River Thames Clean Up - Past, Present & Future

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Introduction

Part 1 – Past to Present

*Cholera, the ‘Great Stink’ and Joseph Bazalgette!*

Part 2 – The Current Challenge

*Dead Fish and Sewage Litter…*

Part 3 – The Future

*Working for a Cleaner Thames*

Conclusions
INTRODUCTION -
UK Water Companies

Thames Water
Our Sewerage Operation

- Over 13 million wastewater customers
- 348 sewage treatment works
- 67,000 km of sewer pipes
- Treat equivalent of 41 Olympic size swimming pools of sewage every hour in London
River Thames in London
PART 1 – River Thames Clean up

Past to Present
Old Rivers of London

- Stamford Brook
- Counters Creek
- West Bourne
- TY Bourne
- Hale Bourne
- Hole Bourne
- Hackney Brook
- Shore Ditch
- Waterloo
- Earl
- River Ravensbourne
- Quaggy River
- Roehampton
- Forest Hill
- Streatham
- Falcon Brook
- Bow
- Islington
- Stoke Newington
- Hampstead
- Notting Hill
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Population Growth & Technology Changes in the 19\textsuperscript{th} Century

- Cesspits developed and by 1800, 150,000 were serving population of 1 million

- Rising population (1 to 6 million between 1820 and 1900) due to immigration from the country

- Flushing toilets were developed but still discharging into cesspits so regularly overflowed

- Caused unpleasant odour and pollution of drinking water wells - sanitation became a large problem in poor areas
Wastewater Crisis in the 19th Century

- Until around 1800 River Thames fairly clean and supported fishing industry (e.g. salmon and lobster)

- Old rivers and sewers discharged onto the foreshore – Thames became increasingly dirty and toxic

- Tides meant buoyant material floated up and down river and deposited on river banks

- Water quality of River Thames worsened and it began to smell – by 1850 only eels could survive!
Public Health Issues

- Overcrowding continued and death rates increased – spread of disease not properly understood

- 1831/2 - first cholera epidemic followed by repetitions in 1848/9 and 1854/5

- Government knew something had to be done – investigations showed diseases related to poor living conditions and polluted drinking water

- Public Health Act 1848 - formation of Metropolitan Commission of Sewers

- Metropolitan Water Act 1852 – abstraction of water from upstream of Teddington Lock (freshwater)
Metropolitan Commission
1848 – 1855

- Undertook major survey of all sewers in London
- Principle of intercepting sewers was considered but technically very difficult
- Involved building canal-like sewers on each bank of Thames to separate the sewers from the river
- Sewers would convey waste to East London - discharge on ebb tide so foul flow taken out to sea
- 1853 Joseph William Bazalgette appointed as Chief Engineer at the Commission
Plan for Intercepting Sewers

- Developed intercepting sewer plan further – based on combined system for foul sewage and surface runoff (Combined Sewer Overflows)

- 82 miles of major intercepting sewers, 2 large storage works, 4 major pumping stations and 4 miles of river embankment!

- Construction cost estimated to be £3.3million

- Plan was rejected, mainly on cost and technical grounds
Metropolitan Board of Works
1855 - 1889

- Basic proposal was accepted in principal in 1856, but many discussions and arguments about details

- Government ordered further investigations and subsequent plans were rejected

- June 1858 – business could not continue in the Houses of Parliament because of the ‘great stink’ of the river

- August 1858 - Prime Minister Benjamin Disraeli agreed Act to enable MBW to obtain a loan and work started
London’s Sewers
London County Council
1889 - 1964

- Quality of river Thames improved
- MBW replaced by London County Council in 1889
- Assessment of system problems and continuing population growth (above Bazalgette’s predictions) resulted in:
  - Two new interceptors on each side of the river built between 1905 to 1911
  - Storm relief sewers between 1879 and 1964
  - Primary treatment (sedimentation) at Beckton and Crossness between 1890 to 1900
  - Mogden STW commissioned in 1935
Changes in the 20th Century

- By 1950s river was anaerobic again - large extensions at Beckton (1964) and Crossness (1974)

- Sludge from Beckton and Crossness treatment processes was transported in vessels out to sea until 1998

- All 5 Tideway sewage treatment works (Beckton, Crossness, Mogden, Long Reach and Riverside) received secondary (biological) treatment by 1978
Tidal Thames Dissolved Oxygen

The Recovery 1950-90

Dissolved Oxygen % Saturation

Km from London Bridge

1950-59
1970
1975
1980
1990
Cumulative Fish Species Recorded in Tidal Thames (Fulham – Tilbury)
Fishing on the Thames
PART 2 –
River Thames Clean Up
*The Current Challenge*
Tideway Combined Sewer Outfalls and Pumping Stations
River Thames & Tideway STWs

River Brent
River Lea
River Roding
River Beam
River Ingrebourne
River Thames & Tideway STWs

Mogden
Beckton
Riverside
Crossness
Barrier
Long Reach
Gravesend
Southend
Thames Estuary

RWE Group

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London’s Principal STWs

Mogden STW

Beckton STW

Crossness STW
London’s Sewers: Current Challenge

- **Acute water quality problems:**
  - Combined sewers reach capacity in heavy rain and discharge into River Thames
  - Localised impact on quality - severe oxygen depletion under worst circumstances

- **Chronic water quality problems:**
  - Quality of STW discharges establishes background for intermittent discharge issues
  - Summer/low flows - minimal freshwater dilution, poor mixing, long retention times
Typical Oxygen Sag Curve

- Mogden STW
- Crossness STW
- Beckton STW
- Critical Point

Dissolved Oxygen % Saturation

Distance from London Bridge km

-51 -41 -31 -21 -11 -1 -11 11 21 31 41 51 61

Typical Oxygen Sag Curve
Combined Sewer Overflows Discharging into River Thames
Litter and Dead Fish on the Thames Foreshore
Protection of Water Quality in Tidal Thames

‘Tideway Operating Agreements’ with Environment Agency:

1. Enhanced effluent quality
   - All 5 Tideway STWs operated to produce better effluent quality during summer period

2. Maintain and operate mobile vessels (Bubbler and Vitality)
   - Oxygenation barges capable of adding 30 tonnes oxygen per day
     - Use when DO concentration falls, to protect river life

Also 2 new skimmer boats to collect litter
Oxygenation Barges – ‘Bubbler’ & ‘Vitality’
PART 3 –
River Thames Clean Up
The Future
Thames Tideway Strategic Study

- Carried out between 2001 - 2005

- Aim to investigate the issues of combined sewer overflows to the River Thames and identify possible solutions

- Independently chaired Steering Group with representatives from:
  - Government
  - Regulators
  - Local Planning Authority
  - Thames Water
Tideway Strategy –
Agreed Environmental Objectives

1. To reduce the incidence of aesthetic pollution (sewage-derived litter)

2. To reduce health risk to recreational users - preserving and improving water quality for bathing and recreational activities

3. To maintain dissolved oxygen concentrations that support a sustainable fish population
Outcomes of the TTSS

1. Improvements to STWs
   - Increased capacity (more flow to be treated before storm discharges are made) at Beckton, Mogden and Crossness STWs
   - Improved effluent discharge quality at Beckton, Crossness, Long Reach and Riverside STWs
   - Improvements will be in place by 2014

2. Tideway Tunnel
   - Underground tunnel to capture flows from combined sewer outfalls currently discharging into the River Thames
   - Flows would be transferred to East London for treatment
2006 Progress

- July 2006 – Government requested further assessment of two options (full tunnel and 2 shorter tunnels)

- Report will be submitted in Dec 2006 and decision expected in early 2007

- Assessment to include technical, cost and environmental aspects

- Principal driver is European Union Commission – improvements of London’s sewerage system to meet requirements of the UWWTD
Tideway Tunnel Options

Option 1
- 34.5km long, 7.2m diameter
- 85m below ground
- Treatment at Beckton STW

Option 2
- Two shorter tunnels
- Treatment at Beckton STW
Summary – River Thames Clean Up

- Quality of the River Thames has improved greatly over the past two centuries

- Main drivers have been:
  - Public health - e.g. cholera epidemics, ‘the great stink’
  - European Union – environmental legislation
  - Public pressure and health risk

- Implemented through mixture of legislation and regulatory bodies (e.g. Environment Agency)
Further Information

- Thames Tideway Strategic Study:
  http://www.thamestidewaystrategicstudy.co.uk

- Thames Water Utilities Limited:
  http://www.thameswater.co.uk

THANK YOU