

Thames Water's Water Resource Planning and Drought Planning Steve Tuck Water Resources Specialist



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Thames Water Utilities Limited





Water services

- 9.2 million clean water customers
- 2,526m litres of drinking water supplied per day
- 87 WTWs, 30 raw water reservoirs, 288 pumping stations and 235 underground service reservoirs
 - 31,186 km of water mains

Sewerage services

- 14.5 million wastewater customers
 - 350 STWs treating an average of more than 4bn litres per day
- 65,585km of sewer, 2,800 pumping stations and 1.2 million manholes
- Two sludge-powered generators and 21 chp plants generating 176 GWh of renewable electricity ³

Water Resources in the Thames Catchment

- Thames basin is one of the most intensively used water resource systems in the world.
- Around 50% of effective rainfall is licensed for abstraction compared to other company areas

| | | IOH | Estimated | Public | | area |
|--------------|------------|-------------------------|-------------------------|------------------------|-------|-------|
| | RF (mm) | ave evaporation (mm) | pot evaporation (mm) | supply (1000m3/day) | % use | (km2) |
| Anglian | 611 | 480 | 520 | 1721 | 25 | 27500 |
| Northumbria | 879 | 485 | 525 | 1071 | 12 | 9400 |
| N West | 1217 | 500 | 542 | 2478 | 9 | 14445 |
| Severn Trent | 773 | 500 | 542 | 2504 | 18 | 21650 |
| Southern | 787 | 480 | 520 | 1317 | 17 | 10450 |
| S West | 1194 | 522 | 565 | 476 | 3 | 10800 |
| Thames | 704 | 480 | 520 | 3799 | 55 | 13750 |
| Welsh | 1334 | 517 | 560 | 1215 | 3 | 21300 |
| Wessex | 864 | 514 | 557 | 926 | 11 | 10000 |
| Yorkshire | 818 | 485 | 525 | 1508 | 14 | 13600 |

Rainfall data from Waterfacts '95 (1941-1970 average)

Water supply data for 1994/95 from Waterfacts '95 (WOCs data has been added to water service company totals)

Evaporation data is actual average evporation from IOH for 1995 but scaled up to give potential evaporation

Water Resources in the Thames Catchment

- Thames Water
- Supply is mainly through surface water abstraction supported by a series of large bunded storage reservoirs
 - London : 80% surface water and 20% groundwater
 - Thames Valley : 30% surface water and 70% groundwater
- In a typical day, we supply 2000 MI/d London (2300 MI/d peak); 600 MI/d Thames Valley (peak 710 MI/d)
- Bulk supplies to neighbouring water companies:
 - Essex and Suffolk Water 91 MI/d raw water
 - Affinity Water 12 MI/d treated water and 2 MI/d raw water
 - Sutton and East Surrey Water 13.6 MI/d treated water (only 5 MI/d taken in recent years)

The impact of winter rainfall



Winter rain is vitally important:

- Summer rain is largely used up by plants and lost to evaporation.
- Winter rain "recharges" the underground aquifers which drive base flows in rivers.
- If we get low winter rainfall aquifers don't replenish as fully and so river levels are lower in the following year.
- That means we cannot refill our reservoirs and levels drop rapidly.

Our Existing Resources



hame Water



- Companies plan on the basis of the worst-case scenario in the historical record
- This assumes the future will be a variation of the past
- An extended dry period such as three dry winters - could lead to level 4 restrictions.

London - water resource challenge



By 2020 demand is forecast to outstrip supply by 133 million litres of water per day (MI/d), growing to 414 million litres per day (MI/d) by 2040: equivalent to the water needed by 2 million people.



Forecast gap between supply and demand in London

Source: Draft Water Resources Management Plan, 2014

WRMP14 : The planning problem



Baseline supply-demand forecast

| Water resource zone | 2011 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 |
|-------------------------------|-------|-------|--------|--------|--------|--------|--------|
| London | 18.8 | -59.4 | -132.7 | -213.1 | -291.7 | -359.1 | -413.9 |
| Swindon and Oxfordshire | 37.34 | 27.08 | -0.14 | -12.05 | -21.30 | -26.70 | -32.66 |
| Slough, Wycombe and Aylesbury | 21.47 | 11.57 | 7.93 | 4.89 | 0.77 | -2.60 | -6.09 |
| Guildford | 6.85 | 0.85 | 0.06 | -1.14 | -2.14 | -2.85 | -3.80 |
| Henley | 5.32 | 5.14 | 4.76 | 4.31 | 3.80 | 3.26 | 2.67 |
| Kennet Valley | 41.25 | 26.05 | 21.68 | 16.38 | 11.41 | 7.84 | 5.49 |











Investigation of the resource options





Water Resources Forum



Why metering?



- On average, our customers each use almost a third more water than they did 30 years ago.
- London average 164 litres per person day compared to the national average 147 litres per person per day
- Currently only one in three homes in our region have a water meter
- We plan to fit over **500,000** meters in London between 2014 and 2020



Will we see more severe droughts in future?







Risk and uncertainty – it is not just climate change...





Thinking big

- Major projects take time to plan, develop and deliver
- We need an overarching long-term plan for water resources
- Our draft Water Resources Management Plan 2014 lists 3 large scale resource options for further investigation – wastewater reuse, regional water transfers and reservoir storage
- We need to look beyond our borders to identify opportunities to collaborate







Aims of Drought Plan



- Drought poses the ultimate test for the supply demand balance and represents the greatest risk for the company
- Statutory Requirement (Water 2003) Conserves reservoir storage as much as possible security of supply
- Through timely actions, protect water supply and the environment
- Improve communication with customers, regulators & stakeholders through clarity of decision making before and during drought
- Minimise the adverse impact on reputation of drought measures
- Minimise, as far as possible, the risk of severe use restrictions

The 1976 Drought

- Following a dry summer in 1975 with approximately 80% average rainfall, October 75 to March 76 saw only 45% average rainfall
- The unprecedented dry spell continued, average rainfall April 76 to September 76 being just 68% of average
- Thames Water is vulnerable to such extended "two year droughts"
- Without groundwater recharge during the wetter winter months, baseflows in the River Thames quickly deplete and we are not able to abstract sufficient water to maintain reservoir storage levels; security of supply is dependent on water stored in our reservoirs





Forecast London reservoir storage to determine drought management measures





Thames Water Drought Plan Levels of Service



| Restriction | Action | Frequency (drought severity) |
|-------------|--|------------------------------|
| Level 1 | Intensive media campaign | 1 in 5 years |
| Level 2 | Sprinkler/unattended hosepipe ban | 1 in 10 years |
| Level 3 | Temporary Use Ban, Drought Permits, Ordinary Drought Order | 1 in 20 years |
| Level 4 | Standpipes and rota cuts requiring an emergency Drought Order | Never |

Severe Water Use Restrictions



- Level 4 restrictions represent the point at which London's reservoir storage has declined to its emergency reserve (equivalent to approximately 30 days storage)
- Demand must be drastically reduced so that London does not run out of water
- Level 4 has major social, economic, environmental and regulatory consequences
- The estimated average daily cost in London is >£250 million
- The company must be able to demonstrate that it has done everything in its power to prevent reaching Level 4

Rainfall March 2010 – March 2012





Groundwater (GW) levels – forecast of Stonor Park borehole for determining London drought levels



Demand side measures



| Measure | Description of measure | Drought Event Level (DEL) | Company Level of Service | |
|---|---|------------------------------------|--------------------------|--|
| Media / water efficiency campaign | Wide-scale media activity and advertising to encourage voluntary reduction in water usage | DEL1 | Level 1 | |
| Enhanced media / water efficiency campaign | Enhancement of above activity DEL2 | | Level 2 | |
| Leakage reduction | eakage reduction Increased leakage activity / Network pressure management | | Not applicable | |
| Sprinkler and unattended hosepipe ban | Sprinkler and unattended hosepipe ban | DEL2 | Level 2 | |
| Temporary Use Ban (formerly hosepipe ban) | 11 categories of use (largely domestic) banning the use of a hosepipe. | DEL3 | Level 3 | |
| Drought Direction 2011 measures (formerly non- essential use ban Ordinary Drought Order) Application to Defra to grant all 10 categories of non-essential use restrictions affecting commercial businesses. | | DEL3 | Level 3 - if enacted | |
| Emergency Drought OrderApplication to Defra to grant an emergency drought order, including rota cuts and stand pipes. | | DEL4 | Level 4 - if enacted | |

Communications Drought campaign 2012

100000



Awareness

 Almost all Thames Water customers (96%) were aware of drought

 2 in 3 (65%) customers had seen our advertising
 - compared to national average of 54%

 Billboard and bus stop advertising was most effective



Supply Side Measures

- Thames Water
- Make best use of existing sources e.g. conserve reservoir storage
- London drought schemes

| Scheme | Benefit MI/d |
|--|--------------|
| | |
| North London Artificial Recharge Scheme (NLARS) | 125 – 210 |
| Hoddesden Transfer scheme | 12.5 – 25 |
| Thames Gateway Water Treatment Works (TGWTW) | 150 |
| West Berkshire Groundwater Scheme (WBGWS) | 90 |
| Small scale groundwater schemes | |
| ELRED, Stratford Box and Old Ford | 28 |
| Chingford Artificial Recharge Scheme (CHARS) | 11 – 18 |

Bulk supplies

- Drought permits to increase existing abstractions e.g. London residual flows
- Re-commissioning of disused sources e.g. Blewbury
- Options of last resort e.g. tankering, non-potable usage

Desalination





Our desalination plant at Beckton is capable of putting an additional 150m litres a day enough for 1m people - into the supply network for London if required.

