London Tideway Tunnels
Modernising London’s Sewerage System

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The Background to London’s Sewers
1848 – Cholera deaths peak in London
1858 - The Great Stink – Parliament suspended
“Lost” rivers of London

Lost rivers of London include:
- River Roding
- Barking Creek
- Stoke Newington
- Hampstead
- Bow
- Islington
- Waterloo
- Black Ditch
- Erith
- Notting Hill
- Beverley Brook
- Battersea
- Chelsea
- Roehampton
- Streatham
- Gravesend

Map showing the location of these rivers within the London area.
London’s Sewers - Evolution and Complexity

Original sewers and local collectors

Bazalgette’s Interceptor Sewers

Storm relief sewers and pumping station

River Wall

River Thames

Ground level

High Tide

Low Tide

Plan

Section
Intercepting sewers
1859 – 1865 Construction of Bazalgette’s new interceptor sewers

Northern Outfall Sewer

Sewer tunnels
The Victorian legacy
After 150 years ....... an Upgrade is Required
Urban Wastewater Treatment Directive
London’s sewerage system today – mostly combined

Beckton STW
Crossness STW

Percentage Connected
Separate system
Partially separate system
Combined system
Distribution of impermeability in the Thames Tideway catchment
Combined Sewer Overflows (CSOs)

- Sir Joseph Bazalgette’s sewerage system constructed with 57 CSO points along the tidal River Thames.
- CSOs prevent flooding to buildings and streets by diverting excess sewage into the river when full to capacity after rainfall.
- On average, in excess of 32 million tonnes of untreated sewage is estimated to be discharged annually.
- Discharges occur more than once a week on average.
- Many sewers run 80% full on dry weather flow
- As little as 2mm of rainfall can trigger a discharge.
57 existing Combined Sewer Overflows
Existing Combined Sewer Overflows
Discharging CSO
London Tideway Tunnels - CSOs proportion of discharge

- Acton
- Hammersmith P/S
- Falcon Brook P/S
- Lots Rd P/S
- Ranelagh
- Western P/S
- Heathwall P/S
- Deptford/Greenwich
- Abbey Mills
- All Other CSOs
Thames Tunnel CSOs proportion of discharge
Increasing recreational use of River Thames
Headline news

THAMES FISH IN POISON DISASTER
Thousands killed as big storm forces raw sewage into the river

Storms kill 10,000 fish in Thames
The Solution
The London Tideway Tunnels
## Solutions?

<table>
<thead>
<tr>
<th>Action before sewer: Source Control &amp; Sustainable Urban Drainage Systems (SUDS)</th>
<th>NO</th>
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</thead>
<tbody>
<tr>
<td>Within sewer network: Localised storage &amp; separation.</td>
<td>NO</td>
</tr>
<tr>
<td>In-river: More ‘Bubbler’ &amp; ‘Skimmer’ vessels.</td>
<td>NO</td>
</tr>
<tr>
<td>Intercept overflows: central storage &amp; transfer.</td>
<td>YES</td>
</tr>
</tbody>
</table>
The Thames and Lee tunnels
Option 1c

This figure is indicative only and subject to site selection process and further design work.

- Pump out to Beckton STW
- Crossness
- Abbey Mills PS
- Houses of Parliament
- Tower of London
- Thames Barrier
- Thames and Lee tunnels
- Option 1c
- The Thames and Lee tunnels
- Option 1c

Legend:
- Proposed Lee Tunnel
- Proposed Thames Tunnel
- ▲ Combined Sewer Overflow (CSO) Pumping station
- ★ Combined Sewer Overflow (CSO) Gravity
- STW Sewage treatment works
- PS Pumping station

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London Tideway Tunnels

Lee Tunnel

• 6.9km tunnel from Abbey Mills Pumping Station to Beckton STW.
• £400m project. Largest single contract ever awarded by Thames Water.
• Will intercept 16 million cubic metres of storm sewage that currently makes its way into the River Thames.

Thames Tunnel

• 32.2km (20 mile) tunnel from west London to Beckton Sewage Treatment Works.
• Starting point still to be determined, major shaft sites and combined sewer overflow connection points required.
• Planning application to be submitted 2011.
• Construction not expected to start until 2012/13 for completion by 2020.
Lee Tunnel - general geology
FABER MAUNSELL | AECOM

Thames Tideway
Lee Tunnel

Beckton Pumping Station
Animation
Thames Tunnel – ground conditions
Tideway Tunnels – 8.8m OD tunnel boring machine (TBM)

Technical challenges

• Tunnel-to-tunnel connections beneath river

• Lining durability - 150 yr design life

• Transient pressure waves

• Aquifer protection

• Proximity to other tunnels

• Settlement impact on third parties

• Construction logistics: 80m water pressure through chalk/very long drives

Earth Pressure Balance Machine
Ground investigations
**CSO interception**

**Challenges**

- 34 CSOs
- Up to 60m$^3$/s
- Up to 30m dia shafts
- Up to 75m deep
- De-aeration
- Air release
- CSO interception in river or busy London Streets
Assessment of fluvial impact of works
Operation and maintenance - purpose made inspection vehicle in Milwaukee sewer tunnel
The search for shaft sites
Thank You

Questions?