1 Socio-economics – construction worker numbers

Contractor		Client
Staff*	**Labour****	**Staff*****
08:00-18:00	**0800-1800**	**08:00-18:00**
15	20	5

** Staff contractor – engineering and support staff to direct and project manage the engineering work on site.*
*** Labour – those working on site doing engineering, construction and manual work.*
**** Staff client – engineering and support staff managing the project and supervising the contractor*

Code of Construction Practice

10.2.6 Measures applicable to all sites incorporated into the *Code of Construction Practice (CoCP)*[i] *Part A* to limit significant adverse air quality, construction dust (Section 7), noise, vibration (Section 9), and visual impacts (Section 4) would help to avoid socio-economic effects, particularly amenity effects.

10.2.7 The *CoCP Part A* also confirms that all land, including highways, footpaths, public open spaces, river embankments / waterways, loading facilities or other land occupied temporarily would be made good to the satisfaction of Thames Water[ii] and the local authority where required. This would be in accordance with the *Ecology and landscape management plan* and the approved landscape design for the site (see Section 4 within the *CoCP* Part A).

10.2.8 Further site specific measures, which could reduce socio-economic effects and particularly amenity effects, are incorporated into the *CoCP Part B*. See the *CoCP* sections in the air quality and odour, noise and vibration, and townscape and visual construction effect assessments (Sections 4.2, 9.2 and 11.2 respectively within this volume) for details on the types of measures that would be employed.

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[i] *Code of Construction Practice (CoCP)* is provided in Vol 1 Appendix A. It contains general requirements (Part A) and site specific requirements for this site (Part B).

[ii] Thames Water Utilities Ltd (TWUL). The Draft Development Consent Order (DCO) contains an ability for TWUL to transfer powers to an Infrastructure Provider (as defined in article 2(1) of the DCO) and/or, with the consent of the Secretary of State, another body.

10.2.9 The *CoCP Part B* makes provision for access to York Gardens Library and Community Centre and York Gardens Adventure Playground to be maintained, and pedestrian access from York Road to York Gardens (see Section 5 within the *CoCP Part B*).

Operation

10.2.10 The installation of above ground structures in the operational phase is described in Section 3 of this volume. Above ground structures would remain within the parameter areas shown on the Site works parameter plan (see separate volume of figures – Section 1).

Environmental design measures

10.2.11 Measures which have been incorporated into the design of the proposed development (described in the design principles) include the:

a. provision of new lighting in the area outside the compound which would be publicly accessible

b. landscape design, which would respond positively to the local authority's emerging Landscape Management Strategy for the York Gardens area

c. reinstatement of the pedestrian access from York Way to York Gardens.

10.3 Assessment methodology

Engagement

10.3.1 Vol 2 Section 10 documents the overall engagement which has been undertaken in preparing the *Environmental Statement*.

10.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of socio-economics for this site has therefore drawn on the scoping response from the LB Wandsworth and is based on professional judgement as well as experience of similar sites.

10.3.3 Specific comments relevant to this site for the assessment of socio-economics are presented in Vol 11 Table 10.3.1.

Vol 11 Table 10.3.1 Socio-economics – stakeholder engagement

Organisation	Scoping opinion item	Response
LB of Wandsworth, February 2012	If this site is required, the Council would insist that nuisance and disruption are kept to a minimum and that an improved public space is subsequently provided in York Gardens.	Consideration of the impact of the proposed development at the site on open space and community facilities users' amenity has been considered. Improvements to the landscaping of public space are proposed in the operational phase.

Organisation	Scoping opinion item	Response
London Councils, February 2012	The noise, pollution and congestion caused by site traffic will impact on quality of life for local residents.	Consideration of the impact of the proposed development on residential amenity has been considered as part of this assessment.

Baseline

10.3.4 The baseline methodology follows the methodology described in Vol 2 Section 10. There are no site specific variations for identifying the baseline conditions for this site.

Construction

10.3.5 For this site, the base case is the peak year of construction works. The assessment area is as set out in Vol 2 Section 10.5.

10.3.6 The assessment methodology for the construction phase follows that described in Vol 2 Section 10. There are no site specific variations for assessing construction effects at this site.

10.3.7 Section 10.5 of this volume details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on socio-economics within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

10.3.8 Of the developments listed in the site development schedule (see Vol 11 Appendix N) none have been considered relevant to the construction assessment base case. This is because the developments which would be completed and operational in the base case outlined in the development schedule (see Vol 11 Appendix N) are beyond the 250m amenity assessment area. Therefore no additional receptors have been considered for the construction base case.

10.3.9 Of the developments listed in the site development schedule (see Vol 11 Appendix N), none are within the relevant 250m assessment area for the amenity related effects on socio-economic receptors considered within this assessment. Therefore, there would not be any cumulative construction effects to assess at this site.

Operation

10.3.10 The base case is Year 1 of operation. The assessment area is as set out in Vol 2 Section 10.5.

10.3.11 The assessment methodology for the operation phase follows that described in Vol 2 Section 10. There are no site specific variations for undertaking the operational assessment of this site.

10.3.12 Section 10.6 of this volume details the likely significant effects arising from the operation at the Falconbrook Pumping Station site. There are no other

Thames Tideway Tunnel project sites which could give rise to additional effects on socio-economics within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

10.3.13 Of the developments listed in the site development schedule (see Vol 11 Appendix N), there are none which would introduce new receptors into the operational base case; significantly alter circumstances for those receptors covered by the operational assessment; or which would give rise to cumulative effects. This is because the only receptor covered in the operational assessment is users of the new public amenity space and none of the major developments would directly affect those users.

Assumptions and limitations

Assumptions

10.3.14 The assumptions and limitations associated with this assessment are presented in Vol 2 Section 10. The following assumptions are specific to the assessment of this site:

a. That York Gardens Adventure Playground and One O'clock Club (details of which are found in para. 10.4.8 to 10.4.10) are well used and that both the usage levels and quality of the facilities (observed to be good) would remain the same up to and including the construction base case.

b. That York Gardens Library and Community Centre is assumed to be well used due to the recent refurbishment and the variety of services and events offered, and that this would continue up to and including the construction base case.

Limitations

10.3.15 There are no limitations specific to the assessment of this site.

10.4 Baseline conditions

Current baseline

10.4.1 The following section sets out the baseline conditions for socio-economics within and around the site. Future baseline conditions (base case) are also described.

Local context

10.4.2 The site is surrounded on three sides by York Gardens and its associated community facilities. The surrounding area within 250m of the site is predominantly residential except for some small retail premises and community facilities to the north east of the site and office and larger retail premises to the west beyond York Road (see Vol 11 Figure 2.1.2 - separate volume of figures). Residential development comprises a range of low and medium rise buildings. The River Thames is situated approximately 200m to the west. Within 1km, the predominant land use is also residential. The surrounding area is intersected by railway lines leading to and from Clapham Junction Station approximately 800m walking distance to the southeast of the site.

Community profile

10.4.3 A detailed community profile is outlined in Vol 11 Appendix H.1[iii]. The following points provide a summary of the community profile and provide context for this socio-economic assessment:

a. The resident population was approximately 2,550 within 250m of the site and approximately 31,175 within 1km at the time of the last census for which data is available[iv].

b. The proportion of under 16 year olds within 250m (23.5%) is notably higher than within 1km (16.8%) and slightly higher than the Greater London average (20.2%).

c. Within 250m and 1km the proportion of over 65 year olds is broadly in line (8.7% and 9.1% respectively), moderately lower than the Greater London average (12.4%).

d. Within 250m, White residents comprise over half of the resident population (54.2%), moderately lower than within 1km (73.8%) and the Greater London level (71.2%).

e. There are approximately twice as many Black and Minority Ethnic (BME) residents within 250m (44.8%) in comparison with the LB of Wandsworth (22.1%). The proportion of Black residents within 250m (33.7%) is considerably higher than the proportion within 1km (16.3%), the LB of Wandsworth (9.6%) and Greater London (10.9%) averages.

f. Within 250m, the proportion of residents suffering from a long term or limiting illness (16.5%) is broadly in line with the Greater London level (15.5%) but slightly higher than for those residents within 1km (14.1%). In contrast, the proportion of residents claiming disability living allowance within 250m (6.7%) is almost twice as high as the LB of Wandsworth (3.9%) and moderately higher than within 1km (4.8%) and Greater London (4.5%).

g. General health is poor at a borough level, with low life expectancy, high death rates from major illnesses and low rates of physical activity in children. Adult obesity is high relative to other London boroughs and child obesity levels are only average.

h. The incidence of income deprivation and overall deprivation within 250m (79.0% for both indices) is considerably higher than it is within 1km (41.3% and 28.3% respectively) and much higher than within the LB of Wandsworth (15.4% and 10.1% respectively).

10.4.4 The above community profile suggests that the community is diverse, with a high proportion of younger persons. There is a high proportion of Black residents and the community generally experiences poor health and low life expectancy. There is a significant incidence of income deprivation and

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[iii] Information sources are provided in the appendix.

[iv] Census 2001. This type of data for the 2011 Census had not been released at the time of the assessment.

overall deprivation within 250m of the site highlighting a significant concentration of deprivation within the immediate local area.

Economic profile

10.4.5 A local economic profile (based on 2012 data) is presented in Vol 11 Appendix H.2. The following points provide a summary of the profile and provide context to this socio-economic assessment:

a. Within approximately 250m of the site there are approximately 2,900 jobs and 400 businesses[v].

b. The three largest sectors as measured by employment within approximately 250m are: Accommodation and Food Service Activities; Wholesale and Retail Trade / Repair of Motor Vehicles and Motorcycles; and Professional, Scientific and Technical Activities.

c. The three largest sectors as measured by number of businesses at locations / units within approximately 250m are: Professional, Scientific and Technical Activities; Real Estate Activities; and Administrative and Support Service Activities.

d. At all geographical levels most businesses fall within the micro size band (one to nine employees), however there is a somewhat lower proportion of these recorded within 250m than for the LB of Wandsworth and Greater London.

e. Businesses within the micro size band also account for the majority within each of the leading sectors within 250m. The size banding profile of each lead sector is broadly similar to that recorded within all three geographical levels.

Receptors

York Gardens Adventure Playground and One O’clock Club

10.4.6 The York Gardens Adventure Playground which contains a One O’clock Club is managed by the LB of Wandsworth. These facilities share the same premises and are situated within York Gardens, immediately adjacent to the northern perimeter of the proposed construction site boundary.

10.4.7 The location of these receptors are shown on Vol 11 Figure 10.4.1 (see separate volume of figures).

10.4.8 The York Gardens Adventure Playground provides supervised adventure play facilities for five to 16 year olds.

10.4.9 The One O’clock Club is one of several in the LB of Wandsworth which provide services for young children and their parents. The centre comprises a one storey modern building containing meeting rooms and

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[v] Source: Experian 2012. Data is aggregated for seven digit post-code units falling wholly or partially within a 250m of the limits of land to be acquired or used (LLAU), including post code units on the opposite side of the River Thames if relevant. Employee data reflect a head count of workers on-site rather than Full Time Equivalent (FTE) jobs. The count of businesses relates to business ‘locations’ or ‘units’; an enterprise may have a number of business locations / units. Businesses as defined here include private sector, public sector and voluntary / charitable entities.

grounds which include play facilities for under five year olds. It provides opportunities for indoor and outdoor play, including in association with the adjacent adventure playground.

10.4.10 The Adventure Playground and One O'clock Club are used by both parents and children, and as a work place for the centre's staff. Based on observations made during the usage surveys of York Gardens, the Adventure Playground appeared to be well used during opening hours (see Vol 11 Appendix H.3). It is judged that the linked One O'clock Club is likely to be similarly well used.

10.4.11 The main factors affecting the sensitivity of users and employees is the nature of the activities undertaken within the One O'clock Club and adventure playground and their ability to cope with any adverse amenity effects. One relevant consideration in this regard is the availability of alternative facilities should the proposed construction works seriously reduce amenity for users of the centre or adventure playground.

a. There are ten other One O'clock Children's Centres in the LB of Wandsworth (LB of Wandsworth, 2012)[2], the closest of which are Bolingbrook One O'clock Centre and Battersea Park One O'clock Centre which are located approximately 1.3km to the south and 1.5km to the north east (walking distances) from the site respectively. Given their distance from York Gardens, these centres may not be easily accessible to some current users of the One O'clock Club.

b. With respect to the adventure playground, there are two other adventure playgrounds in the LB of Wandsworth, the closest of which is Battersea Park Adventure Playground, approximately 1.5km from the site (LB of Wandsworth, 2012)[3]. This does not fall within the walking distance that the GLA outlines play space should be accessible within for children aged between five and 16. There are additional playground facilities within York Gardens, adjacent to the north of the adventure playground, and approximately 200m to the east at Meyrick Road. These alternatives are smaller, unsupervised and do not offer opportunities for 'adventure play'.

10.4.12 In terms of their sensitivity to amenity impacts, it is noted that children are generally considered to be more sensitive to certain amenity effects, such as noise and air pollution, than adults (GLA, 2007)[4]. Children and parents are only likely to use the One O'clock Club centre and adventure playground at certain times of the week, but are unlikely to frequent the premises every day and so the potential for continuous or prolonged exposure to any amenity impacts is considered limited.

10.4.13 Due to the limited opening hours of the One O'clock Club (typically approximately two to three hours daily, weekdays during school term time) and the adventure playground (during after school hours and extended periods at weekends) it is likely that staff will only be at the premises for short periods of time. Therefore, they are not likely to be exposed to potential amenity effects for a prolonged duration.

10.4.14 Taking account of the above factors, it is considered that the sensitivity of users and employees of the children's centre and adventure playground to disruption from construction effects would be medium.

York Gardens Library and Community Centre

10.4.15 York Gardens Library and Community Centre is situated within York Gardens, directly to the south of the proposed construction site. The library offers a variety of services and events. The library was refurbished in 2011 and, given this recent reinvestment in the facility, it is assumed to be well used.

10.4.16 The location of this receptor is shown on Vol 11 Figure 10.4.1 (see separate volume of figures).

10.4.17 The main factors affecting the sensitivity of users and employees is the nature of the activities undertaken within the library and centre by users, and their ability to cope with any adverse amenity effects. The library and community centre operate predominantly indoors, although it is feasible that users could make use of the outdoor seating area in the central section of York Gardens on occasion. It is expected that there is preference for quiet conditions within the library. However, the community centre may be less dependent on very quiet conditions given the different nature of activities that would take place. Users of the library are likely to come from the local area and many may be unable to conveniently access alternative facilities.

10.4.18 Taking account of the above factors, it is considered that the sensitivity of users and employees of the library and community centre to disruption from construction effects is likely to be medium.

Public open space - York Gardens

10.4.19 York Gardens is approximately 2.5ha in size. As such, it is categorised as a 'local park and open space' under the GLA Open Space Hierarchy meaning that it would typically serve a catchment of approximately 400m.

10.4.20 The location of this receptor is shown on Vol 11 Figure 10.4.1 (see separate volume of figures).

10.4.21 York Gardens has a formal landscaped planted area and benches in the centre of the gardens. There are paved pedestrian footpaths running through and around the perimeter of the garden and it is securely fenced with restricted opening hours (generally dawn to dusk). There is a large lawn and active recreation area in the southern portion of the garden which includes publicly accessible outdoor gym equipment for use by older children and adults. To the north of the York Gardens Adventure Playground there is a separate fenced but unsupervised children's play area suitable for use by younger children.

10.4.22 There are several access points to the garden. Trees and landscaping along the western perimeter of York Gardens serve as a visual barrier, shielding park users from the road. The garden is overlooked on its eastern boundary by dwellings in Pennethorne House.

10.4.23 The usage surveys (see Vol 11 Appendix H.3) found York Gardens to be moderately used overall. Walkers and dog walkers passing through the garden were the predominant users within four of the five survey areas (the children's play area being the exception). The usage surveys observed a peak of 162 users per hour passing through the southern portion of the garden during the weekday surveys and 132 at weekends. For static passive recreation, there was a peak usage of 12 people sitting on benches in the central seating area and 18 on the southern lawn at any one time.

10.4.24 During travel peak hours, large numbers of commuters (office workers and school children) were recorded using the pathways through the gardens. Outside of these times the number of users within the gardens dropped notably. Of those people passing through the gardens, it was observed that approximately 10% were walking through the gardens to access the children's centre, adventure playground and library. The children's play area within the gardens (separate from the adventure playground) experienced moderate usage, with a peak of 22 children recorded using the space at any one time during the summer holidays. Usage was varied however, with no usage observed during some survey periods during the summer. A slight predominance of Black and Minority Ethnic (BME) users was recorded, in line with the ethnic profile of the local community area which identifies a significant proportion of BME residents within 250m of the site.

10.4.25 The main factor affecting the sensitivity of users of York Gardens is the availability of alternative comparable open space resources for users. There are no alternative open spaces of a comparable size within the gardens' catchment area (ie, approximately 400m). There is a small open space[vi] situated at Meyrick Road, approximately 200m to the east, which offers opportunities for passive recreation and has seating areas and a children's playground. Within the wider local area, Shillington Gardens, Falcon Park and Fred Wells Gardens are situated between 800m and 1km from the site and provide spaces of similar quality with comparable facilities to York Gardens. These open spaces could provide an alternative resource for users although they would be most accessible to those residents living closest to them.

10.4.26 Taking account of these factors, the sensitivity of users of York Gardens to any reduction in amenity would be medium.

Residential

10.4.27 There are existing and base case residential developments near the proposed construction site.

10.4.28 Land that is predominantly used for residential development is shown in the Land use plan for this site (Vol 11 Figure 2.1.2, see separate volume of figures).

[vi] A small open space is defined as a space between 0.4 and 2ha in area, as defined by the Mayor's Open Space Hierarchy.

10.4.29 It is considered that the sensitivity of nearby residents to overall amenity effects would vary by time of day, with residents being somewhat less sensitive to amenity effects, particularly noise, during the day and more sensitive to such effects during the evening and night.

10.4.30 Therefore, as outlined in the methodology for this socio-economic impact assessment (see Vol 2 Section 10) the sensitivity of nearby residential receptors to amenity impacts would be medium during the day and high during the evening and night.

Business - candle maker (retailer and wholesaler)

10.4.31 There is an existing business directly across York Road from the proposed construction site, a candle maker retailer and wholesaler open to the public. The candle business has candle manufacturing premises and a shop (open daily) that is housed in a large one-storey brick warehouse building. The precise number of employees is not known, however it is estimated that the business is equivalent in size to a micro size enterprise (one to nine employees), or at most to a small size enterprise (ten to 49 employees).

10.4.32 The location of this receptor is shown on Vol 11 Figure 10.4.1 (see separate volume of figures).

10.4.33 In terms of the sensitivity of the business, large windows allow for views from inside the shop across York Road towards York Gardens and the proposed construction site to the east. Visitors to the shop could potentially be exposed to adverse amenity impacts when entering and exiting the premises. However, the specialist nature of the business means that it is likely to rely more on destination trade rather than passing trade. This would limit the degree to which customers would avoid the business if adverse amenity impacts were to arise nearby.

10.4.34 Taking account of the above factors, it is considered that the overall sensitivity of the candle business to amenity impacts would be low.

Community facility - Lavender Road GP surgery

10.4.35 There is a GP surgery situated approximately 100m to the east of the proposed construction site, beyond York Gardens. The surgery is housed in a small one-storey brick building. The GP surgery is one of ten GP surgeries within a 1km radius of the site (all of which are accepting new patients) (NHS, 2012)[5].

10.4.36 The location of this receptor is shown on Vol 11 Figure 10.4.1 (see separate volume of figures).

10.4.37 The nature of the facility means that patient attendance and the number of patients on the surgery roll would be unlikely to be influenced by amenity effects. The centre's on site activities would occur indoors and as a result, users' exposure to certain amenity impacts, eg, noise or visual impacts, could be limited in this regard. Some patients may be more sensitive to amenity effects however, if they were suffering from an illness which may be aggravated by any adverse amenity effects (eg, a respiratory disease).

10.4.38 Taking account of the above factors, it is considered that the overall sensitivity of the GP surgery to amenity impacts would be low.

Summary

10.4.39 A summary of receptors as described in the baseline and their sensitivity is provided in Vol 11 Table 10.4.1.

Vol 11 Table 10.4.1 Socio-economics – receptors

Receptor	Value / sensitivity and justification
Users of York Gardens Adventure Playground and One O'clock Club	Medium – users and employees at the centre would have limited opportunity to avoid effects. Children may be more sensitive to construction related amenity effects but their usage of the centre would be limited to short periods of time. There are two alternative children's centres and two alternative adventure playgrounds within the wider local area, however these are situated over 1km away.
Users of York Gardens Library and Community Centre	Medium – activities take place indoors and this would act to limit users' and employees' exposure to amenity impacts. There are limited conveniently available alternative facilities.
Users of public open space – York Gardens	Medium – there is a smaller, accessible alternative open space 200m east of the site, and within 800m to 1km there are three local parks which offer similar recreation opportunities.
Residents	Medium / High – residents would have limited opportunity to avoid effects. They would have medium sensitive to amenity effects overall during the day but would have high sensitivity to amenity effects overall during the evening and night.
Business – candle maker (retailer and wholesaler)	Low – the business operates indoors and is likely to rely on destination trade rather than passing trade to attract the majority of its custom.
Community facility – Lavender Road GP surgery	Low – there are several alternative surgeries within the local area. Patient attendance is not likely to be affected by the occurrence of any amenity impacts, although patients with certain health conditions may be more sensitive to amenity impacts. Users and employees could have limited ability to avoid impacts but would be likely to have limited exposure to certain amenity impacts given activities would take place indoors.

Construction base case

10.4.40 The construction assessment year and area are as set out in para. 10.3.5.

10.4.41 The base case in the peak year of construction, taking into account the schemes described in para. 10.3.8, would differ as there would be an increase in the number of residential receptors by the base case year. For further details, refer to the base case in the air quality and construction dust, and noise and vibration assessments.

10.4.42 Other than the above, it is assumed that the other base case socio-economic conditions at the site would remain largely the same as the existing baseline conditions.

Operational base case

10.4.43 The operational assessment year and area are as set out in para. 10.3.10.

10.4.44 As described in para. 10.3.13, there are no developments relevant to the operational assessment within the assessment area that would alter the base case.

10.5 Construction effects assessment

Effect on the amenity of York Gardens Adventure Playground and One O'clock Club users

10.5.1 Assessments have been undertaken to examine the likelihood of significant air quality, construction dust, noise, vibration, and visual effects of the project arising during construction. For further information refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11). The following points summarise the residual effect findings of those assessments in relation to York Gardens Adventure Playground and One O'clock Club:

a. Local air quality effects would be **minor adverse**. Construction dust effects would be **minor adverse**.

b. Noise effects and vibration (human response) effects on playground and One O'clock Club users would be **not significant**.

c. No visual receptors were identified as requiring assessment in direct relation to the York Garden Adventure Playground and One O'clock Club.

10.5.2 In assessing the overall magnitude of impact, the above findings have been taken into consideration, together with the following factors that are considered relevant to the receptor's overall experience of amenity at the site:

a. Given the three year construction programme, the effects noted above would be likely to be experienced over a medium term period. The exception is that local air quality effects may not be minor adverse over the whole construction period as the assessment is purely based on the peak construction year and these effects may be negligible in other years.

b. It is assumed that the facility is well used and therefore a moderate or possibly high number of users would be affected by any amenity related effects.

c. Although no visual receptors were identified, viewpoint 2.1, at which there would be a **moderate adverse** visual effect, is considered relevant as a proxy viewpoint for users of the playground. However, given it is an adventure playground, children using the facility are unlikely to be focused on views outside of the playground area.

10.5.3 On the basis of the above findings and factors, it is considered that the magnitude of overall amenity impacts would be low.

10.5.4 Given the low magnitude of impact and the medium sensitivity, the effect on the amenity of York Gardens Adventure Playground and One O'clock Club users would be **minor adverse**.

Effect on the amenity of York Gardens Library and Community Centre users

10.5.5 Assessments have been undertaken to examine the likelihood of significant air quality, construction dust, noise, vibration, and visual effects of the project arising during the construction phase. For further information refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11). The following points summarise the residual effect findings of those assessments in relation to the York Gardens Library and Community Centre:

a. Local air quality effects would be **negligible**. Construction dust effects would be **minor adverse**.

b. Noise effects and vibration (human response) effects would be **not significant**.

c. No visual receptors were identified as requiring assessment in relation to the library and community centre.

10.5.6 In assessing the overall magnitude of impact, the above findings have been taken into consideration together with the following factors that are considered relevant to the receptor's overall experience of amenity at the site:

a. Given the three year construction programme, the effects noted above would be likely to be experienced over a medium term period.

b. It is assumed that the facility is well used and therefore a moderate or possibly high number of users would be affected by any amenity related effects.

10.5.7 On the basis of the above findings and factors, it is considered that the overall amenity impact magnitude would be low.

10.5.8 Taking account of the low magnitude of impact and the medium sensitivity of centre users, the effect on the amenity of York Gardens Library and Community Centre users would be **minor adverse**.

Effect on the amenity of York Gardens open space users

10.5.9 Assessments have been undertaken to examine the likelihood of significant air quality, construction dust, noise, vibration, and visual effects of the project arising during construction. For further information, refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11). The following points summarise the residual effect findings of those assessments in relation to York Gardens:

a. Local air quality effects would be **negligible**. Construction dust effects would be **minor adverse**.

b. No noise and vibration receptors were identified as requiring assessment at the project site in relation to York Gardens open space.

c. Visual effects would be **moderate adverse** at three of the five viewpoints identified (2.1, 2.2 and 2.3) and **minor adverse** at the remaining two viewpoints (2.4 and 2.5).

10.5.10 In assessing the overall magnitude of impact, the above findings have been taken into consideration together with the following factors that are considered relevant to the receptor's overall experience of amenity at the site:

a. Given the three year construction programme, the effects noted above would be likely to be experienced over a medium term period.

b. York Gardens is moderately used for active and passive recreation and so amenity impacts would be experienced by a moderate number of people, depending on the time of day. Of the total users recorded, a high proportion of these were walking through the garden and a moderate proportion were cyclists passing through the garden. As such, these users are likely to be passing by the construction site area rather than staying within the same area in the garden for a prolonged period of time.

c. Due to the length and layout of the gardens and the construction site's location, any adverse amenity impacts would be most directly experienced in the middle of the gardens. This is evidenced by the visual impact assessment, as the moderate adverse effects have tended to be identified at the viewpoints that are closest to, and which afford the clearest views of, the site. The construction dust assessment also concludes that despite the worst case **minor adverse** finding, effects would likely be negligible for dust sensitive receptors beyond 20m of the site.

d. The current view of the pumping station site is of a large brick and concrete structure. Although this view would change during the works, it is considered that use of the gardens for recreational purposes, especially for active recreation and children's play, is not critically dependent on views towards the pumping station and proposed construction site.

10.5.11 On the basis of the above findings and factors, it is considered that the overall impact magnitude would be low.

10.5.12 Given the low impact magnitude and the medium sensitivity of users, the effect on the amenity of York Gardens open space users would be **minor adverse**.

Effect on the amenity of residents

10.5.13 Assessments have been undertaken to examine the likelihood of significant air quality, construction dust, noise, vibration, and visual effects of the project arising during construction. For further information, refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11). The following points summarise the residual effect findings of those assessments in relation to nearby residential receptors:

a. Local air quality effects would be **minor adverse** at two (Pennethorne House and York Place) of the three residential receptors identified and **negligible** at the remaining receptor. Construction dust effects would be **negligible** at all three residential receptors identified.

b. Both noise and vibration effects would be **not significant** at the three residential receptors identified. In regard to road-based and construction traffic, the noise assessment found that the additional numbers of HGVs would not cause any change to the traffic noise levels and that the effects would be **not significant**.

c. Of the six residential receptor viewpoints within 250m of the site, visual effects would be **moderate adverse** at one (viewpoint 1.2), **minor adverse** at three (viewpoints 1.1, 1.5 and 1.7 respectively) and **negligible** at the remaining two (1.3 and 1.4). Visual effects during the night would be **minor adverse** at one viewpoint (1.2) and **negligible** at the remaining viewpoints.

10.5.14 In assessing the overall magnitude of impact, the above findings have been taken into consideration together with the following factors that are considered relevant to a receptor's overall experience of amenity at the site:

a. Given the three year construction programme, the effects noted above would be likely to be experienced over a medium term period. The exception is that local air quality effects may not be minor adverse over the whole construction period as the assessment is based on the peak construction year and these effects may be negligible in other years.

b. While it is estimated that there would be a moderate adverse visual effects at one viewpoint, it is considered that views from a residential property form one of many elements that contribute to the quality of a residential environment. Many of the dwellings at the receptor represented by this viewpoint are also likely to have views in other directions that are either not as severely affected or not affected at all.

10.5.15 On the basis of the above findings and factors, it is considered that the magnitude of impact would be low.

10.5.16 Given the low magnitude of impact and the medium sensitivity, it is assessed that the effect on the amenity of a limited number of residential receptors would be **minor adverse**.

10.5.17 This assessment relates primarily to those residential receptors that would experience adverse local air quality and visual effects. For residential receptors not subject to these effects, it is considered that there would be a negligible effect on their amenity.

Effect on businesses (candle maker) due to construction activity

10.5.18 If customers are sufficiently deterred from visiting the candle maker (retailer and wholesaler) by amenity impacts such as noise, dust or unpleasant views, then the business could in turn suffer deterioration in trade. For this reason the effect on amenity, as it would be experienced by customers of that business, are relevant and are considered below.

10.5.19 Assessments have been undertaken to examine the likelihood of significant air quality, construction dust, noise, vibration, and visual effects of the project arising during construction. For further information, refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11). The following points summarise the residual effect findings of those assessments in relation to the candle maker:

a. Local air quality and construction dust effects would be **minor adverse**.

b. Noise effects and vibration (human response) effects would be **not significant**.

c. No visual receptors were identified as requiring assessment in relation to the retail premises.

10.5.20 In assessing the overall magnitude of impact, the above findings have been taken into consideration together with the following factors that are considered relevant to the receptor’s overall experience of amenity at this site:

a. Given the three year construction programme, the effects noted above would be likely to be experienced over a medium term period. The exception is that local air quality effects may not be minor adverse over the whole construction period as the assessment is based on the peak construction year and these effects may be negligible in other years.

b. Given that there have been no significant effects identified it is unlikely that the customers would be deterred from visiting the business or that the business itself would be significantly affected.

10.5.21 On the basis of the above findings and factors, it is considered that the magnitude of impact would be negligible.

10.5.22 Given the negligible impact magnitude and the low sensitivity, it is assessed that the effect on the business would be **negligible**.

Effect on the amenity of Lavender Road GP surgery users

10.5.23 Assessments have been undertaken to examine the likelihood of significant air quality, constriction dust, noise, vibration, and visual effects of the project arising during construction. For further information, refer to the respective construction effects sections within this volume (see Section 4, Section 9, and Section 11).

10.5.24 The air quality, construction dust, noise and vibration assessments found that the effect on the GP surgery resulting from the construction works would be **negligible** or **not significant**, while no viewpoints were identified as requiring assessment at this receptor. It is therefore assumed that activities at the GP surgery would be able to continue as they would in the base case.

10.5.25 Given the above findings and factors, it is considered that the magnitude of impact would be negligible.

10.5.26 Taking account of the negligible magnitude of the impact and low sensitivity, it is considered that the effect on the amenity of Lavender Road GP surgery users would be **negligible**.

10.6 Operational effects assessment

Effect on users arising from enhancements to a section of York Gardens

10.6.1 In the operation phase, there would be changes to the landscaping of the area between the existing pumping station site and York Road to include a landscaped area for passive recreational use, including a new pedestrian access point to York Gardens. The area is currently publicly accessible but it is occupied by a disused toilet block and is not landscaped in a way that provides for passive or active recreation opportunities.

10.6.2 The magnitude of the impact would be influenced by the following factors:

a. The number of users of the space is likely to be commensurate with the moderate number of users within the rest of York Gardens (see para. 10.4.23) and the community facilities situated to the north and south of the newly enhanced space (see para. 10.3.14).

b. The space is situated between York Road, the One O'clock Children's Centre, the pumping station, and York Gardens Library and Community Centre. In its current condition, it is dominated by a disused toilet block, the position of which serves as a visual and physical barrier between the community facilities and the surrounding open space. The current condition of the space is also likely to give rise to perceived, and potentially actual, safety risks as the position of the block prevents passersby from having clear lines of sight and potentially provides cover for antisocial activities. As such, although the area is publicly accessible from within the park, the space has limited functionality as a part of York Gardens. In contrast, the new space would be likely to function as a unifying element between York Road, the children's centre to the north and the library / community centre to the south and the rest of York Gardens. The more open design of the space, which would be designed in accordance with 'Secured by Design' principles[6] and includes new lighting, would be likely to make users of the space feel safer and reduce opportunities for antisocial activity to take place.

c. The area that would be relandscaped would be relatively modest in size in comparison to the rest of York Gardens, however it would permanently enhance the recreational opportunities available within this section of the park for park users, and also for users of the community facilities located either side of it.

10.6.3 On the basis of the above findings and factors, in particular the permanence of the changes, the impact magnitude is likely to be low.

10.6.4 Given the low impact magnitude and the medium sensitivity of users, it is considered that the overall effect of enhancements to a section of York Gardens would be **minor beneficial**.

10.7 Cumulative effects assessment

Construction effects

10.7.1 As described in Section 10.3, no developments within the amenity effect assessment area would be under construction at the same time as the Thames Tideway Tunnel project at this site. Therefore, no cumulative effects are likely to arise.

10.7.2 Therefore, the effects on socio-economics would remain as described in Section 10.3.

Operational effects

10.7.3 As described in Section 10.3, there would not be any cumulative operational effects. Therefore, the effects on socio-economics would remain as described in Section 10.6.

10.8 Mitigation

Construction effects

10.8.1 The above assessment has concluded that there would not be any major or moderate adverse socio-economic effects in the construction phase at the site that would require mitigation.

Operational effects

10.8.2 The above assessment has concluded that operational effects would be beneficial and therefore mitigation is not required.

10.9 Residual effects assessment

Construction effects

10.9.1 As no mitigation measures are required, the residual construction effects remain as described in Section 10.5. All residual effects are presented in Section 10.10.

Operation effects

10.9.2 As no mitigation measures are required, the residual operational effects remain as described in Section 10.6. All residual effects are presented in Section 10.10.

10.10 Assessment summary

Vol 11 Table 10.10.1 Socio-economics – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Users of York Gardens Adventure Playground and One O'clock Club	Effect on the amenity of York Gardens Adventure Playground and One O'clock Club users	Minor adverse	None	Minor adverse
Users of York Gardens Library and Community Centre	Effect on the amenity of York Gardens Library and Community Centre users	Minor adverse	None	Minor adverse
Users of public open space - York Gardens	Effect on the amenity of York Gardens open space users	Minor adverse	None	Minor adverse
Residents	Effect on the amenity of some residents (see para. 10.5.13 to para. 10.5.17 for detail)	Minor adverse	None	Minor adverse
Retail business - candle maker (retailer and wholesaler)	Effect on the business due to construction activity	Negligible	None	Negligible
GP Surgery	Effect on the GP surgery users resulting from amenity effects	Negligible	None	Negligible

Vol 11 Table 10.10.2 Socio-economics – summary of operational assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Users of public open space – York Gardens	Effect on users arising from enhancements to a section of York Gardens	Minor beneficial	None	Minor beneficial

References

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 11: Townscape and visual

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Thames Tideway Tunnel
Creating a cleaner, healthier River Thames

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 11: Townscape and visual

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11 Townscape and visual

11.1 Introduction

11.1.1 This section presents the findings of the assessment of the likely significant effects of the proposed development on townscape and visual amenity at the Falconbrook Pumping Station site. Construction activities at the Falconbrook Pumping Station highway works site would be small scale in nature and would not give rise to significant townscape and visual effects. Therefore the findings of the assessment presented here relate to the main site only. The assessment describes the current conditions found within and around the site – the nature and pattern of buildings, streets, open space and vegetation and their interrelationships within the built environment – and the changes that would be introduced as a result of the proposed development during construction and operation.

11.1.2 The effects of these changes during construction and operation are assessed. The construction phase assessment includes effects on townscape character areas, and visual effects during daytime and also night time to take account of effects arising from additional lighting. The operational phase assessment includes effects on townscape character areas, and visual effects during daytime for both winter and summer of Year 1 and summer only for Year 15. The assessment also identifies mitigation measures where appropriate.

11.1.3 Effects arising from lighting during the operational phase have not been assessed. This is on the basis that there would not be any significant effects (this is further explained in para. 11.3.18).

11.1.4 Each section of the assessment is structured with townscape aspects described first, followed by visual.

11.1.5 The assessment of the likely significant townscape and visual effects of the project has considered the requirements of the National Policy Statement (NPS) for Waste Water (Defra, 2012)[1]. In line with these requirements, the townscape and visual assessment considers effects during construction and operation on townscape components, townscape character and visual receptors. The construction and design of the proposed development also takes account of townscape and visual considerations in line with the NPS recommendations. Vol 2 Section 11 provides further details on the methodology.

11.1.6 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

11.1.7 A separate but related assessment of effects on the setting of heritage assets is included in Section 7 of this volume.

11.2 Proposed development relevant to townscape and visual

11.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to the townscape and visual assessment are set out below.

Construction

11.2.2 The specific construction works which may give rise to effects on townscape character and visual receptors are listed as follows, with the activities likely to give rise to the most substantial townscape and visual effects described first:

a. clearance of the site in advance of works, including demolition of buildings and removal of vegetation at both the site and the temporary bus stop relocation site

b. use of cranes during shaft sinking and secondary lining of the Falconbrook connection tunnel

c. provision of welfare facilities, assumed to be a maximum of three storeys in height

d. vehicular construction access to the site off York Road

e. installation of 2.4m high hoardings around the boundary of the construction site, and 3.6m high hoardings along the southern boundary with the community centre

f. lighting of the site when required (continuously during the connection tunnelling phase and secondary lining, lasting approximately six months).

Code of Construction Practice

11.2.3 Measures incorporated into the *Code of Construction Practice* (*CoCP*)[i] *Part A* to reduce townscape and visual impacts include:

a. use of well-designed visually attractive hoardings (Section 4)

b. protection of existing trees in accordance with *BS5837*[2] (Section 10)

c. the use of appropriate capped and directional lighting when required.

11.2.4 Measures incorporated into the *CoCP Part B* (Section 4) include:

a. use of climbing plants along the sections of hoarding within York Gardens

b. use of 3.6m high hoardings adjacent to the York Gardens Library and Community Centre, and along the boundary with the York Gardens Adventure Playground

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[i] The *Code of Construction Practice (CoCP)* is provided in Vol 1 Appendix A. It contains general requirements (*Part A*), and site specific requirements for this site (*Part B*).

c. use of dark green painted welfare facilities to tie in with the character of the open space and the planted hoardings.

Other measures during construction

11.2.5 Other measures incorporated into the proposed scheme to help minimise adverse effects during construction include well-planned areas of advance planting within York Gardens to help screen some of the construction activities and provide a long-term improvement to the park.

Operation

11.2.6 The particular components of importance to this topic include the:

a. design, layout and materials used in the public realm including the treatment of planting, seating, boundaries and lighting

b. treatment of the shaft which protrudes above ground at this site

c. design, siting and materials used for the ventilation columns and electrical kiosks, and the zones within which these above ground structures may be located.

Environmental design measures

11.2.7 Figures illustrating the proposed development during operation are contained in a separate volume (see Permanent works layout plan, separate volume of figures – Section 1).

11.2.8 Measures which have been incorporated into the design of the proposed development include (see *Design Principles* report (see Vol 1 Appendix B) and Proposed landscape plan (separate volume of figures – Section 1):

a. locating the ventilation columns, structure and valve chamber within the pumping station compound, and the electrical and control kiosk within the existing Falconbrook Pumping Station

b. planting would be provided to the perimeter of the pumping station compound to provide visual screening of the structure

c. accommodating the raised level required for the shaft and combined valve/interception structures within the overall landscape design

d. new native planting would be provided to the public space to provide seasonal interest

e. permanent removal of the existing advertising screen

f. new paving, public furniture, and railings would be robust, durable and in keeping with the character of the surrounding townscape

g. reinstatement of planting removed during the temporary relocation of the bus stop.

11.3 Assessment methodology

Engagement

11.3.1 Volume 2 Environmental assessment methodology documents the overall engagement which has been undertaken in preparing the *Environmental*

Statement. Specific comments relevant to this site for the assessment of townscape and visual effects are presented here.

11.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of townscape and visual for this site has therefore drawn on the scoping response from the London Borough (LB) Wandsworth and is based on professional judgement as well as experience of similar sites.

11.3.3 The LB of Wandsworth, the neighbouring authority LB of Hammersmith & Fulham (located on the opposite side of the river) and English Heritage have been consulted on the detailed approach to the townscape and visual assessment, including the number and location of viewpoints. The LB of Wandsworth (May 2011) and English Heritage (May 2011) have agreed the proposed viewpoints. The LB of Hammersmith & Fulham have not commented on the proposed viewpoints.

11.3.4 The stakeholders were also consulted on proposed changes to the viewpoints following the preliminary assessment findings, including removing some viewpoints from the operational assessment. The LB of Wandsworth (October 2012) have confirmed acceptance of the proposed changes. The LB of Hammersmith & Fulham and English Heritage have not commented on the proposed viewpoints.

11.3.5 A description of how the on-site alternatives to the proposed approach have been considered and the main reasons why these alternatives have not been adopted is included in Section 3.6 of this volume.

Baseline

11.3.6 The baseline methodology follows the methodology described in Vol 2 Section 11. In summary the following surveys have been undertaken to establish baseline data for this assessment:

a. Preliminary site visit to check the zone of theoretical visibility (ZTV), establish the extents of townscape character areas and identify locations for visual assessment viewpoints (March 2011)

b. Photographic survey of townscape character areas (August 2011)

c. Winter photographic survey of the view from each visual assessment viewpoint (November 2011)

d. Summer photographic surveys of the view from visual assessment viewpoints considered in the operational assessment (August 2011 and May 2012)

11.3.7 As agreed with the LB of Wandsworth and English Heritage, no photomontages have been produced for this site, on the basis that the effects during both construction and operation could be adequately assessed without them. Therefore, no verifiable photography or surveying has been undertaken for this site.

11.3.8 With specific reference to the Falconbrook Pumping Station site, baseline information on open space distribution and type, conservation areas and townscape character has been gathered through a review of *The Core Strategy for the LB of Wandsworth* (LB of Wandsworth, 2010)[3]

Construction

11.3.9 The assessment methodology for the construction phase follows that described in Vol 2 Section 11. Site specific variations are described below.

11.3.10 With reference to the Falconbrook Pumping Station site, the peak construction phase relevant to this topic would be during Site Year 1 of construction, when the shaft would be under construction. Cranes would be present at the site and material would be taken away by road. This has therefore been used as the assessment year for townscape and visual effects. The intensity of construction activities would be similar during Site Year 2 of construction, during the secondary lining of the Falconbrook connection tunnel, involving the import of materials by road.

11.3.11 The assessment area, defined using the methodology set out in Vol 2 Section 11, is indicated in Vol 11 Figure 11.4.5 for townscape and Vol 11 Figure 11.4.6 for visual (see separate volume of figures). The scale of the townscape assessment area has been set by the maximum extents of all character areas located partially or entirely within the construction phase ZTV, except in those locations down York Road to the south of the site and on the opposite bank of the river where the construction works would be barely perceptible. The scale of the visual assessment area has been set by the maximum extents of the construction phase ZTV, except in those locations down York Road to the south of the site and on the opposite bank of the river where the construction works would be barely perceptible. All visual assessment viewpoints are located within the ZTV.

11.3.12 Section 11.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on townscape and visual amenity within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are included in this assessment.

11.3.13 For the construction base case for the assessment of effects arising from the proposed development at the Falconbrook Pumping Station site, it is assumed that there would be no changes in the base case within the assessment area between 2012 and Site Year 1 of construction. This is on the basis that none of the schemes identified in the site development schedule (Vol 11 Appendix N) fall within the townscape and visual assessment area.

11.3.14 As detailed in the site development schedule (Vol 11 Appendix N) no schemes have been identified within the townscape and visual assessment area which meet the criteria for inclusion in the cumulative assessment. Therefore no assessment of cumulative effects has been undertaken for effects on the Falconbrook Pumping Station site in the construction phase.

11.3.15 The assessment of construction effects also considers the extent to which the assessment findings would be likely to be materially different, should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Operation

11.3.16 The assessment methodology for the operational phase follows that described in Vol 2 Section 11. Any site specific variations are described below.

11.3.17 The operational phase assessment has been undertaken for Year 1 of operation and Year 15 of operation.

11.3.18 The operational scheme would have no substantial lighting requirements apart from low level lighting associated with the area of public realm. Therefore, no assessment of effects on night time character is made for this site during operation.

11.3.19 The assessment area, defined using the methodology set out in Vol 2 Section 11, is indicated in Vol 11 Figure 11.4.5 for townscape and Vol 11 Figure 11.4.6 for visual (see separate volume of figures). The scale of the townscape assessment area has been set by the maximum extents of all character areas located partially or entirely within the operational phase ZTV, except in those locations down York Road to the south of the site and on the opposite bank of the river where the proposed development would be barely perceptible. The scale of the visual assessment area has been set by the maximum extents of the operational phase ZTV, except in those locations down York Road to the south of the site and on the opposite bank of the river where the proposed development would be barely perceptible. All visual assessment viewpoints are located within the ZTV.

11.3.20 Section 11.6 details the likely significant effects arising from the operation at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on townscape and visual amenity within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

11.3.21 In terms of the operational base case for the assessment of effects on the Falconbrook Pumping Station site, no developments within the operational phase assessment areas have been identified that meet the criteria for inclusion in the base case, over and above those detailed in para. 11.3.13. Therefore, no other developments are considered in the assessment of effects on the Falconbrook Pumping Station site in the operational phase.

11.3.22 As detailed in the site development schedule (Vol 11 Appendix N) no schemes have been identified within 1km of the site which meet the criteria for inclusion in the cumulative assessment. Therefore no assessment of cumulative effects has been undertaken for effects on the Falconbrook Pumping Station site in the operational phase.

11.3.23 As with construction (para. 11.3.15), the assessment of operational effects also considers the extent to which the assessment findings would be likely to be materially different, should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

Assumptions and limitations

11.3.24 The assumptions and limitations associated with this assessment are presented in Vol 2 Section 11. Site specific assumptions and limitations are detailed below.

Assumptions

11.3.25 For the purposes of the construction phase assessment, it is assumed that the construction activities and plant, site hoardings, welfare facilities and access points are in the location shown on the construction phase 1 (site setup, shaft construction and tunnelling) plan (see separate volume of figures – Section 1). The assessment of effects would be no worse if these elements of the proposed development were in different locations within the maximum extent of working area (shown on Construction phase plans, separate volume of figures – Section 1), with the permanent structures under construction located within the zones shown on the Site works parameter plan (see separate volume of figures – Section 1).

11.3.26 For the purposes of the operational phase assessment, it is assumed that the above ground structures are in the location shown on the Proposed landscape plans (see separate volume of figures – Section 1). The assessment of effects would be no worse if these elements of the proposed development were in different locations within the zones (shown on the Site works parameter plan, separate volume of figures – Section 1).

Limitations

11.3.27 There are no limitations specific to the assessment of this site.

11.4 Baseline conditions

11.4.1 The following section sets out the baseline conditions for the townscape and visual assessment within and around the site as follows:

a. Information on the physical elements that make up the overall townscape character of the assessment area (topography, land use, development patterns, vegetation, open space and transport routes), which inform the identification of townscape character areas. These form the receptors for the townscape assessment.

b. Information on the townscape character (including setting), condition, tranquillity, value and sensitivity of the site and each townscape character area.

c. Information on the nature of the existing views towards the site at daytime from all visual assessment viewpoints, during both daytime and night time and in both winter and summer where relevant. This is ordered beginning with the most sensitive receptors through to the least sensitive.

d. Future baseline conditions (base case) are also described.

Current baseline

Townscape baseline

Physical elements

11.4.2 The physical elements of the townscape in the assessment area are described below.

Topography

11.4.3 The site is located on relatively flat ground on the south bank of the River Thames, with no notable topographic features across the assessment area.

Land use

11.4.4 In the vicinity of the site, the south bank of the river is dominated by modern residential developments, interspersed with some commercial uses along the western side of York Road. The site is located within the existing pumping station and an associated area of hardstanding situated within York Gardens, a medium sized public park.

Development patterns and scale

11.4.5 Vol 11 Figure 11.4.1 (see separate volume of figures) illustrates the pattern and scale of development and building heights within the assessment area.

11.4.6 The site is located in an area of mixed development patterns. The river frontage along the south bank is characterised by dense residential development up to seven storeys high, apart from a recently completed residential block to the north of the site which is fifteen storeys high. To the west of the site, there is a series of low-rise commercial buildings set amongst large areas of hardstanding and car parking.

11.4.7 To the northeast of the site, the area is dominated by a mix of five storey residential apartment blocks and two to three storey residential terraces. The residential area to the east of the site is characterised by larger building plots up to 16 storeys high, set amongst communal open spaces. To the south, the residences are three to four storey high terraced apartment blocks.

Vegetation patterns and extents

11.4.8 Vol 11 Figure 11.4.2 (see separate volume of figures) illustrates the pattern and extent of vegetation, including tree cover, within the assessment area.

11.4.9 Vegetation within the assessment area is generally concentrated within York Gardens and the residential area to the east of the site, characterised by large blocks set amongst communal grounds with scattered mature trees. The river frontages on both banks are characterised by a notable absence of trees or other vegetation.

11.4.10 Some groups of trees to the south of the site are protected by Tree Preservation Orders (TPOs). However, there are no other known TPOs within or close to the site.

Open space distribution and type

11.4.11 Vol 11 Figure 11.4.3 (see separate volume of figures) illustrates the distribution of different open space types within the assessment area, indicating all relevant statutory, non-statutory and local plan designations.

11.4.12 The assessment area is characterised by a number of incidental green spaces, communal areas and private gardens, particularly amongst residential areas to the west of the site. There are also several small and medium sized public and private open spaces, which are described in more detail in Vol 11 Table 11.4.1 below.

Vol 11 Table 11.4.1 Townscape – open space type and distribution

Open space	Distance from site	Character summary
York Gardens	0m (on south bank of river)	Medium sized public park characterised by areas of amenity grass, scattered mature trees, planted beds and several planting beds. The park also incorporates a children's playground to the north of Falconbrook Pumping Station. Designated as 'Other larger protected open space' by the LB of Wandsworth UDP. Characterised as a local park by the GLA public open space hierarchy.
Harroway Road Open Space	250m north (on south bank of river)	Small open space enclosed by fencing and mature trees with a mounded grass and shrub area in the centre. The space also includes some play equipment. Characterised as a small open space by the GLA public open space hierarchy.
Meyrick Road Open Space	250m east (on south bank of river)	Medium sized open space comprising undulating grass areas, scattered semi-mature trees, low hedges and a children's playground. Characterised as a small open space by the GLA public open space hierarchy.

Transport routes

11.4.13 Vol 11 Figure 11.4.4 (see separate volume of figures) illustrates the transport network within the assessment area, including cycleways, footpaths and Public Rights of Way.

11.4.14 The site is located to the east of York Road, which is characterised by relatively high flows of traffic. The remainder of the streets in the assessment area are generally residential in nature, with relatively low levels of traffic. The railway line close to Clapham Junction is located in the far southeast corner of the assessment area.

11.4.15 The Thames Path runs along the majority of the river frontage along the south bank, although it diverts inland around the small area of commercial uses to the west of the site.

Site character assessment

11.4.16 The site is located partially within the confines of the existing Falconbrook Pumping Station, and partially in a small area of hardstanding between the pumping station and York Road. The character of the site is illustrated by Vol 11 Plate 11.4.1 and the components of the site are described in more detail in Vol 11 Table 11.4.2.

Vol 11 Plate 11.4.1 The character of the site

Date taken: 25 August 2011. 18mm lens.

Vol 11 Table 11.4.2 Townscape – site components

ID	Component	Description	Condition
01	Existing pumping building and disused toilet block	Single storey brick building with a flat roof and protruding canopy.	Fair condition
02	Screening chamber structure	Two storey high brick and concrete structure with two mobile phone antennae on the roof	Poor condition
03	Boundary fence	2m high block railings on a low concrete wall.	Fair condition
04	Boundary vegetation	Mix of low shrubs and semi-mature evergreen and deciduous trees of moderate to low value	Fair condition
05	Advertising hoarding	10m high black advertising hoarding with an electronic display	Fair condition

ID	Component	Description	Condition
06	Boundary wall	Brick built boundary wall to the existing pumping station	Poor condition
07	Bus stop	Bus stop located at southwest edge of the site	Fair condition

11.4.17 The condition of the townscape within the site is generally fair to poor, due to the disused nature of some components and the general limited maintenance undertaken on others.

11.4.18 Due to the industrial use of part of the site, dominance of hardstanding and location adjacent to York Road, the site has a low level of tranquillity.

11.4.19 The site has limited townscape value due to the industrial/disused nature of the area.

11.4.20 Due to the poor condition and limited townscape value, the site has a low sensitivity to change.

Townscape character assessment

11.4.21 The townscape character areas surrounding the site are identified in Vol 11 Figure 11.4.5 (see separate volume of figures). They are ordered from the north of the site and continue around the site in a clockwise direction. Each area is described below.

York Gardens TCA

11.4.22 This area comprises York Gardens, a medium sized open space characterised by open grassland, scattered mature trees, a children's playground, a crèche and a community centre/library. The park is surrounded by residential development to the north, east and south, and bounded by York Road to the west. The character of this area is illustrated by Vol 11 Plate 11.4.2.

Vol 11 Plate 11.4.2 York Gardens TCA

Date taken: 25 August 2011. 18mm lens.

11.4.23 The landscape of the open space is well managed. The overall townscape condition is good.

11.4.24 The area has a high level of tranquillity due to the presence of trees, limited levels of activity and intermittent seclusion offered from the surrounding built environment.

11.4.25 The area is considered to be of borough level value due to the area of the open space and the wide range of facilities, both within and adjacent to it.

11.4.26 Due to the good condition and borough value of the townscape, and high level of tranquillity, this character area has a high sensitivity to change.

Thameside Residential TCA

11.4.27 This area is characterised by a variety of mixed use developments (ranging from three to fifteen storeys) along the south bank of the River Thames. The area is bounded by York Road to the east. The development pattern is heavily influenced by the river, with buildings orientated to maximise riverside views. Due to the ad-hoc nature of development in this area, the architectural style is diverse and includes a mix of 20th and 21st century developments. Vegetation within the area is generally limited to occasional amenity shrubs and semi-mature trees. The area does also include some occasional low-rise warehouse buildings, particularly towards the southern end of this character area. The character of this area is illustrated by Vol 11 Plate 11.4.3.

Vol 11 Plate 11.4.3 Thameside Residential TCA

Date taken: 25 August 2011. 18mm lens.

11.4.28 The buildings and public realm within the area are generally well maintained. The overall townscape condition is good.

11.4.29 The tranquillity of the residential area located alongside the river is slightly diminished by the presence of some industrial premises and busy traffic along York Road. Therefore, this area has a moderate level of tranquillity.

11.4.30 The area is likely to be locally valued by residents within the character area.

11.4.31 Due to the good condition and local value of the townscape, and the moderate levels of tranquillity, this area has a medium sensitivity to change.

Lombard Road Commercial TCA

11.4.32 This area is characterised by a cluster of one and two storey commercial and large scale retail premises set amongst extensive areas of hard standing used as storage yards and car parking. The area also includes a helipad which protrudes into the river. The area has a notable absence of vegetation, apart from small clusters amongst parking bays throughout the area. The character of this area is illustrated by Vol 11 Plate 11.4.4.

Vol 11 Plate 11.4.4 Lombard Road Commercial TCA

Date taken: 25 August 2011. 18mm lens.

11.4.33 The buildings and public realm within the area are generally well maintained. The overall townscape condition is good.

11.4.34 Due to the industrial and commercial uses, located along York Road, which is characterised by busy traffic, this area has a low level of tranquillity.

11.4.35 In addition, due to the type of use, with an inherent lack of public amenity or vegetation, the area has limited townscape value.

11.4.36 Due to the low level of tranquillity and limited townscape value, this character area has a low sensitivity to change.

York Gardens Residential TCA

11.4.37 This area is dominated by a distinct residential area, which is highly uniform in character in terms of scale of building, development pattern and architectural styling. The area is characterised by large scale residential apartment blocks ranging from three storey terraces to 15 storey towers. The buildings are set amongst extensive areas of communal open space, characterised by amenity grassland with a high number of scattered mature trees. The southern boundary of the area is formed by the wide area of railway lines outside Clapham Junction mainline station. The area is generally inward looking in character. The character of this area is illustrated by Vol 11 Plate 11.4.5.

Vol 11 Plate 11.4.5 York Gardens Residential TCA

Date taken: 25 August 2011. 18mm lens.

11.4.38 The buildings and public realm within the area are generally well maintained. The overall townscape condition is good.

11.4.39 The area has a moderate level of tranquillity due to its residential character and location adjacent to York Gardens, which is affected to a limited extent by the presence of regular rail traffic along the southern boundary.

11.4.40 The townscape of the character area is likely to be locally valued by residents within the area, particularly with regard to the green outlook provided by the presence of mature trees.

11.4.41 Due to the local value attributed to the townscape and inward looking nature of the built environment, this character area has a medium sensitivity to change.

Hope Street Residential TCA

11.4.42 This area is characterised by four to five storey brick built residential apartment blocks with on-street parking and clusters of garages. The buildings are set amongst small private and communal areas of open space with occasional scattered trees. The pattern of development is inward looking in character. The character of this area is illustrated by Vol 11 Plate 11.4.6.

Vol 11 Plate 11.4.6 Hope Street Residential TCA

Date taken: 25 August 2011. 18mm lens.

11.4.43 The buildings and public realm within the area are generally well maintained. The overall townscape condition is good.

11.4.44 The area has a moderate level of tranquillity due to the residential character, affected to a limited extent by the presence of busy traffic along York Road on the eastern boundary of the character area.

11.4.45 The townscape of the character area is likely to be locally valued by residents within the area.

11.4.46 Due to the local value attributed to the townscape and inward looking nature of the built environment, this character area has a medium sensitivity to change.

Visual baseline

11.4.47 Vol 11 Figure 11.4.6 (see separate volume of figures) indicates the location of the viewpoints referenced below. All residential and recreational receptors have a high sensitivity to change, and transport receptors have a medium sensitivity to change. For each viewpoint, the first part of the baseline description relates to the view during winter, the second part relates to the summer view for viewpoints included in the operational assessment and the final part relates to the view at night time for the purposes of undertaking the assessment of effects arising from additional lighting during construction.

Residential

11.4.48 Residential receptors have a high sensitivity to change, as attention is often focused on the townscape surrounding the property rather than on another focused activity (as would be the case in predominantly employment or industrial areas). The visual baseline for residential receptors (represented by a series of viewpoints, agreed with consultees) is described below.

Viewpoint 1.1: View south from residences on Fairchild Close, adjacent to York Gardens

11.4.49 This viewpoint is representative of the view from the rear of residential properties adjacent to the northern edge of York Gardens on Fairchild Close.

Vol 11 Plate 11.4.7 Viewpoint 1.1 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.50 The view (illustrated in Vol 11 Plate 11.4.7) is an open panorama over York Gardens, comprising open grassland bounded by a belt of mature trees. The children's playground, crèche and the existing Falconbrook Pumping Station form noticeable elements in the background of the view. Views of the site are largely obstructed from this location by intervening fencing, buildings and trees.

11.4.51 At night, the view is largely unlit apart from the background presence of light spill from street lighting and buildings.

Viewpoint 1.2: View southwest from residences in Pennethorne House, adjacent to York Gardens

11.4.52 This viewpoint is representative of a typical view from residential apartments in the block in Pennethorne House, adjacent to the eastern edge of York Gardens.

Vol 11 Plate 11.4.8 Viewpoint 1.2 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.53 The foreground of the view (illustrated in Vol 11 Plate 11.4.8) is dominated by the open grassland and scattered mature trees in York Gardens, and framed by the existing Falconbrook Pumping Station, crèche and adjacent playground. Views from upper storeys encompass York Road and the commercial units to the west (beyond the field of view shown). Views of the site are largely unobstructed from this location, apart from a degree of screening by the existing electrical substation.

Vol 11 Plate 11.4.9 Viewpoint 1.2 – summer view

Date taken: 25 August 2011. 18mm lens.

11.4.54 The character of the view in summer (illustrated in Vol 11 Plate 11.4.9) is marginally enhanced due to the greater degree of screening from foreground trees within York Gardens.

11.4.55 At night, the view is largely unlit apart from the background presence of light spill from street lighting and buildings.

Viewpoint 1.3: View west from residences on Lavender Road at the junction with Darien Road

11.4.56 This viewpoint is representative of the oblique view from residential properties along Lavender Road, close to the junction with Darien Road.

Vol 11 Plate 11.4.10 Viewpoint 1.3 – winter view

Date taken: 17 November 2011. 35mm lens.

11.4.57 The linear view (illustrated in Vol 11 Plate 11.4.10) along Lavender Road is framed by a residential terrace to the south and a mix of residences and open spaces to the north. York Gardens forms the background of the view. Views of the site from this location are largely obstructed by mature trees.

11.4.58 At night, the foreground of the view is lit by street lighting and light spill from surrounding buildings. York Gardens, in the background of the view, are largely unlit.

Viewpoint 1.4: View west from residences on Ganley Court

11.4.59 This viewpoint is representative of the oblique view from residential properties along Lavender Road, close to the junction with Darien Road.

Vol 11 Plate 11.4.11 Viewpoint 1.4 – winter view

Date taken: 17 November 2011. 35mm lens.

11.4.60 The linear view (illustrated in Vol 11 Plate 11.4.11) along Ganley Court is enclosed by residential apartments in the foreground of the view. York Gardens and the existing Falconbrook Pumping Station form the background of the view. Views of the site are largely unobstructed from this location, apart from a degree of screening by the existing electrical substation.

11.4.61 At night, the foreground of the view is lit by street lighting and light spill from surrounding buildings. York Gardens, in the background of the view, are largely unlit.

Viewpoint 1.5: View northwest from residences on Newcomen Road

11.4.62 This viewpoint is representative of the view from residences on Newcomen Road, adjacent to the eastern edge of York Gardens.

Vol 11 Plate 11.4.12 Viewpoint 1.5 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.63 The foreground of the view (illustrated in Vol 11 Plate 11.4.12) is dominated by the open grassland and scattered mature trees in York Gardens. The existing Falconbrook Pumping Station and community centre form dominant components in the view across the park. Views of the site are largely unobstructed from this location.

Vol 11 Plate 11.4.13 Viewpoint 1.5 – summer view

Date taken: 25 August 2011. 18mm lens.

11.4.64 During summer, the overall character of the view towards the site (illustrated in Vol 11 Plate 11.4.13) does not alter, although the deciduous trees provide a greater degree of screening.

11.4.65 At night, the foreground of the view is lit by street lighting and light spill from surrounding buildings. York Gardens, in the middle ground of the view, are largely unlit apart from some low illumination public realm lighting.

Viewpoint 1.6: View southeast from residences on William Morris Way on the northern bank of the river

11.4.66 This viewpoint is representative of a typical view from residential properties located between the Thames Path and William Morris Way on the northern bank of the river.

Vol 11 Plate 11.4.14 Viewpoint 1.6 – winter view

Date taken: 17 November 2011. 35mm lens.

11.4.67 The view (illustrated in Vol 11 Plate 11.4.14) is an open panorama across the River Thames towards the site. The view is characterised by modern high rise residential developments, with trees along the boundary of York Gardens visible in the background of the view. The view towards the site is largely obstructed by intervening structures and buildings on the south bank of the river.

11.4.68 At night, the view across the river is unlit although the opposite bank is lit by light spill from buildings along the river frontage.

Viewpoint 1.7: View southeast from riverfront residences on Bridges Court

11.4.69 This viewpoint is representative of the oblique view from residential properties located on the south bank of the River Thames, close to Bridges Court.

Vol 11 Plate 11.4.15 Viewpoint 1.7 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.70 The oblique view to the east (illustrated in Vol 11 Plate 11.4.15) is characterised by framed by modern residential premises, with York Road visible in the middle ground. The existing Falconbrook Pumping Station is visible in the periphery of the view. Views of the site from lower storeys are largely obscured by intervening buildings and structures. The site is visible in views from upper storeys.

11.4.71 At night, the foreground of the view is dimly lit by public realm lighting and light spill from surrounding buildings.

Recreational

11.4.72 Recreational receptors (apart from those engaged in active sports) generally have a high sensitivity to change, as attention is focused on enjoyment of the townscape. Tourists engaged in activities whereby attention is focused on the surrounding townscape also have a high sensitivity to change. The visual baseline in respect of recreational receptors, including tourists, is discussed below.

Viewpoint 2.1: View south from the northern part of York Gardens

11.4.73 This viewpoint is representative of the view for recreational users of the northern area of amenity grassland in York Gardens.

Vol 11 Plate 11.4.16 Viewpoint 2.1 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.74 The foreground of the view (illustrated in Vol 11 Plate 11.4.16) is dominated by the children's playground, which partially obscures views to the crèche and existing Falconbrook Pumping Station. Views of the site are largely obscured by intervening structures and buildings.

Vol 11 Plate 11.4.17 Viewpoint 2.1 – summer view

Date taken: 25 August 2011. 18mm lens.

11.4.75 In summer, scattered deciduous trees provide some additional screening (illustrated in Vol 11 Plate 11.4.17).

11.4.76 At night, the foreground of the view is largely unlit although street lighting in the middle ground provides a low level of illumination.

Viewpoint 2.2: View southwest from the northeast entrance to York Gardens

Vol 11 Plate 11.4.18 Viewpoint 2.2 – winter view

Date taken: 17 November 2011. 35mm lens.

11.4.77 This viewpoint (illustrated in Vol 11 Plate 11.4.18) is representative of a typical view for recreational users of York Gardens, at the footpath leading to the northeast entrance to the park. The view is an open panorama over the area of amenity grassland in the northern part of the gardens, with the children's playground clearly visible in the background, partially obscuring views to the crèche and existing Falconbrook Pumping Station. Views of the site are largely obscured by intervening structures and buildings.

11.4.78 At night, the view within the park is largely unlit although light spill from street lighting in the background of the view is apparent.

Viewpoint 2.3: View northwest from the feature paved area in the centre of York Gardens

11.4.79 This viewpoint is representative of the view for recreational users of York Gardens, from the circular area of feature paving and planting at the centre of the park.

Vol 11 Plate 11.4.19 Viewpoint 2.3 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.80 The foreground of the view (illustrated in Vol 11 Plate 11.4.19) is dominated by the existing Falconbrook Pumping Station and community centre. Views of the site are largely unobstructed from this location.

Vol 11 Plate 11.4.20 Viewpoint 2.3 – summer view

Date taken: 25 August 2011. 18mm lens.

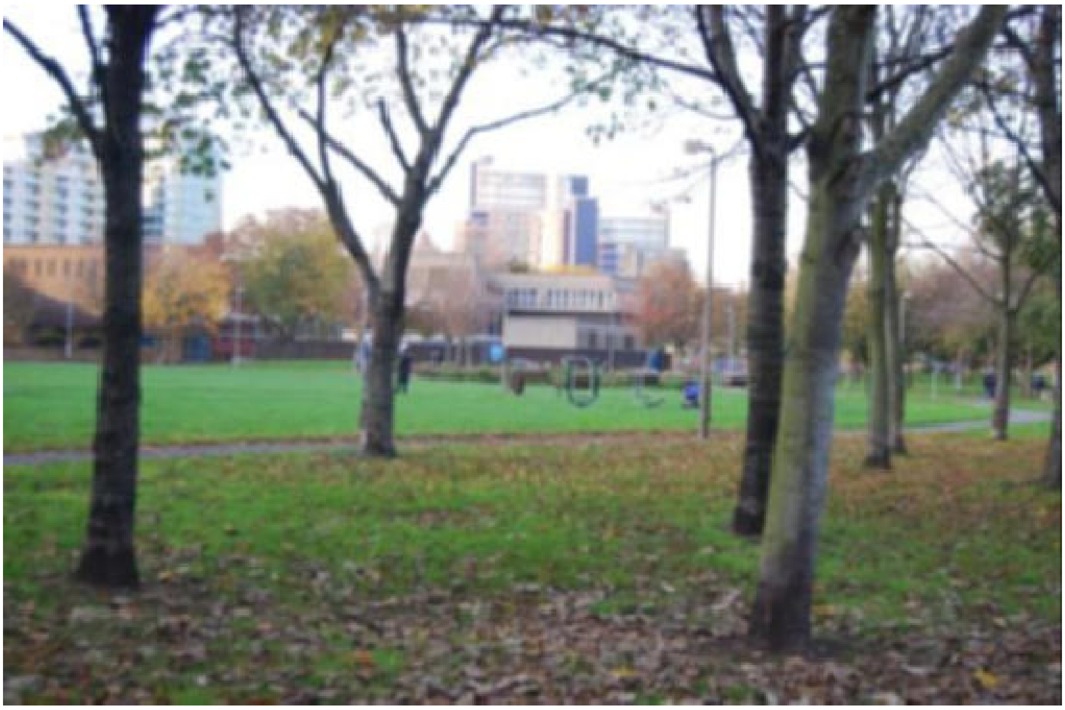
11.4.81 In summer, the view towards the site (illustrated in Vol 11 Plate 11.4.20) is largely unchanged apart from some additional screening of part of the site, provided by a mature deciduous tree.

11.4.82 At night, the view within the park is dimly lit by public realm lighting and light spill from surrounding buildings and street lighting.

Viewpoint 2.4: View north from the southeast entrance to York Gardens

11.4.83 This viewpoint is representative of a typical view for recreational users of York Gardens, at the footpath leading to the southeast entrance to the park.

Vol 11 Plate 11.4.21 Viewpoint 2.4 – winter view



Winter – date taken: 17 November 2011. Summer – date taken: 25 August 2011. 35mm lens.

11.4.84 The view (illustrated in Vol 11 Plate 11.4.21) is an open panorama over the area of amenity grassland and scattered trees in the southern part of the gardens, with the existing Falconbrook Pumping Station and community centre clearly visible in the background. Views of the site are largely unobstructed from this location.

Vol 11 Plate 11.4.22 Viewpoint 2.4 – summer view

Date taken: 25 August 2011. 35mm lens.

11.4.85 In summer, the view towards the site (illustrated in Vol 11 Plate 11.4.22) is largely unchanged due to the height of the crown on the trees in the foreground of the view. Deciduous trees in the background of the view provide some additional screening of the site.

11.4.86 At night, the view within the park is dimly lit by public realm lighting, while light spill from surrounding street lighting and buildings is apparent in the background of the view.

Viewpoint 2.5: View north from the southwest entrance to York Gardens from Plough Way

11.4.87 This viewpoint is representative of a typical view for recreational users of York Gardens, at the southwest entrance to the park, from Plough Way.

Vol 11 Plate 11.4.23 Viewpoint 2.5 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.88 The view (illustrated in Vol 11 Plate 11.4.23) is an open panorama over the area of amenity grassland and scattered trees in the southern part of the gardens, with the existing Falconbrook Pumping Station and community centre clearly visible in the background. Views of the site are partially obstructed by the community centre.

Vol 11 Plate 11.4.24 Viewpoint 2.5 – summer view

Date taken: 23 May 2012. 18mm lens.

11.4.89 In summer, the view towards the site (illustrated in Vol 11 Plate 11.4.24) is largely unchanged, although deciduous trees close to the site provide some additional screening.

11.4.90 At night, the view within the park is dimly lit by public realm lighting, while light spill from surrounding street lighting and buildings is apparent in the background of the view.

Transport

11.4.91 Travel through an area is often the means by which the greatest numbers of people view the townscape. Such receptors generally have a medium sensitivity to change.

Viewpoint 3.1: View south from York Road at the junction with Lombard Road

11.4.92 This viewpoint is representative of the typical view for pedestrians travelling south towards the site along York Road.

Vol 11 Plate 11.4.25 Viewpoint 3.1 – winter view

Date taken: 17 November 2011. 18mm lens.

11.4.93 The linear view (illustrated in Vol 11 Plate 11.4.25) is contained to the west by commercial premises and to the east by mature trees on the boundary of York Gardens. The southern extent of the site is partially visible in the background of the view.

11.4.94 At night, the foreground of the view is brightly lit by street lighting and light spill from vehicles and surrounding buildings.

Construction base case

11.4.95 For the purpose of the construction phase assessment, it is assumed that there would be no substantial change in the townscape and visual baseline between 2012 and Site Year 1 of construction.

Operational base case

11.4.96 For the purpose of the operational phase assessment, it is assumed that there would be no substantial change in the townscape and visual baseline between 2012 and Year 1 of operation.

11.5 Construction effects assessment

11.5.1 The following section details the likely significant effects arising from construction at the Falconbrook Pumping Station site.

11.5.2 Due to the scale of the construction activities proposed across what are, in many cases, prominent locations in London, construction works would be highly visible. In policy terms, the NPS for waste water (Defra, 2012)[4] recognises that nationally significant infrastructure projects are likely to take place in mature urban environments, with adverse construction effects on townscape and visual receptors likely to arise. In addition, construction works are a commonplace feature across London, and therefore the following assessment should be viewed in this context. It should also be noted that construction effects are temporary in nature and relate to the peak construction year defined in Section 11.3. Effects during other phases of works are likely to be less due to fewer construction plant being required at the time and a reduced intensity of construction activity.

11.5.3 Illustrative plans of the possible layout of the site during construction are contained in a separate volume of figures (see Construction phase plans, separate volume of figures – Section 1).

Construction phase site assessment

11.5.4 Effects on the character of the site would arise from clearance of the site and construction activity associated with the construction of the shaft and ventilation equipment, and secondary lining of the Falconbrook connection tunnel. The impacts on specific components of the site are described in Vol 11 Table 11.5.1 below.

Vol 11 Table 11.5.1 Townscape – impacts on existing site components during construction

ID	Component	Impacts
01	Disused toilet block	Demolished during construction.
02	Screening chamber structure	Demolished during construction.
03	Boundary fence	Removed during construction.
04	Boundary vegetation	The majority of this would be cleared during construction to facilitate access onto York

ID	Component	Impacts
		Road.
05	Advertising hoarding	Removed during construction.
06	Boundary wall	The majority of this wall would be removed during construction.
07	Bus stop	Bus stop would be removed and relocated during construction.

11.5.5 The low levels of tranquillity at the site would be affected to a limited extent by the introduction of construction vehicles, plant equipment and high levels of activity in an area not currently intensively used.

11.5.6 Due to the clearance and intense levels of tranquillity, affecting the character of the site and levels of tranquillity to a limited extent, set against the limited overall change to the character of the majority of the site, the magnitude of change is considered to be medium.

11.5.7 The medium magnitude of change, assessed alongside the low sensitivity of the site to change, would result in **minor adverse** effects.

Townscape character areas assessment

York Gardens TCA

11.5.8 The proposed site forms part of the immediate setting for this character area. The setting would be affected by the demolition of buildings and removal of boundary walls, fences and vegetation, the presence of site hoardings and welfare facilities, and the intense level of activity during construction. However, construction activity at the site would be partially obscured by the crèche, community centre, pumping station and electrical substation, which also form key parts of the setting of this area. The effect would be further reduced by mitigation measures embedded into the proposed scheme, including high quality hoardings incorporating climbing plants and advance planting within York Gardens.

11.5.9 The high levels of tranquillity in the area would be affected by demolition, construction activities and construction plant, although the overall green character, which forms a part of people's perception of tranquillity, would be largely retained.

11.5.10 Due to changes to the setting and tranquillity of the area, partially mitigated through advance planting and climbing plants on the hoardings, the magnitude of change is considered to be low.

11.5.11 The low magnitude of change, assessed alongside the high sensitivity of this character area, would result in **minor adverse** effects.

Thameside Residential TCA

11.5.12 The setting of this area would be affected to a limited extent by construction activity at the site, the presence of tall construction plant and cranes, and road transport along York Road. However, the majority of the area, which is principally focused towards the river, would not be affected.

11.5.13 The moderate level of tranquillity in the area would be affected to a limited extent by construction activity and traffic along York Road.

11.5.14 Due to the limited changes to part of the area's setting and tranquillity, the magnitude of change is considered to be low.

11.5.15 The low magnitude of change, assessed alongside the medium sensitivity of this character area, would result in **minor adverse** effects.

Lombard Road Commercial TCA

11.5.16 The setting of this area would be affected to a limited extent by construction activity at the site, the presence of tall construction plant and cranes, and road transport along York Road. However, the majority of the area, which is principally focused towards the river, would not be affected.

11.5.17 The low level of tranquillity in the area would be largely unaffected by construction activity at the site and traffic along York Road.

11.5.18 Due to the limited changes to part of the area's setting, the magnitude of change is considered to be low.

11.5.19 The low magnitude of change, assessed alongside the low sensitivity of this character area, would result in a **negligible** effect.

York Gardens Residential TCA and Hope Street Residential TCA

11.5.20 The setting of parts of these areas would be affected to a limited extent by the presence of tall construction plant and cranes at the site. However, the majority of the areas would not be affected given their inward looking character and the distance from the site.

11.5.21 The moderate levels of tranquillity in the areas would be largely unaffected by construction activity at the site.

11.5.22 Due to the limited changes to part of the areas wider setting, the magnitude of change is considered to be negligible.

11.5.23 The negligible magnitude of change, assessed alongside the medium sensitivity of these character areas, would result in **negligible** effects.

Townscape – sensitivity test for programme delay

11.5.24 For the assessment of townscape effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 11.5.4 to 11.5.23). This is on the basis that there are no known schemes that would change the sensitivity to change of the townscape character areas already presented (paras. 11.4.2 to 11.4.46).

Visual assessment

11.5.25 The visual assessment for the construction phase has been undertaken during winter, in line with best practice guidance, to ensure a robust assessment. However, in some cases, visibility of construction activities may be reduced during summer when vegetation, if present in a view, would be in leaf.

11.5.26 From some locations, no receptors are present at night time and therefore no assessment of effects arising from additional lighting at night time has been undertaken. This is noted in the relevant viewpoints below.

Residential

Viewpoint 1.1: View south from residences on Fairchild Close, adjacent to York Gardens

11.5.27 Views from residences across the park would be affected by the background visibility of tall construction plant and cranes at the site, although intervening fencing, buildings and trees would largely obscure other construction activities. Works associated with the relocation of the bus stop (including removal of trees) would be partially visible in the middle ground of the view, but would not be overly visually intrusive. Therefore, the magnitude of change is considered to be low.

11.5.28 The low magnitude of change, assessed alongside the high sensitivity of the receptor would result in **minor adverse** effects.

11.5.29 At night, due to the use of capped and directional lighting (described in para. 11.2.3c), lighting would be barely perceptible in the background of the view. Therefore, the magnitude of change to the receptor at night is considered to be negligible, resulting in a **negligible** effect.

Viewpoint 1.2: View southwest from residences in Pennethorne House, adjacent to York Gardens

11.5.30 Views from residences across the park would be affected by the foreground visibility of stacked welfare facilities, tall construction plant and cranes at the site. Views of site hoardings and other construction activities from lower storeys would be largely obscured by intervening buildings. The effect would be further reduced by mitigation measures embedded into the proposed scheme, including high quality hoardings incorporating climbing plants and advance planting within York Gardens. However, the removal of existing buildings and intense levels of construction activity would be highly visible from upper storeys. Therefore, the magnitude of change is considered to be medium.

11.5.31 The medium magnitude of change, assessed alongside the high sensitivity of the receptor would result in **moderate adverse** effects.

11.5.32 At night, 24 hour lighting (during the construction and secondary lining of the connection tunnel, lasting approximately six months) would be apparent beyond the site hoardings in the middle ground of the view. However, due to the use of capped and directional lighting (described in para. 11.2.3c) the magnitude of change to the receptor at night is considered to be low, resulting in **minor adverse** effects.

Viewpoint 1.3: View west from residences on Lavender Road at the junction with Darien Road; and Viewpoint 1.4: View west from residences on Ganley Court

11.5.33 Views from residences towards the park would be affected to a limited extent by the background visibility of tall construction plant and cranes at the site, although intervening buildings and trees would almost entirely obscure other construction activities. Therefore, the magnitude of change is considered to be negligible.

11.5.34 The negligible magnitude of change, assessed alongside the high sensitivity of these receptors would result in **negligible** effects.

11.5.35 At night, lighting at the site would be barely perceptible in the background of the views. Therefore, the magnitude of change to these receptors at night is considered to be negligible, resulting in **negligible** effects.

Viewpoint 1.5: View northwest from residences on Newcomen Road

11.5.36 Views from residences towards the park would be affected by the background visibility of stacked welfare facilities, tall construction plant and cranes at the site, although intervening trees would filter the visibility of other construction activities. The effect would be further reduced by mitigation measures embedded into the proposed scheme, including high quality hoardings incorporating climbing plants and advance planting within York Gardens. Therefore, the magnitude of change is considered to be low.

11.5.37 The low magnitude of change, assessed alongside the high sensitivity of the receptor would result in **minor adverse** effects.

11.5.38 At night, lighting at the site would be barely perceptible in the background of the view. Therefore, the magnitude of change to the receptor at night is considered to be negligible, resulting in a **negligible** effect.

Viewpoint 1.6: View southeast from residences on William Morris Way on the northern bank of the river

11.5.39 Construction activity at the site would not be visible from this location, and the presence of cranes would be barely perceptible in the background of the panorama over the river. Therefore, the magnitude of change is considered to be negligible.

11.5.40 The negligible magnitude of change, assessed alongside the high sensitivity of the receptor would result in a **negligible** effect.

11.5.41 At night, lighting at the site would be barely perceptible in the background of the view. Therefore, the magnitude of change to the receptor at night is considered to be negligible, resulting in a **negligible** effect.

Viewpoint 1.7: View southeast from riverfront residences on Bridges Court

11.5.42 Oblique views from residences towards the site would be affected to a limited extent by the visibility of tall construction plant and cranes on the opposite side of York Road. Views of other construction activities from lower storeys would be largely obscured by intervening buildings. However, the removal of existing buildings and intense levels of construction activity would be visible in the background of the view from upper storeys. Therefore, the magnitude of change is considered to be low.

11.5.43 The low magnitude of change, assessed alongside the high sensitivity of the receptor would result in **minor adverse** effects.

11.5.44 At night, lighting at the site would be barely perceptible in the background of the view. Therefore, the magnitude of change to the receptor at night is considered to be negligible, resulting in a **negligible** effect.

Recreational

Viewpoint 2.1: View south from the northern part of York Gardens and Viewpoint 2.2: View southwest from the northeast entrance to York Gardens

11.5.45 Views from these locations across the park would be affected by the visibility of stacked welfare facilities, tall construction plant and cranes in the middle ground of the view, although intervening fencing, buildings and trees would largely obscure other construction activities. Therefore, the magnitude of change is considered to be medium.

11.5.46 The medium magnitude of change, assessed alongside the high sensitivity of these receptors would result in **moderate adverse** effects.

11.5.47 At night, no receptors are typically present at these locations, therefore no assessment of effects arising from additional lighting has been undertaken.

Viewpoint 2.3: View northwest from the feature paved area in the centre of York Gardens

11.5.48 Views from this location across the park would be affected by the foreground visibility of site hoardings, welfare facilities, construction activity and construction plant. The view would also be affected by the demolition of existing structures. However, these effects would be reduced by measures embedded into the proposed scheme, including high quality hoardings incorporating climbing plants, and advance planting within York Gardens, which would be present in the foreground of the view set in front of the site. Therefore, the magnitude of change is considered to be medium.

11.5.49 The medium magnitude of change, assessed alongside the high sensitivity of the receptor would result in **moderate adverse** effects.

11.5.50 At night, no receptors are typically present at this location, therefore no assessment of effects arising from additional lighting has been undertaken.

Viewpoint 2.4: View north from the southeast entrance to York Garden and Viewpoint 2.5: View north from the southwest entrance to York Gardens from Plough Way

11.5.51 Views from these locations across the park would be affected by the background visibility of site hoardings, welfare facilities, construction activity and construction plant, partially obscured by intervening trees. The view would also be affected by the demolition of existing structures. These effects would be further reduced by the mitigation measures embedded into the proposed scheme, including high quality hoardings incorporating climbing plants and advance planting within York Gardens. Therefore, the magnitude of change is considered to be low.

11.5.52 The low magnitude of change, assessed alongside the high sensitivity of the receptor would result in **minor adverse** effects.

11.5.53 At night, no receptors are typically present at these locations, therefore no assessment of effects arising from additional lighting has been undertaken.

Transport

Viewpoint 3.1: View south from York Road at the junction with Lombard Road

11.5.54 Views from this location would be affected to a limited extent by road traffic along York Road and the background visibility of tall construction plant and cranes, heavily filtered by intervening mature trees. Therefore, the magnitude of change is considered to be low.

11.5.55 The low magnitude of change, assessed alongside the medium sensitivity of the receptor would result in a **negligible** effect.

11.5.56 At night, lighting at the site would be barely perceptible in the background of the view. Therefore, the magnitude of change to the receptor at night would be negligible, resulting in a **negligible** effect.

Visual effects – sensitivity test for programme delay

11.5.57 For the assessment of visual effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 11.5.27 to 11.5.55). This is on the basis that there are no known schemes within the assessment area that would introduce new visual receptors, or alter visibility of the proposed development from the viewpoints described in paras. 11.4.48 to 11.4.93.

11.6 Operational effects assessment

11.6.1 The following section details the likely significant effects arising during the operational phase at the Falconbrook Pumping Station site.

11.6.2 Effect on tranquillity is one factor which informs the overall assessment of effects on townscape character. Since the operational scheme would have little activity associated with it, apart from infrequent maintenance visits, it is considered that the proposed development would have a negligible effect on tranquillity for all townscape character areas. This is therefore not stated again for each character area discussed below.

11.6.3 For the site, all surrounding townscape character areas and all viewpoints, it is considered that the commitment to a high quality design as detailed in the design principles summarised in para. 11.2.7 would lead to an improvement of the existing site. Where specific measures are of particular relevance to the effect on a receptor, these are described under each townscape character area and viewpoint below.

11.6.4 Illustrative plans of the proposed development during operation are contained in a separate volume of figures (see Permanent works layout plan, separate volume of figures – Section 1) and design principles describing environmental design measures are set out in Vol 1 Appendix B.

Operational effects Year 1

Site character assessment

11.6.5 The proposed development would constitute a permanent improvement to the character of the site, resulting in the clearance of existing disused and poorly maintained components and the creation of an improved area of public realm. The above ground structures (comprising a 2m high valve chamber, 4-8m high ventilation column, 6m high interception chamber ventilation column and a 3m high ventilation structure would be incorporated within the Falconbrook Pumping Station compound, defined by a new well designed boundary wall, which would enclose a smaller area than at present. An indicative drawing of the design intent for the above ground structures is shown on the Kiosk, wall and valve chamber design intent figure (see separate volume of figures – Section 1). The electrical and control kiosk would be located within the existing Falconbrook Pumping Station building. The remainder of the construction phase working area would be improved and designed as a new hard surfaced area of public realm between the crèche and community centre/library, incorporating new planting. The impacts on specific components of the site are described in Vol 11 Table 11.6.1 below.

Vol 11 Table 11.6.1 Townscape – impacts on baseline components in Year 1 of operation

ID	Component	Impacts
01	Disused toilet block	These would not be reinstated. Instead the area would become part of a new area of public realm.
02	Screening chamber structure	This would not be reinstated.
03	Boundary fence	New fencing would be provided as necessary around the site.
04	Boundary vegetation	Vegetation lost during construction would be replaced in line with a new landscape design for the area.
05	Advertising hoarding	This would not be reinstated.
06	Boundary wall	A new boundary wall around the compound of the pumping station would be constructed.
07	Bus stop	Bus stop would be reinstated.

11.6.6 Due to the removal of existing disused and poorly maintained structures, and the creation of a new area of public realm, the magnitude of change is considered to be medium.

11.6.7 The medium magnitude of change, assessed alongside the low sensitivity of the site, would result in **minor beneficial** effects.

Townscape character areas assessment

11.6.8 This section describes effects arising from the proposed development in operation on York Gardens TCA, which surrounds the site. No assessment of townscape effects has been made for the following character areas, as the components of the operational scheme would not alter their setting:

a. Thameside Residential TCA

b. Lombard Road Commercial TCA

c. York Gardens Residential TCA

d. Hope Street Residential TCA.

York Gardens TCA

11.6.9 Due to the low height of the operational structures, and their location within the reinstated Falconbrook Pumping Station compound, the change to setting introduced by the proposed development would be barely perceptible from this character area. However, the advance planting undertaken prior to construction would improve the character of parts of York Gardens through additional screening of structures in the vicinity of Falconbrook Pumping Station and further enhancement of the green character of the park. Therefore, the magnitude of change is considered to be low.

11.6.10 The low magnitude of change, assessed alongside the high sensitivity of this character area, would result in **minor beneficial** effects.

Townscape – sensitivity test for programme delay

11.6.11 For the assessment of townscape effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 11.6.5 to 11.6.10). This is on the basis that there are no known schemes that would change the sensitivity to change of the townscape character areas already presented (paras. 11.4.2 to 11.4.46).

Visual assessment

11.6.12 For each viewpoint, an assessment of the visual effects during Year 1 of operation has been made. In each instance, the first part of the assessment relates to visual effects during winter, while the second part relates to visual effects during summer.

11.6.13 No assessment of visual effects has been made for the following viewpoints, as the components of the operational scheme would not be visible:

a. Viewpoint 1.1: View south from residences on Fairchild Close

b. Viewpoint 1.3: View west from residences on Lavender Road at the junction with Darien Road

c. Viewpoint 1.4: View west from residences on Ganley Court

d. Viewpoint 1.6: View southeast from residences on William Morris Way on the northern bank of the river

e. Viewpoint 1.7: View southeast from riverfront residences on Bridges Court

f. Viewpoint 2.1: View south from the northern part of York Gardens

g. Viewpoint 2.2: View southwest from the northeast entrance to York Gardens

h. Viewpoint 3.1: View south from York Road at the junction with Lombard Road.

Residential

Viewpoint 1.2: View southwest from residences in Pennethorne House adjacent to York Gardens; and Viewpoint 1.5: View northwest from residences on Newcomen Road

11.6.14 The new area of public realm would be largely obscured from these locations by intervening buildings and vegetation. The above ground structures would be largely obscured by the boundary walling of Falconbrook Pumping Station. However, advance planting undertaken prior to construction would be visible in the middle ground of these views, enhancing the green outlook within York Gardens. This planting would also filter views of existing structures which currently detract from the view. Therefore, the magnitude of change is considered to be low.

11.6.15 The low magnitude of change, assessed alongside the high sensitivity of these receptors would result in **minor beneficial** effects during winter.

11.6.16 During summer, the advance planting would largely obscure views of structures within the park which currently detract from the overall green outlook. Therefore, the magnitude of change is considered to be medium, resulting in **moderate beneficial** effects in summer.

Recreational

Viewpoint 2.3: View northwest from the feature paved area in the centre of York Gardens

11.6.17 The new area of public realm, in the location of the disused structure cleared during construction, would be visible from this location, improving the nature of the view towards the site. Advance planting undertaken prior to construction would also be visible from this view, improving the green outlook and filtering views of structures within the park which currently detract from the overall view. The proposed above ground structures would be obscured by the boundary walling of Falconbrook Pumping Station, the pumping station and the electrical substation. Therefore, the magnitude of change is considered to be low.

11.6.18 The low magnitude of change, assessed alongside the high sensitivity of the receptor would result in **minor beneficial** effects during winter.

11.6.19 During summer, the advance planting would largely obscure views of structures within the park which currently detract from the overall green outlook. Therefore, the magnitude of change is considered to be medium, resulting in **moderate beneficial** effects in summer.

Viewpoint 2.4: View north from the southeast entrance to York Gardens; and Viewpoint 2.5: View north from the southwest entrance to York Gardens from Plough Way

11.6.20 The new area of public realm would be largely obscured from these locations by intervening buildings and vegetation. The above ground structures would be largely obscured by the boundary walling of Falconbrook Pumping Station. However, advance planting undertaken prior to construction would be visible in the background of these views, enhancing the green outlook within York Gardens. This planting would also filter views of existing structures which currently detract from the view. Therefore, the magnitude of change is considered to be low.

11.6.21 The low magnitude of change, assessed alongside the high sensitivity of these receptors would result in **minor beneficial** effects during winter.

11.6.22 During summer, the advance planting would largely obscure views of structures within the park which currently detract from the overall green outlook. However, due to these improvements being located in the background of the view, the magnitude of change is considered to remain low, resulting in **minor beneficial** effects in summer.

Visual effects – sensitivity test for programme delay

11.6.23 For the assessment of visual effects during construction, a delay to the Thames Tideway Tunnel project of approximately one year would not be likely to materially change the assessment findings reported above (paras. 11.6.13 to 11.6.22). This is on the basis that there are no known schemes within the assessment area that would introduce new visual receptors, or alter visibility of the proposed development from the viewpoints described in paras. 11.4.48 to 11.4.93.

Operational effects Year 15

11.6.24 Operational effects for all townscape and visual receptors identified would remain unchanged in Year 15 compared to Year 1. This is due to the limited townscape and visual effects in Year 1 and the limited changes anticipated in the surrounding area in the Year 15 base case. This would also apply in the event of a programme delay to the Thames Tideway Tunnel project of approximately one year.

11.7 Cumulative effects assessment

11.7.1 As detailed in the site development schedule (Vol 11 Appendix N) no schemes have been identified within 1km of the site which meet the criteria for inclusion in the cumulative assessment. Therefore no assessment of cumulative effects has been undertaken. This would also apply in the event of a programme delay to the Thames Tideway Tunnel project of approximately one year.

11.8 Mitigation

11.8.1 All measures embedded in the proposed scheme and *CoCP* of relevance to the townscape and visual assessment are summarised in Section 11.2. No further mitigation during construction is possible due to the highly visible nature of the construction activities.

11.8.2 No mitigation is required during operation as all effects are assessed to be negligible or beneficial.

11.9 Residual effects assessment

Construction effects

11.9.1 As no mitigation measures are proposed, the residual construction effects remain as described in Section 11.5. All residual effects are presented in Section 11.10.

Operational effects

11.9.2 As no mitigation measures are proposed, the residual operational effects remain as described in Section 11.6. All residual effects are presented in Section 11.10.

11.10 Assessment summary

Vol 11 Table 11.10.1 Townscape – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
The site	Change to character due to site clearance and intensity of construction activity.	Minor adverse	None	Minor adverse
York Gardens TCA	Change to setting due to the demolition of structures and presence of site hoardings, welfare facilities and construction activity, reduced by the use of climbing plants on hoardings and advance planting.	Minor adverse	None	Minor adverse
Thameside Residential TCA	Limited change to setting due to the presence of tall construction plant, cranes and road transport.	Minor adverse	None	Minor adverse
Lombard Road Commercial TCA	Limited change to setting due to the presence of tall construction plant, cranes and road transport.	Negligible	None	Negligible
York Gardens Residential TCA	Limited change to part of the areas setting due to the presence of tall construction plant and cranes.	Negligible	None	Negligible
Hope Street Residential TCA	Limited change to part of the areas setting due to the presence of tall construction plant and cranes.	Negligible	None	Negligible

Vol 11 Table 11.10.2 Visual – summary of construction assessment

Receptor[ii]	Effect	Significance of effect	Mitigation	Significance of residual effect
Residential				
Viewpoint 1.1: View south from residences on Fairchild Close, adjacent to York Gardens	Background visibility of tall construction plant and cranes within a park setting. Middle ground visibility of works associated with the relocation of the bus stop.	Minor adverse	None	Minor adverse
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Viewpoint 1.2: View southwest from residences in Pennethorne House, adjacent to York Gardens	Foreground visibility of welfare facilities, tall construction plant and cranes within a park setting, reduced by the use of climbing plants on hoardings and advance planting. Visibility of construction activity from upper storeys.	Moderate adverse	No further mitigation possible	Moderate adverse
	At night, visibility of capped and directional lighting in the middle ground of the view.	Minor adverse	None	Minor adverse
Viewpoint 1.3: View west from residences on Lavender Road at the junction with Darien Road	Background visibility of tall construction plant and cranes.	Negligible	None	Negligible
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Viewpoint 1.4: View west from	Background visibility of tall construction	Negligible	None	Negligible

[ii] Viewpoints where receptors are not present at night time and therefore would not experience any effects arising from additional lighting (refer to para. 11.5.26) are not included in the summary table.

Receptor[ii]	Effect	Significance of effect	Mitigation	Significance of residual effect
residences on Ganley Court	plant and cranes.			
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Viewpoint 1.5: View northwest from residences on Newcomen Road	Background visibility of welfare facilities, tall construction plant and cranes, and filtered visibility of site hoardings and construction activity, reduced by the use of climbing plants on hoardings and advance planting.	Minor adverse	None	Minor adverse
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Viewpoint 1.6: View southeast from residences on William Morris Way on the northern bank of the river	No significant effects.	Negligible	None	Negligible
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Viewpoint 1.7: View southeast from riverfront residences on Bridges Court	Oblique visibility of tall construction plant and cranes and construction activity. Views of construction activity from upper storeys.	Minor adverse	None	Minor adverse
	At night, lighting would be barely perceptible.	Negligible	None	Negligible
Recreational				
Viewpoint 2.1: View south from the northern part of York Gardens	Middle-ground visibility of welfare facilities, tall construction plant and cranes in a park setting.	Moderate adverse	No mitigation possible	Moderate adverse
Viewpoint 2.2: View southwest from	Middle-ground visibility of welfare facilities,	Moderate	No	Moderate

Receptor[ii]	Effect	Significance of effect	Mitigation	Significance of residual effect
the northeast entrance to York Gardens	tall construction plant and cranes in a park setting.	adverse	mitigation possible	adverse
Viewpoint 2.3: View northwest from the feature paved area in the centre of York Gardens	Foreground visibility of site hoardings, welfare facilities, construction activity and construction plant, and demolition of existing structures, reduced by the use of climbing plants on hoardings and advance planting.	Moderate adverse	No mitigation possible	Moderate adverse
Viewpoint 2.4: View north from the southeast entrance to York Gardens	Background visibility of site hoardings, welfare facilities, construction activity and construction plant, reduced by the use of climbing plants on hoardings and advance planting.	Minor adverse	None	Minor adverse
Viewpoint 2.5: View north from the southwest entrance to York Gardens from Plough Way	Background visibility of site hoardings, welfare facilities, construction activity and construction plant, reduced by the use of climbing plants on hoardings and advance planting.	Minor adverse	None	Minor adverse
Transport				
Viewpoint 3.1: View south from York Road at the junction with Lombard Road	Visibility of road transport and background visibility of tall construction plant and cranes.	Negligible	None	Negligible
	At night, lighting would be barely perceptible.	Negligible	None	Negligible

Vol 11 Table 11.10.3 Townscape – summary of Year 1 and Year 15 operational assessment[iii]

Receptor[iv]	Effect	Significance of effect	Mitigation	Significance of residual effect
The site	Removal of existing disused and poorly maintained structures, and the creation of a new area of public realm	Minor beneficial	None	Minor beneficial
York Gardens TCA	Slight change to setting due to the advance planting undertaken prior to construction, improving the green outlook and filtering elements that detract from the setting.	Minor beneficial	None	Minor beneficial

[iii] Operational effects have been assessed to be the same in both Year 1 and Year 15 of operation

[iv] Townscape character areas not assessed during operation (refer to para 11.6.7) are not included in the summary table

Vol 11 Table 11.10.4 Visual – summary of Year 1 and Year 15 operational assessment[v]

Receptor[vi]	Effect	Significance of effect	Mitigation	Significance of residual effect
Residential				
Viewpoint 1.2: View southwest from residences in Pennethorne House adjacent to York Gardens	Middle ground visibility of advance planting, enhancing the green outlook and filtering visibility of structures which currently detract from the view.	Winter-Minor beneficial	Winter – None	Winter – Minor beneficial
		Summer – Moderate beneficial	Summer – None	Summer – Moderate beneficial
Viewpoint 1.5: View northwest from residences on Newcomen Road	Middle ground visibility of advance planting, enhancing the green outlook and filtering visibility of structures which currently detract from the view.	Winter – Minor beneficial	Winter – None	Winter – Minor beneficial
		Summer – Moderate beneficial	Summer – None	Summer – Moderate beneficial
Recreational				
Viewpoint 2.3: View northwest from the feature paved area in the centre of York Gardens	Foreground visibility of the new area of public realm and advance planting, improving the green outlook and filtering elements which currently detract from the view.	Winter – Minor beneficial	Winter – None	Winter – Minor beneficial
		Summer – Moderate beneficial	Summer – None	Summer – Moderate beneficial
Viewpoint 2.4: View north from the	Background visibility of advance	Winter – Minor	Winter –	Winter – Minor

[v] Operational effects have been assessed to be the same in both Year 1 and Year 15 of operation.
[vi] Viewpoints not assessed during operation (refer to para 11.6.11) are not included in the summary table

Receptor[vi]	Effect	Significance of effect	Mitigation	Significance of residual effect
southeast entrance to York Gardens	planting, improving the green outlook and filtering views of features which currently detract from the view.	beneficial	None	beneficial
		Summer – Minor beneficial	Summer – None	Summer – Minor beneficial
Viewpoint 2.5: View north from the southwest entrance to York Gardens from Plough Way	Background visibility of advance planting, improving the green outlook and filtering views of features which currently detract from the view.	Winter – Minor beneficial	Winter – None	Winter – Minor beneficial
		Summer – Minor beneficial	Summer – None	Summer – Minor beneficial

References

[1] Department of Environment, Food and Rural Affairs. *National Policy Statement for Waste Water* (2012).

[2] *BS5837. Trees in Relation to Construction – Recommendations'*

[3] LB of Wandsworth. *LDF Core Strategy* (October 2010).

[4] Department of Environment, Food and Rural Affairs (2012). See citation above.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 12: Transport

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Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 12: Transport

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12 Transport

12.1 Introduction

12.1.1 This section presents the findings of the assessment of the likely significant transport effects of the proposed development at the Falconbrook Pumping Station site. The project-wide transport effects are described in Volume 3 Project-wide effects assessment.

12.1.2 Construction of the proposed development at the site has the potential to affect the following transport elements:

a. pedestrian routes

b. cycle routes

c. bus routes and patronage

d. London Overground and National Rail services and patronage

e. car parking

f. highway layout, operation and capacity.

12.1.3 The assessment considers the effects on each of these elements during construction, as well as effects on specific receptors including nearby residents and occupants of commercial properties and users of York Gardens, York Gardens Library and Community Centre and York Gardens Adventure Playground.There are no river services in the vicinity of the Falconbrook Pumping Station site and it is not proposed to use the river to transport materials at this site therefore effects on river passenger services and river navigation are not considered at this site.

12.1.4 The operation of the Falconbrook Pumping Station site has the potential to affect pedestrians and cyclists, parking, highway layout and operation and therefore effects on these are considered within the operational assessment.

12.1.5 The assessment of transport presented in this section has considered the requirements of the National Policy Statement for Waste Water (Defra, 2012)[1] section 4.13. Further details of these requirements can be found in Vol 2 Section 12.3.

12.1.6 Additionally, a separate *Transport Assessment* has been produced which provides an assessment of the effects on the transport network as a result of the construction and operational phases at the Falconbrook Pumping Station site. The *Transport Assessment* accompanies the application for development consent (the 'application').

12.1.7 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

12.1.8 The separate but related assessments of effects of transport on air quality and noise and vibration are contained in Sections 4 and 9 respectively.

12.2 Proposed development relevant to transport

12.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to transport are set out below.

Construction

12.2.2 The construction site would be located to the east of York Road (A3205) within the boundaries of the existing Thames Water Falconbrook Pumping Station in the London Borough (LB) of Wandsworth. Vehicle access to and from the site would take place from the southbound carriageway of York Road (A3205).

12.2.3 During construction it is anticipated that the elements listed under para. 12.1.2 may be affected as a result of the relocation of the pedestrian access to York Gardens, a diversion of pedestrians across York Road (A3205), relocation of a bus stopping point on York Road (A3205), restriction of parking spaces and additional construction traffic along York Road (A3205) (associated with Falconbrook Pumping Station and other Thames Tideway Tunnel project construction sites with construction routes along York Road (A3205).

12.2.4 Details of the peak year of construction, anticipated lorry movements and the activities which would generate these movements are provided in Vol 11 Table 12.2.1

Vol 11 Table 12.2.1 Transport – construction details

Description	Assumption
Assumed peak period of construction lorry movements	Site Year 1 of construction
Assumed average peak daily construction lorry vehicle movements (in peak month of Site Year 1 of construction)	36 movements per day (18 vehicle trips)
Types of lorry requiring access (comprising rigid-bodied, flatbed and articulated vehicles)	Office delivery lorries Temporary construction material lorries including Pipe/track/oils/greases lorries Plant and equipment lorries Readymix mixer lorries Steel reinforcement lorries Excavation lorries Imported fill lorries

Note: a movement is a construction vehicle moving either to or from the site. A Site Year is a 12 month period, one in a series of Site Years; Site Year 1 commences at the start of construction.

12.2.5 During construction it is anticipated that all materials would be transported by road.

12.2.6 Vehicle movements would take place during the standard day shift of ten hours on weekdays (08:00 to 18:00) and five hours on Saturdays (08:00 to 13:00). It is only in exceptional circumstances that HGV and abnormal load movements could occur up to 22:00 on weekdays for large concrete pours and later at night on agreement with the LB of Wandsworth.

Construction traffic routing

12.2.7 The Falconbrook Pumping Station site is located on York Road (A3205), which forms part of the Transport for London Road Network (TLRN). Two new vehicle access points to the site would be constructed on York Road (A3205). These would enable the site to be accessed directly from York Road (A3205) and avoid the need for construction vehicles to use the residential roads located to the east of the site. These two new vehicle access points would be for the construction phases only and would be removed upon completion of the works.

12.2.8 The access plan and highway layout during construction plan (see separate volume of figures – Section 1) present the highway layout during construction.

12.2.9 The site accesses would operate on a 'left in / left out' basis. Vehicles accessing the site would travel southbound on York Road (A3205) and turn left into the site at the northern access point, whilst vehicles departing would turn left from the southern access point back onto York Road (A3205). Construction vehicles would not be permitted to make right turns across York Road (A3205) when entering or leaving the site.

12.2.10 The primary approach route for construction vehicles routing to the site would be via Trinity Road (A214), St Johns Hill (A3036), Battersea Rise (A3) and Latchmere Road (A3220). Vehicles would then travel westbound along Battersea Park Road (A3205) onto York Road (A3205). All of these roads form part of the TLRN.

12.2.11 The primary route for vehicles departing from the site would be westbound along York Road (A3205) and then southbound on Trinity Road (A214).

12.2.12 Vol 11 Figure 12.2.1 (see separate volume of figures – Section 2) shows the construction traffic routes for access to/from the Falconbrook Pumping Station site. Construction routes have been discussed with both Transport for London (TfL) and the Local Highway Authority (LHA), the LB of Wandsworth for the purposes of the assessment.

Construction workers

12.2.13 The construction site is expected to require a maximum workforce of approximately 40 workers at any one time. The number and type of workers is shown in Vol 11 Table 12.2.1.

Vol 11 Table 12.2.1 Transport – maximum estimated construction worker numbers

Contractor		Client
Staff*	**Labour****	**Staff**
08:00-18:00	**08:00-18:00**	**08:00-18:00**
15	20	5

** Contractor Staff – engineering and support staff to direct and project manage the engineering work on site.*
*** Contractor Labour – those working on site doing engineering, construction and manual work.*
**** Client Staff– engineering and support staff managing the project and supervising the Contractor*

12.2.14 It is difficult to predict with certainty the directions to and from which workers at the site would travel. The exact directions of travel to and from the site which workers would use have not been determined. Staff could potentially be based in the local area or in the wider Greater London area and are unlikely to have the same origin-destination distributions as construction lorries.

12.2.15 On this basis it has been assumed that the origins of worker vehicle trips would be similar to the origins of trips to the zone in the TfL Highway Assignment Model (HAM) in which the Falconbrook Pumping Station site is located.

12.2.16 The methodology for assigning worker trips to the transport networks is described in Volume 2 Environmental assessment methodology.

12.2.17 At the Falconbrook Pumping Station site it is assumed that while there would be no parking provided within the site boundary for construction workers and measures would be incorporated into site-specific Travel Plan requirements in order to minimise the number of workers travelling to and from the site by car (in accordance with the overall aims and objectives of the *Draft Project Framework Travel Plan*), some construction workers may drive to the site. This is therefore considered as part of the assessment, further details of which are provided in paras.12.5.2-12.5.5.

Code of Construction Practice

12.2.18 Measures incorporated into the *Code of Construction Practice (CoCP)*[i] *Part A* (Section 5) to reduce transport effects include:

a. site specific *Traffic Management Plans* (*TMP*): to set out how vehicular access to the site would be managed so as to minimise impact on the local area and communicate this with the local borough and other stakeholders. This includes any works on the highway, diversion or temporary closure of the highway or public right of way

[i] The Code of Construction Practice (CoCP) is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B)

b. HGV management and control: to ensure construction vehicles use appropriate routes to the sites and the vehicle fleet and/or drivers meet current safety and environmental standards.

12.2.19 In addition to the general transport measures within the *CoCP Part A* (Section 5) the following transport measures have been incorporated into the *CoCP Part B* (Section 5) relating to the Falconbrook Pumping Station site:

a. new access/egress points are required off York Road (A3205)

b. vehicles would be permitted to access the site using left turn in from York Road (A3205) and left turn out movements only.

c. the security barrier would be positioned to allow a standard rigid tipper vehicle to be wholly off the road whilst awaiting barrier operation

d. only emergency access would be permitted through Lavender Road/housing area unless agreed otherwise

e. the existing access arrangements for Thames Water operational vehicles would be maintained as per the existing regime through Lavender Road

f. access to York Gardens Library and Community Centre and York Gardens Adventure Playground to be maintained.

g. existing bus stop on York Road (A3205) to be relocated to a suitable alternative position as necessary. The alternative position would be located approximately 15m south of existing location as agreed with TfL

h. pedestrian access from York Road to York Gardens would be maintained during construction

i. disabled parking facility (one bay) for Community Centre to be maintained during the construction period at an accessible location

j. a vehicle marshal or similar would be provided where required to ensure the safety of pedestrians crossing the construction access

k. a small area available for car parking adjacent to the York Gardens Library and Community Centre would be suspended during construction

l. the existing pedestrian access to the York Gardens Library and Community Centre would be maintained.

m. access to the existing pedestrian drop off area immediately east of the York Gardens Library and Community Centre would be maintained

n. the footpath diversion is to be adequately signed

12.2.20 The effective implementation of the *CoCP Part A* and *Part B* measures is assumed within the assessment.

12.2.21 Based on current travel planning guidance including TfL's 'Travel planning for new development in London (TfL, 2011)[2], this development falls within the threshold for producing a *Strategic Framework Travel Plan*. A *Draft Project Framework Travel Plan* has been prepared based on the TfL

ATTrBuTE guidance (TfL, 2011)[3]; and accompanies the application. The *Draft Project Framework Travel Plan* addresses project-wide travel planning measures, including the need for a project-wide Travel Plan Manager, initial travel surveys during construction and a monitoring framework. It also contains requirements and guidelines for the site-specific *Travel Plans* to be prepared by the site contractors. The site-specific travel-planning measures of relevance to the *Draft Project Framework Travel Plan* are as follows:

a. information on existing transport networks and travel initiatives for the Falconbrook Pumping Station site

b. a mode split established for the Falconbrook Pumping Station site construction workers to establish and monitor travel patterns

c. site-specific targets and interim targets based on the mode share which would link to objectives based on local, regional and national policy

d. a nominated person with assigned responsibility for managing the monitoring and action plans specifically for this site.

Operation

12.2.22 During operation, maintenance vehicles would enter the site via the existing vehicular entrance to the Pumping Station which is located on York Gardens, as set out in the Falconbrook Pumping Station design principles. Access to the site would be achieved by travelling along Grant Road and then onto Winstanley Road and Newcomen Road with access to the site then found on the left hand side at York Gardens. Egress from the site would be achieved by going straight on from York Gardens and travelling along Lavender Road. At the junction vehicles would turn left along Darien Road and then turn right and proceed along Ingrave Street.This route is currently used by maintenance vehicles accessing the existing Pumping Station and ancillary buildings.

12.2.23 Access would be required for a light commercial vehicle on a three to six monthly maintenance schedule. Additionally there would be more substantive maintenance visits at approximately ten year intervals which would require access to enable two mobile cranes and associated support vehicles to be brought to the site, from York Gardens via Falcon Road (A3207). To provide access for the cranes and flat bed vehicles temporary restriction of on-street parking in the vicinity of the site may be required.

12.2.24 During operation, a new landscaped pedestrian and cycle access route would be created allowing access from York Road through to York Gardens. During the construction phase the existing pedestrian and cycle route would be diverted 15m south. The operational phase access route would be 25m north of this construction access route, thus being 10m north of the current access route.

12.3 Assessment methodology

Engagement

12.3.1 Vol 2 Section 12 documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. Specific comments relevant to this site for the assessment of traffic and transport are presented in Vol 11 Table 12.3.1.

12.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of transport for this site has therefore drawn on the scoping response from the LB of Wandsworth and is based on professional judgement as well as experience of similar sites

12.3.3 It was reported in the *Scoping Report* that operational traffic effects for the project as a whole were scoped out of the environmental impact assessment (EIA). However, while the environmental effects associated with transport for the operational phase are not expected to be significant or adverse, the assessment of transport effects in the *Environmental Statement* examines relevant aspects of the operational phase in order to satisfy the relevant stakeholders that technical issues have been addressed.

Vol 11 Table 12.3.1 Transport – stakeholder engagement

Organisation	Comment	Response
Transport for London, Transport assessment workshop, November 2012	ATC survey undertook in July, which is a school holiday ATC to be resurveyed	The ATC surveys on York Road were undertaken between 20 May and 12 June 2011, which is outside of school holidays.
LB of Wandsworth, phase two consultation, February 2012	Investigation of whether materials could be transfered to the river at one of the other nearby riverside sites, such as Kirtling Street.	The *Transport Strategy* sets out those sites where river transport is proposed. The proposals at the Falconbrook Pumping Station site are for the transport of materials by road to/from this site.
Transport for London, phase two consultation, February 2012	The safety of the site accesses should be assessed in relation to the Cycle Superhighway on York Road (A3205).	This has been considered as part of the site access design and has been agreed with the TfL Cycle Superhighway Team.
Transport for London, phase two	The location of the relocated bus stop	The relocation of the bus stop has been

Organisation	Comment	Response
consultation, February 2012	should be agreed with TfL, including whether a lay-by is required. If a lay-by is not required the kerb line should be straightened at the point where buses will stop.	discussed with TfL and it has been agreed that a lay-by would not be required. The existing kerb layout would not be changed.
LB of Wandsworth, targeted consultation, January 2012	LB of Wandsworth requested that a lay-by at the relocated bus stop should be avoided if possible to minimise third party land requirements.	Earlier proposals to relocate the bus stop further to the north are no longer relevant. There would be no layby at the relocated bus stop to the south of the site.
LB of Wandsworth, targeted consultation, January 2012	The parking surveys at Falconbrook Pumping Station adjacent to the site and Library and Community Centre did not record any parked vehicles. Additional surveys should be carried out to assess the parking conditions during event/function days at the Library/Community Centre.	Parking surveys were undertaken in March 2012. The results from this survey showed that some vehicle parking was recorded with some spare capacity. Further details are provided in paras. 12.4.5712.4.57-12.4.58.
Transport for London, consultation workshop, June 2011	The gates at the site entrance should be set back from the footway such that if construction vehicles arrive when the gates are closed they can wait off the highway.	Construction layouts include a gate setback.
Transport for London, consultation workshop, June 2011	The new exit point should be deflected to encourage exiting vehicles to left turn out.	The site egress has been designed to ensure that drivers turn left into and out of the site.

Baseline

12.3.4 The baseline methodology follows the methodology described in Vol 2 Section 12. However, no traffic modelling was undertaken for the junction of York Road (A3205) / Plough Road / York Place or York Road (A3205) / Bridges Court as construction lorries at this site are low and are able to be held at the site without causing queues should York Road (A3025) be congested and hence would not interfere with the existing traffic.

Construction

12.3.5 The assessment methodology for the construction phase follows that described in Vol 2 Section 12 with the exception, as described above, at the junction of York Road (A3205) / Plough Road / York Place where no traffic modelling has been undertaken due to lorries being able to wait until traffic flow on York Road (A3205) not congested before exiting the site.

12.3.6 The effect of all other Thames Tideway Tunnel project sites on the area surrounding Falconbrook Pumping Station has been taken into account within the assessment of the peak year of construction at this site.

12.3.7 As indicated in the site development schedule (see Vol 11 Appendix N), there are four developments identified within 1km of the Falconbrook Pumping Station site. Three of these developments would be complete and operational by Site Year 1 of construction and have therefore been included in the construction base case. They comprise:

a. mixed use development at Battersea Reach

b. redevelopment of the Cemex site on Townmead Road

c. mixed use development at Imperial Wharf.

12.3.8 In addition, the Chelsea Creek development at a site adjacent to Fulham Gasworks 900m from the site would be partially complete by Site Year 1 of construction at Falconbrook Pumping Station but later phases would still be under construction. This suggests that the transport assessment should consider cumulative effects in relation to that development under construction at the same time as construction works at Falconbrook Pumping Station. However, the TfL Highway Assignment Models (HAMs) which have been used in this assessment have been developed by TfL using GLA employment and population forecasts, which are based on the employment and housing projections set out in the *London Plan 2011* (GLA, 2011)[4]. As a result the assessment inherently takes into account a level of future growth and development across London.

12.3.9 This means that the trips associated with the other developments described above within 1km of the Falconbrook Pumping Station site which could alter the operation of the transport networks in the future are already taken into consideration within the traffic modelling.

Construction assessment area

12.3.10 The assessment area for the Falconbrook Pumping Station site includes the site accesses directly from York Road (A3205) which is part of the TLRN. The assessment also includes the junction of York Road (A3205) / Plough Road / York Place and the junction of York Road (A3205) / Bridges Court.

12.3.11 These roads and junctions have been assessed for highway, cycle and pedestrian impacts. Effects on local bus services within 640m of the site and rail services within 960m of the site have also been assessed[ii].

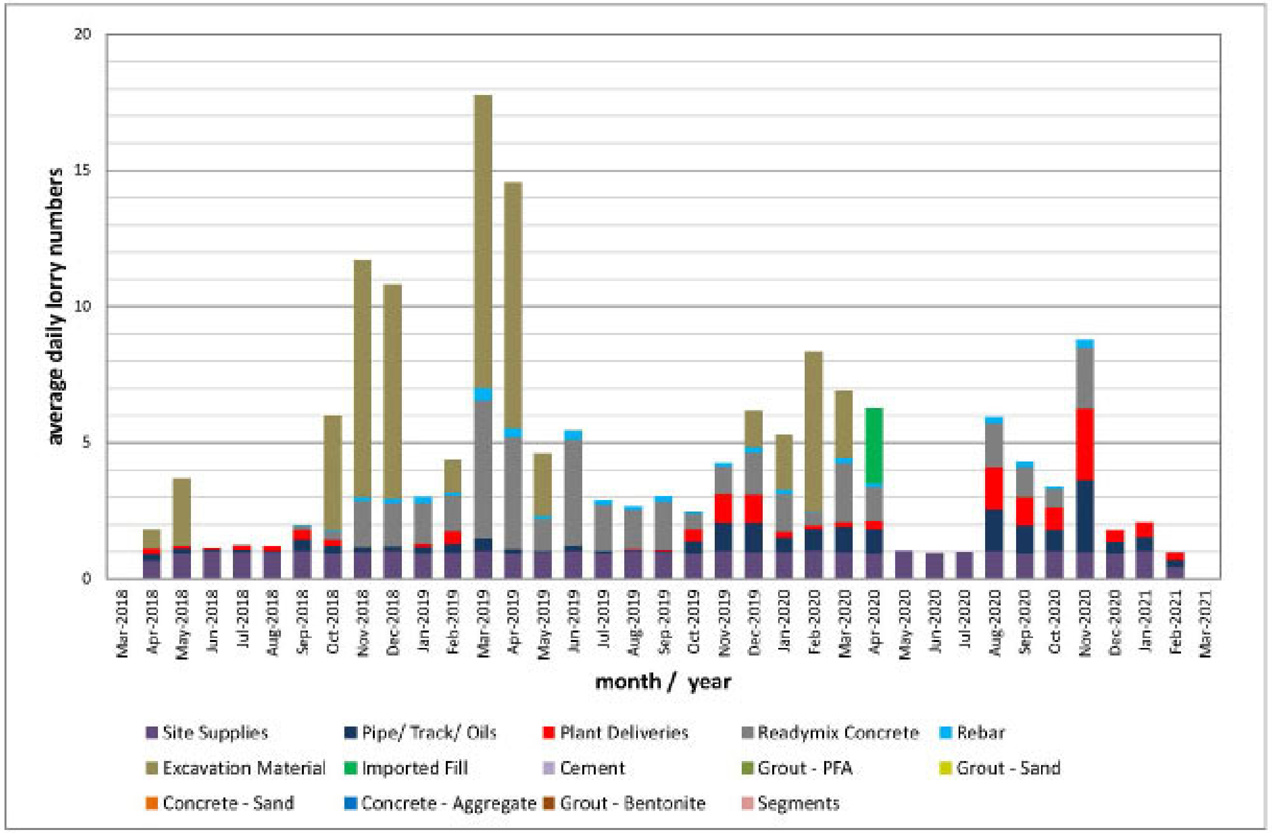
Construction assessment years

12.3.12 A site-specific peak construction assessment year has been identified. The histogram in Vol 11 Plate 12.3.1 shows that the peak site-specific activity at the Falconbrook Pumping Station site would occur in Site Year 1 of construction.

12.3.13 The assessment of construction effects also considers the extent to which the assessment findings would be likely to be materially different should the programme for the Thames Tideway Tunnel project be delayed by approximately one year.

[ii] Distances derived from the Public Transport Accessibility Level (PTAL) methodology described in Volume 2.

Vol 11 Plate 12.3.1 Transport – estimated construction lorry profile



Note: Plate shows approximate volumes and number of lorry trips based upon assumed timings for the works. It is not a programme and remains subject to change.

Operation

12.3.14 The assessment methodology for the operational phase follows that described in Vol 2 Section 12. There are no site specific variations for undertaking the operational assessment of this site.

12.3.15 Once the Thames Tideway Tunnel project is operational it is not expected there would be any significant effects on the transport infrastructure and operation within the local area because maintenance trips to the site would be infrequent and short-term. On this basis it is not necessary to assess the effects on all the elements listed at para. 12.1.2. The elements considered are:

a. effects on pedestrian and cyclist routes

b. effects on car parking

c. effects on highway layout and operation.

12.3.16 These elements are considered qualitatively (as described in Vol 2 Section 12) because the minimal effect on the highway network means that a quantitative assessment is not required. The scope of this analysis has been discussed with the LB of Wandsworth and TfL.

12.3.17 Also, given the local impact of the transport activity associated with the Thames Tideway Tunnel project during the operational phase, only the localised transport effects around the Falconbrook Pumping Station site are assessed. Other Thames Tideway Tunnel project sites would not affect the area around the Falconbrook Pumping Station in the operational phase and therefore they are not considered in the assessment.

12.3.18 With regard to other developments in the vicinity of the site (as detailed in Volume 11 Appendix N), all four developments identified within 1km of the Falconbrook Pumping Station site would be complete and operational by Year 1 of operation. As a result, they have been included within the operational base case. There are no operational cumulative effects requiring assessment.

Operational assessment area

12.3.19 The assessment area for the operational assessment differs from that for the construction assessment. It comprises Ingrave Street, Darien Road, Lavender Road, Newcomen Road, Winstanley Road and Grant Road, as well as the effects on the Ingrave Street / Falcon Road (A3207) junction.

Operational assessment year

12.3.20 As outlined in Vol 2 Section 12 the operational assessment year has been taken as Year 1 of operation. As the number of vehicle movements associated with the operational phase is very low there is no requirement to assess any other year beyond that date.

12.3.21 As with construction, the assessment of operational effects also considers the extent to which the assessment findings would be likely to be materially different should the programme for the Thames Tideway Tunnel project (and hence opening year) be delayed by approximately one year.

Assumptions and limitations

12.3.22 The general assumptions and limitations associated with this assessment are presented in Vol 2 Section 12.

Assumptions

12.3.23 There would be deliveries of fuel for construction plant at this site and a number of construction products may be classified as hazardous. For the Falconbrook Pumping Station site, it is assumed that there would be one hazardous load per fortnight generated by the site.

12.3.24 With regard to construction workers travelling to the site, it is assumed that some construction workers may drive to the site and this is taken into account in the assessment.

Limitations

12.3.25 There are no site-specific limitations of the transport assessment undertaken for this site.

12.4 Baseline conditions

12.4.1 The following section sets out the baseline conditions for transport within and around the site. Future baseline conditions (base case) are also described.

Current baseline

12.4.2 The site is located within the LB of Wandsworth and is currently accessed by vehicles from the east through York Gardens. No direct vehicle access exists to the site off York Road (A3205). The location of the site is shown in Vol 11 Figure 12.4.1 (see separate volume of figures – Section 2).

Pedestrian routes

12.4.3 The existing pedestrian network and facilities in the vicinity of the site are shown in Vol 11 Figure 12.4.2 (see separate volume of figures – Section 2).

12.4.4 York Road (A3205) provides a continuous pedestrian link between the Wandsworth gyratory system to the southwest and Battersea Park Road (A3205) to the northeast. There are footways in place on both sides of York Road (A3205) with an approximate width of between 2.5m and 4.0m.

12.4.5 A signalised pedestrian crossing is in place at the junction of York Road (A3205) / Plough Road / York Place which is approximately 95m walking distance to the south of the site.

12.4.6 A second signalised pedestrian crossing is located approximately 180m walking distance to the north of the site at the junction of York Road (A3205) and Lombard Road (B305).

12.4.7 There are no pedestrian crossings at the York Road (A3205) / Bridges Court junction.

12.4.8 There is a pedestrian access route to York Gardens located to the south of Falconbrook Pumping Station. This access provides a route between

York Road (A3205) and Lavender Road and through the park to the residential area in the east.

Cycle facilities and routes

12.4.9 The existing cycle network and facilities in the vicinity of the site are shown in Vol 11 Figure 12.4.2 (see separate volume of figures – Section 2).

12.4.10 National Cycle Routes 4 and 20 run within close proximity of the site. There is a good network of cycle provision available to connect the site to these National Cycle Routes. Route 4 is about 1.5km north of the site and runs from Greenwich in central London to Fishguard in west Wales. Route 20 starts about 1.2km southwest of the site and runs from Wandsworth to Brighton.

12.4.11 There are many on-road cycle routes designated within the surrounding area, including along York Road (A3205). This route connects to a wider network of on-road and off-road routes leading to destinations such as Battersea, Clapham Junction, Wandsworth Town and Hammersmith.

12.4.12 Advance cycle stop lines are provided for cyclists at the junctions of York Road (A3205) / Plough Road / York Place and York Road (A3205) / Bridges Court. There are also advance cycle stop lines provided for cyclists on each arm of the York Road (A3205) / Lombard Road junction.

12.4.13 The closest Cycle Superhighway (CS) route to the site is CS8 which runs between Ram Street in Wandsworth and Millbank in Westminster. CS8 runs along the A3025 York Road (A3205), Battersea Park, Queenstown Road (A3216), Chelsea Bridge and Grosvenor Road (A3212) to Millbank, with an approximate 30 minute cycle journey time from Wandsworth to Millbank. CS8 runs on carriageway along York Road (A3205) immediately to the west of the site. The Cycle Superhighway connects with on-road cycle routes along Yelverton Road, Wye Street and Falcon Road (A3207).

12.4.14 There are currently no cycle hire docking stations within the vicinity of the site.

12.4.15 There are three cycle stands located on the junction of York Road (A3205)/Plough Road.

Public Transport Accessibility Level

12.4.16 The Public Transport Accessibility Level (PTAL) of the site has been calculated using TfL’s approved PTAL methodology (TfL, 2010)[5] and assumes a walking speed of 4.8km/h and considers rail stations within a 12 minute walk (960m) of the site and bus stops within an eight minute walk (640m).

12.4.17 Using this methodology the site has a PTAL rating of 6b, rated as ‘excellent’ (with 1 being the lowest accessibility and 6b being the highest accessibility).

12.4.18 Vol 11 Figure 12.4.3 (see separate volume of figures – Section 2) shows the public transport network around the Falconbrook Pumping Station site.

Bus routes

12.4.19 As shown in Vol 11 Figure 12.4.3 (see separate volume of figures – Section 2) a total of eight daytime bus routes and five night bus routes operate within 640m of the site. These bus routes operate from the following bus stops:

a. York Gardens bus stop on York Road (A3205) – northbound and southbound, 50m walking distance south of the site

b. Wallis Close bus stop on Plough Road – northbound and southbound, 160m walking distance south of the site

c. Hope Street bus stop on York Road (A3205) –northbound and southbound, 180m walking distance south of the site

d. Clapham Junction, Ingrave Street bus stop on Falcon Road (A3207)– northbound and southbound, 620m walking distance west of the site.

12.4.20 These routes would also serve other stops further from the site as shown on Vol 11 Figure 12.4.3 (see separate volume of figures).

12.4.21 On average there are a total of 127 and 120 daytime bus services per hour in the AM and PM peaks respectively (two-way direction) within a 640m walking distance of the site.

12.4.22 There are approximately 14 night-time bus services per hour Monday to Friday between 00:00 and 06:00 and on Saturdays between 00:00 and 06:00 within 640m walking distance of the site.

London Underground

12.4.23 There is no London Underground service in the immediate vicinity of the site. The nearest station is at Fulham Broadway on the north side of the River Thames, approximately 2.9km walking distance from the Falconbrook Pumping Station site.

London Overground

12.4.24 London Overground trains serve Clapham Junction station which is located approximately 800m walking distance southeast of the Falconbrook Pumping Station site.

12.4.25 The London Overground runs from Clapham Junction eastwards to Stratford. Trains run approximately every eight to nine minutes in the AM peak hour and every ten minutes in the PM peak hour, giving a typical service of seven trains per hour in the AM peak and six trains per hour in the PM peak.

National Rail

12.4.26 National Rail services serve Clapham Junction station.

12.4.27 Clapham Junction provides access to Southern and South West Trains services. Trains run to Willesden Junction, Waterloo and Victoria Stations to the north and destinations to the south and west of London including Brighton, Reading, Guildford, Woking, Dorking, Weymouth, Littlehampton and Worthing, Chessington South, Sutton, Windsor and Eaton, East

Bus routes

12.4.19 As shown in Vol 11 Figure 12.4.3 (see separate volume of figures – Section 2) a total of eight daytime bus routes and three night bus routes operate within 640m of the site. These bus routes operate from the following bus stops:

a. York Gardens bus stop on York Road (A3205) – northbound and southbound, 50m walking distance south of the site

b. Wallis Close bus stop on Plough Road – northbound and southbound, 160m walking distance south of the site

c. Hope Street bus stop on York Road (A3205) –northbound and southbound, 180m walking distance south of the site

d. Clapham Junction, Ingrave Street bus stop on Falcon Road (A3207)– northbound and southbound, 620m walking distance west of the site.

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Grinstead, East Croydon, Weybridge via Hounslow, Shepperton, Basingstoke and Exeter.

12.4.28 In the AM and PM peak hours, trains depart for Waterloo and Victoria from Clapham Junction every two to three minutes. Trains routing south to a variety of destinations depart at similar frequencies.

Parking

12.4.29 Vol 11 Figure 12.4.4 (see separate volume of figures – Section 2) shows the locations of the existing car parks and car club spaces within the vicinity of the site.

Existing on-street car parking

12.4.30 There are no parking facilities along York Road (A3205). On-street parking is available on the residential streets to the east of the site. The majority of this parking is not subject to a controlled parking zone (CPZ) and is mainly used by residents of the area.

12.4.31 A small area of on-street parking which is bounded by Wye Street to the west, Ingrave Street to the south, Falcon Road (A3207) to the east and York Road (A3205) to the north is subject to a CPZ which operates from 09:00 to 16:30 Monday to Friday with a maximum stay of four hours permitted.

Existing off-street/private car parking

12.4.32 There is unrestricted parking on the un-named access road to both the York Gardens Library and Community Centre and the York Gardens Adventure Playground. There is also one marked blue badge parking bay outside the Library and Community Centre, off the access road and a wider parking area opposite the Adventure Playground.

12.4.33 Off-street parking is also available at a large Asda supermarket located on Lavender Hill, southeast of the site. There is no charge for store customers to use the parking and it is approximately 1km walking distance from the site.

Coach parking

12.4.34 There are no coach parking facilities in the vicinity of the site.

Car clubs

12.4.35 There are a number of car club spaces within 640m of the site. The closest car club parking space to the site is operated by ZipCar and is approximately 150m walking distance northwest of the site, on Bridges Court.

12.4.36 The next closest car club location is situated 350m walking distance north of the site on Holman Road, also operated by Zipcar.

Servicing and deliveries

12.4.37 There are no dedicated on-street loading bays in the vicinity of the site.

Taxis

12.4.38 There are no taxi ranks in the vicinity of the site. The nearest taxi rank to the site is located on St John's Hill / Prested Road (approximately 1.1km walking distance southeast of the site, close to Clapham Junction station) with eight taxi spaces.

Highway network and operation

12.4.39 York Road (A3205) forms part of the TLRN and is a four lane single carriageway at this point separated by a central reservation. Additionally, there is a separate left-hand turning lane at the junction of York Road (A3205) and Bridges Court. York Road (A3205) routes northeast from Wandsworth gyratory and continues onto Battersea Park Road (A3205). A 30mph speed limit applies to York Road (A3205)

12.4.40 Cycle lanes as part of CS8 are present on both sides of York Road (A3205) and are identified by road markings and signage.

12.4.41 There are a number of junctions along York Road (A3205) including the priority junction with Bridges Court which is located opposite the site. There is also a signalised junction with Plough Road/York Place, which is located approximately 95m southwest of the site. Bridges Court and Plough Road are not part of the TLRN or Strategic Road Network (SRN.)

Data from third party sources

Description of data

12.4.42 The following data have been sourced from TfL:

a. five year accident data on roads within the vicinity of the site

b. traffic flow surveys.

Accident analysis

12.4.43 A total of one fatal, seven serious and 29 slight accidents occurred in the Falconbrook Pumping Station assessment area over the five years of accident data analysed.

12.4.44 The fatal accident was recorded at the York Road (A3205) / Plough Road / York Place junction. A car turning at high speed mounted a footwayh causing a collision with a pedestrian.

12.4.45 The majority of the serious accidents, a total of six accidents, occurred along York Road (A3205) and at the junctions with Lombard Road and York Place / Plough Road / York Place. One serious accident also occurred along Plough Road.

12.4.46 Of the total accidents, three involved light goods vehicles (LGVs) and two involved medium goods vehicles (MGVs) which all led to slight accidents.

12.4.47 Overall, the majority of the serious and slight accidents were the result of vehicle drivers/riders failing to look properly or undertaking a poor turn or manoeuvre. The descriptions within the accident reports suggest that none of these accidents involved HGVs or happened as a result of road geometry.

Survey data

Description of surveys

12.4.48 Baseline survey data for the Falconbrook Pumping Station site were collected in May, July, September and November 2011 to establish the existing transport movements and parking usage in the area. Additional traffic surveys were also undertaken in January 2012. Volume 11 Figure 12.4.5 (see separate volume of figures – Section 2) shows the survey locations in the vicinity of the site.

12.4.49 As part of surveys in May, July and September 2011, manual and automated traffic surveys were undertaken to establish specific traffic, pedestrian and cycle movements including turning volumes, queue lengths, saturation flows and traffic signal timings. Parking surveys were undertaken in November 2011 and January 2012 to establish the usage of nearby on-street and private parking.

Results of the surveys

12.4.50 The surveys inform the analysis of the baseline situation in the area surrounding the site.

Pedestrian and cyclists

12.4.51 A small number of pedestrians use York Road (A3205) with the maximum number of 36 and 37 pedestrians walking northbound and southbound respectively in the PM peak hour. In the AM peak hour there were 18 pedestrians walking northbound and 29 pedestrians walking southbound. The survey also observed that flows along this part of York Road (A3205) were lower at other times of day and at weekends.

12.4.52 During the AM peak hour there were 421 cyclists northbound along York Road and 45 cyclists in the southbound direction. In the PM peak hour the dominant flow is reversed with 223 heading south and 63 cyclists heading north. During the Saturday peak hour the flows are more balanced with approximately 30 cyclists heading in each direction.

Traffic flows

12.4.53 ATC data collected as part of the surveys has been analysed to identify the existing traffic flow along York Road (A3205). The weekday vehicle and HGV flows for a 12-hour period (07:00 to 19:00) show that the PM peak for York Road is the busiest hour with a maximum of approximately 180 vehicles travelling eastbound every 15 minutes. The highest flow in the westbound also occurs in the PM peak with 175 vehicles travelling every 15 minutes.

12.4.54 The traffic flows in the AM peak period show that on York Road (A3205) the eastbound direction is busiest with 175 vehicles every 15 minutes, in comparison there are only 160 vehicles travelling westbound.

12.4.55 The junction surveys undertaken have been validated against the TfL data. The traffic flows for the busiest period (weekday AM peak) within the area are indicated in Vol 11 Figure 12.4.6 and Vol 11 Figure 12.4.7 (see separate volume of figures – Section 2).

Parking

12.4.56 There are no parking facilities along York Road (A3205).

12.4.57 Surveys and engagement with the stakeholders confirm that the parking around the Library and Community Centre is lightly used other than on Wednesday and Friday lunchtimes when the Community Centre holds events. A local survey of the roads on the boundary of the Community Centre confirmed that there is still significant spare capacity during these busier periods.

12.4.58 There are currently 218 unrestricted on-street parking to the east of the Falconbrook Pumping Station site on Newcomen Road, Lavender Road, Winstanley Road, Darien Road and Ingrave Street. The parking surveys indicate that usage of these roads is relatively high. The survey suggests that about 82% to 87% of all available spaces were used throughout the weekday. However, this still equates to at least 28 available spaces due to the high number of total unrestricted parking spaces in the local vicinity of the site. The utilisation is slightly lower at approximately 37% on the Saturday interpeak when compared to the weekday AM, PM and interpeak periods.

Local highway modelling

12.4.59 Two new site accesses would be provided on the eastern side of York Road (A3205) of which the one to the north would be for left-turn entry only and the one to the south would be for left-turn egress only to York Road (A3205).

12.4.60 As the site accesses do not exist in the baseline scenario there are no baseline model results for these junctions.

Transport receptors and sensitivity

12.4.61 The receptors and their sensitivities in the vicinity of the Falconbrook Pumping Station site are summarised in Vol 11 Table 12.4.1. The transport receptor sensitivity is defined as high, medium or low using the criteria detailed in Vol 2 Section 12.

12.4.62 The transport effects identified in this assessment are directly related to changes to the operation of transport networks which may occur as a result of physical changes to transport networks or of additional vessel or vehicle movements or additional public transport patronage. These changes in operation could lead to effects which would be experienced by people using those transport networks, whether as pedestrians, cyclists, public transport or private vehicle users. The assessment identifies several ‘generic’ groups of transport users in the list of transport receptors.

12.4.63 Receptors who are occupiers and users of or visitors to existing or committed developments in the vicinity of each of the project sites may experience transport effects on their journeys to and from those developments. In many cases those effects would be similar (or identical) to the effects identified for the ‘generic’ groups of transport users. However, the assessment specifically includes these receptors to ensure that any particular effects that they would be likely to experience (for instance because they make use of particular routes or transport facilities) have been identified.

Vol 11 Table 12.4.1 Transport – receptors and sensitivity

Receptors (relating to all identified transport effects)	Phase at which receptor is sensitive to identified impacts	Value/sensitivity and justification
Pedestrians and cyclists (including sensitive pedestrians[iii]) using York Road (A3205).	Construction	High sensitivity to increases in HGV traffic and changes to pedestrian environment.
Pedestrians and cyclists (including sensitive pedestrians) using maintenance vehicle routes including Lavender Road, Ingrave Street, Darien Road, Newcomen Road and Winstanley Road	Operation	High sensitivity to increases in HGV traffic and changes to pedestrian environment.
Private vehicle users in the area using the local highways or on-street parking.	Construction Operation	Medium sensitivity to increases in HGV traffic and changes in journey time.
Emergency vehicles travelling on York Road (A3205)	Construction Operation	High sensitivity to journey time delays due to time constraints on journey purposes.
Bus users (passengers) travelling along York Road (A3205)	Construction	Medium sensitivity to journey time delays as a result of increases to traffic flows.
Public transport users on rail services within the area	Construction	Low sensitivity due to distance from the site and low numbers of construction workers
Residents of Pennethorne House, 45m east of the site	Construction Operation	High sensitivity to increases in HGV traffic and changes to pedestrian

[iii] Sensitive pedestrians include those with mobility impairments, including wheelchair users.

Receptors (relating to all identified transport effects)	Phase at which receptor is sensitive to identified impacts	Value/sensitivity and justification
		environment resulting in journey time delays.
Users of York Gardens Library and Community Centre, adjacent to north of the site Users of York Gardens Adventure Playground, adjacent to north of the site Pupils, parents and staff of Thames Christian College School, 115m east of the site	Construction Operation	High sensitivity with users and staff close to HGV movements.
Users of recreational spaces at York Gardens, adjacent to east and south of site	Construction Operation	High sensitivity to increases in HGV traffic and changes to pedestrian environment resulting in journey time delays. Vulnerable pedestrian groups are likely to be present (eg, children, mobility impaired users).
Staff and visitors to candle shop, 20m west of the site on York Road (A3205)	Construction	Medium sensitivity to increases in HGV traffic and changes to pedestrian environment.

Construction base case

12.4.64 As described in Section 12.3 the construction assessment year for transport effects in relation to this site is Site Year 1 of construction.

12.4.65 There are no known proposals to change the cycle or pedestrian network by Site Year 1 of construction and the network will operate as indicated in the baseline situation.

12.4.66 There are no specific improvements to National Rail and London Overground services passing through Clapham Junction that would change the situation in the construction base case, although it is acknowledged that rail service patterns will evolve over time and that patronage on these services will tend to increase.

12.4.67 In order to ensure that the busiest base case scenario is used in the assessment the capacity for National Rail and London Overground in the base case has been assumed to remain the same as capacity in the baseline situation. This ensures a robust assessment as outlined in Vol 2 Section 12.

12.4.68 Baseline traffic flows (from the junction surveys) have been used and forecasting carried out to understand the capacity on the local highway network in the vicinity of the Falconbrook Pumping Station site in Site Year 1 of construction without the Thames Tideway Tunnel project. The scope of this analysis has been discussed with the LB of Wandsworth and TfL. Traffic flows for the base case (derived from the survey data) providing inputs to the PICADY model are shown on Vol 11 Figure 12.4.6 and Figure 12.4.7 (see separate volume of figures – Section 2).

12.4.69 The site access to the Falconbrook Pumping Station would be installed only for the purpose of the construction works. In the construction base case there would be no vehicular access to the site from the southbound carriageway of York Road (A3205). An assessment of the site accesses in the construction base case was therefore not required for the Falconbrook Pumping Station site.

12.4.70 The construction base case takes into account traffic growth and new developments within the local area by Site Year 1 of construction including the developments detailed in paras. 12.3.7 and 12.3.8. There are no developments within 250m of the site and therefore are no new receptors to consider in the assessment.

Operational base case

12.4.71 The operational assessment year for transport is Year 1 of operation.

12.4.72 The elements of the transport network that would be affected during operation are highway layout and operation, pedestrian and cyclist routes and parking. For the purposes of the operational base case, it is anticipated that all will be as indicated in the construction base case.

12.4.73 The operational base case takes into account the developments described in Vol 11 Appendix N (site development schedule). All four of the developments within 1km of the site would be completed by Year 1 of operation. None are located within 250m of the site and therefore none represent receptors requiring consideration in the operational effects assessment.

12.5 Construction effects assessment

12.5.1 This section summarises the findings of the assessment undertaken for the peak year of construction at the Falconbrook Pumping Station site (Site Year 1 of construction).

12.5.2 The worker mode split has been derived by taking the highest number of workers during the peak month and calculating the percentage of trips by mode using the 2001 Census journey to work data for the area in the vicinity of the Falconbrook Pumping Station site[iv]. The Census data indicates that the predominant mode of travel for journeys to work in this area is public transport.

12.5.3 At this site there would be no parking provided within the site boundary for workers and measures would be incorporated into site-specific Travel Plan requirements in order to minimise the number of workers travelling to and from the site by car. This accords with the overall aims and objectives of the *Draft Project Framework Travel Plan*.

12.5.4 However, given that not all parking in the surrounding streets is subject to restrictions at all times and that spare capacity has been observed within the available on-street parking provision, the transport assessment has considered the effects that could arise if some workers were to travel by car and park in surrounding streets. This is to ensure a robust assessment of the likely effects.

12.5.5 The mode split outlined in Vol 11 Table 12.5.1 has been used to assess the impacts of worker journeys on the highway and public transport networks.

Vol 11 Table 12.5.1 Transport – mode split

Mode	Percentage of trips to site	Equivalent number of worker trips (based on 40 worker trips)	
		AM peak hour	PM peak hour
Bus	10%	4	4
National Rail and London Overground	25%	10	10
Underground	9%	4	4
Car driver	40%	16	16
Car passenger	2%	<1	<1
Cycle	3%	1	1
Walk	9%	4	4
River	0%	0	0
Other (taxi/motorcycle)	2%	<1	<1
Total	**100%**	**40**	**40**

[iv] Based on 2001 Census as this type of data had not been released from the 2011 Census at the time of assessment.

Pedestrian routes

12.5.6 There would be two new site accesses located on the eastern side of York Road (A3205) to accommodate vehicles accessing and egressing the construction site. This would result in additional crossing points for pedestrians and could lead to some minor delay to their journey time. It would also result in a potential increase in pedestrian/vehicle conflicts at these locations. Vehicle marshals could be employed to mismise this risk.

12.5.7 Part of the construction works would involve drilling a 1m diameter pipe through the footway between the proposed site accesses into the Falconbrook connection tunnel. This would require the closure of the footway while this work is carried out. During this time, pedestrians would not be able to route past the site on the eastern footway of York Road. Pedestrians wishing to route past the site from the south would be diverted to the western footway at the junction with Plough Lane. Pedestrians wishing to route past the site from the north would be diverted to the western footway at the junction with Lombard Road. Both of these junctions have signalised pedestrian crossing facilities and therefore offer a safe option for crossing York Road. The construction period of the pipe drilling work is is expected to be around four weeks of the total three year site construction period.

12.5.8 The construction phase (phase 1 and phase 2) plans (see separate volume of figures – Section 1) shows the layout of the pedestrian footways during construction.

12.5.9 To assess the busiest case scenario it has been anticipated that all worker trips would finish their journeys to the site and start their journeys from the site by foot. As a result the 40 worker trips generated by the site have been added to the construction base case pedestrian flows during the AM and PM peak hours.

12.5.10 At present, pedestrian flow is relatively low along York Road (A3205). The additional worker trips are not expected to have a detrimental impact on York Road (A3205) in terms of footway capacity and width.

12.5.11 Pedestrian access to York Gardens from York Road (A3205) would be maintained although it would be relocated approximately 15m south of the existing access. Pedestrians would route eastwards to access the gardens which would result in a slight increase in their journey time. Signage would be provided for this diversion.

12.5.12 In determining the magnitude of impacts on pedestrian routes the relevant impact criteria are pedestrian delay, pedestrian amenity and accidents and safety (as set out in Vol 2 Section 12).

12.5.13 It is anticipated that although pedestrians on the eastern footway of York Road (A3205) would have to cross two site accesses, the number of construction vehicles is sufficiently low that there would be minimal additional delays to pedestrian journey times. The relocation of the existing access to York Gardens 15m south would result in an increase in pedestrian journey times by approximately ten seconds.

12.5.14 During the pipe construction work that would require closure of the footway on the eastern side of York Road (A3205) between the two site accesses, a pedestrians would experience a total diversion of around 43m (19m diversion across York Road (A3205) at the Plough Lane junction and 24m across York Road (A3205) at the Lombard Road junction) along this route, which would result in an increase in pedestrian journey time of around 30 seconds. This delay would only be experienced for less than one month of the total 36 month construction period at Falconbrook Pumping Station.

12.5.15 Overall the impact on pedestrian delay has been assessed as negligible.

12.5.16 With regard to pedestrian amenity, pedestrians would be diverted away from the eastern footway of York Road (A3205) across this road during the pipe construction works. This equates to a high adverse effect on pedestrian amenity, but this diversion would be for less than four weeks of the total 36 month site construction period. At other times the footways would require some protection around the site access points. When considering the whole 36 month construction period, this equates to a medium adverse impact on pedestrian amenity.

12.5.17 In relation to accidents and safety, although pedestrians would be required to cross two site access points and, for four weeks of the construction period, would have to make two additional roads crossings if their route takes them past the site on the eastern footway of York Road (A3205). This would equate to a high adverse impact on accidents and safety. However, during the other 32 weeks of construction the impact would be negligible as this diversion is only for four weeks of the construction period, pedestrian flows would be less than 120 people per hour and construction traffic flows less than four two way HGV movements per hour. Overall, the impact magnitude for pedestrian accidents and safety would be classified as low adverse.

Cycle facilities and routes

12.5.18 The relevant impact criteria for determining the magnitude of impacts on cycle facilities and routes are cycle delay and accidents and safety (as set out in Vol 2 Section 12).

12.5.19 As with pedestrians, cyclists on York Road (A3205) southbound may use the relocated access (approximately 15m south) to York Gardens which would result in a small delay to their journey time. Signage would be provided for this diversion.

12.5.20 The effect on cycle journey times on the highway network, York Road (A3205) and in the wider area, is identified in the highway operation and network assessments (paras. 12.5.46-12.5.47). This confirms that there would not be any change in journey times for cyclists. This represents a negligible impact.

12.5.21 With regard to accidents and safety, southbound cyclists on York Road (A3205) would have to pass the two site access points. This could present occasional potential conflicts with HGVs, although the construction vehicle flow would be less than four two way HGV vehicle movements per hour. Overall this represents a negligible impact on cyclist accidents and safety.

Bus routes and patronage

12.5.22 An existing bus stop is situated at the location of the proposed site egress point. In order to facilitate the movement of construction vehicles the existing bus shelter would remain in place but the stopping point would be moved approximately 11m to the south. The routing of bus services in the area would not be affected by the construction works at the Falconbrook Pumping Station site.

12.5.23 Additional construction vehicles serving the site would not affect bus journey times along York Road (A3205), as detailed in the highway operation and network assessment (paras. 12.5.46-12.5.47). This represents a negligible impact.

12.5.24 It is expected that approximately four additional two-way worker trips would be made by bus during the AM and PM peak hours, which would result in less than one worker trip per bus (based on a service of approximately 127 and120 buses within a 640m walking distance during the AM and PM peak hours respectively).

12.5.25 Based on the impact criteria outlined in Vol 2 Section 12 the additional worker trips made by bus in peak hours would have a negligible impact on bus patronage.

National Rail and London Overground services and patronage

12.5.26 The mode split in Vol 11 Table 12.5.1 is based on 2001 Census data and was collected before the introduction of London Overground services. As most overground sites used to serve national rail, the numbers for the overground mode split have therefore been based on rail numbers and were then combined with the rail site in the vicinity of the Falconbrook Pumping Station site.

12.5.27 No rail stations are directly adjacent to the site and therefore none would be directly affected by the construction works at the site. It is anticipated that approximately 14 construction workers and labourers would use London Overground or National Rail services to access the site. This would equate to less than one additional passenger per train based on high service frequencies calling at Clapham Junction in the AM and PM peak hours.

12.5.28 Based on the quantitative assessment of patronage and the impact criteria on rail patronage in Vol 2 Section 12 this would result in a negligible impact on London Overground and National Rail patronage.

Parking

12.5.29 To accommodate the construction site 13 parking spaces would need to be removed from the unrestricted parking on the access road to both the York Gardens Library and Community Centre and the York Gardens Adventure Playground The 13 parking spaces would not be replaced.

This is on the basis that there is sufficient spare capacity on-street in the vicinity to accommodate this loss of parking (see para. 12.4.57).

12.5.30 The highway layout during construction plan (see separate volume of figures – Section 1) summarises the proposed restriction of car parking bays associated with the construction works at the Falconbrook Pumping Station site.

12.5.31 Parking for essential maintenance vehicles would be provided on site. There would be no on-site parking for workers and measures would be taken through the *Draft Project Framework Travel Plan* and site-specific *Travel Plan* to discourage workers from travelling by car and promote the use of public transport, walking and cycling. However, using the Census mode share data, approximately 16 workers could potentially drive to the Falconbrook Pumping Station site per day.

12.5.32 In determining the magnitude of impacts on parking the relevant criteria is vehicle parking and loading changes (see Vol 2 Section 12).

12.5.33 Taking account of the removal of parking bays at the Community Centre, the potential for some workers to drive to the site (notwithstanding the measures that would be taken to discourage this) and the available spare capacity in on-street parking bays in the vicinity, the impact on parking would be low adverse.

12.5.34 As there are no loading bays in the vicinity the assessment of the effects on loading are not relevant at this site.

Highway network and operation

12.5.35 The highway layout during construction plan (see separate volume of figures – Section 1) shows the highway layout during the construction phase at the Falconbrook Pumping Station site. The site is on the eastern side of York Road (A3205) and would be accessed from the southbound lane. The highway layout during construction vehicle swept path analysis plan (see Falconbrook Pumping Station Transport Assessment Figures) demonstrates that the construction vehicles would be able to safely enter and leave the site.

12.5.36 Two new site accesses would be created on York Road (A3205) to serve the construction site. These would operate on a left turn in and left turn out basis.

12.5.37 Construction lorry movements would be limited to the day shift only (08:00 to 18:00 Monday to Friday and 08:00 to 13:00 Saturday) except in exceptional circumstances when HGV and abnormal load movements could occur up to 22:00 on weekdays for large concrete pours and later at night by agreement with the LB of Wandsworth and TfL.

12.5.38 Vol 11 Table 12.5.1 shows the construction lorry movement assumptions for the local peak traffic periods. These are based on the peak months of construction activity at this site. The table also shows the construction worker vehicle movements expected to be generated by the site. The assessment has been based on 10% of the daily number of lorry journeys occurring in the peak hours, which has been agreed with TfL as a reasonable approach. It is recognised that it may be desirable to reduce the number of construction lorry movements in peak hours and the mechanisms for addressing this would form part of the *Traffic Management Plan*s which are required as part of the *CoCP* (Section 5).

Vol 11 Table 12.5.1 Transport – peak construction works vehicle movements

Vehicle type	Vehicle movements per time period				
	Total daily	**07:00 to 08:00**	**08:00 to 09:00**	**17:00 to 18:00**	**18:00 to 19:00**
Construction lorry vehicle movements 10%*	36	0	4	4	0
Other construction vehicle movements**	26	0	3	3	0
Worker vehicle movements***	16	16	0	0	16
Total	**78**	**16**	**7**	**7**	**16**

** The assessment has been based on 10% of the daily construction lorry movements associated with materials taking place in each of the peak hours.*
*** Other construction vehicle movements includes cars and light goods vehicles associated with site operations and contractor activity.*
**** Worker vehicle numbers based on 40% of workers driving, derived by taking the highest number of workers during the peak month and calculating the % of trips using the 2001 Census Journey to Work data. This represents an unconstrained case, as there would be no parking on site for workers and the Draft Project Framework Travel Plan would include measures to discourage workers from parking in surrounding streets.*

12.5.39 To ensure a robustness the assessment has been based on a combination of the peak hour of movements for construction and worker vehicle movements between 07:00-09:00 and 17:00-19:00. These have been combined and applied to the peak hour to take into account the highest number of movements generated by the site.

12.5.40 Assuming that all construction material is transported by road an average peak flow of 78 vehicle movements a day is expected during the months of greatest activity during Site Year 1 of construction at this site. At other times in the construction period vehicle flows would be lower than this average peak figure.

12.5.41 The relevant impact criteria for determining the magnitude of impacts on the highway network and operation are; accidents and safety, road network delay and hazardous loads (see Vol 2 Section 12).

12.5.42 It is anticipated that along York Road (A3205) there would be an additional four HGV movements per hour as a result of the construction at Falconbrook Pumping Station, plus three HGV movements during the peak hour associated with other Thames Tideway Tunnel project sites passing along York Road (A3205) during Site Year 1 of construction at the Falconbrook Pumping Station site. This results in a negligible impact on accidents and safety. However, given that the site access is directly from the TLRN and considering the criteria set out in Vol 2 Section 12 it is considered that this elevates the accident and safety impact to medium adverse.

12.5.43 It is assessed that potentially there would be one vehicle every fortnight transporting hazardous loads to or from this site during construction and therefore the impact on the highway network in relation to hazardous loads would be low adverse.

12.5.44 The local PICADY model has been used to apply the construction traffic demands and local geometrical changes to the construction base case to determine the changes in the highway network operation due to the project (ie, comparison of base and development cases). This relates specifically to the introduction of the two new site accesses on York Road (A3205) during the construction period. The development case traffic flows (providing input to the PICADY model) are shown on Vol 11 Figure 12.4.6 and Figure 12.4.7 for the AM and PM peaks respectively (see separate volume of figures – Section 2).

12.5.45 A summary of the construction assessment results for the site access is presented in Vol 11 Table 12.5.3. There is no construction base case model as the site accesses would be created for the Thames Tideway Tunnel project construction works at the Falconbrook Pumping Station site.

12.5.46 The construction assessment indicates that there would be insignificant delay associated with the new site access points. The new site entrance would not result in delay to traffic on York Road (A3205) as construction vehicles would be able to turn left into the site without delay and would be able to turn off of York Road (A3205) at the site entrance gate. As there would be no traffic leaving the site at this location, a PICADY model is not required.

12.5.47 The PICADY model for the site egress suggests that on average it would take approximately ten seconds and 12 seconds for site traffic to gain access onto York Road (A3205) in the AM and PM peak hours respectively. Traffic on York Road (A3205) would have priority and would not be delayed. The site egress would operate well within capacity with no queues expected.

12.5.48 Overall the introduction of the new site access points and the additional construction vehicle movements would result in a negligible impact, based on the impact criteria identified in Vol 2 Section 12.

Vol 11 Table 12.5.2 Transport – construction PICADY model outputs

Approach	Movement	Weekday							
		AM peak hour (08:00-09:00)				PM peak hour (17:00-18:00)			
		Flow (veh)	RFC	Max. Queue	Delay (seconds per veh)	Flow (veh)	RFC	Max. Queue	Delay (seconds per veh)
Site egress	Left	4	1%	0	10	5	2%	0	12

Notes: 1. RFC represents Ratio of Flow to Capacity; MMQ represents Mean Maximum Queue for the busiest-case 15 minute modelled period (in vehicle lengths). Delay represents the mean delay per vehicle.
2. Site entrance is not included in table as PICADY model only considers movements where vehicles have to 'give way'.

Significance of effects

12.5.49 The significance of effects has been determined based on the transport impacts described above, considered in the context of the sensitivity of the receptors identified in Vol 11 Table 12.4.1 .

12.5.50 Vol 11 Table 12.5.3 sets out the effects on each receptor in the vicinity of the site in the construction phase.

Vol 11 Table 12.5.3 Transport – significance of effects during construction

Receptors (relating to all identified transport effects)	Significance of effect	Justification (receptor sensitivity and impacts)
Pedestrians and cyclists (including sensitive pedestrians) using York Road (A3205).	Minor adverse effect on pedestrians. Negligible effect on cyclists	**Pedestrians:** • High sensitivity • Negligible impact on pedestrian delay • Medium adverse impact on pedestrian amenity • Low adverse impact on accidents and safety • Due to negligible, low adverse and medium adverse impacts, equates to a minor adverse effect overall. **Cyclists:** • High sensitivity • Negligible impact on cycle delay and accidents and safety • Negligible impacts equates to negligible effect.
Private vehicle users in the area using the local highways or on-street parking.	Minor adverse effect on highway users Minor adverse effect on parking users	**Highway users:** • Medium sensitivity • Negligible impact on road network delay • Medium adverse impact on accidents and safety. • Low adverse impact from hazardous loads. • Due to a range of impact magnitudes and given sensitivity of receptor, equates to minor adverse effect. **Parking users:** • High sensitivity • Low adverse impact on on-street

Receptors (relating to all identified transport effects)	Significance of effect	Justification (receptor sensitivity and impacts)
		parking • Due to low adverse impact magnitude, equates to minor adverse effect.
Emergency vehicles travelling on York Road (A3205)	Minor adverse effect	• High sensitivity • Negligible impact on road network delay • Medium adverse impact on accidents and safety. • Low adverse impact from hazardous loads. • Due to a range of impact magnitudes and given sensitivity of receptor, equates to minor adverse effect.
Bus users (passengers) travelling along York Road (A3205)	Negligible effect	• Medium sensitivity • Negligible impact on road network delay and patronage • Negligible impact equates to negligible effect.
Public transport users on rail services within the area	Negligible effect	• Low sensitivity • Negligible impact on patronage. • Negligible impact equates to negligible effect.
Residents of Pennethorne House Users of York Gardens Library and Community Centre Users of York Gardens Adventure Playground Pupils, parents and staff of Thames Christian College School	Negligible effect on pedestrians Negligible effect on cyclists Minor adverse effect on highway users Minor adverse effect on parking users	**Pedestrians:** • High sensitivity • Negligible impact on pedestrian delay • Medium adverse impact on pedestrian amenity • Low adverse impact on accidents and safety • Taking into account the timescale over which receptors would be affected, overall effect would be negligible. **Cyclists:** • High sensitivity • Negligible impact on cycle delay and accidents and safety

Receptors (relating to all identified transport effects)	Significance of effect	Justification (receptor sensitivity and impacts)
Users of recreational spaces at York Gardens Staff and visitors to candle shop		• Negligible impacts equates to negligible effect. **Highway users:** • High sensitivity • Negligible impact on road network delay • Medium adverse impact on accidents and safety. • Low adverse impact from hazardous loads. • Due to a range of impact magnitudes and given sensitivity of receptor, equates to minor adverse effect. **Parking users:** • High sensitivity • Low adverse impact on on-street parking • Due to low adverse impact magnitude, equates to minor adverse effect.

Sensitivity test for programme delay

12.5.51 The assessment has been based on an estimated programme for the construction of the Thames Tideway Tunnel project. That programme has been used to derive construction vehicle numbers and to understand the relationships between the project and other developments in the vicinity of project sites, in order to allow appropriate receptors to be identified.

12.5.52 If the overall programme were to be delayed by approximately a year, the implications in relation to the transport effects would be as follows:

a. It is unlikely that the effects on pedestrians and cyclists would change. Over the course of one year, it is unlikely that pedestrian or cycle traffic in the vicinity of the project site would increase by a sufficient amount to change the magnitude of impacts or the significance of effects reported, nor that the arrangements for pedestrian diversions would be any different to those currently proposed

b. Effects on public transport are unlikely to change as the rate of public transport patronage growth is relatively low and over the course of one year, any reduction in spare capacity on existing public transport networks would be small. Additionally, there is a general trend towards the enhancement of the public transport network through the provision of additional bus, rail and river services in order to meet future demand and accommodate future patronage growth. The transport assessment typically indicates that the additional public transport patronage arising from Thames Tideway Tunnel project sites would be small and not significant in the context of the capacity available on the wider networks

c. Effects on the operation of the highway network are derived from the use of the TfL Highway Assignment Models (HAMs), which have a forecast model year of 2021. To provide consistency within the assessment, it has been agreed with TfL that this is an appropriate approach. Since the local highway capacity models for the base case also use traffic flow information from the HAMs, it follows that both the strategic and local capacity assessments are effectively based on a year of 2021. As the peak months of activity at the Falconbrook Pumping Station site fall before 2021 based on the programme that has been assessed, it follows that a delay of up to one year would not alter the outcomes of the highway network modelling and therefore would not alter the effects reported

d. Based on the site development schedule (see Vol 11 Appendix N), it is possible that as a result of a one year delay, more of the Chelsea Creek development would be complete and occupied. However, it is not expected that new receptors would experience any different effects to those receptors which have been assessed above; rather it would be a case of the potential for some additional receptors to experience the same effects that have already been identified.

12.6 Operational effects assessment

12.6.1 This section summarises the findings of the assessment undertaken for Year 1 of operation at the Falconbrook Pumping Station site.

12.6.2 The transport demands created by the development in the operational phase would be extremely low and limited to occasional maintenance visits every three to six months, with certain instances where larger mobile cranes and other associated support vehicles may be required for access to the shaft and tunnel every ten years.

12.6.3 The assessment of the operational phase is therefore limited to the physical issues associated with accessing the site from the highway network and to effects on the immediate pedestrian and cycle networks as outlined in Section 12.2. This has been discussed with the LB of Wandsworth and TfL.

12.6.4 The operational assessment has taken into consideration those elements that would be affected, which comprise the short-term impacts on on-street parking and on the highway layout and operation when maintenance visits are made to the site. In addition, any users of recreational and community spaces at York Gardens adjacent to east and south of site could also be affected by the maintenance visits.

Pedestrians and cyclists

12.6.5 In the operational phase the two vehicle accesses to the construction site from York Road (A3205) would be removed and the existing pedestrian and cycle access to York Gardens would be widened and relocated approximately 25m north from the construction phase location between York Road (A3205) and York Gardens.

12.6.6 The new pedestrian and cycle access between York Gardens and York Road (A3205) would improve pedestrian permeability between the residential area to the east of York Gardens and York Road (A3205). The impact on pedestrian amenity would therefore be medium beneficial compared with the operational base case. The impact on pedestrian delay would be negligible.

12.6.7 The footway on the eastern side of York Road (A3205) would be reinstated to the baseline condition. The impact on pedestrian accidents and safety would therefore be negligible. There would be no impact on cycle accidents and safety compared to the operational base case as the construction site accesses would be removed and conditions on York Road (A3205) would therefore be the same as in the operational base case.

12.6.8 Although maintenance vehicles would use Lavender Road to access the site during the operational phase, this activity would be infrequent and short term and where necessary, measures would be put in place to protect pedestrians and cyclists whilst large maintenance vehicles are manoeuvring.

12.6.9 The overall effect on pedestrians and cyclists in the immediate area including users of the recreational and community facilities is therefore assessed as **minor beneficial** in the operational phase.

Parking

12.6.10 When large vehicles are required to service the site a maximum of 23 parking bays would have to be temporarily restricted to ensure the vehicles have sufficient space to manoeuvre into the site. The restrictions would occur on Winstanley Road, Newcomen Road, Darien Road and Ingrave Street with nine, nine, two and three parking space restrictions respectively. This temporary restriction would be on an infrequent basis, once every ten years, and on occasion where a flatbed vehicle is used for routine six monthly inspections.

12.6.11 Based on the impact magnitude criteria outlined in Vol 2 Section 12, the temporary restriction of 23 parking bays would result in a medium adverse impact on parking within the local area.

12.6.12 Taking into consideration the infrequent and temporary nature of the arrival of vehicles at Falconbrook Pumping Station which would require parking restriction and the sensitivity of the relevant receptors it is anticipated that there would be a **negligible** effect on parking.

Highway layout and operation

12.6.13 During the operational phase, access to the site would be achieved by travelling along Grant Road and then onto Winstanley Road and Newcomen Road with access to the site then found on the left hand side at York Gardens. Egress from the site would be achieved by going straight on from York Gardens and travelling along Lavender Road. At the junction vehicles would turn left along Darien Road and then turn right and proceed along Ingrave Street. The permanent highway layout plan (see separate volume of figures – Section 1) show the site layout during the operational phase.

12.6.14 For routine three or six monthly inspections vehicular access would be required for light commercial vehicles, typically a transit van. On occasion there may be a need for flatbed vehicles to access the site.

12.6.15 During ten-yearly inspections space to locate two large mobile cranes and other associated support vehicles within the site area would be required. The cranes would facilitate lowering and recovery of tunnel inspection vehicles and to provide duty/standby access for personnel. To assess the effect of these on the highway layout, swept paths have been undertaken for the largest vehicles expected to require access; 11.36m mobile cranes, a 10m rigid vehicle and a 10.7m articulated vehicle. The permanent highway layout vehicle swept path analysis plans (see Falconbrook Pumping StationTransport Assessment Figures) demonstrates that vehicles can safely enter and exit the site.

12.6.16 As identified above, as a result of the large turning circles of the cranes, a maximum of 23 car parking bays would have to be restricted to ensure the vehicles have sufficient space to manoeuvre into the site. This would be approximately every ten years. This would also be the case for the more frequent trips by flatbed vehicles, required on some occasions for the six month inspections.

12.6.17 When larger vehicles are required to service the site, there may also be some temporary, short-term delay to other road users while manoeuvres are made. However it is anticipated that the arrival of large vehicles would normally be scheduled to take place outside of the peak hours to minimise the effect on the local highway network.

12.6.18 In accordance with the criteria outlined in Vol 2 Section 12, during the routine inspections of the operational site there would therefore be a negligible impact on road network delay.

12.6.19 Taking into consideration the various sensitivities of the receptors affected during the operational phase (pedestrians, cyclists, private vehicle users, emergency vehicles, residents of Pennethorne House, users of York Gardens Library and Community Centre, York Gardens Adventure Playgroundand York Gardens, and pupils, parents and staff at Thames Christian College School), this would result in a **negligible** effect on highway layout and operation.

Sensitivity test for programme delay

12.6.20 If the opening year of the Thames Tideway Tunnel project were to be delayed by approximately one year, the results of the operational assessment would not be materially different to the assessment findings reported above.

12.7 Cumulative effects assessment

Construction effects

12.7.1 As indicated in the site development schedule (see Vol 11 Appendix N) there is one development (Chelsea Creek development) that would still be partially under construction in Site Year 1 of construction.

12.7.2 However, for the reasons set out in paras.12.3.8 and 12.3.9, there is no need for a cumulative assessment on transport for the construction phase as the TfL Highway Assignment Models (HAM) used in the assessment have been developed by TfL using GLA employment and population forecasts, which are based on the employment and housing projections set out in the *London Plan 2011*. As a result the assessment inherently takes into account a level of future growth and development across London.

12.7.3 Therefore the effects on transport would remain as described in Section 12.5. This would also be the case if the programme for the Thames Tideway Tunnel project were delayed by approximately one year.

Operational effects

12.7.4 As indicated in the Development Schedule (see Appendix N) all other developments identified within 1km of the Falconbrook Pumping Station site that would be complete and operational by Year 1 of operation. Therefore there is no need for a cumulative assessment on transport and the effects would remain as described in Section 12.6. This would also be the case if the programme for the Thames Tideway Tunnel project were delayed by approximately one year.

12.8 Mitigation

12.8.1 The project has been designed to limit the effects on transport networks as far as possible and many measures have been embedded directly in the design of the project, including the *CoCP* and *Draft Project Framework Travel Plan* (see Section 12.2). No additional measures are required for transport and therefore there is no mitigation identified for either construction or operation.

12.9 Residual effects assessment

Construction effects

12.9.1 As no mitigation measures are proposed the residual construction effects remain as described in Section 12.5. All residual effects are presented in Section 12.10.

Operational effects

12.9.2 As no mitigation measures are proposed the residual operational effects remain as described in Section 12.6. All residual effects are presented in Section 12.10.

12.10 Assessment summary

Vol 11 Table 12.10.1 Transport – summary of construction assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Pedestrians and cyclists (including sensitive pedestrians) using York Road (A3205).	• Movement of large construction vehicles • Additional journey time due to diversions • Potential conflicts at site access points	Minor adverse effect on pedestrians. Negligible effect on cyclists	None	Minor adverse effect on pedestrians. Negligible effect on cyclists
Private vehicle users in the area using the local highway or on-street parking.	• Movement of large construction vehicles • Reduced availability of parking on access road to York Garden Library / Community Centre / Children's Centre / Adventure Playground	Minor adverse effect on highway users Minor adverse effect on parking users	None	Minor adverse effect on highway users Minor adverse effect on parking users
Emergency vehicles travelling on York Road (A3205)	• Movement of large construction vehicles	Minor adverse effect	None	Minor adverse effect
Bus users (passengers) travelling along York Road (A3205)	• Relocation of bus stopping point at bus stop on south of site on York Road (A3205) • Some additional patronage from construction workers	Negligible effect	None	Negligible effect
Public transport users on rail services within the area	• Some additional patronage from construction workers	Negligible effect	None	Negligible effect

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Residents of Pennethorne House Users of York Gardens Library and Community Centre Users of York Gardens Adventure Playground Pupils, parents and staff of Thames Christian College School Staff and visitors to candle shop Users of recreational spaces at York Gardens	• Movement of large construction vehicles • Changes to pedestrian amenity • Reduced availability of parking on access road to York Garden Library / Community Centre / Children's Centre / Adventure Playground	Negligible effect on pedestrians Negligible effect on cyclists Minor adverse effect on highway users Minor adverse effect on parking users	None	Negligible effect on pedestrians Negligible effect on cyclists Minor adverse effect on highway users Minor adverse effect on parking users

Vol 11 Table 12.10.2 Transport – summary of operational assessment

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Pedestrians and cyclists (including sensitive pedestrians) using maintenance vehicle routes including Lavender Road, Ingrave Street, Darien Road, Newcomen Road and Winstanley Road Private vehicle users in the area using the local highways or on-street parking. Emergency vehicles travelling on York Road (A3205) Residents of Pennethorne House Users of York Gardens Library and Community Centre Users of York Gardens Adventure Playground Pupils, parents and staff of Thames Christian College School Users of recreational spaces at York Gardens	• Occasional restriction of parking spaces and short-term delay to road users in the immediate vicinity of the site during maintenance visits.	Negligible effect	None	Negligible effect

References

[1] Defra, *National Policy Statement for Waste Water* (2012).

[2] Transport for London, *Travel Planning for new development in London,* Transport for London (2011).

[3] Transport for London, *Assessment Tool for Travel Plan Building Testing and Evaluation (ATTrBuTE)*, 2011. Available at: http://www.attrbute.org.uk/

[4] Greater London Authority, *London Plan*, July 2011.

[5] Transport for London, *Transport Assessment Best Practice Guidance*, April 2010.

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 13: Water resources - groundwater

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Environmental Statement

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Section 13: Water resources − groundwater

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13 Water resources − groundwater

13.1 Introduction

13.1.1 This section presents the findings of the assessment of the likely significant effects of the proposed development on groundwater at the Falconbrook Pumping Station site (including the Falconbrook Pumping Station highway work site).

13.1.2 The proposed development has the potential to affect groundwater due to:

a. creation of pathways for pollution

b. obstruction to groundwater flows

c. seepages into and out of the combined sewer overflow (CSO) drop shaft during operations.

13.1.3 The groundwater assessment at this site should be read in conjunction with the supporting Vol 11 Appendix K (K.1 – K.9) and the land quality assessment (see Vol 11 Section 8 Land quality).

13.1.4 The site is underlain by thick layer of London Clay Formation, which is relatively impermeable. Construction would not extend down into the Lambeth Group. No dewatering would be required at the Falconbrook Pumping Station site and instead the groundwater in the River Terrace Deposits (upper aquifer) would be cut off from the proposed development using a sheet pile or secant pile wall[i].

13.1.5 An assessment of project-wide environmental effects on groundwater is presented in Volume 3 Project-wide assessment.

13.1.6 The assessment of groundwater presented in this section has considered the requirements of the National Policy Statement for Waste Water (Defra, 2012)[1] Section 4.2. The physical characteristics of the groundwater environment including groundwater resources and quality are presented and the anticipated effects (including cumulative effects) on these resources addressed in the assessment that follows (further detail can be found in Vol 2 Section 13.3).

13.1.7 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

13.2 Proposed development relevant to groundwater

13.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to groundwater are set out below.

[i] Secant or sheet piles – a sub-surface structure installed to support excavation and which amongst other things helps to control inflows of shallow groundwater typically formed of intersecting concrete or overlapping shafts of concrete in the case of a secant pile wall. In the case of a sheet pile wall, overlapping sheets of metal area used.

Construction

13.2.2 The elements of construction at the Falconbrook Pumping Station site, relevant to the consideration of groundwater, would include:

a. a CSO drop shaft approximately 9m internal diameter (ID) and approximately 40m deep (or 64.75mATD[ii] based on an assumed finished cover level of 104.8mATD) (excluding an approximately 2m thick base once constructed).

b. an interception chamber for the existing CSO (which would extend to approximately 18m below ground level)

c. a connection culvert from the interception chamber to the CSO drop shaft

d. a connection tunnel from the CSO drop shaft to the main tunnel.

13.2.3 The proposed methods of construction for these elements, of relevance to the groundwater assessment, are described in Section 3 of this volume and summarised in Vol 11 Table 13.2.1. Approximate duration of construction and depths are also included in Vol 11 Table 13.2.1.

Vol 11 Table 13.2.1 Groundwater – methods of construction

Design elements	Method of construction	Construction periods (years)*	Construction depth** (mbgl)
CSO drop shaft	Sheet piling through superficial deposits– Sprayed Concrete Lining (SCL) through London Clay Formation	<1	Deep
Interception chamber and connection culvert	Secant or sheet piles into London Clay Formation	<1	Deep
Connecting tunnel from CSO drop shaft to the main tunnel	SCL	<1	Deep

** The site would be used for construction purposes for up to 3 years*
*** In terms of construction depth - Shallow (<10m) and Deep (>10m)*

Code of Construction Practice

13.2.4 All works would be undertaken in accordance with the *Code of construction practice (CoCP)*. The *CoCP* is provided in Vol 1 Appendix A.

[ii] In general, the measurements of depth are expressed as metres Above Tunnel Datum (mATD). The standard zero point for mATD scale is -100maOD (metres above Ordnance Datum is based on Newlyn datum point for mean sea level). The use of the mATD scale avoids the need for use of negative values, and is widely used for large scale sub-surface projects.

It contains general requirements (Part A), and site specific requirements for this site (Part B). Relevant measures included within the *CoCP* Part A to ensure adverse effects on groundwater are minimised as follows:

a. Measures include providing bunded stores for fuel/oils held on site and the settlement of water from excavations, if required, to prevent silty water from entering watercourses, surface water drains and onto roads as per Environment Agency guidelines (EA, 2011)[2]. The contractor would have plans and equipment in place to deal with emergency situations as well as ensuring that staff are appropriately trained.

b. A precautionary approach, involving targeted risk-based audits and checks of water quality monitoring, would be applied to licensed abstractions thought to be at risk.

c. Monitoring arrangements for any permits required on change of licensing regulations would be developed in liaison with the EA (see also the groundwater monitoring strategy in Vol 3 Appendix K.1).

d. The use of any materials for ground treatment would be agreed with the EA prior to use.

e. At the end of construction where temporary support does not form part of the operational structure it would be removed, piped through or cut down to avoid the build-up of groundwater on the upstream side of underground structures.

13.2.5 There are no site specific groundwater measures contained within the *CoCP Part B*.

Other measures during construction

13.2.6 The depth of the CSO drop shaft means that it would extend down through the Made Ground, Alluvium, River Terrace Deposits (upper aquifer) into the London Clay Formation, namely into unit A2 (see Vol 11 Table 13.4.1 and Vol 11 Appendix K.1). The base slab would also extend into the London Clay Formation, unit A2. No dewatering of the upper aquifer is anticipated to be required. Instead a secant or sheet pile wall would be constructed around parts of the Falconbrook Pumping Station site into the London Clay Formation to seal out the River Terrace Deposits (upper aquifer) and any groundwater inflows from the London Clay Formation. Any water entering through the secant or sheet pile walls would be pumped out and discharged directly to an appropriate sewer on site, following any necessary treatment and subject to EA approval.

13.2.7 The depth of the interception chamber and connection culvert means that it would extend down into the London Clay Formation, unit B. The interception chamber and connection culvert are deeper than at other sites; therefore secant or sheet piles would be installed (to approximately 17mbgl) to minimise groundwater ingress. Water entering through the secant pile walls would be pumped out and discharged directly to an appropriate sewer on site, following any necessary treatment and subject to EA approval.

13.2.8 For the purposes of this assessment, no ground treatment[iii] or grouting[iv] would be required for the construction of the drop shaft; however, localised grouting in the River Terrace Deposits may be required for the construction of the interception chamber. While grouting has the potential to introduce contaminants, such as turbidity, into groundwater and to deteriorate groundwater quality, any grouting products used would be first approved by the EA

Operation

13.2.9 A groundwater monitoring strategy is one of the project's environmental design measures (see Vol 3 Appendix K.1). This covers groundwater levels and groundwater quality, and would outline the future monitoring and actions in the event of trigger levels being exceeded.

13.3 Assessment methodology

Engagement

13.3.1 Vol 2 documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. Site-specific comments relevant to this site for the assessment of groundwater are presented here.

13.3.2 The *Scoping Report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of groundwater for this site has therefore drawn on the scoping response from the London Borough (LB) of Wandsworth and is based on professional judgement as well as experience of similar sites.

13.3.3 The phase two consultation has not highlighted any new issues relating to groundwater at the Falconbrook Pumping Station site.

Baseline

13.3.4 The baseline methodology follows the methodology described in Vol 2. There are no site-specific variations for identifying the baseline conditions for this site.

13.3.5 The baseline describes receptors within a 1km radius of the site.

13.3.6 There are unlikely to be any effects on groundwater beyond a kilometre at the Falconbrook Pumping Station site given the hydrogeological setting and the method of construction used.

Construction

13.3.7 The assessment methodology for the construction phase follows that described in Vol 2. There are no site-specific variations for undertaking the construction assessment at this site.

[iii] Ground treatment – stabilisation of soils/rocks by injection of grouts and or freezing techniques.

[iv] Grouting - a thin, coarse mortar injected into various narrow cavities or voids , such as rock fissures, to fill them and consolidate the adjoining objects into a solid mass and to eliminate water.

13.3.8 The assessment year applied to the construction assessment is Site Year 1 of construction, when sheet piling or secant piling could obstruct groundwater flows and small scale pumping from within these pile walls would take place. The baseline is not anticipated to change substantially between 2011 and Site Year 1 of construction (2018) and so baseline data from 2011 have formed the basis (base case) for the construction assessment.

13.3.9 The developments considered as part of the base case and those included in the cumulative effects assessment are presented in Vol 11 Table 13.3.1. The developments relevant to groundwater are those which would contain basements and Sustainable Drainage System (SuDS).

Vol 11 Table 13.3.1 Groundwater – construction base case and cumulative assessment developments (2018)

Development	Component or receptor relevant to groundwater	Construction base case	Cumulative impact assessment
Townmead Road London	None	✗	✗
Battersea Reach	Basement*	✓	✗
Imperial Wharf	Basement*	✓	✗
Chelsea Creek	Basement* SuDS*	Blocks C, D & E completed	Blocks A, B, F, G under construction

** Relevant to the upper aquifer*
Symbols ✓ applies ✗ does not apply

13.3.10 Section 13.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on groundwater resources within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

Operation

13.3.11 The assessment methodology for the operation phase follows that described in Vol 2. There are no site-specific variations for undertaking the operational assessment at this site.

13.3.12 The assessment year applied to the operational assessment is Year 1 of operation. The baseline is not anticipated to vary significantly before the start of the operational phase in 2023; and therefore baseline data from 2011 has formed the basis for the operational assessment.

13.3.13 In addition, information on proposed development schemes likely to have been completed before commencement of the operation at the Thames Tideway Tunnel project has formed part of the operational base case. The developments considered as part of the operational base case are included in Vol 11 Table 13.3.2. No developments have been identified which would be considered as part of the cumulative effects assessment. The developments relevant to groundwater are those which would contain basements and SuDS.

Vol 11 Table 13.3.2 Groundwater – operational base case and cumulative assessment developments (2023)

Development	Component or receptor relevant to groundwater	Operation base case	Cumulative impact assessment
Townmead Road London	None	✗	✗
Battersea Reach	Basement*	✓	✗
Imperial Wharf	Basement*	✓	✗
Chelsea Creek	Basement* SuDS*	✓	✗

** Relevant to the upper aquifer*
Symbols ✓ applies ✗ does not apply

13.3.14 Section 13.6 details the likely significant effects arising from the operation at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on groundwater resources within the assessment area for this site during the operational phase and so no other Thames Tideway Tunnel project sites are considered in this assessment.

Assumptions and limitations

Assumptions

13.3.15 The construction assumptions relevant to this site are presented in Section 13.2.

13.3.16 The assessment of obstruction effects in Sections 13.5 and 13.6 has been based on an estimated hydraulic gradient[v] of 0.004 in the upper aquifer.

13.3.17 The upper aquifer is assumed to be in hydraulic continuity with the overlying layers, Alluvium and Made Ground.

13.3.18 This assessment has assumed that the shaft would have a design criterion to limit the rate of seepage of 1l/m^2/d (see Vol 2 Appendix K.3).

13.3.19 In the absence of onsite ground investigation or monitoring boreholes, the hydrogeological conditions and groundwater quality conditions encountered at the nearest off site boreholes were assumed to represent on site conditions.

[v] Hydraulic gradient – the slope of the water table which drives groundwater movement

13.3.20 The measurements of the depth of shafts are quoted to two decimal places, however these measurements may be altered slightly in the future and are therefore indicative only.

13.3.21 For the purposes of this assessment, deep refers to greater than 10metres below ground level (mbgl) and shallow refers to less than 10mbgl.

13.3.22 For the purposes this assessment, it is assumed that non-infiltration type SuDS would be used on any neighbouring developments which take place locally.

Limitations

13.3.23 No site-specific pumping tests have yet been undertaken as part of the ground investigation. In the absence of site-specific hydrogeological data, published sources of hydrogeological information have been used in this assessment (see Vol 11 Appendix K.2).

13.3.24 No ground investigation or monitoring boreholes specifically dedicated to the Falconbrook Pumping Station site have been undertaken. The nearest boreholes are located at the nearby Bridges Court Car Park site (the phase one consultation preferred site) and situated approximately 70m to the northwest.

13.3.25 Groundwater level data available to this assessment, with monitoring data available from two boreholes (or monitoring horizon) within the upper aquifer; this has meant that hydraulic gradients could only be estimated across the site and a value of 0.004 was used. In addition, the range of hydrological conditions experienced during the monitoring period (2010-2012) did not include a prolonged wet winter period when exceptionally high groundwater levels might occur.

13.3.26 There has also been limited groundwater quality data available locally for the assessment area.

13.3.27 Despite the limitations identified above, the assessment (which uses the best available information) is considered robust.

13.4 Baseline conditions

13.4.1 The following paragraphs set out the baseline conditions for groundwater within and around the site. Future baseline conditions (base case) are also described.

13.4.2 This section of the assessment is supported by Vol 11 Appendix K.1 – K.9.

Current baseline

Hydrogeology

13.4.3 The CSO drop shaft to the main tunnel would pass through Made Ground, Alluvium, River Terrace Deposits and London Clay Formation, units B, A3ii, A3i and A2. The superficial and solid geology in the vicinity of the site, as published by the British Geological Survey (BGS)[3], is shown in Vol 11 Figure 13.4.1 and Vol 11 Figure 13.4.2 respectively (see separate volume of figures). The depths and thicknesses of geological layers encountered are summarised in Vol 11 Table 13.4.1.

Vol 11 Table 13.4.1 Groundwater – ground conditions and hydrogeology

Formation	Top elevation* (mATD)	Depth below ground level (m)	Thickness (m)	Hydrogeology
Made Ground	104.49	0.0	2.6	Hydraulic continuity with upper aquifer
Alluvium	101.89	2.6	0.8	
River Terrace Deposits	101.09	3.4	5.5	Upper aquifer
London Clay Unit B Unit A3ii Unit A3i Unit A2	 95.59 81.76 70.76 68.86	 8.9 22.73 33.73 35.63	 13.83 11.00 1.90 11.07	Aquiclude[vi]
Harwich Formation	57.79	46.70	0.05	Aquitard[vii] / Aquifer

**Based on an assumed ground level of 104.49mATD at Bridges Court Car Park*
***It has been assumed that the made ground and alluvium are in hydraulic connectivity for the purposes of this assessment.*

13.4.4 The River Terrace Deposits form the upper aquifer and have been classified by the EA as a secondary A aquifer[viii]. The London Clay Formation has been considered an aquiclude, in which any groundwater present is likely to consist of localised seepages and/or minor flows, with the exception of unit A3ii where the presence of fine sand laminea/lenses at this horizon, map act as horizontal conduits for groundwater movement during drilling. The CSO drop shaft would be founded in the lower part of the London Clay Formation, unit A2. The shaft would not extend into the lower aquifer (Upnor Formation, Thanet Sands and Chalk) and the separation distance between the base slab and the top of the lower aquifer is over 25m based on borehole log from PR1100D.

Groundwater level monitoring

13.4.5 Groundwater level monitoring has been undertaken at a number of ground investigation boreholes across the assessment area. In addition, the EA has a regional network of monitoring boreholes, mainly within the lower aquifer, across London with records available dating back over 50 years.

[vi] Aquiclude - a hydrogeological unit which, although porous and capable of storing water, does not transmit it at rates sufficient to furnish an appreciable supply for a well or spring[vi].

[vii] Aquitard - a poorly-permeable geological formation that does not yield water freely, but may still transmit significant quantities of water to or from adjacent aquifers.

[viii] Secondary aquifer – Either permeable strata capable of supporting local supplies or low permeability strata with localised features such as fissures (was previously preferred to as a minor aquifer).

13.4.6 Information on groundwater levels for this assessment has been collected from the nearby ground investigation boreholes (SA1099A and SR1099C), located within 70m to the northwest of the Falconbrook Pumping Station site. These boreholes have response zones[ix] (EA, 2006)[4] in the River Terrace Deposits and are monitoring groundwater levels in the upper aquifer. The locations are shown in Vol 11 Figure 13.4.3 (see separate volume of figures).

13.4.7 The recorded water levels in the River Terrace Deposits at SA1099A and SR1099C range between 100.62mATD and 100.98mATD. These water levels consistently remained below the top of the formation, which is at 101.09mATD, indicating that this formation is not fully saturated at this location. The water levels show variation and fluctuate with the tidal cycle. The average, minimum and maximum recorded water levels in the River Terrace Deposits are shown in Vol 11 Table 13.4.2.

Vol 11 Table 13.4.2 Groundwater – water level summary

Borehole ID	Maximum water level (mATD)	Minimum water level (mATD)	Average water level (mATD)
SA1099A	100.98	100.65	100.78
SR1099C	100.84	100.62	100.73

13.4.8 A plot of the groundwater levels within the River Terrace Deposits in the vicinity of the site is shown in Vol 11 Figure 13.4.3 (see separate volume of figures). The data collected is all from boreholes to the west of the site and it is therefore not possible to accurately determine the direction of groundwater flow in the upper aquifer. It is likely that the direction of groundwater movement would be with topography from south to north, towards the River Thames, in these shallow deposits.

Licensed abstractions

13.4.9 There are no licensed groundwater abstractions within in the upper aquifer within 1km of the site. The licensed abstractions from the Chalk are unlikely to be impacted as no construction would take place in or around lower aquifer.

13.4.10 There are no known unlicensed groundwater abstractions from the upper aquifer within 1km of the Falconbrook Pumping Station site.

Groundwater source protection zone

13.4.11 The EA defines a Source Protection Zone (SPZ) around all major public water supply abstractions sources and large licensed private abstractions in order to safeguard groundwater resources from potentially polluting activities. The nearest SPZ for a Chalk source (lower aquifer) is located at approximately 2.2km to the northeast of the Falconbrook Pumping Station site.

[ix] Response zone – the section of a borehole that is open to the host strata (EA, 2006)

Environmental designations

13.4.12 There are no designations relevant to groundwater within 1km of the Falconbrook Pumping Station site.

Groundwater quality and land quality

13.4.13 The groundwater quality data presented in Vol 11 Appendix K.7, Vol 11 Table K.6 has been sourced from the ground investigation and monitoring works undertaken as part of the Thames Tideway Tunnel project and includes data from monitoring boreholes (SR1099C, SR1102A and SA1101) located at approximately 70m, 830m and 900m respectively from the site (for locations see Vol 11 Figure 13.4.1 in separate volume of figures). The data has been compared with the UK drinking water standards (The Water Supply Regulations, 2000)[5] or relevant Environmental Quality Standards – EQS) (River Basin Districts Typology, Standards and Groundwater Threshold Values, 2010)[6].

13.4.14 The data shows exceedances of the relevant standards for ammonia, nitrate, sulphate and turbidity in close proximity to the Falconbrook Pumping Station site at SA1099A and SR1099C (at 70m from the site) and for hydrocarbons, pesticides and heavy metals further from site at SR1102A and SA1101 (located 830m and 900m from the site respectively). Further details are included in Vol 11 Appendix K.7.

13.4.15 The land quality data from the ground investigation boreholes used in the groundwater quality assessment show several exceedances of the human health screening values(EA, 2009)[7] (soil guideline values designed to be protective of human health) with respect to hydrocarbons, heavy metals within the Made Ground and the River Terrace Deposits. Further detail is provided in the land quality assessment (see Vol 11 Appendix F).

Groundwater flood risk

13.4.16 The closest recorded groundwater flooding incident is 500m to the east of the site, based on information from the LB of Wandsworth Surface Water Management Plan (SWMP) (Capita Symonds and Scott Wilson, 2011)[8].

Groundwater receptors

13.4.17 Groundwater receptors which could be affected during construction or operation are summarised in Vol 11 Table 13.4.3 below. It can be seen that the only receptor of relevance to the Falconbrook Pumping Station site and which has therefore been assessed, is the upper aquifer.

Vol 11 Table 13.4.3 Groundwater – receptors

Receptor	Construction	Operation	Comment
Groundwater body – upper aquifer	✓	✓	Penetrated by CSO drop shaft, interception chamber and connection culvert
Groundwater body - lower aquifer	✗	✗	Base of CSO drop shaft more than 20m above the lower aquifer

Receptor	Construction	Operation	Comment
Licensed abstractions – upper aquifer	✗	✗	No licensed abstractions from the upper aquifer within 1km of site
Unlicensed Abstractions	✗	✗	No known unlicensed abstractions from the upper aquifer within 1km of site
Planned developments	✗	✗	No impact on groundwater in the upper aquifer

Note: Symbols ✓ applies ✗ does not apply

Receptor sensitivity

13.4.18 The upper aquifer (River Terrace Deposits) is classified by the EA as a secondary A aquifer and is allocated a medium value in terms of quality and quantity in this assessment.

Construction base case

13.4.19 The construction base case in Site Year 1 is as per the current baseline and also includes any developments that are likely to be complete and partially or fully operational during construction at the Falconbrook Pumping Station site and would have the potential to lead to a change to groundwater in the upper aquifer.

13.4.20 The basements associated with other developments identified in Vol 11 Table 13.3.1 may cause any disruption to groundwater flow in the upper aquifer. Any substantive changes from the baseline conditions prior to construction would be detected by monitoring of groundwater levels in the upper aquifer.

13.4.21 None of the proposed developments identified in Vol 11 Table 13.3.1 would impact on the lower aquifer and it can be concluded that there would be no change to the base case in Site Year 1 of construction.

Operational base case

13.4.22 The operational base case in Year 1 is as per the construction base case.

13.4.23 The Chelsea Creek SuDS scheme (see Vol 11 Table 13.3.2) is located on the other side of the River Thames and would not impact on groundwater levels in the upper at the Falconbrook Pumping Station site.

13.4.24 None of the proposed developments identified in Vol 11 Table 13.3.2 would impact on the lower aquifer and it is concluded that there would be no change from the current observed groundwater baseline (levels, movements and quality).

13.5 Construction effects assessment

Construction impacts

Groundwater quality

13.5.1 The baseline groundwater quality data available for the upper aquifer at the Falconbrook Pumping Station site shows four exceedances of the relevant standards for nutrients and turbidity in close proximity to the site (SA1099A and SR1099C at 70m from the site). No dewatering of the upper aquifer is required at the Falconbrook Pumping Station site and instead sheet and secant pile walls would be constructed around the CSO site and the interception structure excavations, there would be no potential for mobilisation of contamination at this site. The magnitude of the impact on the upper aquifer is assessed to be negligible.

13.5.2 The construction of the interception chambers may require grouting in the River Terrace Deposits to prevent ingress of water within the sheet or secant pile walls. There is the potential for grout contaminated groundwater (characterised by excess turbidity) to migrate and impact on groundwater quality in the upper aquifer. However grout setting generally occurs on a timescale of a few minutes and therefore in most circumstances the impact is likely to be localised. The magnitude of the impact on the upper aquifer is assessed to be negligible.

Physical obstruction

13.5.3 The presence of the sheet and secant pile walls and the CSO drop shaft and interception structures excavations may disrupt groundwater flow and alter groundwater levels in the upper aquifer.

13.5.4 The method for assessing the impact of all below ground activities upon the groundwater levels in the upper aquifer is described in Vol 2 Appendix K.2. It has been estimated that the amount groundwater rise resulting during the construction phase at the Falconbrook Pumping Station site would be approximately 0.15m.

13.5.5 Based on the limited available data, groundwater levels in the upper aquifer (River Terrace Deposits) can reach 101mATD, which is approximately 3.5m below the existing ground surface at the Falconbrook Pumping Station site (around 104.5mATD). On this basis, the predicted rise in water levels (around 0.15m) is small (as a proportion of the distance between the ground level and the top of the upper aquifer). The magnitude of impact on the upper aquifer has been assessed to be negligible.

Construction effects

13.5.6 By combining the impacts above with the receptor value (see para. 13.4.19) the significance of the effects can be derived using the generic significance matrix (as detailed in Vol 2 Section 2). The results are described in the following sections.

Groundwater quality

13.5.7 A negligible impact on the upper aquifer, a medium value receptor for groundwater quality would result in a **negligible** effect.

13.5.8 A negligible impact on the upper aquifer would also be generated from the use of grouts, which would result in a **negligible** effect.

Physical obstruction

13.5.9 The predicted rise in groundwater levels of 0.15m is small. A negligible impact on the upper aquifer, a medium value receptor for groundwater quantity would result in a **negligible** effect.

13.6 Operational effects assessment

Operation impacts

Physical obstruction

13.6.1 The presence of the CSO drop shaft, interception chamber and connection culvert in the upper aquifer may disrupt groundwater flow and alter groundwater levels.

13.6.2 The method for assessing the impact upon the groundwater levels in the upper aquifer is described in Vol 2 Appendix K.2. It has been estimated that groundwater would rise during the operation phase at the Falconbrook Pumping Station site by approximately 0.02m.

13.6.3 The predicted rise in water levels of 0.02m is small as a proportion of the distance between the ground level and the top of the upper aquifer (3.5m). This small predicted rise in water levels is less than the predicted rise during the construction phase as the secant or sheet piles, where not part of operational structure, would be broken out or pipes cut through to reduce the build of groundwater. The magnitude of impact on the upper aquifer has been assessed to be negligible.

Seepage into CSO drop shaft

13.6.4 An estimate of the theoretical seepage volume into the CSO drop shaft at the Falconbrook Pumping Station site is included in Vol 2 Appendix K.3. The estimated loss of water resources from the upper aquifer is $46m^3$/annum (Vol 2 Appendix K.3, Vol 2 Table K.4) and is assessed as negligible for the upper aquifer.

Seepage from CSO drop shaft

13.6.5 An estimate of the theoretical seepage volumes from the CSO drop shaft at Falconbrook Pumping Station is included in Vol 2 Appendix K.3. The shaft would be full for only approximately 3% of the year or 11 days per year (see Vol 3 Section 13). The estimated volume of seepage from the drop shaft into the upper aquifer is $1m^3$/annum (Vol 2 Appendix K.3, Vol 2 Table K.5). In addition, higher heads outside the drop shaft means that any risk of seepage from the drop shaft into the upper aquifer would be further reduced. The magnitude of impact has been assessed as negligible for the upper aquifer.

13.6.6 No other operational impacts are envisaged.

Operational effects

13.6.7 Combining the receptor value (see para.13.4.18) with the impacts identified above, the significance of the effects can be derived using the generic significance matrix (as detailed in Vol 2 Section 2). The results are described in the following sections.

Physical obstruction

13.6.8 The predicted rise in groundwater levels of less than 0.02m is small. A negligible impact on the upper aquifer, a medium value receptor for groundwater quantity, would lead to a **negligible** effect.

Seepage into CSO drop shaft

13.6.9 The seepage into the drop shaft would be very small. A negligible impact on the upper aquifer, a medium value receptor for groundwater quantity, would lead to a **negligible** effect.

Seepage from CSO drop shaft

13.6.10 The drop shaft would be constructed with a secondary lining and would only be full on a few occasions a year. A negligible impact on the upper aquifer, a medium value receptor for groundwater quality, would lead to a **negligible** effect.

13.7 Cumulative effects assessment

Construction effects

13.7.1 One development has been identified in Vol 11 Table 13.3.1 which could potentially give rise to cumulative effects relevant to groundwater in the upper aquifer through the inclusion of a basement and SuDS (non-infiltration type assumed given the London Clay geology underlying the site). The development is located 0.9km distance away from the Falconbrook Pumping Station site and the potential use of SuDS at this development are unlikely to cause any disruption to groundwater flow in the upper aquifer. No cumulative construction effects are therefore anticipated.

Operational effects

13.7.2 No cumulative operational effects assessment is required as development schemes identified already form part of the base case prior to the operational phase of the Thames Tideway Tunnel project. Therefore, the effects on groundwater during operation would remain as described in Section 13.6.

13.8 Mitigation

13.8.1 There are few impacts from the construction phase and those which have been identified would have negligible effects and therefore no mitigation is required.

13.8.2 For the operational phase, no significant adverse effects have been identified and therefore no mitigation is proposed.

13.9 Residual effects assessment

Construction effects

13.9.1 As no mitigation measures are required, the residual construction effects remain as described in Section 13.5. All residual effects are presented in Section 13.10.

Operational effects

13.9.2 As no mitigation measures are required, the residual operational effects remain as described in Section 13.6. All residual effects are presented in Section 13.10.

13.10 Assessment summary

Vol 11 Table 13.10.1 Groundwater – construction assessment summary

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Upper aquifer	Deterioration in groundwater quality caused by creation of a pathway – upper aquifer	Negligible	None	Negligible
Upper aquifer	Deterioration in groundwater quality from grouting	Negligible	None	Negligible
Upper aquifer	Change in groundwater storage and flood risk as a result of physical obstruction in upper aquifer	Negligible	None	Negligible

Vol 11 Table 13.10.2 Groundwater – operational assessment summary

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Upper aquifer	Change in groundwater levels as a result of physical obstruction	Negligible	None	Negligible
Upper aquifer	Seepage into shaft affecting groundwater resources	Negligible	None	Negligible
Upper aquifer	Deterioration in water quality in the upper aquifer from seepage out of shaft	Negligible	None	Negligible

References

[1] Defra. *National Policy Statement for Waste Water* (2012).

[2] Environment Agency*. Introducing pollution prevention: PPG 1 – EA Consultation* (2011)

[3] British Geological Survey. *British geology onshore digital maps 1:50 000 scale*. Received from Thames Tunnel, February 2009.

[4] Environment Agency. *Guidance on the design and installation of groundwater quality monitoring points* Science Report SC020093 (2006). Available at: http://publications.environment-agency.gov.uk/PDF/SCHO0106BKCT-E-E.pdf

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[8] Capita Symonds and Scott Wilson. *London Borough of Wandsworth Surface Water Management Plan.* (September 2011).

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 14: Water resources - surface water

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 14: Water resources – surface water

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14 Water resources – surface water

14.1 Introduction

14.1.1 This section presents the findings of the assessment of the likely significant effects of the proposed development on surface water at the Falconbrook Pumping Station site. The assessment of surface water presented in this section has considered the requirements of the *National Policy Statement for Waste Water,* 2012 (NPS)[1]. The physical characteristics of the surface water environment including surface water resources and quality are presented and the anticipated effects (including cumulative effects) on these resources addressed in the assessment that follows. Further details on how the NPS requirements relevant to surface water resources have been met can be found in Vol 2 Section 14.3.

14.1.2 The proposed development has the potential to affect surface water resources (ie, surface waterbodies including the tidal reaches of the River Thames [tidal Thames]) due to:

a. construction activities

b. operation of the main tunnel

14.1.3 The assessment of construction and operational effects on surface water includes the following:

a. identification of existing surface water resources baseline conditions

b. determining base case conditions against which the proposed development has been assessed

c. assessment of significant effects of the proposed development during construction and operation

d. identification of mitigation measures and the residual effects both during construction and operation

14.1.4 The assessment of surface water partially overlaps with that for groundwater, land quality, aquatic ecology and flood risk. Effects on groundwater resources are assessed separately in Section 13 of this volume. Land quality is addressed in Section 8 Land quality. Effects on aquatic ecology are assessed in Section 5 of this volume. A Flood Risk Assessment (FRA), which assesses the effects of the proposed development on surface water run-off and considers the use of Sustainable Drainage Systems (SuDS), has been carried out separately and is included in Section 15 of this volume.

14.1.5 This assessment covers the effects of the proposed developed at the Falconbrook Pumping Station site and in particular in relation to the interception of the Falconbrook Pumping Station combined sewer overflow (CSO). It is however important to recognise that whilst the reduction in spills from the Falconbrook Pumping Station CSO would be important to water quality in the immediate area of the CSO outfall, the overall water quality benefits in any part of tidal Thames would accrue as a result of the project as a whole, rather than a single part of it. The catchment-wide effects on the tidal Thames, particularly the water quality improvements anticipated from the proposed Thames Tideway Tunnel project are assessed separately and presented in Volume 3 Project-wide effects assessment Section 14.

14.1.6 Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

14.2 Proposed development relevant to surface water

14.2.1 The proposed development is described in Section 3 of this volume. The elements of the proposed development relevant to surface water are set out below.

Construction

14.2.2 The site is located within the grounds of the existing Thames Water Falconbrook Pumping Station, approximately 200m east of the River Thames. The site is split in two, with works proposed at the main site within the pumping station and on the nearby highway. For the purposes of this assessment both sites have been considered together and will be referred to as the site.

14.2.3 There is no direct pathway to the tidal Thames, but it is considered that an indirect pathway to the river is present via the surface water and combined drainage system (as shown on the Construction plans, see separate volume of figures – Section 1).

14.2.4 The CSO drop shaft would be constructed almost entirely within London Clay and it is assumed that dewatering and ground treatment would not be required at this location. The impacts on surface water resources from the disposal dewatering effluent have therefore not been considered in this assessment.

Code of Construction Practice

14.2.5 There is an indirect pathway for pollutants to be discharged to the tidal Thames via surface water drains. The *Code of construction practice (CoCP)*[i] Part A (Section 8) includes a number of measures to minimise the potential for impacts to surface waters, including impacts such as discharge of pollutants via surface water drains, and these are summarised below.

14.2.6 Appropriate drainage, sediment and pollution control measures are included in the *CoCP* Part A (Section 8). These are in accordance with the relevant Pollution Prevention Guidelines (PPGs) issued by the Environment Agency (EA) and other Construction Industry Research and Information Association (CIRIA) documents.

[i] The *Code of Construction Practice (CoCP)* is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

14.2.7 All site drainage would be drained and discharged to mains foul or combined sewers. Where this is not practicable, the site would be drained such that accumulating surface water would be directed to holding or settling tanks, separators and other measures prior to discharge to surface water drains. Foul drainage from the site welfare facilities would be connected to the mains foul or combined sewer.

14.2.8 Suitable spill kits would be provided and positioned in vulnerable areas and staff would be trained in their use and a record would be kept of all pollution incidents or near-misses, to ensure appropriate action is taken and lessons are learned from incidents. Regular 'toolbox talks' would be held to raise staff awareness of pollution prevention and share lessons learned from any recorded incidents. There would be written procedures in place for dealing with spillages and pollution (The *Pollution Incident Control Plan* or *PICP*).

14.2.9 There are no site specific measures incorporated in the *CoCP* Part B (Section 8) relevant to the surface water assessment. There is a measure in *CoCP* Part B (Section 8) for this site that relates to SuDS and flood alleviation; this is only of relevance to the FRA contained in Section 15 of this volume.

Operation

14.2.10 The operation of the main tunnel would enable the interception of combined sewage generated during storms which would otherwise discharge to the tidal Thames at the Falconbrook Pumping Station CSO. There would therefore be a reduction in the frequency, duration and volume of spills from this CSO.

14.3 Assessment methodology

14.3.1 The methodology used for the assessment of effects on surface water differs from the standard Website Transport Analysis Guidance (WebTAG)[2] (DFT, 2003) environmental impact assessment (EIA) methodology for Water Resources, in that the requirements of the Water Framework Directive (WFD) have also been taken into account. In the absence of an EIA specific assessment methodology for WFD compliance, an assessment methodology has been derived specifically for the project to assess significance of effect. The methodology also takes into consideration the requirements of the Urban Waste Water Treatment Directive (UWWTD)[3] and is outlined in Vol 2 Section 14. A WFD assessment for the project as a whole is presented in Vol 3 Section 14.

Engagement

14.3.2 Vol 2 documents the overall engagement which has been undertaken in preparing the *Environmental Statement*. The *Scoping report* was prepared before Falconbrook Pumping Station had been identified as a preferred site. The scope for the assessment of surface water for this site has therefore drawn on the scoping response from the LB Wandsworth and is based on professional judgement as well as experience of similar sites

14.3.3 Vol 2 Section 14 summarises the engagement that has been undertaken for the surface water assessment and summarises consultation responses relevant to surface water.

14.3.4 There are no site specific engagement comments relevant to the surface water assessment at the Falconbrook Pumping Station site.

Baseline

14.3.5 The baseline methodology follows the methodology described in Vol 2 Section 14. There are no site specific variations for identifying baseline conditions for this site.

Construction

14.3.6 The assessment methodology for the construction phase follows that described in Vol 2 Section 14. There are no site specific variations for undertaking the construction assessment of this site.

14.3.7 The assessment year for construction effects is Site Year 1 when construction would commence. No modelled water quality data are available for this year. The water quality conditions for the base case have therefore been derived from available modelled simulation data which uses population projections for 2021. This assumption is considered reasonable as substantial changes in water quality are considered unlikely between 2018 and 2021.

14.3.8 The Lee Tunnel and the sewage works upgrades at Mogden, Beckton, Crossness, Long Reach and Riverside sewage treatment works (STWs) would be operational by the time construction of the Thames Tideway Tunnel project commences, as described in Vol 2 Section 14. Significant improvements in the water quality in the tidal Thames are anticipated as a result of these projects. Both the construction base case and the operational base case would be the water quality in the tidal Thames with the Lee Tunnel and sewage works upgrades in place.

14.3.9 The construction base case has considered the developments that are scheduled to be complete and in operation by Site Year 1 (details presented in Vol 11 Appendix N). These developments would not result in additional surface water receptors (ie, waterbodies) and are considered unlikely to result in changes in water quality as they are remote from the tidal Thames. The base case would therefore not change from that outlined above.

14.3.10 Phases of the Chelsea Creek development would be under construction during Site Year 1. These phases have been considered in the cumulative effects assessment (see Section 14.7).

14.3.11 The assessment area for the effects of construction activities at the Falconbrook Pumping Station site would be limited to two sections of the river, namely the Thames Upper and Thames Middle waterbodies, listed below in Vol 11 Table 14.4.1.

14.3.12 Section 14.5 details the likely significant effects arising from the construction at the Falconbrook Pumping Station site. There are no other Thames Tideway Tunnel project sites which could give rise to additional effects on surface water within the assessment area for this site, therefore no other Thames Tideway Tunnel project sites are considered in this assessment.

Operation

14.3.13 The assessment methodology for the operation phase follows that described in Vol 2 Section 14. There are no site specific variations for undertaking the operational assessment of this site.

14.3.14 The assessment year for operation effects is Year 1 of operation. As with the construction assessment, the operational assessment also relies on modelled water quality data which uses population projections for 2021. In addition, the influence of climate change on the proposed development has been assessed in 2080.

14.3.15 As noted above, the operational base case would be the water quality in the tidal Thames with the Lee Tunnel and sewage works upgrades in place. The operational base case has also considered the developments within 1km of the Falconbrook Pumping Station site that are scheduled to be complete and in operation by Year 1 (details presented in Vol 11 Appendix N). These developments would not result in additional surface water receptors and are considered unlikely to result in changes in water quality as they are remote from the tidal Thames. The base case would therefore not change from that outlined above.

14.3.16 No developments have been identified that would be under construction during Year 1 of operation, therefore a cumulative effects assessment has not been undertaken for the operation phase (see Section 14.7).

14.3.17 The operational assessment uses the same assessment area identified above for the construction assessment. Section 14.6 details the likely significant effects arising from the operation at the Falconbrook Pumping Station site.

Assumptions and limitations

14.3.18 The assumptions and limitations associated with this assessment are presented in Vol 2 Section 14. Based on the geology at the site, it is assumed that no dewatering and or ground treatment would be required. There are no other assumptions and limitations specific to the assessment of this site.

14.4 Baseline conditions

14.4.1 The following section sets out the baseline conditions for surface water within and around the site. Future baseline conditions (base case) are also described.

Current baseline

Water quality

14.4.2 A list of all surface water receptors and their WFD status given in the River Basin Management Plan (EA, 2009)[4] (RBMP) which are either adjacent to the site, or downstream of the site and therefore have the potential to be affected by the proposed development[ii], is included in Vol 11 Table 14.4.1 below.

14.4.3 The overall classification of status or potential under the WFD is a detailed process, which includes an assessment of water quality physico-chemical and hydromorphological elements. Reference should be made to the United Kingdom Technical Advisory Group (UKTAG)[5] guidance, as given in the RBMP (EA, 2009)[6].

Vol 11 Table 14.4.1 Surface water – receptors

Waterbody name/ID	Hydro-morphological status	Current ecological quality	Current chemical quality	2015 Predicted ecological quality	2015 Predicted chemical quality	2027 target status
Thames Upper GB530603911403	Heavily Modified	Moderate Potential	Good	Moderate Potential	Good	Good
Thames Middle GB530603911402	Heavily Modified	Moderate Potential	Fail	Moderate Potential	Fail	Good

14.4.4 The River Thames and its Tidal Tributaries are designated as a Site of Importance for Nature Conservation (Grade III of Metropolitan importance). The Thames Upper (which stretches from Teddington to Battersea Bridge) and Thames Middle (which stretches from Battersea Bridge to Mucking Flats) waterbodies are considered to be high value waterbodies as although the current and predicted status in 2015 (target date from RBMP [EA, 2009][7]) is moderate potential, a status objective of good by 2027 has been set. In addition, the tidal Thames is a valuable resource, habitat and source of amenity, recreation and transport throughout London.

14.4.5 Sediment levels within the tidal Thames are estimated to currently reach a peak of 4,000kg/s in the lower tidal Thames estuary, or more than 40,000t (or 20,000m^3 assuming an in-situ density of 2t per m^3) of sediment a day during spring tides (HR Wallingford, 2006)[8].

14.4.6 There are no licensed surface water abstractions within 1km of the Falconbrook Pumping Station CSO.

14.4.7 The Falconbrook Pumping Station CSO outfall lies between the Putney and Cadogan Automatic Quality Monitoring Station (AQMS) monitoring points, approximately 2km downstream of Putney and approximately 1km upstream of Cadogan, as shown in Vol 11 Figure 14.4.1 (see separate

[ii] The EA has provided advice on CSO excursion areas[ii], which states that CSOs below Tower Bridge will only impact the Thames Middle waterbody and those upriver of Tower Bridge will impact both the Thames Upper and Thames Middle waterbodies.

volume of figures). 2011 summary data from these two AQMS monitoring points, which give 90 percentile values for ammonium (concentration that is exceeded 10% of the time) and 10% percentile values for dissolved oxygen (DO) (concentration exceeded 90% of the time), are presented below in Vol 11 Table 14.4.2 and Vol 11 Table 14.4.3.

Vol 11 Table 14.4.2 Surface water – Cadogan Pier AQMS 2011

Month	DO (mg/l) (10%)	Ammonium (mg/l) (90%)
January	11.06	4.15
February	9.18	0.57
March	8.44	0.84
April	5.89	1.54
May	6.15	1.84
June	3.7	1.68
July	3.17	1.90
August	3.04	3.06
September	4.34	4.04
October	5.60	6.24
November	5.22	4.80
December	8.09	4.41

Vol 11 Table 14.4.3 Surface water – Putney Pier AQMS 2011

Month	DO (mg/l) (10%)	Ammonium (mg/l) (90%)
January	11.00	0.94
February	9.76	0.89
March	8.66	0.67
April	6.17	1.10
May	5.31	1.76
June	3.03	1.78
July	2.62	1.60
August	3.08	1.40
September	3.67	2.99
October	4.70	2.96
November	6.15	3.50
December	10.16	3.36

14.4.8 The data presented above demonstrate that the dissolved oxygen (DO) levels in the tidal Thames decrease in the summer months, as there is an inverse relationship between temperature and oxygen saturation ie, warmer water holds less DO than colder water. The discharge from the Falconbrook Pumping Station CSO has the effect of depleting DO in the tidal Thames as a result of the biological breakdown of organic matter in the discharges. This causes both a localised (at Falconbrook Pumping Station CSO) and more widespread (tidal Thames wide) effect of rapidly dropping DO levels. Vol 3 Section 14 details half-tide plots displaying the changes in DO levels along the tidal Thames.

14.4.9 Historical mapping shows contaminative activities on site to be limited to the sewage pumping station and electrical substation. A 250m search radius[iii] shows the surrounding area comprised an industrial area to the west of the site and a mixed use residential/community area to the east of the site. An assessment of potential on-site contamination is provided within Section 8 of this volume.

Current CSO operation

14.4.10 The current operation of the Falconbrook Pumping Station CSO has been characterised using the catchment model of the sewer system (See Vol 3 Section 14 for further details of catchment modelling), and the annual average duration, frequency and volume of spill have been defined as follows:

a. the CSO spills on average 42 times in the Typical Year[iv]

b. the CSO spills for a total duration of 267 hours in the Typical Year

c. the spill volume from the CSO is approximately 709,000m^3 in the Typical Year, representing 1.8% of the total volume discharged to the tidal Thames in the Typical Year

14.4.11 Using the same catchment model, the annual polluting loading of biochemical oxygen demand (BOD), ammonia and total Kjeldahl nitrogen (TKN) (the sum of organic nitrogen, ammonia [NH_3], and ammonium [NH_4^+]) of spill from the Falconbrook Pumping Station CSO has been defined as follows:

a. the CSO discharges 59,000 kg of BOD in the Typical Year

b. the CSO discharges 2,000 kg of ammonia in the Typical Year

c. the CSO discharges 9,100 kg of TKN in the Typical Year.

14.4.12 Each discharge increases the risk of exposure to pathogens for river users who come into contact with the water. An assessment of health impacts upon recreational users of the River Thames was conducted and reported by the Health Protection Agency in 2007 (Lane, C, Surman-Lee, S, Sellwood, J and Lee, JV, 2007)[9] . The study concluded that risk of

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[iii] 250m buffer has been included within the assessment area in order to take account of any off-site sources / receptors, as discussed in the Volume 2 Section 8 Land Quality Methodology.

[iv] Typical Year: single year which is most representative of an observed typical year of rainfall with the dataset. The 1979-1980 'water year' defined as the 12 month period ending on the 30th September 1980

infection can remain for two to four days following a spill as the water containing the sewage moves back and forward with the tide. The same study also noted that analysis of the illness events reported against discharges on the tidal Thames shows that 77% of cases related to rowing activities undertaken within three days of a CSO discharge.

14.4.13 Assuming the average 42 spills per annum from the Falconbrook Pumping Station CSO occur on separate days, there could be up to 168 days per year where recreational users are at risk of exposure to pathogens in the vicinity of the outfall as a result of the Falconbrook Pumping Station CSO alone (Lane, C, Surman-Lee, S, Sellwood, J and Lee, JV , 2007)[10].

14.4.14 The operation of the Falconbrook Pumping Station CSO results in the discharge of sewage litter along with the discharge of effluent. It has been estimated by the *Thames Tideway Strategic Study* (TTSS) (Thames Water, 2005) that overflows from all the CSOs along the tidal Thames introduce approximately 10,000t of sewage derived solid material to the tidal Thames annually. Catchment modelling of the current CSO operation has defined the average volume of discharge from the Falconbrook Pumping Station CSO and assuming litter tonnages are proportional to discharge volumes, this would indicate that approximately 180t of sewage derived litter is discharged from the Falconbrook Pumping Station CSO in the Typical Year. An assessment of the amenity effects of the sewage litter is given in Vol 3 Section 10 Socio-economics.

Construction base case

14.4.15 As explained in Section 14.3, both the construction base case and the operational base case would therefore be the water quality in the tidal Thames with the Lee Tunnel and sewage works upgrades in place (further details are provided below under operational base case).

14.4.16 The base case in Site Year 1 of construction taking into account the schemes described in Section 14.3 would not change since no new sensitive receptors would be introduced.

Operational base case

14.4.17 As noted above, the operational base case would be the same as the construction base case and would include water quality improvement achieved by the Lee Tunnel and the sewage works upgrades.

14.4.18 The base case in Year 1 of operation, taking into account the schemes described in Vol 11 Appendix N, would not change since the developments are remote from the tidal Thames.

14.4.19 Catchment modelling results of the base case has demonstrated that by Year 1 of operation (assessed using 2021 modelled assumptions), the duration and volume of spills from the Falconbrook Pumping Station CSO would have increased (as a result of increased population) beyond the current baseline as follows:

a. the CSO would spill 42 times in the Typical Year (the same as the current baseline)

b. the CSO would spill for a total duration of 291 hours in the Typical Year (24 hours more than the current baseline)

c. the spill volume from the CSO would be approximately 780,000m^3 in the Typical Year (71,000m^3 more than the current baseline).

14.4.20 The same catchment modelling has demonstrated that by the operational assessment year the annual polluting loading of BOD, ammonia and would have increased (as a result of increased population) beyond the current baseline as follows:

a. the CSO would discharge 105,200kg of BOD in the Typical Year (46,200kg more than the current baseline)

b. the CSO would discharge 4,100kg of ammonia in the Typical Year (2,100kg more than the current baseline)

c. the CSO would discharge 17,100kg of TKN in the Typical Year (8,000kg more than the current baseline).

14.4.21 Following on from the interpretation of the current baseline as per para.14.4.12, the number of risk days for river users being exposed to pathogens during the operational base case year (taking into account 2021 modelled assumptions) would be a maximum of 168 days in the Typical Year as a result of spills from the Falconbrook Pumping Station CSO alone.

14.4.22 The tonnage of sewage derived litter discharge from the Falconbrook Pumping Station CSO can be expected to increase by approximately 10% from approximately 180t to approximately 199t in the Typical Year.

14.5 Construction effects assessment

14.5.1 This section presents an overview of the construction impacts that could occur at the site and identifies where no assessment of effects is required them (for example where the impact pathway has been removed). The second part of the section identifies any effects that may occur and the likely significance of these effects.

Construction impacts

Surface water drainage

14.5.2 There is an indirect pathway to the river for contaminated runoff, high suspended solids and other pollution from the site. However, appropriate site drainage would be used to control pollutants in the general site runoff, preventing the discharge of pollutants via combined or surface water drains as part of the surface water discharge from the construction site (see *CoCP* Part A (Section 8)). This would enable the pollution pathway to be removed and therefore there is considered to be no impact from this source. Therefore surface water drainage is not considered further within this assessment.

Construction effects

14.5.3 The assessment above has not identified any potential impacts as a result of the proposed development; therefore no significant construction effects are considered likely for the construction phase at this site.

14.6 Operational effects assessment

14.6.1 This section presents the operational impacts that could occur at the site. The second part of the section identifies any effects that may occur and the likely significance of these effects.

Operational impacts

Reduction in Falconbrook Pumping Station CSO spills

14.6.2 Catchment modelling of the operational development case (with the operational Thames Tideway Tunnel project) predicts that by Year 1 of operation, the frequency, duration and volume of spills from the Falconbrook Pumping Station CSO would substantially decrease (as a result of the capture of combined sewage overflows into the tunnel) as follows:

a. the CSO would spill four times in the Typical Year (38 times less than the operational base case)

b. the CSO would spill for a duration of 22 hours in the Typical Year (269 hours less than the operational base case)

c. the spill volume from the CSO would be approximately 45,000m^3 in the Typical Year (735,000m^3 less than the operational base case).

14.6.3 The frequency, duration and volume of spills at the Falconbrook Pumping Station CSO would therefore be reduced by approximately 94% as a result of the operation of the Thames Tideway Tunnel project.

14.6.4 Given the reduction in spills, the number of risk days in which river users would be exposed to pathogens in the development case year as a result of spills from the Falconbrook Pumping Station CSO would be a maximum of 16 days in the Typical Year (a reduction of up to 152 days of risk of exposure).

14.6.5 Similarly, the tonnage of sewage derived litter from the CSO can be expected to reduce by approximately 94% from approximately 199t to approximately 12t in the Typical Year.

14.6.6 The reduction in polluting load that would be discharged from the CSO with the project in place would be as follows:

a. the CSO would discharge 5,500kg of BOD in the Typical Year (99,700kg less than the operational baseline)

b. the CSO would discharge 210kg of ammonia in the Typical Year (3,890kg less than the operational baseline)

c. the CSO would discharge 890kg of TKN in the Typical Year (16,210kg less than the operational baseline).

14.6.7 Catchment modelling of the 2080 future development case (to account for the effects of climate change and predicted increases to population) has simulated that by 2080 with the project in place, the frequency, duration and volume of the Falconbrook Pumping Station CSO would be the following:

a. the CSO would spill on average three times per year (once less than the Year 1 of operation development case)

b. the CSO would spill for an average duration of 26 hours (four more than the Year 1 of operation development case)

c. the spill volume from the CSO would be approximately 85,558m^3 per year (40,558m^3 more than the Year 1 of operation development case).

14.6.8 It is predicted that in the 2080 development case scenario the Falconbrook Pumping Station CSO will reduce in spill frequency, but increase in total spill duration and volume. These changes in spill frequency, duration and volume would be due to the impact of climate change, which is expected to lead to fewer, but more intense rainfall events during winter and drier summers.

14.6.9 Climate change is also predicted to increase average water temperatures, which combined with changes to rainfall patterns could affect water quality in the tidal Thames. As these water quality changes would be realised across the tidal Thames they have been assessed in Vol 3 project-wide and climate change is not considered further within this site assessment.

Operational effects

14.6.10 The potential surface water impacts identified above as likely as a result of operation at Falconbrook Pumping Station have been assessed for significance against the relevant WFD objectives as described in Vol 2 Section 14 and summarised below.

14.6.11 The WFD objectives as taken from Article 4 of the WFD are as follows:

a. WFD1 – Prevent deterioration of the status of all bodies of surface water

b. WFD2 – Protect, enhance and restore all bodies of surface water, with the aim of achieving good surface water status by 2015

c. WFD3 – Protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015

d. WFD4 – Reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances

14.6.12 The significance of these effects has then been assessed based on the magnitude of the effect as described in Vol 2 Section 14.

Reduction in Falconbrook Pumping Station CSO spills

14.6.13 The reduction in spills from the Falconbrook Pumping Station CSO would represent an important contribution towards:

a. meeting the requirements of the Urban Waste Water Treatment Directive (May 1991)[11] (UWWTD) in relation to the Falconbrook Pumping Station CSO

b. meeting the required TTSS DO standards

c. moving the tidal Thames towards its target status under the WFD, both locally and throughout the tidal Thames

14.6.14 Therefore, the reduction in spills would result in a **major beneficial** effect most notably in the context of the UWWTD. However it should be noted that, as explained in Section 14.1, the water quality in the vicinity of the Falconbrook Pumping Station CSO outfall also depends on the project-wide improvements, as documented in Vol 3 Section 14.

14.6.15 The associated reduction in exposure to pathogens would greatly improve the conditions for recreational users of the tidal Thames around the Falconbrook Pumping Station CSO, allowing the tidal Thames in this location to be used more frequently with a reduced risk of exposure. This is considered to be a **moderate beneficial** effect.

14.6.16 The reduction in sewage litter discharge would also improve the aesthetic quality of the tidal Thames locally, improving conditions for recreational users. This is considered to be a **moderate beneficial** effect. As explained in Section 14.4, an assessment of the amenity effects of the sewage litter is given in Vol 3 Section 10 Socio-economics.

14.7 Cumulative effects assessment

14.7.1 Considerable improvements in the water quality of the tidal Thames will occur as a result of the works associated with the Lee Tunnel and sewage works upgrades. These already form part of the base case and so are not considered as part of the assessment of cumulative effects.

14.7.2 Of the projects described in Vol 11 Appendix N which could potentially give rise to cumulative effects with the proposed development at the Falconbrook Pumping Station site, it is not considered that any would lead to cumulative effects on surface water. This is because no significant effects are considered likely for the construction phase and also because the other development is not of sufficient scale such that it is likely to generate significant effects in relation to surface water quality. As explained in Section 14.3, no developments have been identified that would be under construction during Year 1 of operation, therefore a cumulative effects assessment has not been undertaken for the operational phase.

14.7.3 No significant cumulative effects have therefore been identified for the construction or operational phases at this site and therefore the effects on surface water would remain as described in Section 14.5 and Section 14.6 above.

14.8 Mitigation

14.8.1 No significant adverse effects have been identified and therefore no mitigation is required.

14.9 Residual effects assessment

Construction effects

14.9.1 As no mitigation measures are proposed the residual construction effects remain as described in Section 14.5. All residual effects are presented in Section 14.10.

Operational effects

14.9.2 As no mitigation measures are proposed, the residual operational effects remain as described in Section 14.6. All residual effects are presented in Section 14.10.

14.10 Assessment summary

Vol 11 Table 14.10.1 Surface water resources – construction assessment summary

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Thames Upper and Middle	The assessment has not identified any likely significant adverse effects.	N/A	N/A	N/A

Vol 11 Table 14.10.2 Surface water resources – operational assessment summary

Receptor	Effect	Significance of effect	Mitigation	Significance of residual effect
Thames Upper and Middle	Compliance with UWWTD and WFD. Improved water quality in the vicinity of the Falconbrook Pumping Station CSO by reduced pollutant loading and no reduction of dissolved oxygen levels due to reduced spill frequency, duration and volume from the Falconbrook Pumping Station CSO.	Major beneficial	None	Major beneficial
Thames Upper and Middle	Risk of exposure days to pathogens would be reduced to a maximum of 16 days in the Typical Year (a reduction of up to 152 days of risk of exposure).	Moderate beneficial	None	Moderate beneficial
Thames Upper and Middle	Sewage derived litter discharge at Falconbrook Pumping Station CSO would be reduced by approximately 94% improving the aesthetic quality of the river locally.	Moderate beneficial	None	Moderate beneficial

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[11] *The Urban Waste Water Treatment Directive, Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0271:EN:NOT*

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Environmental Statement

Doc Ref: **6.2.11**

Volume 11: Falconbrook Pumping Station site assessment

Section 15: Water resources - flood risk

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Thames Tideway Tunnel

Environmental Statement

Volume 11: Falconbrook Pumping Station site assessment

Section 15: Water resources – flood risk

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15 Water resources – flood risk

15.1 Introduction

Background

15.1.1 This section forms a Flood Risk Assessment (FRA) for the Falconbrook Pumping Station site. This FRA has been developed in line with the requirements of the National Policy Statement (NPS) for Waste Water (Defra, 2012)[1] Section 4.4 and includes a qualitative appraisal of the flood risk posed to the site, the potential impact of the development on flood risk on and off the site and an appraisal of the scope of possible measures to reduce the flood risk to acceptable levels. Further details on how the NPS requirements relevant to flood risk have been met can be found in Volume 2 Environmental assessment methodology Section 15.3.

15.1.2 The proposed development is described in Section 3 of this volume. Plans of the proposed development as well as figures included in the assessment for this site are contained in a separate volume (Volume 11 Falconbrook Pumping Station Figures).

15.1.3 A summary of the regulations and policy that have informed the assessment are presented in this section. Section 15.2 provides a summary of the elements of the proposed development relevant to flood risk. Section 15.3 provides an assessment of the flood risk to the site and elsewhere as a result of the development, during both the construction and operational phases. Section 15.4 provides details of the design measures that have been adopted within the proposals to ensure the flood risk to the site is not increased and ensure that flood risk does not increase elsewhere.

15.1.4 The assessment of flood risk should be considered in conjunction with the assessment of other water resources ie, groundwater and surface water. The assessment of effects on groundwater and surface water is presented in Section 13 and Section 14 of this volume respectively.

15.1.5 A project-wide FRA has been undertaken and is presented in Volume 3 Project-wide effects assessment.

Regulatory context

15.1.6 This FRA has been developed in line with the Waste Water NPS. The NPS seeks to ensure that where the development of new waste water infrastructure is necessary in areas at risk of flooding, flood risk from all sources of flooding is taken into account at all stages in the planning process in order for the development to be safe without increasing flood risk elsewhere.

15.1.7 A review of relevant documents that inform flood risk and planning policy to the proposed development is provided in Volume 11 Appendix M.1.

NPS Sequential and Exception Tests

15.1.8 The Waste Water NPS aims to direct development towards low risk areas through the use of a sequential approach which avoids inappropriate development in areas at risk of flooding. Using this approach, preference should be given to locating projects in Flood Zone 1 although if there is no 'reasonably available site' in Flood Zone 1 then projects should be located in Flood Zone 2. However if there is no 'reasonably available site' in Flood Zones 1 or 2, then nationally significant waste water infrastructure projects can be located in Flood Zone 3 subject to the Exception Test.

15.1.9 The Exception Test is detailed in Section 4.4.15 of the NPS. The test requires overall sustainability benefits (part a) to outweigh flood risk, whilst ensuring the development is safe and does not increase flood risk elsewhere (part c) and is preferably located on previously developed land (part b).

15.1.10 The overall project is considered to pass the Sequential Test, as detailed in Vol 3 Section 15. The project-wide Exception Test is also detailed in Vol 3 Section 15.

15.1.11 The proposed development at the Falconbrook Pumping Station site would form an integral part of the Thames Tideway Tunnel project and so would help achieve the project-wide sustainability benefits outlined in the *Sustainability Statement*. Given the project-wide sustainability benefits, the proposed development is considered to satisfy part a) of the Exception Test.

15.1.12 The proposed development at the Falconbrook Pumping Station site would be located on previously developed land, therefore satisfying part b) of the Exception Test.

15.1.13 This FRA shows that the proposed development would be appropriate for the area as flood risk to the development would be managed through appropriate design measures and the development would not lead to an increase in flood risk on the surrounding areas. Therefore, part c) of the Exception Test has also been met.

15.2 Elements of the proposed development relevant to flood risk

15.2.1 The proposed development at this site is described in Section 3 of this volume. The site comprises two parts; a main site including the Thames Water Falconbrook Pumping Station and a disused toilet block, and the Falconbrook Pumping Station highway works site. The highway works have not been considered in the assessment as they are not relevant in terms of flood risk.

15.2.2 The elements of the proposed development relevant to flood risk are set out below.

Construction

15.2.3 The construction elements of the proposed development relevant to flood risk would include:

a. Construction of the Falconbrook connection tunnel that links the combined sewer overflow (CSO) interception to the main tunnel.

b. For the interception and connection an interception chamber, valve chamber, connection culvert and CSO drop shaft would be constructed.

c. Interception of numerous existing sewers through the construction of the interception chamber, upstream of the Falconbrook Pumping Station following the completion of the main tunnel.

d. Surface water drainage from the site would be reconstructed to reflect the layout of the permanent works. During the construction phase suitable replacement drainage would be provided.

Code of Construction Practice

15.2.4 Appropriate measures regarding emergency planning are included in the *Code of Construction Practice (CoCP)*. *CoCP* is provided in Vol 1 Appendix A. It contains general requirements (Part A), and site specific requirements for this site (Part B).

15.2.5 Appropriate emergency planning procedures would be adopted by the contractor during the construction phase to manage the potential consequences in the event of a breach in the flood defence wall at the site or a failure of the Thames Barrier.

15.2.6 The *CoCP* (Section 8) notes that no temporary living accommodation would be permitted onsite and that an evacuation route and safe refuge would be provided in the event of a flood event.

Operation

15.2.7 During the operational phase the following elements are proposed that are relevant to flood risk:

a. An above ground ventilation column and building to house air management plant and equipment.

b. Sewage flows would be intercepted upstream of the Falconbrook Pumping Station at the interception chamber and would be diverted to the main tunnel via the drop shaft and Falconbrook connection tunnel. The existing Falconbrook Pumping Station CSO Outfall and the Pumping Station itself would remain operational to spill when the main tunnel reaches capacity, or is unavailable during maintenance periods

c. Surface water runoff from the site would be attenuated on site and discharged to the site surface water drainage network. A brown roof would be installed on the ventilation structure.

15.3 Assessment of flood risk

Introduction

15.3.1 The NPS requires that all potential sources of flooding that could affect the proposed development are considered.

15.3.2 This assessment is based on an FRA screening exercise that identified relevant potential flood sources and pathways. The tidal and fluvial assessments were based on the flood zones which do not take account of the presence of existing defences.

15.3.3 The assessment of flood risk from the proposed development takes into account the proposed design measures detailed in Section 15.4.

15.3.4 It should be noted that due to the nature of a flood risk assessment, the risk based approach outlined in the National Planning Policy Framework (NPPF) (Communities and Local Government, 2012)[2] was considered to be preferable to the general environmental impact assessment (EIA) methodology described in Vol 2 Section 3. This approach is based on the probability of an event occurring as a result of the proposed development rather than a direct change in conditions. This is detailed further in Vol 2 Section 15.

Tidal flood risk to the proposed development

Level of risk based on flood zones

15.3.5 The Falconbrook Pumping Station site is located approximately 200m from the River Thames. The Environment Agency (EA) Flood Map identifies the site to lie within Flood Zone 3. The location of the site in relation to the flood zones is shown in Vol 11 Figure 15.3.1 (see separate volume of figures). As the site is located within Flood Zone 3a, although benefiting from the presence of flood defences, the risk of tidal flooding to the site is considered to be high (as detailed in Vol 2 Section 15).

Existing tidal defences

15.3.6 A raised flood defence wall is aligned along the edge of the River Thames approximately 200m to the west of the site. The site is also protected from tidal flooding by the Thames Barrier located approximately 23km downstream.

15.3.7 The EA stated that the statutory flood defence level relevant to the Falconbrook Pumping Station site is 5.41m Above Ordinance Datum (AOD). The National Flood and Coastal Defence Database (NFCDD) (EA, 2011)[3] crest level of the flood defences at the site are 5.41mAOD with a section at 5.37mAOD to the south, which in some places results in the crest height being below the statutory defence level

15.3.8 Condition surveys of the flood defences carried out by the EA in November 2010[4] state that the flood defences are in good condition (Grade 2).

15.3.9 The site is defended from tidal flooding to the statutory level, but floodwaters could inundate the site in the event overtopping (for example if the Thames Barrier fails to close during a tidal event) or a failure of the flood defences as a result of a breach.

15.3.10 The Strategic Flood Risk Assessment (SFRA) for the London Borough (LB) of Wandsworth (Scott Wilson Ltd , 2009)[5] quantifies the residual risk in the event of a breach in the local defence wall or overtopping as a result of a failure of the Thames Barrier. One of the selected breach locations

(P2) is located approximately 200m to the west of the Falconbrook Pumping Station site. The area of land in which the Falconbrook Pumping Station site is situated is designated in the SFRA as an area of low to high hazard (Defra and EA, 2006)[6i]. A flood depth of up to 0.9m would be experienced on the site in the modelled event. This risk is residual and has not been considered to compromise the long term operational function of the main tunnel, as this would be able to withstand full inundation during a breach or overtopping of the defences. Further detail regarding residual risk is included within Section 15.5.

Tidal flood level modelling

15.3.11 The most extreme flood risk scenario that could affect the site would be a combination of a high tide with a storm surge in the Thames Estuary. This scenario, assuming the Thames Barrier is operational, is the EA's 'design flood' event, a hypothetical flood representing a specific likelihood of occurrence, in this case the 1 in 200 year (0.5% Annual Exceedance Probability [AEP][ii]) flood event.

15.3.12 The EA *Thames Tidal Defences Joint Probability Extreme Water Level Study* (EA, 2008)[7] provides modelled tidal flood levels for the 1 in 200 year (0.5% AEP) flood event for specific locations (model node locations) within the River Thames.

15.3.13 Vol 11 Table 15.3.1 presents the modelled tidal levels from this study for years 2005 and 2107 and for model node 2.25 which is the most relevant (ie, closest) to the site (see Vol 11 Figure 15.3.1 in separate volume of figures). It should be noted that the water levels are expected to decrease in the future due to an amended future Thames Barrier closure rule (see Vol 2 Section 15) therefore the 2005 scenario produces the highest water level.

15.3.14 Vol 11 Table 15.3.1 also confirms that the existing level of flood defences close to the site is above the 0.5% AEP tidal flood level; therefore the site is protected from tidal flooding up to and above the 1 in 200 year flood event.

Vol 11 Table 15.3.1 Flood risk – modelled water levels

Return period	Flood level (mAOD)	NFCDD Flood defence level (mAOD)
0.5% AEP (2005)	5.07	5.37-5.41
0.5% AEP (2107)	5.04	

Tidal flood risk from the proposed development

15.3.15 The proposed development would not increase tidal flood risk elsewhere, as the development footprint would not impede flood flows or increase tidal levels, as a result of a breach or overtopping of the tidal defences. The proposed works would not affect the flood defence line.

[i] Designated using a combination of consequence and distance from the defence as per the Defra publication *Flood Risks to People Phase Two Draft*

[ii] A flood with a 0.5% AEP has a one in 200 year probability of occurring

Flood defence integrity

15.3.16 The main tunnel excavation process using tunnel boring machines (TBMs) and other construction methods, has the potential to create differential settlement (that is a gradual downward movement of foundations due to compression of soil which can lead to damage if settlement is uneven), which could affect the level of some of the existing flood defences. The proposed tunnel alignment passes under the existing River Thames defences approximately 200m to the west of the Falconbrook Pumping Station site and therefore has the potential to affect these defences.

15.3.17 The proposed design has been informed by consideration of settlement and the alignment and methods used have been selected to minimise it as far as possible.

15.3.18 A potential settlement of up to 7mm is estimated to occur at the flood defences 200m to the west of the site. The flood defence levels following settlement is estimated to range from 5.36mAOD to 5.41mAOD, with some sections falling below the EAs statutory defence level (5.41mAOD). However, it should be noted that the defences are currently already below the statutory level in this location at 5.37mAOD.

15.3.19 No other construction activities at the site would influence the integrity of the flood defences.

15.3.20 Where settlement of river walls is thought possible, this would be monitored and mitigated in agreement with the asset owner and the EA as appropriate. With this strategy in place, no effects of settlement are anticipated.

Loss of volume from the tideway

15.3.21 The presence of temporary and permanent structures within the foreshore has the potential to reduce the availability of flood storage within the River Thames. The impact of the removal of flood storage on flood levels may propagate throughout the hydrological unit of the Thames reach and has been modelled on a project-wide basis.

15.3.22 The Falconbrook Pumping Station site is not located on the foreshore of the River Thames but is still within the tidal influence of the River Thames. Therefore a consideration has been made regarding the implications of the project on water levels within the Tideway and the implications for flood defence freeboard at the Falconbrook Pumping Station site.

15.3.23 The Falconbrook Pumping Station site is located within the reach of Richmond to Chelsea in the tidal and fluvial modelling study. The modelling identifies that for this reach the potential maximum decrease in peak water level is 0.038m during the temporary works scenario reducing to 0.018m during the permanent scenario. The modelling also identifies a potential maximum increase of 0.017m in peak water level during the temporary works scenario reducing to 0.010m during the permanent scenario. As identified in para. 15.3.7 the flood defences at this site are above the statutory flood defence level and when compared to the 1 in 200 year tidal level for the year 2107 would provide 0.33-0.37m in freeboard. These predicted changes in water level and therefore freeboard are not considered to reduce flood protection at this site below design standard requirements and are therefore not deemed significant.

15.3.24 The results of the above modelling exercise show that the proposed project –wide works (both temporary and permanent works) are not considered to have a detrimental impact on the flood storage or tidal levels within the tidal reaches of the River Thames (tidal Thames). This is discussed further in Vol 3 Section 15.

Fluvial flood risk to the proposed development

Level of risk based on the flood zones

15.3.25 At this location along the tidal Thames, both fluvial and tidal inputs are component parts of the resulting water level. The impacts of flooding from the tidal influence of the tidal Thames are judged to be of much greater importance than those from fluvial influences. At this location therefore the assessment of tidal risk to the proposed development is considered to be representative of the flood risk from the tidal Thames.

Fluvial flood risk from the development

15.3.26 The development is located within the defended floodplain of the River Thames. Therefore the impact of the proposed development on the fluvial flood risk is considered not applicable and is not assessed further.

Surface water flood risk to the proposed development

15.3.27 Flooding of land from surface water runoff is usually caused by heavy rainfall that is unable to infiltrate into the ground or drain quickly enough into the local drainage network. Flooding can also occur at locations where the drainage network system is at full capacity and floodwater is not able to enter the system. This form of flooding often occurs in lower lying areas where the drainage system is unable to cope with the volume of water.

15.3.28 As part of the Drain London Project[iii], a Surface Water Management Plan (*SWMP*) was prepared for the LB of Wandsworth (Capita Symonds and Scott Wilson, 2011)[8]. This identifies the land immediately adjacent to the Falconbrook Pumping Station site, to the south and east, to be located within the Clapham Junction Critical Drainage Area (CDA)[iv] which indicates that it may be more susceptible to surface water flooding than other areas within the borough. Modelling results for a 1 in 100 year rainfall event plus climate change allowance show potential surface water flooding of 0.1-0.5m deep in the south of the site.

15.3.29 There is a decline in ground levels from a high point in York Gardens to the south of the site, at an elevation of approximately 4.4mAOD, towards the site at 3mAOD. To the south of the high point within York Gardens, the elevation decreases to the south. York Road runs to the west of the pumping station and raises slightly at an elevation of approximately

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[iii] A London wide strategic surface water management study undertaken by the Greater London Authority (GLA) and London Councils

[iv] Area susceptible to surface water flooding.

3.9mAOD adjacent to the pumping station. The grassed area to the east slopes slightly upwards away from the pumping station. The playground to the north of the site has an elevation of approximately 4mAOD. As the pumping station is at a low topography in relation to the surrounding areas, there is the potential for surface water to flow towards the site. Ponding of surface water would be likely at the site entrance, where the ground levels are lowest. As much of the surrounding area is grass there is likely to be infiltration of some surface water runoff, reducing the quantity that flow towards the site

15.3.30 The *SWMP* details a surface water flood incident approximately 100m to the southeast of the site in a low topographic area. A further surface water flood incident is recorded approximately 400m to the south of the site. 14 surface water flood incidents are recorded approximately 500m to the east of the site. However, from review of local topography, no flow path has been identified from the east towards the site.

15.3.31 As the *SWMP* suggests flood depths of up to 0.5m, and there is a potential pathway from the surrounding area towards the site, the flood risk from this source is considered to be medium (see Vol 2 Section 15).

Surface water flood risk from the proposed development

15.3.32 An assessment of the likely significant effects of surface water from the Falconbrook Pumping Station site is provided in Section 14 of this volume.

15.3.33 The NPS requires that surface water runoff on new developments is effectively managed so that the risk of surface water flooding to the surrounding area is not increased. In accordance with NPS, runoff rates from the proposed development should not be greater than the existing (pre-development) rates. Furthermore, the *London Plan 2011* (GLA, 2011)[9] and the Mayor's Water Strategy (GLA, 2011)[10] set out a preferred standard of attenuation to the greenfield runoff rate and an essential standard of 50% attenuation of the peak surface water runoff rate at peak times.

15.3.34 The site is currently almost 100% hard standing (impermeable) land and any surface water runoff generated drains to the existing network of surface water sewers. Post development, the site would remain as 100% hard standing (impermeable).

15.3.35 In order to comply with the NPS and Mayor's essential standards, surface water runoff from the new development would be attenuated on site before being discharged to the local sewer network. The required surface water attenuation volume is estimated to be approximately between 90m^3 and 130m^3 for a 1% AEP plus climate change rainfall event.

15.3.36 A history of contamination on the site and the high density buried infrastructures restricts the use of infiltration systems and underground storage tanks. As such, a brown roof is proposed on the ventilation structure, which would help manage surface water runoff as well as provide wider sustainability benefits. Where possible, the additional attenuation requirements would be achieved through the implementation of other SuDS measures such as the use of lined porous paving.

15.3.37 If required, on site underground storage (to a depth compatible with existing on site infrastructures) would also be provided in combination with SuDS measures in order to meet the necessary attenuation requirements and achieve the Mayor's essential standard.

15.3.38 Therefore following the implementation of the above drainage measures, the risk of surface water flooding as a result of the proposed development is considered to be unchanged and would remain as medium.

Groundwater flood risk to the proposed development

15.3.39 Groundwater flooding occurs where groundwater levels rise above ground surface levels. Groundwater levels in the upper aquifer (river terrace deposits) have been recorded by Thames Water for the nearest boreholes (SA1099A and SR1099C) to the site, 40m to the northwest. At this location the average water levels in the upper aquifer are approximately 3.71m below ground level (bgl) and remain below the top of the river terrace deposits (at 3.4m bgl). The groundwater level shows seasonal variations and fluctuations with the tide. The upper aquifer is unconfined and there is hydraulic continuity with the overlying alluvium and made ground layer.

15.3.40 The closest recorded groundwater flooding incident identified in the *SWMP* was 500m to the east of the Falconbrook Pumping Station site.

15.3.41 Average groundwater levels are 3m below ground level therefore the risk is considered to be low.

Groundwater flood risk from the proposed development

15.3.42 An assessment of the likely effects on groundwater at the Falconbrook Pumping Station site is provided in Section 13 of this volume.

15.3.43 The CSO drop shaft would pass through made ground, alluvium, river terrace deposits and London Clay. The drop shaft would not extend down into the lower aquifer and would be predominantly in the London Clay layer. No dewatering of the upper aquifer is anticipated to be required. Sheet pilling would be constructed to seal out the river terrace deposits and seepages from the London Clay.

15.3.44 The presence of the CSO drop shaft creating a physical barrier has been assessed in the groundwater assessment as having a predicted rise in water levels (less than 0.1m); however, this would not significantly increase the likelihood of groundwater levels reaching the ground surface and hence there is considered to be no increase in groundwater flood risk.

Sewers flood risk to the proposed development

15.3.45 Sewer flooding arises when the local sewer network is exceeded or a problem arises such as a blockage or fracture.

15.3.46 The Falconbrook Pumping Station site and surrounding area are served by numerous combined sewers which convey surface and foul water to the Falconbrook Pumping Station. The 2285mm diameter Low Level Sewer No. 1 Relief Sewer enters the Falconbrook Pumping Station from the south. The Wandsworth and Battersea Storm Relief Sewer (1829mm diameter) sewers flows from the east before joining the overflow branch of the Low Level Sewer No. 1 to the south of the site. The Falconbrook (Lavender Road Branch) (1219mm by 813mm) flows towards the Falconbrook Pumping Station from the east. An overflow from the Low Level Sewer No. 1 (Main Line) flows towards the site from the west.

15.3.47 The Low Level Sewer No. 1 (Main Line) runs approximately south to north passing immediately to the west of the Falconbrook Pumping Station site. The Low Level Sewer No. 1 also has an overflow to the Falconbrook Pumping Station via a 1210mm by 1230mm pipe branching off eastward to Falconbrook Pumping Station.

15.3.48 The overflow of the Low Level Sewer No.1 (Main Line), the Wandsworth and Battersea Storm Relief Sewer, the Low Level No.1 Relief Sewer and the Falconbrook (Lavender Road Branch) all gravitate towards the pumping station. Flows are then discharged to the tidal Thames via pumping.

15.3.49 Falconbrook Pumping Station pumps CSO overflows to the tidal Thames to the west via the Falconbrook Pumping Station CSO (2286mm diameter). This discharges to the tidal Thames in the vicinity of Bridges Wharf.

15.3.50 During storm conditions, flows from the local sewer network can overflow to the pumping station where they are discharged to the tidal Thames via the Falconbrook Pumping Station CSO.

15.3.51 If the capacity of the local sewer network and the Falconbrook Pumping Station were exceeded, sewage would surcharge through outlets such as man holes and gullies located along the length of the sewers. Manholes are present within the Falconbrook Pumping Station site along the 1050mm by 600mm foul sewer, Low Level Sewer No. 1 and Falconbrook Sewer (Lavender Road Branch). If the local sewer network upstream of Falconbrook Pumping Station surcharged to ground level, the site would potentially flood as it is at a topographic low point.

15.3.52 Thames Water flooding records (Thames Water, 2012)[11] show that there has been 1 record of sewer flooding within 200m of the site since 1990.

15.3.53 As there has been a record of flooding within the vicinity of the site and the site is located at a topographic low point, the risk of flooding from this source is considered to be medium (see Vol 2 Section 15).

Sewers flood risk from the proposed development

15.3.54 It is proposed that combined sewage flows from the Low Level Sewer No.1 Relief Sewer would be intercepted to the south and upstream of Falconbrook Pumping Station. A valve chamber and interception chamber would be constructed and connected to the drop shaft to the west by a short connection culvert. The Falconbrook connection tunnel would connect the drop shaft to the main tunnel. The flood risk during this phase would be managed using design measures described in Section 15.4.

15.3.55 The CSO interception and connections have been designed so that there is no increased flooding risk in the existing system for the 1 in 15 year design storm when compared to the base case scenario[v]. Further detail is provided in Vol 3 Section 15.

15.3.56 At present, during high tide events, sewage is pumped from the Falconbrook CSO Outfall to the tidal Thames. Following construction, there would only be a restriction on sewage flows entering the main tunnel should the main tunnel be full or unavailable. In this situation, flows would overflow from the connecting culvert and discharge to the river.

15.3.43 Following the construction of the proposed development the risk of flooding from this source would be unchanged and therefore would remain medium.

Artificial sources of flood risk to and from the development

15.3.57 There are no nearby artificial flood sources eg, canals, reservoirs, which could lead to flooding of the site.

15.3.58 The flood risk from this source both to and from the proposed development is not applicable at this site and therefore it has not been assessed further.

15.4 Design measures

15.4.1 Design measures have been incorporated into the design of the proposed development to ensure that the risk of flooding to and from the site and surrounding areas is not increased during the construction and operational phases. These measures are described below although many have already been referred to in the preceding section.

Tidal and Fluvial

Construction

Flood defences

15.4.2 No works are proposed to the local flood defences as part of the construction or operation of the Falconbrook Pumping Station site. However, as discussed in para. 15.3.16 the proposed tunnel alignment passes under the river wall flood defences approximately 200m to the west of the Falconbrook Pumping Station site and has the potential to affect the integrity of the defences.

15.4.3 During construction, defence assets, which are considered to be at risk of settlement, would be monitored, and where required repairs would be made in agreement with the asset owner and the EA to ensure crest heights of the flood defences are maintained to the existing. With this strategy in place, no effects of settlement are anticipated.

15.4.4 Appropriate Protective Provisions would be agreed with the EA for any works within 16m of the flood defences on the landward side and within the river. These would be agreed prior to any works within 16m of the flood defences being commenced.

[v] The base case scenario comprises the sewage treatment works (STW) Improvements and Lee Tunnel in 2020s.

Emergency Plan

15.4.5 Appropriate emergency planning procedures would be adopted by the contractor during the construction phase to mitigate the potential consequences in the event of a breach in the flood defence wall protecting the site or a failure of the Thames Barrier. Further information is included within the *CoCP* (Section 8).

Operation

Emergency plan

15.4.6 During the operational phase the site would not be permanently staffed with the exception of visits from maintenance personnel. An emergency plan would only be required for staff undertaking maintenance visits.

Surface Water

Construction

15.4.7 In accordance with the *CoCP* (Section 8) all site drainage during construction would be drained and discharged to mains foul or combined sewers and where this is not practicable, the site would be drained such that accumulating surface water would be directed to holding or settling tanks, separators and other measures prior to discharge to the combined or surface water drains. Foul drainage from the site welfare facilities would be connected to the mains foul or combined sewer. This approach would help to manage flood risk from this source during construction but would not reduce the overall level of risk associated with this flood source.

15.4.8 During the construction phase all surface water drainage serving the site would be protected, realigned or abandoned as relevant. During the construction phase suitable replacement drainage would be provided.

Operation

Surface Water Management

15.4.9 As described in para. 15.3.33 surface water would be attenuated to the Mayor's essential standard (50% attenuation). A brown roof would be installed on the ventilation structure. It is proposed that surface water runoff is discharged to the Falconbrook CSO Outfall and utilise the existing drainage system.

Groundwater

Construction and operation

15.4.10 Groundwater monitoring is proposed during construction and operation. No dewatering would be required during the construction phase. No further design measures are proposed in addition to those outlined in Section 13 of this volume.

Sewers

Construction

15.4.11 A foul water sewer running approximately east to west would be protected during the construction phase. The low level sewers in the Falconbrook Pumping Station site would also be protected during construction.

15.4.12 To protect the storm relief sewer, the interception chamber would be constructed around the existing sewer so that it would not be exposed at any time.

Operation

15.4.13 Following the completion of the main tunnel and the works at Falconbrook Pumping Station, the combined sewage flows upstream of Falconbrook Pumping Station would be intercepted. The interception of the storm relief sewer would be completed without requiring the exposure of the sewer.

15.4.14 Following construction, there would only be a restriction on sewage flows entering the main tunnel should the tunnel be full or unavailable. In this situation, flows would overflow from the connecting culvert and discharge to the river, ensuring no increase of flood risk compared to the existing scenario.

15.5 Assessment summary

Flood risk

15.5.1 The Falconbrook Pumping Station site is located in Flood Zone 3a associated with the tidal Thames and benefits from the presence of flood defences ie, river wall.

15.5.2 In line with NPS, this FRA shows that the proposed development would be appropriate for the area as flood risk to the development would remain unchanged as it would be managed through appropriate design measures and the development would not lead to an increase in flood risk on the surrounding areas. Therefore, no significant flood risk effects are likely.

15.5.3 Vol 11 Table 15.5.1 provides a summary of the findings of this FRA.

Residual risk to the development

15.5.4 The residual risk to the site is the risk that remains after all design measures have been incorporated.

15.5.5 The site is at residual risk of tidal flooding in the event of a breach in the local flood defence wall along the edge of the River Thames or overtopping of the defence wall as a result of a failure of the Thames Barrier.

15.5.6 In the very unlikely event of a mechanical failure at the pumping station, there is potential for sewage to back up within the system and surcharge through manholes and gullies.

15.5.7 It is considered that the consequence of a breach or failure of flood defences or a failure of the pumping station, would not compromise the long term operational function of the main tunnel and therefore no additional measures above those outlined above are proposed. Further detail is provided in Vol 3 Section 15.

Residual risk from the development

15.5.8 Following the incorporation of the design measures outlined in Vol 11 Table 15.5.1, the level of residual risk from the development to adjacent areas would remain unchanged. The project wide residual risks are discussed in Vol 3 Section 15.

Vol 11 Table 15.5.1 Flood risk – FRA summary

Source	Pathway	Current flood risk to the site	Design measures	Flood risk from the site (post design measures)	Flood risk to site post design measures
Tidal	tidal Thames	High (but residual only)	Emergency Plan	No increase in tidal flood risk as a result of proposed development.	High (but residual only)
Fluvial	tidal Thames	High (but residual only)	Emergency Plan	No increase in fluvial flood risk as a result of proposed development.	High (but residual only)
Surface water	Surrounding area	Medium	Drainage is accordance with *CoCP* (Section 8) during construction. On site attenuation to achieve Mayor's essential standards. Surface water discharged to the onsite drainage network at a restricted rate.	No increase in surface water flood risk as a result of proposed development.	Medium
Groundwater	Underlying geology and groundwater levels un restricted pathway	Low	Monitoring proposed during construction and operation.	No increase in groundwater flood risk as a result of proposed development.	Low

Source	Pathway	Current flood risk to the site	Design measures	Flood risk from the site (post design measures)	Flood risk to site post design measures
Sewers	Local drainage system	Medium	Low level sewers protected during construction. Storm sewers and Pumping Station maintained and remain operational during construction and operation. Sewers not exposed during construction process.	No increase in sewers flood risk as a result of proposed development.	Medium
Artificial sources	None	Not applicable	Not applicable	Not applicable	Not applicable

** Definitions of these classifications are included in Vol 2 Section 15*
() indicate the flood risk is residual ie in the event of a failure or overtopping of flood defences

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