

Waste Water National Policy Statement

Appraisal of Sustainability Post-Adoption Statement

March 2012

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1. Introduction

1.1 Waste Water National Policy Statement

The Planning Act 2008 provides for the establishment of a decision maker¹ which will take planning decisions on Nationally Significant Infrastructure Projects (NSIPs).

The Waste Water National Policy Statement (NPS) sets out Government policy for the provision of major waste water infrastructure. It will be used by the decision maker to guide its decision making on development consent applications for waste water developments that fall within the definition of a Nationally Significant Infrastructure Project (NSIP) as defined in the Planning Act 2008.

The Planning Act 2008 empowers the examination of planning applications and decisions for the following waste water NSIPs in England:

- construction of waste water treatment plants which are expected to have a capacity exceeding a population equivalent of 500,000 when constructed; or
- alterations to waste water treatment plants where the effect of the alteration is expected to increase the capacity of the plant by more than a population equivalent of 500,000.

The Waste Water NPS also provides information on two potential NSIPs. These are a sewage treatment works scheme at Deephams in North East London and a waste water collection, storage and transfer tunnel (the Thames Tunnel). Although the Thames Tunnel project does not fall within the thresholds as detailed above, the Government has stated its intention to consider the project at a national level.

The Waste Water NPS was designated as a national policy statement for the purpose of the Planning Act 2008 on the 26 March 2012. Copies of the Waste Water NPS and accompanying documents including the AoS, HRA and EqIA are available at www.defra.gov.uk/environment/quality/water/sewage/

1.2 Appraisal of Sustainability (AoS) and Habitat Regulations Assessment (HRA)

The Government has ensured that the Waste Water NPS has undergone an Appraisal of Sustainability (AoS) before it is designated, as required by the Planning Act 2008. The purpose of the AoS is to ensure that the NPS takes account of environmental, social and economic considerations, with the objective of contributing to the achievement of

¹ Amendments to the Planning Act 2008 that will come into effect in April 2012 (following the commencement of provisions in the Localism Act 2011) will result in the abolition of the Infrastructure Planning Commission (IPC). From April 2012 the Planning Inspectorate ('the examining authority') will hold examinations for development consent and will then make a recommendation to the Secretary of State. Decisions on applications will then be taken by the Secretary of State ('the decision maker').

sustainable development. The AoS for the Waste Water NPS incorporates the requirements of the European Strategic Environmental Assessment (SEA) Directive².

A Habitats Regulations Assessment (HRA) examines the potential effects of a plan or project on nature conservation sites that are designated to be of European importance. These sites are referred to as Natura 2000 sites or European Sites. A HRA has been carried out for the Waste Water NPS because it is considered to be a 'plan' for the purposes of the European Habitats Directive³. The HRA assesses the effects of both the generic policy contained in the NPS, and the effects of the two schemes described above; Deephams and the Thames Tunnel.

The AoS and HRA are a strategic-level stage in the process of ensuring that the potential impacts of new waste water infrastructure are properly considered. The Government has taken account of the findings of the AoS, the HRA and the public consultation on the draft Waste Water NPS before designating the Waste Water NPS.

All individual applications for projects which are likely to have a significant effect on the environment will also need to be accompanied by an Environmental Statement (ES), in accordance with the European Environmental Impact Assessment Directive⁴. The ES for an application will include a more detailed assessment of potential environmental impacts likely to result from developing new waste water infrastructure on a particular site. There may also need to be a more detailed HRA at the project level.

1.3 Consultation

The draft scoping report for the Appraisal of Sustainability (AoS) for the Waste Water NPS was subject to a five week consultation with the designated SEA Consultation Bodies from the 5th November 2009 to the 10th December 2009. A summary of the comments and how they were addressed is included in Appendix C of the AoS. Further consultation with the SEA statutory consultees was undertaken in September 2010.

The draft Waste Water NPS, AoS and HRA were subject to public consultation between 16th November 2010 and 22nd February 2011. The purpose of the consultation was to give stakeholders the opportunity to comment on the NPS, the accompanying appraisals including the Equalities Impact Assessment (EqIA), and the framework it sets for planning decisions on nationally significant waste water infrastructure projects.

A summary of the Government's responses to the consultation on the draft Waste Water NPS and accompanying appraisals and how they have been addressed are detailed in

² Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, implemented through 'The Environmental Assessment of Plans and Programmes Regulations 2004'.

³ Directive 92/43/EEC on the conservations of natural habitats and of wild fauna and flora implemented through The Conservation (Natural Habitats, &c) Regulations 1994 (as amended)

⁴ Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, amended by Directives 97/11/EC and 2003/35/EC. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009

Defra's 'Consultation on the draft National Policy Statement for Waste Water – Summary of responses, February 2012⁵.

1.4 Post Adoption Statement

When a plan or programme is adopted the SEA Directive⁶ requires that information is made available on:

- how the environmental considerations and consultation responses have been taken into account;
- the reasons for choosing the plan in light of reasonable alternatives; and
- how the significant environmental effects of implementing the plan or programme will be monitored in order, among other things, to identify unforeseen adverse effects and to be able to undertake remedial action.

This statement has been drafted to fulfil these requirements and is structured as follows:

- Section 2 sets out how environmental considerations in relation to the SEA Directive have been integrated into the designated Waste Water NPS
- Section 3 Sets out how the recommendations of the AoS have been taken into account in the designated Waste Water NPS
- Section 4 sets out how opinions expressed during the consultation exercise have been taken into account
- Section 5 outlines the reason for choosing the Waste Water NPS as adopted in light of reasonable alternatives.
- Section 6 sets out how significant effects will be monitored.

⁵ <http://archive.defra.gov.uk/corporate/consult/waste-water/120207-wastewaterpolicy-summary-responses.pdf>

⁶ Articles 9 &10, SEA Directive

2. How Environmental Considerations have been integrated into the Waste Water NPS

2.1 Introduction

Environmental considerations have been integrated into the Waste Water NPS throughout the AoS process.

The range of sustainability effects to be considered by the AoS was informed primarily by the SEA Directive and Regulations, using published Government guidance. Annex I of the SEA Directive requires that the assessment should include information on the 'likely significant effects on the environment, including on issues such as: biodiversity; population; human health; fauna; flora; soil; water; air; climatic factors; material assets; cultural heritage, including architectural and archaeological heritage; landscape and the inter-relationship between the issues referred to'.

The secondary, cumulative and synergistic effects were also considered throughout the appraisal process, as required by the SEA Directive.

You may want to refer to Table 3.1 'Scope of Annex I Issues and AoS Topics' from the AoS report⁷.

The initial scoping report included a review of existing plans, programmes, policies and strategies to help identify any relevant environmental protection objectives which needed to be taken into account during the Waste Water NPS preparation.

The appraisal was undertaken using an objectives-led approach. The baseline information obtained from the initial review was used to develop 17 AoS Objectives which broadly presented the preferred sustainability outcomes. Each objective was supported by a series of guide questions to appraise the Waste Water NPS and the two London-specific schemes. Consideration and appraisal of the reasonable alternatives was a fundamental aspect of the Waste Water NPS development, providing clear and reasoned justification for the selection of the preferred option.

2.2 Engagement with Stakeholders

Consultation has been integral to the AoS process as engagement with stakeholders helped identify and refine the environmental issues considered within it. The iterative process of consultation (as identified in section 1.3) throughout the preparation of the Waste Water NPS and the supporting appraisals enabled a transparent, inclusive consultation exercise subject to public scrutiny throughout.

The formal statutory consultation exercise was supported throughout by informal engagement across government departments and with key stakeholder specialists and agencies.

⁷ <http://archive.defra.gov.uk/corporate/consult/waste-water/101116-wastewaterpolicy-condoc-annex3b.pdf>

2.3 Stages of Integration

AoS Development and Consultation	Purpose
Draft Scoping Report for the AoS. Consultation Nov-Dec 2009	Review of plans, programmes and strategies to identify AoS objectives.
Draft AoS, HRA, EqIA. Consultation September 2010	<p>To ensure the Waste Water NPS takes account of environmental, social and economic considerations with the objective of contributing to the achievement of sustainable development.</p> <p>The HRA examined the potential effects of the Waste Water NPS on nature conservation sites of designated European interest.</p>
Draft AoS & HRA, EqIA reports Published November 2010	<p>These were published for consultation alongside the draft Waste Water NPS for completeness and transparency of process.</p> <p>These documents have not been amended following consultation.</p>
AoS Post-adoption Statement Published March 2012 after the designation of the Waste Water NPS.	Summarises how the appraisal and consultation have been taken into account for the final designated Waste Water NPS.

3. How the Appraisal of Sustainability has been taken into account

3.1 Introduction

This section sets out how the recommendations contained in the Appraisal of Sustainability (AoS) have been taken into account in the designated Waste Water NPS.

In addition to the appraisal of the environmental considerations mentioned in section 2, the scope of the AoS covers social and economic effects as well as climate change (as required by the Planning Act 2008).

The aim of the AoS was to identify, describe and evaluate the likely environmental, social and economic effects of implementing the policy set out in the Waste Water NPS, and of the effects of the two schemes included in the Waste Water NPS (the proposed Thames Tunnel scheme and the Deephams Scheme).

3.2 Recommendations from the AoS and how these have been addressed

The AoS made recommendations on nine out of the seventeen AoS topics that were appraised. These are detailed in **Table 3-1**.

Table 3-1: Recommendations from the AoS and how these have been taken into account

AoS Summary of Recommendations	How this been addressed in the WWNPS
<p>1. Climate Change and Adaptation</p> <p>Overall, it is considered that the Waste Water NPS has both positive and negative effects in relation to climate change. Positive effects can be enhanced through the adoption of the following mitigation measures:</p> <ul style="list-style-type: none"> Requiring, where possible, the use of construction materials with lower embodied energies. When considering the detail of design and within engineering appraisal, the carbon associated with construction materials should be considered, for example it's source, distance to be transported, method of transport and volume. Where reasonable lower carbon alternatives are available they should be considered. Making explicit the requirement for on-site renewable energy provision up to 2020 and beyond including through the use of obligations. In addition, policy wording could be included to give favourable consideration to new development that incorporates the use of leading edge renewable energy technologies. Inclusion of a requirement within the Waste Water 	<p>Criteria for Good Design are set out in the NPS and addresses these recommendations. Additional text requiring specific standards would go beyond the current remit of the Waste Water NPS, and may be contrary to existing policy.</p> <p>Applicants are required to seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that this is the best overall environmental outcome. The latter might include reuse and renewable energy provision through use of sewage sludge/biosolids.</p> <p>The most suitable technology will vary from location to location and may well be dependent on the nature of the receiving water for final effluent and should be decided on a case by case basis - the Waste Water NPS currently allows for this.</p> <p>The Waste Water NPS also sets out clear criteria to applicants that they must consider</p>

<p>NPS for all buildings on site to be designed to the highest standards of energy efficiency, incorporating features such as energy efficient insulation materials, lighting and heating systems. This could include consideration of site orientation to optimise solar gain, insulation and passive ventilation techniques as well as ensuring energy efficiency measures within all office equipment and fittings.</p> <ul style="list-style-type: none"> • Provision of additional guidance to that set out in the Waste Water NPS with regard to the use of sewage sludge as a renewable resource. This guidance could cover, for example, optimising the co-incineration of wastes and the promotion of anaerobic digestion technologies. 	<p>the impacts of climate change on the location, design and operation of new waste water infrastructure with the aim of increasing adaptive resilience to climate change impacts.</p>
<p>2. Biodiversity</p> <p>Mitigation measures as set out in the draft Waste Water NPS could be expanded and supplemented in the Waste Water NPS by setting out further measures as outlined below:</p> <ul style="list-style-type: none"> • Habitat fragmentation should be avoided by minimising the removal of habitat wildlife corridors. • Habitat creation and enhancements should examine opportunities to contribute towards or meet Local Biodiversity Action Plan targets. • Planting should comprise native species that provide habitat for affected ecosystems. • Adoption of SuDS onsite (see Water Quality and Resources) 	<p>These suggestions have been provided for in the Waste Water NPS in the Key Principles (under Biology and Geological Conservation) and in good practice guidance, as referred to in the Waste Water NPS.</p> <p>The decision maker should be satisfied that priority has been given to the use of sustainable drainage systems (SuDS).</p>
<p>3. Soil and Geology</p> <p>Positive effects on this objective could be enhanced through the adoption of the following mitigation measures:</p> <ul style="list-style-type: none"> • Setting out in which circumstances development on the best and most versatile agricultural land might be acceptable. • Provision of guidance relating to potential mitigation (e.g. locating development so that the loss of such land is kept to a minimum) and compensatory measures where development is to take place on the best and most versatile agricultural land. • Provision of guidance relating to development adjacent to best and most versatile agricultural land. 	<p>The Waste Water NPS Land Use provisions require applicants to identify existing and planned land uses near the site and any effects on them, to avoid the loss of the best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) and preferably reuse brownfield land or use land in areas of poorer quality (grades 3b, 4 and 5) except where this would be inconsistent with other sustainability considerations. Other guidance is referred to in existing policy, and therefore the NPS is considered adequate in this regard.</p>
<p>4. Land Use</p> <p>No mitigation relating to Green Belt is set out in the Waste Water NPS. Where development on green belt is justified by the IPC, this should as far as practicable maintain the openness of the Green Belt.</p>	<p>Where development on Green Belt is justified by the IPC, it should as far as practicable maintain the openness of the Green Belt and not conflict with the purposes of Green Belt set out in national policy</p>
<p>5. Water Quality and Resources</p> <p>Positive effects could be enhanced further by including</p>	<p>The Waste Water NPS requires the applicant to consider existing water resources affected</p>

<p>within the Waste Water NPS measures that address the following mitigation measures:</p> <ul style="list-style-type: none"> • encourage infrastructure to be located, where possible, so as to minimise any adverse effect on the hydrology of surface flows. Surface mapping can inform the identification of areas that may be most at risk and allow a concentrated focus on prevention. • require that water resources to be used during construction works be identified and sourced at an early stage; and that abstraction and water use be accompanied by measures to minimise environmental effects to the source. • stipulate that sustainable drainage techniques (SuDSs) be adopted to manage surface drainage of the NSIP, unless demonstrably not possible. Examples include surface storage and attenuation or infiltration to ground if suitable hydrogeology exists. Assuming the site(s) is greenfield, run-off from rainfall should be limited to defined greenfield rates. In line with the requirements of PPS25 and other equivalent bodies, and in consultation with the SuDS approval body (i.e. local authority) SuDS should be used to attenuate any increases in surface runoff rates. It is noted that SuDS are referenced under the mitigation measures for flood risk. • enhance Section 6.2 (which specifies that the impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling) by specifying that new infrastructure in the area served by the NSIP should incorporate water efficiency and re-use measures (such as demand management techniques, grey water recycling and rain water harvesting) where appropriate in order to minimise demand for water resources and any consequential environmental effects. • specify that 'ecology' includes 'fisheries', thereby making them an explicit consideration for applicants and the IPC. 	<p>by the proposed project and the impacts of the proposed project on water resources, noting any relevant existing abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates (including any impact on or use of mains supplies and reference to Catchment Abstraction Management Strategies).</p> <p>The most suitable technology will vary from location to location and may well be dependent on the nature of the receiving water for final effluent and should be decided on a case by case basis - the Waste Water NPS currently allows for this.</p>
<p>6. Waste Management</p> <p>Positive effects on this objective could be enhanced through the adoption of the following mitigation measures:</p> <ul style="list-style-type: none"> • Amend policy wording to give favourable consideration to new development that incorporates the leading edge waste water treatment technologies. 	<p>The most suitable technology will vary from location to location and may well be dependent on the nature of the receiving water for final effluent and should be decided on a case by case basis – the Waste Water NPS currently allows for this.</p>
<p>7. Resources and Raw Materials</p> <p>Positive effects of the Waste Water NPS could be enhanced through the adoption of the following mitigation measures:</p> <ul style="list-style-type: none"> • Make explicit that good design includes the principles of sustainable design and construction. 	<p>Criteria for Good Design are set out in the Waste Water NPS and will address these points.</p> <p>Additional text requiring specific standards would go beyond the current remit of the NPS,</p>

<ul style="list-style-type: none"> • Making explicit the requirement for on-site renewable energy provision up to 2020 and beyond including through the use of obligations. • Amending policy wording to give favourable consideration to new development that incorporates the use of leading edge renewable energy technologies. • Provision of guidance in addition to that set out in the Waste Water NPS with regard to the use of sewage sludge as a renewable energy resource. This guidance could cover, for example, optimising the co-incineration of wastes and the promotion of anaerobic digestion technologies. • Inclusion of a requirement for the sustainable use of raw materials during the construction stage and lifetime of the development. • Adding the potential for nutrient/heavy metal extraction and recovery together with guidance. • Consideration of effluent discharge volumes as contributing to base flow of the receiving waters, thereby contributing to both the natural asset and potential for re-use (extraction) further downstream. 	<p>and may be contrary to existing policy.</p> <p>Applicants are required to seek to minimise the volume of waste produced and the volume of waste sent for disposal unless it can be demonstrated that this is the best overall environmental outcome. The latter might include reuse and renewable energy provision through use of sewage sludge.</p>
<p>9. Air Quality</p> <p>Positive effects could be enhanced if the following mitigation measures are considered:</p> <ul style="list-style-type: none"> • Promotion of waste water treatment technologies that minimise the need for road based transport. • Provision of guidance on the assessment of in-combination effects and their geographical extent. • Promotion of technologies and operating systems that minimise the generation of and/or impact of odours. 	<p>These provisions are set out in the Waste Water NPS and Traffic and Transport Impacts section including suggested use of DfT WebTAG guidance, the use of travel plans, and requirement for applicants to set out proposed measures for more sustainable forms of transport.</p> <p>Additional text promoting certain technologies could go beyond the current remit of the Waste Water NPS, and may be contrary to existing policy.</p>
<p>10. Landscape, Townscape and Visual</p> <p>Further mitigation measures that could be included in the Waste Water NPS are:</p> <ul style="list-style-type: none"> • Including a requirement to consider using local vernacular styles for any new buildings located in a designated landscape. 	<p>The Waste Water NPS requires that applications in designated sites are carried out to high environmental standards including through use of appropriate conditions where necessary.</p> <p>It also requires that the decision maker consider whether the project has been designed carefully, taking account of environmental effects on the landscape and siting, operational and other relevant constraints, to minimise harm to the landscape, including by reasonable mitigation.</p>

4. How the opinions expressed and the results of the public consultation have been taken into account.

4.1 Introduction

A summary of the Government's responses to the consultation on the draft Waste Water NPS and accompanying appraisals and how they have been addressed are detailed in Defra's 'Consultation on the draft National Policy Statement (NPS) for Waste Water – Summary of responses, February 2012'. This explains in detail how the opinions expressed and the results of the public consultation have been taken into account.

A wide range of issues were raised in responses to consultation, many of which did not relate to the consultation questions. These are detailed in section 14 the Summary of responses document.

5. Reasons for choosing the Waste Water NPS as adopted in light of other reasonable alternatives

5.1 Introduction

As required by the SEA Directive, Section 2 of the AoS includes an assessment of reasonable alternatives to the policies set out in the Waste Water NPS at a strategic level.

5.2 Process of Identifying Reasonable Alternatives

A range of potential alternatives were set out within the AoS Scoping Report which demonstrated Defra's provisional views on options at that stage in the development of the Waste Water NPS, without providing a judgement as to whether they could be interpreted as 'reasonable'.

The reasonable alternatives originally identified were refined in light of the scoping consultation exercise taking account of the views of other Government departments including the Department for Communities and Local Government as coordinating department for NPS preparation. This led to some of the alternatives that were initially proposed in the Scoping Report not being taken forward and further work being undertaken to define those options that were taken forward.

5.3 Reasonable Alternatives Considered for the Waste Water NPS

The reasonable alternatives subsequently considered by Defra are detailed below. They centre on responding to the two key questions:

- Can the demand for new nationally significant waste water infrastructure be met in another way? and
- If not, what should be the proposed approach to locating waste water infrastructure?

5.3.1 An NPS which sets out alternative ways to meet the need for waste water infrastructure other than the construction of new nationally significant treatment works.

This could include implementing a number of small scale methods such as:

- Reducing the volume of surface water run-off entering the combined sewer systems through the wider use of Sustainable Drainage Systems (SuDs);
- Reducing household water consumption and therefore the volume of waste water entering the sewerage system, through implementing demand management measures such as the installation of water meters and the promotion of water efficient devices and appliances;
- Diverting surface water drainage away from the combined sewer systems in new developments to be discharged directly into a nearby watercourse;

- This could also include an NPS which specifies the decentralisation of waste water treatment infrastructure, whereby waste water is treated at smaller works (below the NSIP threshold) within the sewerage catchment from which it originates, rather than being pumped often over long distances for treatment at one large centralised works.

5.3.2 An NPS that sets exclusionary criteria

This would specify avoiding the location of nationally significant waste water infrastructure on nationally designated sites, or in locations where adverse effects could not be mitigated.

5.3.3 An NPS that is only site specific

This would only include specific information in relation to identified nationally significant waste water infrastructure projects.

5.3.4 An NPS that does not specify particular scheme locations

This would only include generic information and not identify any known nationally significant waste water infrastructure projects.

5.3.5 Reasonable alternatives to the Thames Tunnel and Deephams Schemes

Following resolution to the preferred approach to location within the development of the Waste Water NPS, consideration then turned to the inclusion of known schemes that would be included within the Waste Water NPS. These are the Thames Tunnel and Deephams schemes. Consistent with the approach to consideration of reasonable alternatives for the Waste Water NPS, alternatives to these schemes were also considered.

5.4 Preferred Option for the Waste Water NPS

Demand for new nationally significant waste water infrastructure may be reduced in the future by implementing the alternatives above. However, these alternatives even in combination are unlikely to achieve the volume reductions necessary to prevent future demand for additional waste water treatment capability

Using exclusionary criteria through an NPS preventing the development of waste water NSIPs on European designated sites would result in a positive effect on protected habitats and species. However, it may affect the provision of adequate waste water infrastructure needed to meet European and national water quality standards.

Adverse health impacts arising from recreational use of surface waters may arise by deferring or deterring any waste water infrastructure. In addition this could potentially constrain regional development and economic growth.

An NPS that sets exclusionary criteria is therefore not considered to provide direction that provides the appropriate balance between the differing aspects of sustainability.

The findings of the AoS indicated the benefits of an NPS which contains both relevant generic information and identifies and includes specific information on known schemes. Identifying nationally significant waste water infrastructure schemes in a location specific NPS provides certainty to water companies and local communities regarding the need for development. A location specific NPS also ensures that the likely effects of a proposed scheme are identified and where such effects are adverse, appropriate mitigation measures considered.

The Waste Water NPS remains consistent with the thresholds for NSIPs that have been laid down in the Planning Act 2008 and although a combination of the alternatives (reducing demand, wider use of SuDS, separate sewer systems) will help to reduce the need for new nationally significant waste water infrastructure, there are circumstances where need cannot be met in another way, particularly in large urban areas where NSIPs are envisaged.

5.5 Consideration of the Alternatives to the site specific elements of the Waste Water National Policy Statement

Whereas the Waste Water NPS sets out Government policy for waste water infrastructure of national significance, it also identifies the need for two potential Nationally Significant Infrastructure Projects, namely Deephams Sewage Treatment Works in north London and the Thames Tunnel. In relation to the Thames Tunnel, the Waste Water NPS also considers what alternatives there are to the proposed scheme. It does not consider the alternatives for Deephams Sewage Treatment Works as the developer has not established a preferred option.

A significant number of the opinions expressed in the public consultation process related to this aspect of the Waste Water NPS. This section sets out the background to the consideration of reasonable alternatives to the Thames Tunnel, and the way in which the representations on this submitted as part of the consultation process into the draft Waste Water NPS were taken into account.

5.5.1 Thames Tideway Strategic Study

The Thames Tideway Strategic Study (TTSS)⁸ was set up in 2000 to assess the environmental impact of intermittent discharges of storm sewage to the Thames Tideway with a view to identifying objectives for improvement and to propose potential solutions, having regard to costs and benefits that would comply with the Urban Waste Water

⁸ Thames Tideway Strategic Study Steering Group Report 2005
http://files.thamestunnelconsultation.co.uk/files/thamestunnel/02%20TTSS%20Steering%20Group%20Report_Feb05.pdf

Treatment Directive (UWWTD)⁹. Thames Water, the Environment Agency, the Greater London Authority, Defra and Ofwat (as an observer) all contributed to the study, which was independently chaired by engineering consultant Professor Chris Binnie.

The environmental objectives identified by the TTSS were:

- Reduce the adverse environmental impacts on the river by meeting dissolved oxygen standards for the tidal Thames to protect ecology such as fish;
- Reduce the elevated health risks to river users;
- Reduce the aesthetic pollution by sewage material and sanitary products.

These objectives were defined in order to control pollution from London's combined sewer overflows (CSOs) and so to fully meet the requirements of the UWWTD.

In 2004, to contribute to the TTSS, the Environment Agency assessed all 57 CSOs discharging into the Thames Tideway. This assessment, which was conducted in line with the guidance underpinning the UWWTD, identified 36 CSOs as unsatisfactory and causing an adverse environmental impact by various combinations of:

- reducing dissolved oxygen levels causing ecological harm, including, under adverse conditions, fish kills;
- creating visually offensive aesthetic conditions on the river and its foreshore by large amounts of sewage solids and sewage-derived litter, grease and scum; and
- increasing health risks to recreational river users by introducing large amounts of pathogenic organisms into the river.

This assessment was reviewed by the Environment Agency in 2006 to look at the aesthetic and health impacts in more detail, which confirmed the numbers and locations of the unsatisfactory CSOs with a greater degree of confidence. It is important that all the unsatisfactory CSOs are dealt with to address the differing types of adverse impact. For example, where CSOs do not cause a dissolved oxygen problem, the sewage-derived litter and health impacts must still be tackled, and it is preferable to do this before the sewage enters the river, rather than ameliorating the adverse impacts after it has done so. The categorisation of the Tideway CSOs was reviewed further by the Environment Agency in 2008 and again in 2011, concluding that those causing adverse environmental impacts continued to be properly identified.

The TTSS also investigated strategies and options to reduce the adverse effects on the tidal waters of the River Thames with its recommendations refined so as to comply fully with the studies set objectives. It was considered that the complex nature of

⁹ http://ec.europa.eu/environment/water/water-urbanwaste/index_en.html

the Thames Tideway and the interconnected nature of the many points of discharge meant that the conventional improvement of individual discharges (to achieve its objectives) ceased to be a practicable approach. It was therefore recognised that the network capacity should be approached as a whole and that either the discharges were to be made much less frequently (at the same quality) or their polluting impact was to be greatly lessened if discharging at a comparable frequency. This led to the investigation of the following strategies:

- **Before the rain water enters the sewerage system** e.g. source control; Sustainable Drainage Systems (SuDS). The TTSS considered that as the catchment was very mature and served a very densely urbanised environment it was very difficult to apply source control. In relation to SuDS it considered that incorporating SuDS into existing highly developed areas was not normally possible due to the excessive costs involved in replacing ground surfaces and the lack of available land to provide for storage and attenuation of flows. There were also severe constraints on the use of these systems where the underlying strata are impervious as in London. The widespread retrofitting of SuDS techniques in central London was not considered to be technically feasible. It was therefore considered by the TTSS that this strategy was not viable.
- **Within the sewerage system** e.g. separation, in-line storage (attenuation), new on or off-line storage tanks. The TTSS considered that the construction of an entirely new separate sewerage system would only be possible at extreme cost and disruption over a very long timescale. It was considered unlikely to provide a complete solution to the storm pollution problems of the Thames Tideway, as surface water runoff would include its own pollutants; also it could not be guaranteed that the systems will remain separate over an extended period due to continual redevelopment and misconnections. It was therefore considered that this strategy was not viable.
- **At the interface between the sewers and the river (combined sewer overflow outfalls)** e.g. screening to remove litter; new storage; return flows to treatment. The TTSS considered that only solutions developed within this strategy could realise the study's objectives by providing intervention at the interface between the sewers and the river. Potential solutions within this were also investigated revealing that there were only a few practical engineering solutions, which were likely to realise the desired levels of improvement at reasonable cost.
- **In the river itself** e.g. more injected oxygen from river craft or riverside hydrogen peroxide dosing of discharges. The TTSS concluded that this strategy could not be considered a preventative strategy in that once the sewage has reached the river, the polluting effects could only be ameliorated - reflecting the practice of oxygenation which did not address the aesthetic and health risk issues. However, the TTSS did acknowledge that these options should be used as interim amelioration measures until a longer term solution was delivered.

The TTSS concluded that only solutions developed providing intervention at the interface between the sewers and the river could realise its objectives. This led to the development of the London Tideway Improvements Scheme. The scheme comprised of three integrated solutions:

The construction of a 34km single storage tunnel (the Thames Tunnel) for the tidal Thames that intercepts the overflows at the river and transfers the sewage to Crossness and Beckton Sewage Treatment Works for treatment, with;

A 7km connecting tunnel for the River Lee to address the largest CSO, Abbey Mills pumping station, which discharges to the River Lee before entering the tidal Thames. The Lee Tunnel would join the main Thames Tunnel to the west of Beckton Sewage Treatment Works, and;

Extensions to London's sewage treatment works. This included increased capacity at Mogden, Beckton and Crossness Sewage Treatment Works, to treat a greater proportion of the flow received.

This was backed-up by a supplementary report produced by the TTSS in November 2005¹⁰.

5.5.2 Ofwat Jacobs Babbie report

Ofwat commissioned its own report (Jacobs Babbie report)¹¹ to review the work and reports of the TTSS. This was published in February 2006 and proposed additional options for dealing with the CSO discharges at a potentially lower cost, but with lower CSO control. It proposed constructing a 9km tunnel to intercept discharges in West London (Hammersmith to Heathwall CSOs), a screening plant to reduce sewage-derived litter and faecal matter discharged to the River Thames, and an enhanced primary treatment plant at Abbey Mills pumping station in East London. These measures were in addition to proposed upgrades at Crossness, Mogden, Beckton, Long Reach and Riverside sewage treatment works, litter skimmer boats, and oxygenation measures ('bubblers' and hydrogen peroxide dosing plants). It also suggested that SuDS should be implemented over the medium term where appropriate in London's suburban fringes. However, the Jacobs Babbie report was reviewed by the TTSS and assessed as not meeting the objectives set within the TTSS.

¹⁰ Thames Tideway Strategic Study Supplementary Report to Government November 2005
http://files.thamestunnelconsultation.co.uk/files/thamestunnel/08%20TTSS%20Supplementary%20Report%20to%20Government_Nov05.pdf

¹¹ *Independent review to assess whether there are economic partial solutions to problems caused by intermittent storm discharges to the Thames Tideway*, 2006. www.ofwat.gov.uk/sustainability/rpt_gen_tidewaybabbie20060214

Ofwat's Jacobs Babbie Report was also considered in Defra's 2007 Regulatory Impact Assessment (RIA)¹² which concluded that the recommendations would not meet the objectives set within the TTSS, and so they were not accepted. The Jacobs Babbie recommendations would still leave frequent discharges from 19 combined sewer overflows between Vauxhall Bridge and the tidal barrier (which would continue to discharge around 10 million cubic metres per year) and ultimately dissolved oxygen targets for the River Thames would not be met. Also, skimmer and bubbler boats could not be considered an effective strategy under the Urban Waste Water Treatment Directive as they would not prevent pollution entering the river.

A 'western-only' storage tunnel proposed by the Jacobs Babbie review was revisited by the Thames Tunnel Commission (report issued October 2011)¹³. Being shorter, it would be of lower capacity unless built to a much larger diameter, and would need pumping out within 48 hours of a rainfall event before the effluent contained in it turned septic and malodorous, with the formation of sulphuric acid and poisonous hydrogen sulphide gas. This duration has been established by research overseen by Professor Saul (the national expert in this field), involving testing at Thames Water's dedicated research facility at the Abbey Mills Pumping Station. The pump-out would rely on surplus capacity in the existing sewerage network. However, Thames Water has undertaken a detailed study of existing sewerage capacity, concluding that the northern Beckton catchment sewers have no additional capacity and so could not be used, while the southern Crossness catchment sewers have only very limited intermittent additional capacity that would not enable the 48-hour pump-out target to be met.

Use of the southern sewers in this way would also significantly increase the risk, frequency, and volume of CSO discharges downstream from the western tunnel (e.g. at the Clapham and Deptford CSOs) as it is pumped out, with the existing base (dry weather) flow variations during the day, plus any heavy and/or back-to-back rain events, and in the future the base flows increasing with population growth. If discharges took place more than 48 hours after storage in the tunnel, their increased septicity would result in greater adverse environmental impact in the river, including significant odour problems, as well as increased acid attack on the existing sewer system, compromising its integrity and requiring increased levels of maintenance. Retro-fitting linings to the existing sewers to prevent that would be an expensive and disruptive operation, as well as further reducing their capacity and exacerbating the wider capacity problem.

With a western-only tunnel solution, there would remain 17 unsatisfactory CSOs, of which 11 discharge significant quantities of sewage-derived litter into the middle and

¹² <http://archive.defra.gov.uk/environment/quality/water/waterquality/sewage/documents/overflows-ria.pdf>

¹³ http://www.lbhf.gov.uk/Images/BkACE%20Thames%20Tunnel%20Commission%202011%20WEB_tcm21-165704.pdf

lower reaches of the tidal Thames, with associated health risks to river users from harmful micro-organisms in the untreated waste water. UK policy regarding compliance with the Urban Waste Water treatment Directive is to use screens as the minimum measure to address the sewage-derived litter impact, but this does not address the health-related risks. Use of skimmer boats has been discounted as being a mitigation measure that does not tackle the sewage-derived litter problem at source. A full solution comprising a full-length tunnel would both capture the litter and better address the health risks, ensuring that the pollution of the river is reduced as limited by the Urban Waste Water Treatment Directive.

Using the same methods as for the proposed full-length Thames Tunnel, Thames Water has developed a cost for a western-only tunnel. This indicates a total cost of £1.91 billion at current prices for the tunnel alone. While cheaper overall than a full-length tunnel whose equivalent cost is estimated to be £4.1 billion, it would also require additional costs for any mitigating measures for the CSOs east of the western tunnel. We have not costed those in detail, but they would significantly reduce any cost savings that might arise in comparison with the full-length tunnel. In terms of estimated cost, per cubic metre of storage, the western tunnel would cost £3,820/m³ for a volume of about 500,000m³, compared with £2,730/m³ for a 1,500,000m³ volume full-length tunnel; in other words, a western-only tunnel would be 40% more expensive per m³.

5.5.3 Working Group on Thames Tideway and 2012 Olympic Games

The work of this group (in 2005) was initially to consider whether a partial solution, coherent with the approach to the wider Thames Tunnel problem, could be delivered in time to protect the 2012 Olympic and Paralympic Games against the risk of significant aesthetic pollution from CSOs. Members of the group included the organisations involved in the TTSS and the London Thames Gateway Development Corporation, British Waterways, the Olympic Development Authority, and several other Government departments.

This work led to the Minister of State for Climate Change and Environment writing on 27 July 2006 to ask Thames Water to provide a detailed assessment of and cost information on two options to intercept overflow discharges and take them for treatment in East London. This work was to build on the earlier reports provided by the TTSS and Ofwat's Jacobs Babbie report.

Two options were developed and evaluated:

- A 30km long tunnel to intercept and contain overflow discharges along the length of the tidal Thames, from Hammersmith in west London to Beckton in east London, and convey the waste water for secondary treatment at Beckton STW.
- two separate shorter tunnels comprising a west tunnel (with pump out to the existing sewer network), and an east tunnel, to intercept and contain overflow discharges

along these stretches of the river. Collected waste water to be conveyed to Beckton and Crossness Sewage Treatment Works for secondary treatment.

5.5.4 Thames Tideway Advisory Group 2006

Defra, the Environment Agency, Ofwat Consumer Council for Water, London Thames Gateway Development Corporation, and other Government departments) were involved in the development of the two options which, together with a separate Olympic Measures Group, replaced the Working Group on Thames Tideway and the 2012 Olympic Games. This new group provided a focal point for progress reports, input to and comment on the detailed assessment being carried out by Thames Water from August – December 2006. The key considerations were measures taking into account the planned sewage treatment work upgrades to:

- Reduce overflows from the collecting system connected to Beckton and Crossness by providing significant additional storage;
- To limit pollution of the tidal River Thames and River Lee from CSOs to achieve the TTSS objectives (target dissolved oxygen levels, reduction of aesthetic pollution and health risk).

On 6 December 2006 Defra published an update¹⁴ on progress in developing the two options identified by Ministers and invited comments on the two options. Results of this detailed assessment were submitted by Thames Water to Ministers on 29 December 2006¹⁵ in its **Tackling London's Sewer Overflows report**¹⁶. This concluded that the full tunnel options achieved a higher proportion of the TTSS objectives and scored more highly in the cost benefit ranking. The substantial benefits provided by the Abbey Mills to Beckton sewage treatment works tunnel (the Lee Tunnel) and the upgrades to the Beckton sewage treatment works could be realised significantly earlier than if linked to the longer lead time Hammersmith to Beckton sewage treatment works tunnel (the Thames Tunnel). In particular, these benefits included the interception of combined sewer overflow discharges from Abbey Mills pumping station, which represent in excess of 50% of the total spill volume from unsatisfactory combined sewer overflows.

¹⁴ <http://webarchive.nationalarchives.gov.uk/20061209064849/http://www.defra.gov.uk/environment/water/quality/sewage/overflows.htm>

¹⁵ Thames Water (2006), Thames Tideway Tunnel and Treatment – Option Development, Summary Report, December 2006. <http://www.thamestunnelconsultation.co.uk/document-library/timeline-view/>

¹⁶ http://www.thamestunnelconsultation.co.uk/doclib/summary-report/?came_from=411

5.5.5 Defra's Regulatory Impact Assessment

In March 2007 Defra produced a Regulatory Impact Assessment (RIA) of the options put forward by the TTSS and Ofwat's Jacobs Babbie report:

- The 30km long tunnel was considered by the RIA to meet the requirements of the UWWTD as it would significantly reduce the frequency and volumes from unsatisfactory overflows. It was estimated, with the existing collecting system and Beckton and Crossness sewage treatment works upgrades, to enable over 99% of collected sewage (domestic, industrial and rainwater run-off) to receive secondary treatment. Although overflow discharges would still occur these were expected to be infrequently and of small annual volumes (compared to the annual volume collected and receiving secondary treatment). Taking account the effect on the tidal River Thames and River Lee, it was considered to limit pollution from storm water overflows satisfactorily and protect the environment from the adverse effects of sewage discharges.
- It was considered that the option of two separate shorter tunnels did not meet the requirements of the UWWTD as it did not reduce 17 or 18 overflows which had been identified as unsatisfactory.

The RIA's overall conclusion was that a phased, single-tunnel approach, which addresses all the unsatisfactory overflows, was the minimum required to meet the Government's obligations. It was therefore proposed that Thames Water should be asked to proceed urgently with the development and implementation of a scheme which reduces and limits pollution from storm water overflows (starting with Abbey Mills pumping station) of the Beckton and crossness sewerage system in the most cost effective way. Such an approach was considered to offer the quickest prospect of making a significant impact on the volume of the discharges, and would convey a sense of urgency and commitment to take measures to comply with the Urban Waste Water Treatment Directive.

Thames Water subsequently proposed the following work collectively known as London Tideway Improvements:

- The Thames Tunnel;
- The Lee Tunnel; and
- Upgrades to tidal sewage treatment works.

It was proposed that the Thames Tunnel will be 7.2 m in diameter and up to 67 m deep, and Thames Water's preferred route is up to 25 km (16 miles) long. A tunnel of this size is necessary to provide sufficient storage capacity within it and the depth is necessary to avoid other tunnels and to allow the sewage to flow through the tunnel by gravity. The route generally follows the route of the River Thames so that it can be connected to the combined sewer overflows located along the riverbank. It follows the River Thames as far as Limehouse, where it will continue north-east to Abbey Mills pumping station near

Stratford. Here it will be connected to the Lee Tunnel, which will transfer the sewage to Beckton Sewage Treatment Works.

5.5.6 Draft Waste Water National Policy Statement

The draft Waste Water NPS was subject to formal consultation from 16 November 2010 – 22 February 2011. It acknowledges that there is an existing system to mitigate the reduced oxygen levels in the River Thames but considers that this is not a sustainable or complete solution in the long term. Four alternative solutions are therefore considered:

- Preventing the rainwater from entering the sewerage system;
- Providing extra capacity within the sewerage system;
- Converting the combined drainage to a separate drainage system; and
- Intercepting the Combined Sewer Overflows at their point of discharge to the river and conveying away to a suitable site for treatment (the Thames Tunnel).

The **Appraisal of Sustainability (AoS)**¹⁷ for the Waste Water NPS (which incorporates the requirements of the SEA Directive) provides further detail on the alternatives to the Thames Tunnel. It states that work on identifying and assessing options to address polluting combined sewer overflow discharges into the River Thames has been ongoing since the establishment of the TTSS in 2000. Table 2.2 of the AoS summarises the Thames Tideway intervention strategies considered by the TTSS.

In their response to the Waste Water NPS consultation, the London Borough of Hammersmith and Fulham argue that neither the draft Waste Water NPS or accompanying AoS assessed the alternative tunnel options, including the options recommended by Jacobs Babtie. The Borough considered that a range of alternative options were discarded too quickly by the last Government without thorough investigation of their overall benefits in terms of cost, delivery timescale, disruption caused, as well as social and environmental impacts. They concluded by calling for an alternative hybrid scheme, involving a shorter tunnel, diversion of run-off rainwater and skimming of the river at appropriate times and locations, to be investigated as a matter of urgency. See paragraphs 4.11 – 4.16 for consideration of the Jacobs Babtie report.

5.5.7 Environment Food and Rural Affairs Select Committee Report into the Draft Waste Water NPS

Under the Planning Act 2008 the Secretary of State is required to lay the draft Waste Water NPS before Parliament for scrutiny at the same time as going out to formal consultation. Hearings into the draft Waste Water NPS took place before the EFRA

¹⁷ http://www.lbhf.gov.uk/Images/BkACE%20Thames%20Tunnel%20Commission%202011%20WEB_tcm21-165704.pdf

Committee in January and February 2011¹⁸. Their report was issued on 4 April 2011¹⁹. The Government's response to this report was laid before Parliament on 9 February 2012²⁰.

5.5.8 Thames Tunnel Commission

The Thames Tunnel Commission was launched on 4 July 2011 to evaluate the case for the Thames Tunnel, looking at alternate options. Chaired by Lord Selborne, the Commission consisted of academics and engineers from the UK, Netherland and the USA. It was sponsored by five London Boroughs – Hammersmith & Fulham, Richmond, Southwark, Kensington & Chelsea and Tower Hamlets. The Commission took evidence from a number of parties, including Defra, the EA, Ofwat and Professor Chris Binnie. On 31 October 2011 it issued a report²¹ into its findings. As some of these relate to the Waste Water NPS, they are considered as a late response to the formal consultation. A summary of the recommendations/comments relevant to the Waste Water NPS can be found in the Government's response to consultation at:

<http://archive.defra.gov.uk/corporate/consult/waste-water/120207-wastewaterpolicy-summary-responses.pdf>

Consideration of key issues raised by the Thames Tunnel Commission is set out below:

Generic only Waste Water NPS - One of the objectives of the Planning Act 2008 is to clarify the policy framework for Nationally Significant Infrastructure Projects. For waste water, this has been achieved by identifying within the Waste Water NPS those projects required for development. Their inclusion provides a degree of certainty to developers as to what waste water infrastructure of national significance is required in the future, based on project-specific considerations.

Analysis of the consideration of alternatives - There has been comprehensive assessment of different approaches to reducing sewage discharges into the River Thames for more than a decade. This section of the Post Adoption Statement has already detailed the TTSS, the report produced by Jacobs Babbie for Ofwat and the Defra's 207 Regulatory Impact Assessment.

¹⁸ <http://www.parliament.uk/business/committees/committees-a-z/commons-select/environment-food-and-rural-affairs-committee/inquiries/waste-water-nps/>

¹⁹ <http://www.publications.parliament.uk/pa/cm201011/cmselect/cmenvfru/736/73602.htm>

²⁰ <http://www.defra.gov.uk/publications/files/pb13710-waste-water-nps-response.pdf>

²¹ http://www.lbhf.gov.uk/Images/BkACE%20Thames%20Tunnel%20Commission%202011%20WEB_tcm21-165704.pdf

In September 2010 the Government confirmed its support for a tunnel based solution to the problems in the Thames Tideway in a Written Ministerial Statement presented to Parliament and reaffirmed this support in a further Written Ministerial Statement in November 2011. This latter statement was supported by a document setting out from a Government **position the strategic and economic case for the full-length Thames Tunnel, supported by a cost-benefit analysis**²². The Strategic Case reaffirms what was set out in the 2007 RIA. It states that, at the time of Ian Pearson's conclusion (2007) that Thames Water should proceed with a tunnel-based approach to address the unsatisfactory discharges into the Thames Tideway, no alternative solutions had been identified which would comply with both the environmental objectives set by the TTSS and the requirements of the Urban Waste Water Treatment Directive. Furthermore, neither would any alternative approach provide a quicker or more cost-effective solution. The Strategic Case goes on to say that at the time of these considerations, estimated discharge volumes were available but firm data on some of the combined sewer overflow discharges were lacking. Therefore, it was acknowledged that further investigation into the development and design of a single tunnel approach was needed to refine further the solution and the costs. The ministerial agreement at that stage in 2007 was to a tunnel-based solution on an 'in principle' basis, with a view to further work being completed and reviewed. Since that time, detailed investigations have been carried out by Thames Water, leading to refinements in the preferred route for a Thames Tunnel and to improved knowledge of the level of discharges from combined sewer overflows into the Thames.

This concluded that there is an environmental case for action in the Thames, and that without a solution the current situation was expected to deteriorate. That scenario would be contrary to the Water Framework Directive's requirement to prevent deterioration in water quality status. Furthermore, the full-length Thames Tunnel remained the cheapest solution which addressed these problems, complied with statutory requirements, and met the objectives set by the TTSS for water quality improvements in the Thames Tideway within an acceptable timeframe.

None of the alternatives identified during the extensive studies carried out over the last decade have been found to address swiftly and adequately the environmental and health objectives for the Thames Tideway, while at the same time meeting the Government's statutory obligations. Other approaches, summarised within the strategic case document, such as separating rainwater from foul water sewerage systems would be more costly (estimated to be at least £13 billion at 2007 prices, excluding the economic costs of disruption to traffic and businesses during the construction work), extremely disruptive and take too long to complete. A shorter tunnel coupled with Green Infrastructure measures, such as Sustainable Urban Drainage Systems (SuDS), would

²² <http://www.defra.gov.uk/environment/quality/water/sewage/overflows/>

still not fully reduce the volume and frequency of discharges, either sufficiently or quickly, and so fail to meet environmental and health objectives. The costs of implementing SuDS - According to Thames Water - (alongside a western-only tunnel) requiring in total an open area 40 times the size of Hyde Park to significantly reduce CSO discharges, are estimated to be in excess of £13 billion and could take up to 40 years to complete. However, the Government recognises that SuDS and other Green Infrastructure measures can play an important role in reducing the volume that the London's sewer network has to contend with, and to that extent, SuDS should be implemented as opportunities arise, both in new-build and retro-fitting situations where appropriate and help future-proof London's drainage system.

'In river treatment' through the use of skimmer and bubbler boats was considered by the TTSS and dismissed. This approach could not be considered a preventive strategy in that sewage would continue to be discharged into the river, and once in the river, the polluting effects could only be ameliorated.

Assessment of Combined Sewer Overflows - See paragraphs 4.7 to 4.8 of this section.

Dissolved oxygen standards - Dissolved Oxygen (DO) standards were set by the Thames Tideway Strategic Study in 2005, to include salmon among the sustainable fish population in the Tideway. Since then, the Environment Agency has concluded that a self-sustaining population of salmon in the Tideway is not viable for the present. The Environment Agency also advise that:

- DO standards are not unnecessarily high for the Thames Tideway - the scientific community would generally argue for even higher water quality standards in an estuary to achieve a sustainable fishery;
- DO standards have been derived in a scientifically-robust and defensible way that has been peer-reviewed. They are bespoke, and recognised by the industry as good practice because they take account of specific hypoxic conditions that develop in the Tideway from CSO discharges, and they are underpinned by the study of specific needs of Tideway fish species; and
- DO standards are appropriate to protect sensitive and vulnerable fish species in the Tideway other than salmon, some of which are specifically protected under EU and UK law – such as sea trout, eels, river and sea lampreys, and twaite shad. Resolving water quality issues associated with Thames CSO discharges is key in securing the long-term sustainability of these species under the requirements of UK and EU law such as the Salmon and Freshwater Fisheries Act, the Habitats Directive, and Eel Regulations.

The species mentioned above are known to be present in the Thames Estuary, with sea trout, the same species as brown trout (used as a surrogate for salmon in developing the

TTSS DO standards due to their similar sensitivity to DO), becoming increasingly common and almost certainly breeding in the river.

Statutory DO standards for transitional waters under the Water Framework Directive have been in place since August 2010, and are relevant to the control of continuous discharges (e.g. treated effluent from sewage treatment works). The current Tideway TTSS DO standards, while not directly comparable (because they are relevant to the control of intermittent discharges), are nonetheless compatible with these. Modelling undertaken by Thames Water shows that with all the proposed Thames Tideway Improvements in place (i.e. the Thames and Lee Tunnels, and sewage treatment works improvements), water quality in the middle estuary reaches will be improved, but even so it will only achieve moderate ecological status under the Water Framework Directive. Any relaxation of the TTSS DO standards would therefore be likely to lead to a deterioration in the ecological status. This would not meet the Water Framework Directive requirement to prevent deterioration, or the achievement of good status by 2027 wherever possible.

The proposed Thames Tunnel meets the requirement of the Urban Waste Water Treatment Directive to limit pollution, as overflow discharges will occur only after unusually heavy rainfall. It does not aim to eliminate all Combined Sewer Overflow discharges, but together with the construction of the Lee Tunnel and sewage treatment works expansions, will reduce the current overall discharge volume by some 96% and limit discharges to around four discharges a year. This is in line with current international practice for similar schemes on major rivers, which typically capture 95-97% of total discharge flows and permit 3-6 untreated discharges in a typical year. None of these schemes have dissolved oxygen standards below those set for the Thames Tideway, and indeed with the Tideway improvements in place (i.e. the Lee and Thames Tunnels, and sewage treatment works improvements), the Thames Estuary will achieve no higher Water Framework Directive classification than is achieved in other estuaries in England and Wales.

Best Technical Knowledge Not Entailing Excessive Costs (BTKNEEC) - The Urban Waste Water Treatment Directive refers to “*best technical knowledge not entailing excessive costs*” (BTKNEEC). This is frequently misunderstood to mean “if a scheme costs a lot of money you don’t have to do it”, but this is flawed as is made clear by the opinion of the Advocate-General (the legal adviser to the Court of Justice of the European Union) in the European Commission’s case against the UK for alleged breaches of the Directive in London (and Whitburn), published on 26 January 2012 (Case C-301/10). This opinion notes that the BTKNEEC clause in the Urban Waste Water Treatment Directive cannot be used to undermine the principle that all waste water should be collected for treatment other than in exceptional circumstances. It cannot be used to set a pre-determined cost level above which the obligation to collect and treat all waste water ceases to exist. The Advocate-General’s conclusion was that the untreated waste water discharges into the Thames Tideway breach the Directive, and that the proposed Thames Tunnel was not a disproportionate response. The Government has

reviewed the benefits that will accrue from the completion of the Thames Tunnel, and it is clear from this analysis that the costs are broadly in line with the benefits. It therefore meets the test that it is neither excessively, nor disproportionately, costly.

Western tunnel - A western only tunnel is explored at paragraphs 4.13 – 4.16 of this section

Dry weather flow rates - The key driver of CSO discharges is the amount of rainfall run-off, combined with existing dry weather flows in the sewer system. Dry weather flow rates are directly proportional to population levels. With the current population of London, the sewer system is operating at close to full dry weather flow capacity. Estimates taken from Office of National Statistics data and the London Plan indicate growth in London's population of 0.6 – 0.7% per year for the foreseeable future. This will result in higher dry weather flow rates, further reducing sewer capacity, and result in increased CSO discharges during rain events. There have been suggestions made that reducing water consumption per head of population would significantly reduce the dry weather flow and so free up spare capacity to absorb rainfall run-off, thus reducing frequency and volumes of CSO discharges. However, while measures and behavioural changes to reduce overall water consumption may have an effect over time, the rate of reduction would be more than offset by overall population growth, resulting in little or no net difference to dry weather flows and subsequent CSO discharges.

5.5.9 Conclusion of the consideration of alternatives to the Thames Tunnel

Resolving the issue of frequent spills of untreated wastewater containing sewage into the tidal reaches of the River Thames has been subject to extensive and comprehensive studies, including the consideration of a wide range of alternative solutions, for more than a decade. As a result of which the Government is satisfied that the development of the Thames Tunnel is the most cost effective and timely solution to address the problem of untreated sewage is discharging into the River Thames as demonstrated in the Waste Water National Policy Statement.

6. Monitoring of significant environmental effects

6.1 Introduction and Purpose

The SEA Directive requires monitoring of significant effects from implementing the plan or programme, including unforeseen adverse effects.

Article 10 (1) states “Member States shall monitor the significant environmental effects of the implementation of plans and programmes in order, *inter alia*, to identify at an early stage unforeseen adverse effects, and to be able to undertake appropriate remedial action.” Article 10(2) goes on to say “In order to comply with paragraph 1, existing monitoring arrangements may be used if appropriate, with a view to avoiding duplication of monitoring.”

6.2 Who will monitor the Significant Environmental Effects

As the plan maker, Defra will be responsible for monitoring the significant environmental effects of the Waste Water NPS. Information required on the environmental and socio-economic trends identified as significant for the Waste Water NPS overall may be obtained from a number of sources and agencies and organisations identified in **Table 6-1**. These include the Environment Agency, Natural England and Thames Water. Wherever possible existing and established monitoring systems will be used.

6.3 Proposed Monitoring Framework

Monitoring should be focussed on significant environmental effects as identified in the AoS, for example those:

- that indicate a likely breach of international, national or local legislation, recognised guidelines or standards.
- that may give rise to irreversible damage, with a view to identifying trends before such damage is caused.
- where there is uncertainty over possible adverse effects, and where monitoring may enable mitigation measures to be taken.

Monitoring should be undertaken when the Waste Water NPS has been designated. The frequency of the data collation and reporting should be commensurate with the strategic nature of the effects being monitored.

Tables 6-1, 6-2 and 6-3 below details the significant effects identified in the AoS to be monitored for each of the relevant AoS Objectives including proposed indicators and sources of information.

Table 6-1 Monitoring of Significant Effects for the Waste Water NPS

AoS Topic and Objective	Effect to be Monitored	Indicator	Sources of Information
<p>2. Biodiversity</p> <p>To maintain and enhance biodiversity</p>	Uncertain effects on biodiversity	<ul style="list-style-type: none"> • Condition reports for designated sites. • Population and species diversity and surface water biological indicators near waste water infrastructure sites. • Any deterioration in water quality. 	<ul style="list-style-type: none"> • Natural England • The Environment Agency wildlife survey data. • The Environment Agency are responsible for monitoring water quality under the Water Framework Directive
<p>5. Water quality and resources</p> <p>To maintain and enhance water resources and quality</p>	Significant positive effects on water quality and resources	<ul style="list-style-type: none"> • Any improvement or deterioration in water quality. • Any improvement or deterioration in the productivity of fisheries 	<ul style="list-style-type: none"> • The Environment Agency is responsible for monitoring water quality and biology of receiving water and for monitoring freshwater and migratory fisheries under the Water Framework Directive. And for investigation pollution sources and events. • Effluent quality and flow, and water quality monitoring data carried out by Water Companies.

Table 6-2 Proposed Monitoring of Significant Effects for the Thames Tunnel Scheme

AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
<p>2. Biodiversity</p> <p>To maintain and enhance biodiversity</p>	Uncertain effects on biodiversity	<ul style="list-style-type: none"> • Bird numbers in the Thames Estuary & • Marshes SPA/Ramsar site 	<ul style="list-style-type: none"> • Wildfowl and wader count data (British Trust for Ornithology)
<p>3. Soil and geology</p> <p>To conserve and enhance soil and geology and encourage the efficient use of land</p>	Uncertain effects on soil and geology	<ul style="list-style-type: none"> • The proportion of development taking place within a SSSI designated for geological interest • The percentage of soil excavated during construction that is re-used/ recycled. 	<ul style="list-style-type: none"> • Natural England • It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
<p>4. Land use</p>	Uncertain effects	<ul style="list-style-type: none"> • The proportion of 	<ul style="list-style-type: none"> • Local authorities in London are

Department for Environment, Food and Rural Affairs

AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
To contribute to a more sustainable pattern of land use	on land use	development taking place on previously developed land. <ul style="list-style-type: none"> • The loss of green/open space or sports and recreation grounds 	expected to monitor both of these indicators to inform the London Plan Annual Monitoring Report (KPI 1 and KPI 13)
5. Water quality and resources To maintain and enhance water resources and quality	Significant positive effects on water quality and resources	<ul style="list-style-type: none"> • Any improvement or deterioration in water quality at outfalls • Any improvement or deterioration in the productivity of nearby fisheries • Any improvement or deterioration in the abundance or health of indicator species at outfalls 	<ul style="list-style-type: none"> • Environment Agency water quality data for the Thames Tideway. • Defra (and other) fisheries management records.
6. Waste management (also see 7. Below) To minimise waste arisings, promote re-use, recovery and recycling and minimise the impact of wastes on the environment and communities	Uncertain effects on waste management	<ul style="list-style-type: none"> • The overall proportion of ash produced at Beckton STW that is recycled (e.g. to produce aggregates) relative to that being disposed of to landfill. • The percentage of material excavated during construction that is re-used/recycled. 	<ul style="list-style-type: none"> • It is expected that Thames Water will monitor the volumes of ash disposed of to landfill. • It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
7. Resources and raw materials To promote the sustainable use of resources and natural assets and to deliver secure, clean and affordable energy	Uncertain effects on resources and raw materials	<ul style="list-style-type: none"> • Net renewable energy generation per tonne dried sludge, per annum at Beckton STW • The percentage of raw materials that are recovered during construction. 	<ul style="list-style-type: none"> • It is expected that Thames Water will monitor net renewable energy generation. • It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
10. Landscape, townscape and visual	Uncertain effects on landscape, townscape and visual amenity.	<ul style="list-style-type: none"> • Whether the development has adversely affected the existing 	<ul style="list-style-type: none"> • Landscape character assessments undertaken by Natural England and local authorities identify specific

AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
To protect and enhance the character of landscapes and townscapes		townscape or landscape character .	characteristics that can be treated as 'receptors' for monitoring adverse change and measures for enhancement..
11. Equality To encourage equality and sustainable communities	Uncertain effects on equality	<ul style="list-style-type: none"> Any decline in local air quality that could affect equality target groups 	<ul style="list-style-type: none"> Local authorities will monitor air quality within AQMAs and be able to provide information on demographics within their Boroughs.
14. Traffic and transport To minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects	Uncertain effects on traffic and transport	<ul style="list-style-type: none"> The proportion of construction materials that are transported by barge and rail relative to by road. The increase in traffic volumes around construction sites and Beckton STW 	<ul style="list-style-type: none"> It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan. The London Sustainable Development Commission monitors traffic volumes.
16. Economy To promote a strong and stable economy	Uncertain effects on economy	<ul style="list-style-type: none"> The increase in Thames Water customers' bills as a result of the Scheme Savings achieved by the scheme 	<ul style="list-style-type: none"> It is expected that Thames Water will monitor and report on the impact of the scheme on customers' bills. It is expected that local authorities will monitor costs associated with the clean-up of debris. The Environment Agency will monitor use of the Thames Bubbler and the cost of fish re-stocking.

Table 6-3 Proposed Monitoring of Significant Effects the Deephams Scheme

AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
3. Soil and geology To conserve and enhance soil and geology and encourage the efficient use of land	Uncertain effects on soil and geology	<ul style="list-style-type: none"> The percentage of soil excavated during construction that is re-used/ recycled. 	<ul style="list-style-type: none"> It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
4. Land use	Uncertain effects on land use	<ul style="list-style-type: none"> The proportion of development taking 	<ul style="list-style-type: none"> Local authorities in London are expected to monitor both the

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AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
To contribute to a more sustainable pattern of land use		<p>place on previously developed/derelict land.</p> <ul style="list-style-type: none"> • The loss of green/open space or sports and recreation grounds. • The loss of green belt 	<p>proportion of development taking place on derelict land and the loss of open space to inform the London Plan Annual Monitoring Report (KPI 1 and KPI 13)</p> <ul style="list-style-type: none"> • It is expected that Enfield Borough Council will monitor any development within green belt.
<p>5. Water quality and resources</p> <p>To maintain and enhance water resources and quality</p>	Significant positive effects on water quality and resources	<ul style="list-style-type: none"> • Any deterioration in water quality at outfalls • Any deterioration in the productivity of nearby fisheries • Any deterioration in the abundance or health of indicator species at outfalls 	<ul style="list-style-type: none"> • Deephams water monitoring at outfalls • Environment Agency water quality data • Defra (and other) fisheries management records
<p>6. Waste management (also see 7. Below)</p> <p>To minimise waste arisings, promote re-use, recovery and recycling and minimise the impact of wastes on the environment and communities</p>	Uncertain effects on waste management	<ul style="list-style-type: none"> • The overall proportion of ash produced at Deephams STW that is recycled (e.g. to produce aggregates) relative to that being disposed of to landfill. • The percentage of material excavated during construction that is re-used/ recycled. 	<ul style="list-style-type: none"> • It is expected that Thames Water will monitor the volumes of ash disposed of to landfill. • It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
<p>7. Resources and raw materials</p> <p>To promote the sustainable use of resources and natural assets and to deliver secure, clean and affordable energy</p>	Uncertain effects on resources and raw materials	<ul style="list-style-type: none"> • Net renewable energy generation per tonne dried sludge, per annum at Deephams STW • The percentage of raw materials that are recovered during construction. 	<ul style="list-style-type: none"> • It is expected that Thames Water will monitor net renewable energy generation. • It could be specified that the construction contractor be required to monitor this as part of the Construction Management Plan.
<p>8. Population and human health</p> <p>To protect and enhance the physical and mental health of</p>	Uncertain effects on population and human health	<ul style="list-style-type: none"> • Improvements in water quality in the River Lee • Number of odour/dust nuisance complaints 	<ul style="list-style-type: none"> • The Environment Agency are responsible for monitoring water quality under the Water Framework Directive • Thames Water are expected to monitor nuisance complaints • The London Borough of Enfield is

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AoS Topic and Objective	Effect to be Monitored	Indicator	Source of Information
the population		<ul style="list-style-type: none"> Loss of sports/recreation land for formal and informal leisure activities. 	<p>expected to monitor the any loss of open space to inform the London Plan Annual Monitoring Report (KPI 13)</p>
<p>10. Landscape, townscape and visual</p> <p>To protect and enhance the character of landscapes and townscapes</p>	Uncertain effects on landscape, townscape and visual	<ul style="list-style-type: none"> Whether the development has adversely affected or enhanced existing townscape or landscape character . 	<ul style="list-style-type: none"> Landscape character assessments undertaken by Natural England and Enfield Borough Council identify specific characteristics that can be treated as 'receptors' for monitoring adverse change and measures for enhancement.
<p>11. Equality</p> <p>To encourage equality and sustainable communities</p>	Uncertain effects on equality	<ul style="list-style-type: none"> Any decline in local air quality that could affect equality target groups 	<ul style="list-style-type: none"> Enfield Borough Council will monitor air quality within AQMAs and be able to provide information on demographics within their Boroughs.
<p>12. Archaeology and cultural heritage</p> <p>To protect and conserve archaeology and cultural heritage</p>	Uncertain effects on archaeology and cultural heritage	<ul style="list-style-type: none"> Whether the planning process is undertaken in accordance with relevant policy including PPS5 and any local policies. 	<ul style="list-style-type: none"> Thames Water will be expected to undertake preliminary archaeological investigations prior to submission of a planning application and further invasive investigations if considered necessary.
<p>14. Traffic and transport</p> <p>To minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects</p>	Uncertain effects on traffic and transport	<ul style="list-style-type: none"> The increase in traffic volumes around construction sites and Beckton STW 	<ul style="list-style-type: none"> The London Sustainable Development Commission monitors traffic volumes.
<p>15. Flood risk</p> <p>To avoid an increase in flood risk and to avoid siting flood sensitive infrastructure in areas of high flood risk</p>	Uncertain effects on flood risk	<ul style="list-style-type: none"> Any increase in the potential for flood risk Development in an area of inappropriate flood risk? 	<ul style="list-style-type: none"> The Flood Risk Assessment that will need to be undertaken by Thames Water in accordance with PPS25.

