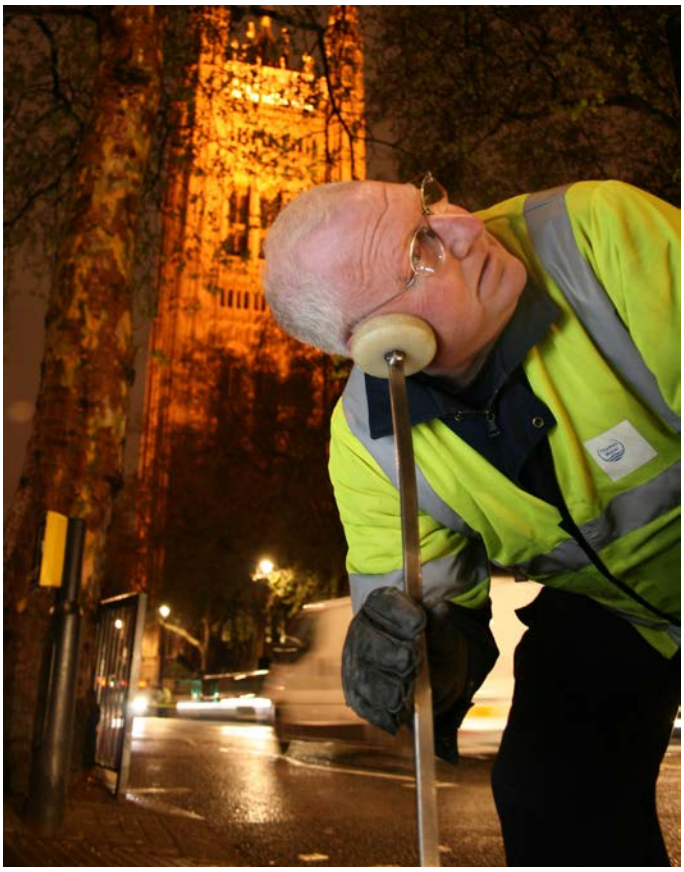
Thames Water

Final Water Resources Management Plan 2015 - 2040

Main Report



Section 9: Preferred Programme

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Section 9 Preferred Supply Demand Plan

In this section the final planning solutions for each Water Resource Zone (WRZ) are presented and discussed. These solutions are referred to as the preferred plan or final plan.

Our preferred plan has been developed to give the best overall balance between the preferences of customers, flexibility to deal with a range of risks and uncertainties and to make a contribution to sustainable development.

We show why we have chosen our preferred plan over alternatives.

London has a baseline supply-demand deficit of 133Ml/d by 2020 (c6%), increasing to 414Ml/d by 2040 (c21%); the uncertainty around the AMP6 programme of activities is 17 Ml/d in AMP6, so the overall supply demand deficit incorporating the risk is 150 Ml/d in AMP6. The preferred plan to meet this is to focus on demand management in the short-term and adopt a flexible long-term plan of demand management and resource development.

Three of the five Thames Valley Zones have a supply-demand deficit within the planning period, Swindon and Oxfordshire (SWOX), Slough, Wycombe and Aylesbury (SWA), and Guildford. The remaining two zones, Henley and Kennet Valley, are in surplus throughout the 2015-2040 period. SWOX goes into deficit in 2020 in peak week conditions with an imbalance of -33 Ml/d by 2040; SWA has a peak week deficit of 3Ml/d in 2035 increasing to 6Ml/d by 2040; and Guildford has a peak week deficit of 1Ml/d in 2025 rising to 4Ml/d by 2040.

Our preferred plan in Thames Valley is to rollout a programme of full household metering starting from 2020.

Our preferred plan for both London and Thames Valley WRZs resolves the forecast deficits.

There is risk in our plan but in this section we detail alternative options to manage these risks should the forecast yields not materialise.

Our estimate of greenhouse gas emissions over the planning period is included in this section.

9.1 Overview

In this section the final planning solutions for each WRZ are presented and discussed. These solutions are referred to as the preferred plan.

Our preferred plan has been developed to give the best overall balance between the findings of the customer research, the needs of customers in the long-term, flexibility to deal with a range of risks and uncertainties and to make a contribution to sustainable development.

There are both lower and higher cost plans than our preferred plan. There are also lower and higher risk plans than our preferred plan. However, as shown in this section our plan is towards the lower end on cost and adopts a series of interventions that are not the historic ‘engineering concrete’ solutions but aim to achieve a sustainable approach to water resource management.

This gives our plan a different risk profile from previous water resource plans which we consider to be the most appropriate balance in the long-term.

For both London and the Thames Valley the foundation of the preferred plan has been the least cost plan. We used the results of the programme appraisal approach to develop the best value plan which is termed the preferred plan (Section 8).

For London, our preferred plan follows the themes of the least cost plan and focuses heavily on demand management in the short term and as a result, delays the need for new resource schemes.

For the Thames Valley, we have looked to demand management as the key building block for a long-term, sustainable water supply system for the future. This activity does not pass a numerical cost-benefit test in all WRZs, however, when wider issues are taken account we consider it is the approach that delivers best value to customers in that it is more sustainable, flexible and equitable. The investment activity in the Thames Valley is from 2020 and therefore this strategy and plan has no impact on customers' bills in the 2015-2020 period.

As the Henley and Kennet Valley Resource Zones in the Thames Valley have no forecast supply-demand deficit the investment in these zones is discretionary. However, the programme appraisal presented in Section 8, recommends that our preferred plan of implementing demand management in all Thames Valley zones from 2020 is a better value plan, meeting wider objectives and giving customers throughout our supply area a consistent message on the value of water. The cost of the plan will be higher but the results indicate the non-monetised benefits of the plan are greater and the plan has a better programme appraisal score.

In this section we first describe the preferred plans for each resource zone and then describe the components of the plan, such as leakage, in more detail[1]. The outcomes of this preferred plan have been incorporated into the 2014 Business Plan[2].

Thames Water will, in accordance with requirements, conduct an annual review of the plan. Where differences between actual results and the forecasts contained in the plan are material, we will re-examine our plan. At the latest, if not required by an earlier annual review, we will re-issue or plan for public consultation in 2018, following a full bottom-up review.

In May 2013 we published our dWRMP14 covering the 25-year period from 2015 to 2040 for public consultation. We received 350 responses to the public consultation. On 30 October 2013 we published our Statement of Response in which we set out the representations that we received to the consultation, our consideration of the issues raised and changes made to the dWRMP14 as a result of the representations. We have also taken account of new and updated technical data and information in revising our plan.

[1] Note that the figures presented in this section are as annual, or AMP, total or year end values. Figures for the same items presented in Appendix A will be presented as annual average or mid year values, Differences between these are therefore expected, both are correct they are simply expressed in different terms.

[2] This includes not just the forecast operating and capital cost of the plan but also where there are synergies with general maintenance costs. This is explained later in the document.

9.2 London

9.2.1 The final plan for London

As set out in Section 6, in London there is a significant supply demand deficit against dry year annual average (DYAA) demand throughout the planning period. Without investment, security of supply would not be achieved in this zone.

The deficit is driven largely by a combination of population growth and the impact of climate change.

As a result of our preferred plan, the supply-demand deficit will be removed in AMP6 and supply and demand will remain in balance throughout the period. We balance supply and demand through the combination of demand management and resource development, which we consider to be the most flexible and sustainable response to the forecast supply-demand deficit.

We presented our preferred plan to the Environment Agency and Ofwat prior to submission of our draft Plan in March 2013. We also held a stakeholder event to present the process behind the preferred plan and its components. Since submission of our draft plan we have updated our preferred plan to take into account comments received as part of the public consultation and updated technical information, as set out in our Statement of Response.

The key features of the preferred plan are:

Short-term (2015-2020)

- Reduce leakage by ~10% (59Ml/d) between 2015-20 through a combination of mains replacement, active leakage control, reduction in supply pipe and customer side leakage, and pressure management.
- Start rollout of 'full' meter penetration of household customers. 441k progressive household meters in the period 2015-20. Total household meter penetration of 70% is achieved by 2025. We will use smart meter technology[3].
- New water trading agreement to reduce volume of existing raw water transfer to Essex and Suffolk Water (DO gain of 17Ml/d).
- New short-term water trading agreement with RWE N-Power to use abstraction licence surplus created by the closure of Didcot A coal fired power station at the end of March 2013 (DO gain of 17Ml/d).
- The development of new groundwater schemes providing approximately 9 Ml/d of water supply.

[3] Automatic Metering Infrastructure (AMI) - This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast (17 Ml/d not including life cycle deterioration of savings). The programme comprises two main components, the "baseline" programme which is the foundation for our engagement with customers and delivers our legal duty to promote water efficiency and an "enhanced" programme to help to meet the water resources deficit in our supply area. Further detail is provided in Appendix O.
- Focused programme to achieve reductions in our own water use (1Ml/d).
- Forecast reduction in non-household use from water efficiency brought on by the introduction of competition[4]. A benefit of 4.7Ml/d reduction over AMP6.

Medium to Long-term (2020-2040)

- Further development of small groundwater schemes, providing 23.5 Ml/d of additional water supply.
- Raw water transfer using the Oxford Canal to increase available water in London by 17 Ml/d.
- Continue to rollout progressive household metering to complete by 2025, achieving a total household meter penetration of 70%.
- Approximately 9% further leakage reduction (45Ml/d) through a combination of mains replacement and reduction in supply pipe and customer side leakage.
- Rollout innovative tariffs in the 2020-2025 period to promote water efficiency.
- 150Ml/d wastewater re-use plant for delivery in 2025-2030 to secure long-term resilience. However, three options (transfers, re-use and storage) are proposed to be taken forward for more detailed study in AMP6 to give future flexibility and help deliver a solution that could achieve supply resilience for the South East as a whole.

The plan is presented in Tables 9-1 to 9-5 and Figures 9-1 and 9-3.

Plan Description

The supply and demand balance will be maintained during AMP6 due to the reduction in bulk supply transfer to Essex and Suffolk Water, a new raw water trading agreement with RWE N-Power in 2015, 8.9Ml/d from new groundwater schemes in the period 2015 – 2020 and the delivery of a comprehensive demand management programme. AMP6 will continue and intensify the progressive metering programme established in AMP5, with 441,000 progressive meters installed, in addition to the 129,255 planned optant meters. This is integrated with a comprehensive water efficiency programme in line with that linked to the customer education associated with the progressive metering programme; engaging and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. This is accompanied by a programme of mains replacement for leakage reduction and pressure management. At the end of AMP6, meter penetration in London will have increased from 30.6%

[4] Based on the estimated impact of the introduction of retail competition in Scotland.

in 2014/15 to 54 % of properties. AMP7 will continue the roll out of the demand management programme across London with a further 294,000 progressive meters installed, in combination with 76,955 optant meters, and the continued approach to water efficiency and customer education.

Tariffs are introduced in AMP7. There is a significant lead time between the start of progressive metering in AMP5 and the introduction of tariffs in AMP7. This enables Thames Water to research the best way to introduce tariffs, putting customers in control of their water bills, whilst retaining customer confidence and ensuring a tariff system that will protect vulnerable customers.

In addition to active leakage control, the preferred plan includes 481km of mains replacement to reduce leakage and a programme of pressure management.

Although not covered in this plan, as mains replacement also has benefits on our day-to-day maintenance activities, we have reduced our overall water service business plan forecasts to allow for the synergies this programme brings[5]. This is included in our Business Plan submitted to Ofwat in December 2103.

We have also taken into account the impact of future water savings in this plan in our capital maintenance forecasts for our water treatment works expenditure in London[6].

Resource development over the period 2020-2040 is dominated by the 150 Ml/d wastewater re-use scheme, but there is a further 23.5 Ml/d of groundwater development and 17 Ml/d associated with the Oxford Canal transfer.

Impact of the plan on Customer Bills

Our preferred plan for London has a total capital cost of £360.1m and operating cost of £34.8m in 2015-2020[7].

The preferred plan has a programme appraisal score of 21 which is the same as the base least cost plan. However, the preferred plan is considered to be more flexible, makes a better contribution to sustainable development, and is better aligned to customer priorities, stakeholder feedback and government objectives for only a small cost premium.

[5] To control material deterioration of our water mains we calculate c650km of mains need to be replaced each 5 year period. Some of the mains replacement activity in the Water Resource Management Plan will contribute to maintaining the overall performance of our water network. In building our plan we have looked at the synergy between maintenance and the Water Resource Management Plan and adjusted our capital maintenance replacement rates downwards. This is included in our Business Plan. We discuss this in Appendix M in more detail.

[6] We have built risk models for our water treatment works in London. This shows that some works would face a significant risk of failure to meet demand in the 2015-2020 period due to a lack of resilience. We have looked at how reductions in demand as a result of the activities within the Water Resource Management Plan would affect our planning of water treatment works investment and used this to reduce our draft spend forecasts. This work is included in our Business Plan for the 2014 Periodic Review.

[7] The total cost of the plan is estimated to cost between £5-£7/yr/household by 2020 depending on the financing assumptions and the future regulatory regime to finance.

Performance of the Preferred Plan

The preferred plan for London ensures that security of supply is maintained throughout the planning period and removes the supply demand deficit predicted in the baseline forecast, as shown in Figure 9-2 below.

The requirement for a large resource in 2027 provides flexibility in the planning process to clarify some of the future uncertainties with respect to population increase, requirements of the Water Framework Directive and to enhance our understanding of the implications of climate change. Taking forward the three large scale options of wastewater re-use, regional water transfers and reservoir storage for further investigation in AMP6, ensures that the most appropriate scheme(s) can be developed to ensure resilience in water supply for the UK's capital and the wider South East region.

Table 9-1: London Final Plan – Overall Plan (DYAA)

Final Plan	Delivery date and ongoing supply demand benefit (Megalitres per day)				
London	**2015-2020**	**2020-2025**	**2025-2030**	**2030-2035**	**2035-2040**
Leakage reduction in London (mains replacement, active leakage control and customer supply pipe repairs)	39	33	11		
Pressure Management in London	20				
Progressive Household Metering • 441,270 households in 2015-20, • 293,896 households in 2020-25	23.8	14.3			
Optant meters (inc in baseline forecast) (AMP6: 129,255; AMP7: 76,955)	-	-	-	-	-
Water Efficiency[8]	13	-0.5			
Tariffs and behaviour change*	5	41	8	8	8
Water transfers					
• BT ESW Chingford reduction	17	17	17	17	
• BT RWE Didcot	17				
Groundwater and artificial recharge schemes					
GW Tottenham	1.4				
ELRED Groundwater	0.95				
ASR Darent Valley (Horton Kirby)	5				
GW Honor Oak	1.5				
AR Kidbrooke		5			
AR SLARS Merton		6			

[8] The savings arising from household and non-household water efficiency in AMP6 are 13 in AMP6, this is less than the savings reported in the Business Plan of 17 Ml/d as they take account of the decay in savings as explained in Appendix O.

Final Plan	Delivery date and ongoing supply demand benefit (Megalitres per day)				
London	**2015-2020**	**2020-2025**	**2025-2030**	**2030-2035**	**2035-2040**
GW Southfleeet/Greenhithe			9		
RWT Oxford Canal Transfer [London](GW sourced)					17
AR Hornsey					2
GW – Addington					1.5
Wastewater re-use (Beckton Sewage Treatment Works)			150		
Commercial Reduction From Competition	4.7	3.1			
Thames Water Building Water Reduction	1				

*This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-2: London Final Plan - Water Resource Schemes

Scheme	DYAA Yield (Ml/d)	Delivery year
Essex & Suffolk bulk supply reduction	17	2015/16
BT RWE Didcot	17	2015/16
GW Tottenham BH	1.4	2015/16
GW ELRED	0.95	2015/16
ASR Darent Valley (Horton Kirby)	5	2019/20
GW Honor Oak	1.5	2019/20
AR Kidbrooke	5	2021/22
AR SLARS - Merton	6	2021/22
GW Southfleet/Greenhithe	9	2026/27
Beckton STW RO Wastewater Re-use	150	2027/28
RWT Oxford Canal Transfer [London]	17	2038/39
AR Hornsey	2	2039/40
GW Addington	1.5	2039/40

Table 9-3: London Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
London	533	474	441	429	429	429

Table 9-4: London Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
London	54%	70%	72%	73%	75%

Table 9-5: London Final Plan - Programme Appraisal Score

	Financial	Customer	Sustainability	Delivery	Resilience	Total
Least Cost	5	4	4	4	4	21
Preferred	3	4	5	5	4	21

Figure 9-1: London Final Plan – Waterfall diagram

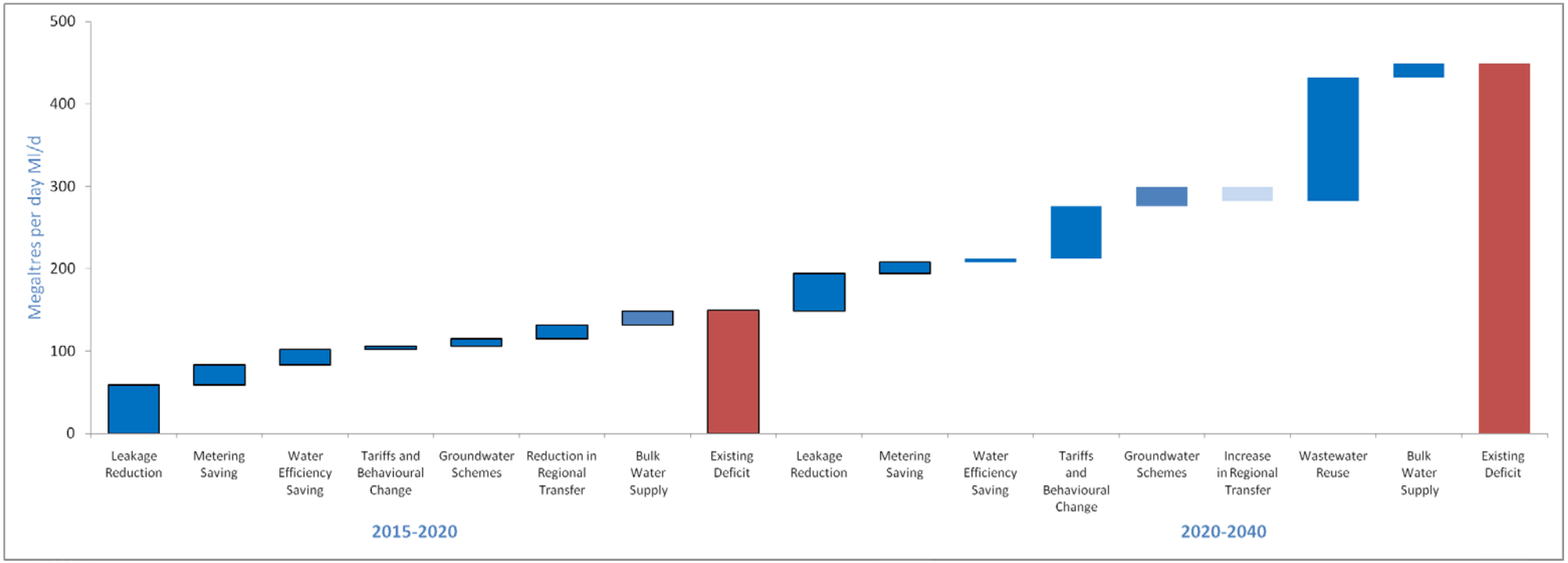
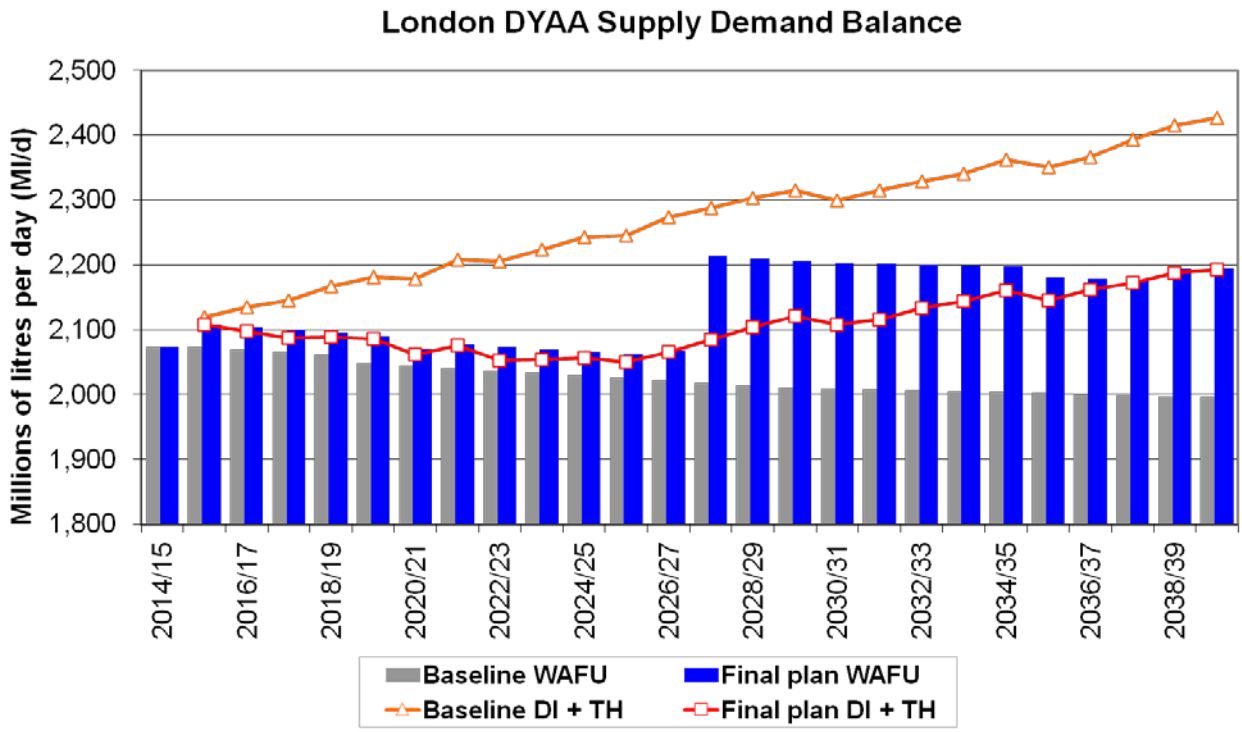


Figure 9-2: London Final Plan – Supply-Demand Balance (DYAA)



WAFU = Water Available For Use

DI = Distribution Input

TH = Target Headroom

9.2.2 Selection of the preferred plan

To produce our preferred plan we used the results and learning from the programme appraisal work (Section 8), feedback received from our Customer Challenge Group (CCG) and feedback from stakeholder events and evaluations to inform our plan such as the SEA.

We presented our analysis on the programme appraisal to our Executive and Board over the period October 2012 – October 2013. A series of detailed technical sessions were held with our Board to describe our recommended preferred plan and detail the risks and costs of the plan. We also discussed how the plan interacts with the remainder of our business plan forecasts for the water service to ensure we are delivering best value overall.

Given the large number of potential combinations of choices we have summarised the decision making process in Appendix W. The preferred plan is built from programme 6 in the programme appraisal, presented in Section 8.

Our preferred plan is not the base least cost plan but we consider it is the best value plan in the long term because it is more flexible, makes a better contribution to sustainable development, and is more closely aligned to customer research, stakeholder feedback and government objectives. The Plan does not have an undue impact on customer bills.

The key difference from the least cost plan is that our preferred plan includes lower risk and marginally cheaper groundwater schemes in AMP6 and a reverse osmosis wastewater re-use scheme in 2027 (Beckton 150Ml/d). Using reverse osmosis technology, rather than membrane bioreactor technology, for wastewater treatment is the key explanatory factor accounting for the increased cost of the preferred plan. The use of reverse osmosis technology aligns with the recommendations of the Independent Expert Panel who reviewed the suitability of different water treatment technologies for a wastewater scheme in London.[9] The change in cost between the preferred and least cost plan is relatively small at <15% over the planning period[10] but we consider it to more robust, have a far better overall performance and to be more aligned to a sustainable water sector.

The results of the programme appraisal work showed that our preferred plan:

- Meets customer expectations for greater reduction in leakage, focusing less on new resource development and greater focus on sustainable use of water.
- Aligns well to government policy objectives set out in the Water Resources Management Plan Guideline.[11]

[9] Thames Water Technology Choice for Planned Indirect Potable Reuse for London. Final Report of the Independent Expert Review Panel 15 March 2013

[10] Investment NPV for the base least cost plan was £967m and for the preferred programme was £1067m. The lower cost is largely due to the introduction of tariffs in the preferred programme.

[11] Environment Agency (2012), Water Resources Management Planning Guidelines, Guiding Principles, Page 5.

- Is flexible as the plan has a spread of solution types which can be stopped or accelerated as needed.
- Reduces the demand for water and therefore reduces carbon footprint, reduces customer exposure to issues such as increased power costs and also helps provide regional resilience.
- Delays the need for large resource options early in the planning period until both the need and resource type are better understood, moving the plan away from historical 'engineering solutions' to a more holistic management of water resources.
- Given the uncertainties on cost and performance of wastewater re-use and the wider environmental sustainability issues in our supply zone and the wider South-East, the results indicate that detailed planning studies should continue through AMP6 for all three long term resource options of re-use, transfers and storage options. These studies should be progressed in partnership with other companies, regulators and stakeholders so the final decision meets the strategic needs of South East England.

Higher cost plans

Section 8 presents a range of different programme choices that we explored in the programme appraisal. There are a range of higher cost plans than our preferred plan. These are characterised by programmes that select regional transfers or storage options as the solution to long-term resilience.

These programmes scored lower overall programme appraisal scores – largely due to the higher cost and hence potential affordability issues these plans could give rise to. They were therefore rejected as the preferred plan on that basis.

However, the programme appraisal shows that these options trade off higher cost for greater resilience. In Section 10 we present the results of our scenario analysis where we test the plan against future uncertainties. The results show that given the scale of future uncertainties such as the Water Framework Directive or the impacts of climate change, both regional transfers and storage options should be progressed in detail going forward as our plan is sensitive to large scale derogations in the supply-demand balance.

Lower cost plans

The least cost plan and the differences between it and our preferred plan are detailed above in Section 8.

9.2.3 Risks and Uncertainties in the Preferred Plan

Although confident that our preferred plan is appropriate for the London WRZ, there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Management Planning guidelines[12] these are described below. These were also discussed with our Executive and Board prior to submission.

Risk: High Reliance on Demand Management

Of the 150 Ml/d planning deficit in London by 2020, 106Ml/d is removed through demand management interventions. The benefits of metering or water efficiency are not fully in the control of the company, and given that we are already working in a number of boroughs in London for the Thames Tunnel, careful management of the delivery of the plan and sensitive liaison with stakeholders and customers will be vital for a successful outcome.

To mitigate these risks we have set-up a dedicated metering team that will look at the end-to-end delivery of a metering programme from supply-chain management to customer communications and customer queries.

We are also working closely with stakeholders, such as the GLA, to ensure we have a consistent customer message across London.

Whilst the annual level of metering is approximately twice that of the recent Southern Water installation programme, it is of a similar magnitude to work volumes undertaken post privatisation. We have also undertaken a series of trials on smart metering in this AMP period and have accumulated considerable experience of delivering a metering plan which we will bring into effect to achieve the higher volumes forecast.

We will monitor the water savings achieved through the demand management programme and report performance in Annual Return, this approach will ensure that we identify any shortfall and are able to act to mitigate a shortfall. Mitigation options are to implement contingency schemes such as AR SLARS – Streatham (5Ml/d) and bring forward GW Addington (1.5Ml/d) and AR Hornsey (2 Ml/d) which are proposed for later in the period, or step up in leakage reduction through find and fix activity.

Risk: Metering and Tariffs

The plan includes the introduction of innovative tariffs in 2020-2025 as these have the potential to be highly cost effective in the reduction of the long-term cost of water supply through pricing water based on its scarcity. However, tariffs may not be supported by customers and/or, given the relatively low marginal cost of water, their use may be found to be inelastic to all reasonable pricing structures.

[12] Water Resources Management Plan Guidelines, Technical Guidelines, Section 7.1

To mitigate this risk our retail business plan (for the 2014 Periodic Review) includes work on future tariffs including consideration on the types of tariffs and forecast savings. Our metering team will lead this further research on different tariff options.

If meter tariffs are not accepted by customers, or do not have an impact of usage, it would bring forward long-term resilience schemes by c3-4 years in the plan (c2023-2027).

Furthermore we will monitor the effectiveness of the demand management activities including tariffs, report performance as part of the Annual Return to the EA and also publish this information on our website. This approach will enable us to identify any risks to security of supply and mitigate these risks through the implementation of resource options with a short lead time. The information as a result of the metering programme and monitoring of the overall demand management programme will be used to inform our future plans.

Risk: Long-term resilience

On the balance of evidence, our forecasts point to a deepening supply-demand problem in London and that demand management alone will not be enough to close the gap. This coupled with the wider water stressed picture of the South East of England points to the need to continue the Water Resources in the South East group to examine future possible solutions in more detail.

We believe the subject of failing to deliver long-term resilience can be mitigated by examining large scale wastewater re-use, water transfers and storage options in detail in the next five years. This is particularly pertinent given the impact of the uncertainties below.

Uncertainty: Long-term sustainability reductions

There is considerable uncertainty in the long-term level of sustainability reductions that may affect the London Water Resource Zone. We test the sensitivity of the plan to this in the following section. To achieve the best long-term solution to supply resilience for London (and the South East) we consider it is important to agree the long-term position in the next 5 years so that efficient and effective planning can be undertaken. The approach of focussing on demand management in the short-term helps mitigate this long-term uncertainty.

Uncertainty: Climate Change

As shown in Section 5 on Headroom, climate change could have significant impact on the water resource availability in London. This is due to a combination of the impact on available resource but also on the quality of water. Whilst we believe this is manageable in the short-term, the potential large adverse impact that deeper and more frequent drought could have on the London system means that it is important to plan ahead and look at long-term solutions to maintain resilience. Thames Water commissioned HR Wallingford to undertake work to examine the potential occurrence of more extended and severe droughts in the River Thames basin linked to climate change and the results of this work and implications are discussed in detail in Section 10. The approach of focussing on demand management in the short-term helps mitigate this long-term uncertainty.

Similarly, if climate change impacts are found to be less than forecast then the plan has sufficient flexibility to postpone or scale down activity (for example – the removal of innovative tariffs). However, the work we have undertaken on Future Flows shown in Section 10 suggests that climate change will increase drought frequency and intensity.

9.2.4 London - Preferred Plan Summary

The above sections summarise the preferred plan for London. From the work we have undertaken we consider the preferred plan has the right overall balance between demand management and supply options, aligns to the customer research, is flexible and makes a positive contribution to sustainable development.

We believe the underlying strategy behind the plan to reduce the overall demand for water, lose less from our system and understand where and when water is being used is the appropriate and necessary long-term strategy if we are to meet the future challenges.

9.3 Swindon and Oxfordshire (SWOX)

9.3.1 The final plan for Swindon and Oxfordshire

As set out in Section 6, in Swindon and Oxfordshire (SWOX) there is a supply-demand deficit on dry year critical period starting in 2019/20 and increasing to -33Ml/d by 2039/40. There is also a deficit on dry year annual average, starting in 2023/24 and increasing to 14.6Ml/d by 2039/40. The deficit at average and peak demand is driven largely by a combination of population growth and the impact of climate change as well as sustainability reductions in the 2015-2020 period which reduce overall supply capability.

As a result of our preferred plan, the supply-demand deficit will be removed in AMP6 and the zone will remain in balance throughout the period. We propose to balance supply and demand through demand management including leakage reduction. There is a very small baseline deficit of 0.14 Ml/d in 2019/20 and this will be managed through a programme of tariff trials that we will undertake as part of our plans for rolling out innovative tariffs in London and Thames Valley from 2022/23. Apart from work associated with these trials, no investment is planned in the Thames Valley WRZs 2015-2020 in our preferred plan[13].

We presented our preferred plan to the Environment Agency and Ofwat prior to submission of our draft WRMP in March 2013. We also held a stakeholder event to present the process behind the preferred plan and its components. Since submission of our draft plan we have updated our preferred plan to take into account comments received as part of the public consultation and updated technical information as set out in our Statement of Response.

Our preferred plan is built from programme 3 in the programme appraisal (Section 8).

[13] Excluding optant meter costs

The key features of the preferred plan are:

Short-term (2015-2020)

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast. We will also undertake trials of innovative tariffs to inform the planned roll out across our water supply area commencing in 2022/23.

Medium to Long-term (2020-2040)

- Start rollout of 'full' meter penetration of household customers from 2020. Install 82,531 progressive household meters in the period 2020-30. Achieve total SWOX household meter penetration of 92.7% by 2030. We propose to use smart meter technology as this gives the best ratio of cost to benefit[14].
- Rollout innovative tariffs during 2020-2025 to promote water efficiency.
- Transfer from SWA WRZ

The plan will put customers in control of their water bills. The plan is presented in Tables 9-6 to 9-9 and Figure 9-3.

Plan Narrative

Our preferred plan is to rollout a programme of full household metering across SWOX starting from 2020, supported by a water efficiency programme and introduction of innovative tariffs. This ensures that the water resource zone stays in balance during both dry year annual average and peak times during the planning period.

The supply and demand balance will be maintained over the planning period through a preferred programme of full household metering starting in 2020, supported by a water efficiency programme and introduction of innovative tariffs.

The plan includes for 19,859 optant meters in AMP6, followed by 82,531 progressive meters installed between 2020-2030. This is integrated with a comprehensive water efficiency programme, in line with the metering programme, customer education, engaging and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. We would promote this from 2015 to give a consistent message across our customer base on the need for water efficiency.

[14] Specifically Automatic Metering Infrastructure. This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

Innovative tariffs are introduced in AMP7. As stated above for London, this gives sufficient time to trial different tariff options.

The preferred plan reduces leakage by 1.9Ml/d during the period 2020-2030 as result of the metering programme in AMP7 and AMP8 and reduction in supply pipe leakage. There is no mains replacement in the preferred plan.

The plan assumes that capital maintenance expenditure will ensure that mains leakage is maintained at current levels through Active Leakage Control during the planning period.

In 2038-40 the existing pipeline between SWA and SWOX is used to balance supply and demand between the two zones and therefore groundwater source enhancement at Bibury is not required to maintain security of supply. The transfer costs are in line with existing assumptions.

Impact of the plan on Customer Bills

Our preferred plan has no cost impact in AMP6 other than the forecast cost of £6.8m capex and £<0.3m opex for optant meters.

There is no difference in cost between the preferred plan and the least cost plan in AMP6 for the Thames Valley as a whole. However, over the planning period the preferred plan is approximately £19m NPV more than the least cost plan, when allowance for bulk transfers linked to WRSE regional requirements for the wider South East is taken into account.[15]

The estimated effect on customer bills by the end of the period would be small and we do not think the plan impacts unduly on customers yet it delivers considerable benefits on water efficiency, long-term cost reduction on day-to-day operations and has positive benefits to the environment.

Performance of the Preferred Plan

The preferred plan for SWOX ensures that security of supply is maintained throughout the planning period and removes the supply demand deficit predicted in the baseline, as shown in Figure 9-3 below.

[15] WRSE A shared water resources strategy in the South East of England, Phase 3 Report, December 2013

Table 9-6: SWOX Final Plan – Overall Plan (DYCP)

Final Plan	Delivery date and ongoing supply demand benefit (Megalitres per day)				
SWOX	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Leakage reduction	-	0.6	1.0	0.3	-
Pressure Management	-	-	-	-	-
Progressive Household Metering • 62,828 households in 2020-25, • 19,703 households in 2025-30	1.6	8.6	4.3	0.9	1.3
Optant meters (inc in baseline forecast) (AMP6: 19,859, AMP7: 21,381, AMP8: 6,406)					
Water Efficiency*	0.0	3.3	0.3	-2.1	-0.8
Tariffs and behaviour change**	0.2	8.2	1.3	0.2	0.2
Transfer from SWA WRZ					2.3

*There is a decay in savings from water efficiency savings over time mainly in regard to the effectiveness of products. Further information is presented in Appendix O.

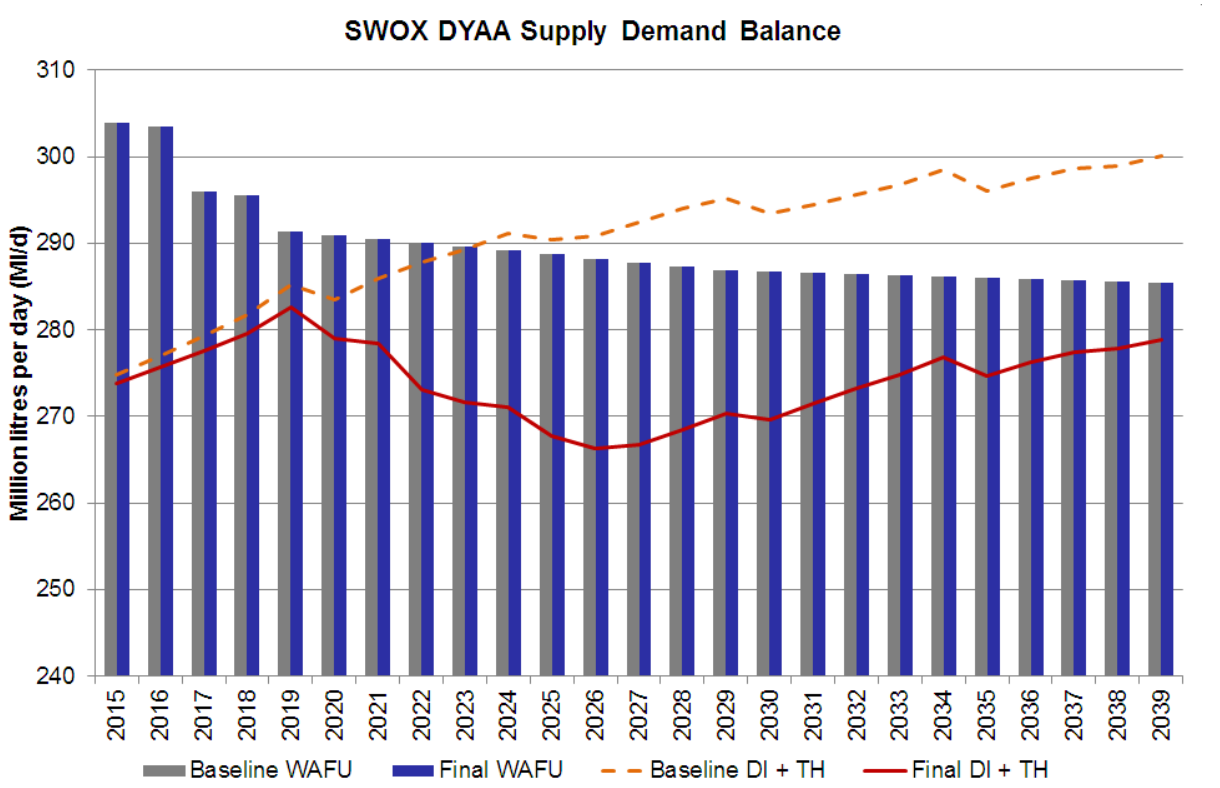
**This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-7: SWOX Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
SWOX	59.5	59.5	58.9	57.9	57.6	57.6

Table 9-8: SWOX Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
SWOX	65.2%	84.7%	92.7%	92.9%	93.1%



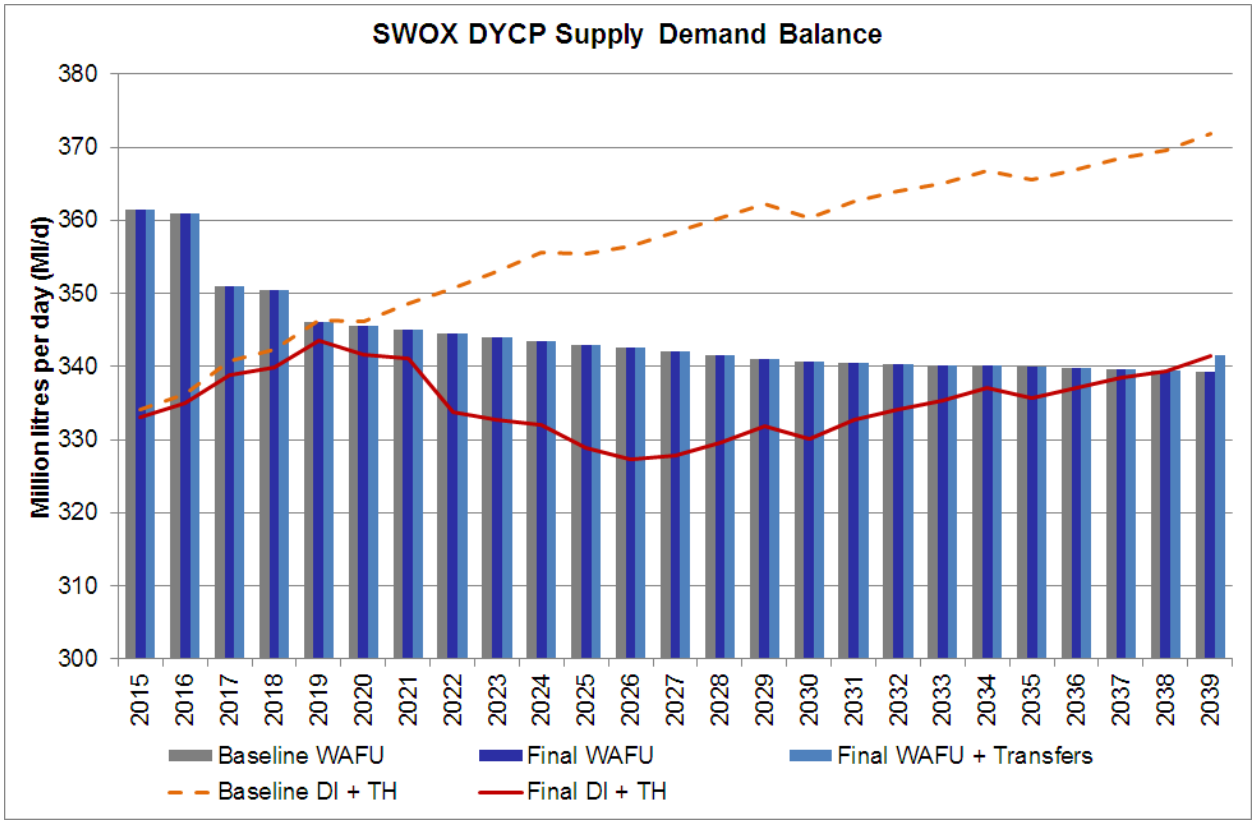


Figure 9-3: SWOX Final Plan – Supply-Demand Balance (DYAA & DYCP)

9.3.2 Building the preferred plan

Our preferred plan is built from programme 3 in the programme appraisal and we have followed the same stakeholder and governance process outlined above for London in developing our preferred plan.

As stated above our preferred plan for the Thames Valley is not the least cost plan. The least cost plan would include a combination of both demand management and groundwater development. Instead our preferred plan focuses predominantly on water efficiency and demand management within all water resource zones within the Thames Valley. There is need for a small resource scheme in Guildford WRZ, and removal of a network constraint in SWA WRZ to facilitate WRSE transfers linked to the regional water resources strategy for the South East.

We consider that a plan based on demand management mid-way through the planning period is the most appropriate, balanced plan. Whilst this plan is higher cost, it has considerable benefits outside the monetised economic appraisal. This is the best plan long-term because:

- It makes a positive contribution to sustainable development
- It gives a consistent message across our area on the need to conserve water given our status as seriously water stressed[16]
- It treats all customers in our area equitably
- It places customers in control of their water bills
- It has closer alignment to Government policy objectives outlined in the Water White Paper
- We have a number of environmentally sensitive catchments in SWOX (such as the upper River Kennet) and this programme will reduce stress on these systems in the future despite population growth and the impact of climate change
- It is flexible

These factors are reflected in the programme appraisal score of the preferred plan which is higher than the least cost plan (23 versus 19), demonstrating that the preferred plan delivers better overall value for customers.

We consider this approach is consistent with the Water Resources Management Plan guidelines which states a company in surplus can implement options and adhere to Government policies and aspirations, improve the environment and carry out the wishes of its customers.

[16] The plan to increase metering is consistent with Ofwat's study on 'Exploring the costs and benefits of faster, more systematic water metering in England and Wales' which found that metering to 90% household meter penetration in England and Wales by 2030 was better than the 'business as usual approach' Ofwat (2011), Exploring the costs and benefits of faster, more systematic metering in England and Wales. Page 2

The issue of environmental sensitivity is important as there is concern over the impact of abstraction in a number of the catchments in the SWOX area. There have been significant sustainability reductions implemented in the Cotswolds and more are planned for the upper Kennet catchment. Other sources have been subject to investigation to assess the impact of abstraction and whilst the requirement for sustainability reductions has been largely identified, it has been recognised that abstraction increases should be constrained where possible, for example abstraction from the River Thames at Farmoor. We have been working closely with WWF on a water efficiency initiative called 'Save Water Swindon' to encourage customers to use water wisely in order to minimise abstraction impacts on the environment and we need to build on this initiative and demonstrate our commitment to avoiding increased impact on the environment. Widespread metering is an important requirement to demonstrate our commitment matches that of our customers and avoids stress on environmental systems in the future despite population growth and the impact of climate change.

The wider roll-out of metering will also provide benefit for our management of drought in the future. With the impact of climate change the climate is forecast to become more variable with the frequency and intensity of drought likely to increase. The SWOX WRZ would be potentially heavily reliant on drought permit options in the event of a drought of greater severity than has been experienced in the period of record and so widespread metering is important for the benefits it will bring for management of demand under future climate uncertainty.

The preferred plan has no impact on customer bills in 2015-20.

The further advantage of our preferred programme is the importance of a clear message on water stress and the importance of using water wisely in the South East of England. If long-term our plan did not focus on metering outside of London this would be a confusing scenario for customers. Customers moving from one part of our supply area to another would perceive a very different message on water efficiency.

This latter point on consistent communication is particularly significant for the long-term if better use of water resources is to be achieved.

Taking all factors into account, we consider that the rollout of metering across SWOX is the right plan for the long-term but that it should not start until 2020.

We included the role of metering in Thames Valley as a specific consultation question on our plan to discuss with our stakeholders and customers whether they consider this is the right strategy going forward now. Overall respondees were supportive of progressive metering recognising the importance of metering to ensure the sustainable management of resources. The issues raised by customers and stakeholders related to the need to find innovative solutions to enable monitoring of all individual properties; the need to monitor the programme to understand the costs and benefits and mitigate any risks of under delivery; and the need to ensure vulnerable customers are protected.

<u>Higher cost plans</u>

Higher cost plans would include acceleration of metering into AMP6 and/or water transfers from Wessex Water or groundwater development earlier in the programme.

Earlier rollout of metering has a number of advantages as it gives a consistent timing message across our region however, there would be an inevitable bill impact in AMP6 and Thames Water's objective is to limit bill increases in AMP6 as far as is practically possible given potential affordability issues.

Bringing forward a Wessex Water transfer would be higher cost but it would delay the need for demand management or new groundwater schemes in the least cost plan. We rejected this option on the grounds that it does not reduce the demand for water in our area.

Lower cost plans

The least cost plan and the differences to our preferred plan are detailed above.

9.3.3 Risks and Uncertainties in the Preferred Plan

The preferred programme for SWOX ensures that security of supply is maintained throughout the planning period, and removes the supply demand deficit predicted in the baseline forecast for average and peak demand.

Although confident that our preferred plan is appropriate for the Swindon and Oxfordshire WRZ there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Management Planning Guidelines[17] these are described below. These were also discussed with our Executive and Board prior to submission.

Risk: Metering Plan is not accepted post 2020

The principal risk in the plan is that wholesale household metering is not accepted as the right way forward for a sustainable water supply system.

Given the timing of the proposed metering, the plan is flexible and alternative, but potentially less sustainable options can be implemented instead.

9.3.4 SWOX - Preferred Plan Summary

The above sections summarise the preferred plan for the SWOX WRZ. From the work we have undertaken we consider the preferred plan has the right overall balance, aligns to the customer research, is flexible to future uncertainties and makes a positive contribution to sustainable development. It has a better overall appraisal score when looking at an holistic view of the plan.

We consider that the underlying strategy behind the plan to reduce the overall demand for water and enable greater understanding of where and when water is being used is the correct long-term strategy if we are to meet the future challenges.

[17] Water Resource Management Plan Guideline, Technical Guidelines, Section 7.1

9.4 Slough/Wycombe/Aylesbury (SWA)

9.4.1 The final plan for SWA

As set out in Section 6, in Slough/Wycombe/Aylesbury (SWA) there is a baseline supply-demand deficit on dry year critical period starting in 2031/32 increasing to -6.1Ml/d by 2039/2040.

The least cost plan for the Thames Valley as shown in Section 8 would be to implement two new schemes in SWA to replace existing sources, one network constraint scheme (Datchet) and one groundwater scheme (Medmenham) because the new schemes would have a lower opex than existing assets.

However, such a plan results in the same level of demand on the system and the environment.

Our preferred plan for SWA is based on programme 3 from our programme appraisal for Thames Valley and is to adopt a programme of household metering from 2020 together with a programme of water efficiency.

The key features of the preferred plan are:

Short-term (2015-2020)

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast.

Medium to Long-term (2020-2040)

- Start rollout of 'full' meter penetration of household customers from 2020, installing, 54,233 progressive and 14,102 optant meters in the period 2020-30. Total household meter penetration of 87.7% by 2030. We propose to use smart meter technology as this gives the best ratio of cost to benefit[18].
- Rollout innovative tariffs during 2020-2025 to promote water efficiency
- Removal of network constraint at Datchet to facilitate treated water transfer to SWOX WRZ from the SWA WRZ at times of peak demand.

The plan is presented in Tables 9-9 to 9-11 and Figure 9-4.

[18] Specifically Automatic Metering Infrastructure. This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

Plan Narrative

Our recommended plan is to rollout a programme of full household metering across SWA starting from 2020, supported by a water efficiency programme and introduction of innovative tariffs. The water resource zone will stay in surplus over the whole period.

Available headroom by the end of the period is approximately 4.5Ml/d (DYCP), following the proposed WRSE regional transfer export of 10 Ml/d to South East Water (Surrey Hills) from 2030.

The plan includes for 9,436 optant meters in AMP6, followed by 54,233 progressive meters installed between 2020 and 2030. As with SWOX, this is integrated with a comprehensive water efficiency programme; in line with the metering programme, customer education and engaging and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. We would promote this from 2015 to give a consistent message across our customer base on the need for water efficiency.

Tariffs are introduced in AMP7. As stated above for SWOX, this gives sufficient time to trial different tariff options.

The preferred plan reduces leakage by 1.3Ml/d in SWA as a result of the metering programme and reduction in customer supply pipe leakage. There is no mains replacement in the preferred plan. The plan assumes that capital maintenance expenditure will ensure levels of mains leakage are maintained through active leakage control during the planning period.

Resource development is not required in addition to demand management activity to maintain security of supply but removal of a network constraint (NTC Datchet 5 Ml/d) is required to enable transfer of treated water to SWOX in the last 5 years of the planning period.

In 2038-40 the existing transfer pipeline between SWA and SWOX is used to balance demand and supply between the two zones.

Impact of the plan on Customer Bills

The preferred plan has no impact on customer bills in AMP6 other than through optant meters.

Performance of the Preferred Plan

The preferred plan for SWA ensures that security of supply is maintained throughout the planning period as shown in Figure 9-4 below.

Table 9-9: SWA Final Plan – Overall Plan (DYCP)

Final Plan	Delivery date and ongoing supply demand benefit [Ml/d]				
SWA	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Leakage reduction	-	0.5	0.6	0.2	-
Pressure Management	-	-	-	-	-
Progressive Household Metering • 37,912 households in 2020-25, • 16,321 households in 2025-30	0.6	5.2	2.9	0.4	0.6
Optant meters (inc in baseline forecast) (AMP6: 9,436, AMP7: 10,260 AMP8: 3,842)					
Water Efficiency	0.0	1.5	0.1	-1.0	-0.4
Tariffs and behaviour change*	0.5	4.0	1.0	0.1	0.1
Regional water transfers	-	-	-	-10	-10
Datchet NCT					5.2
Transfer to SWOX					-2.3

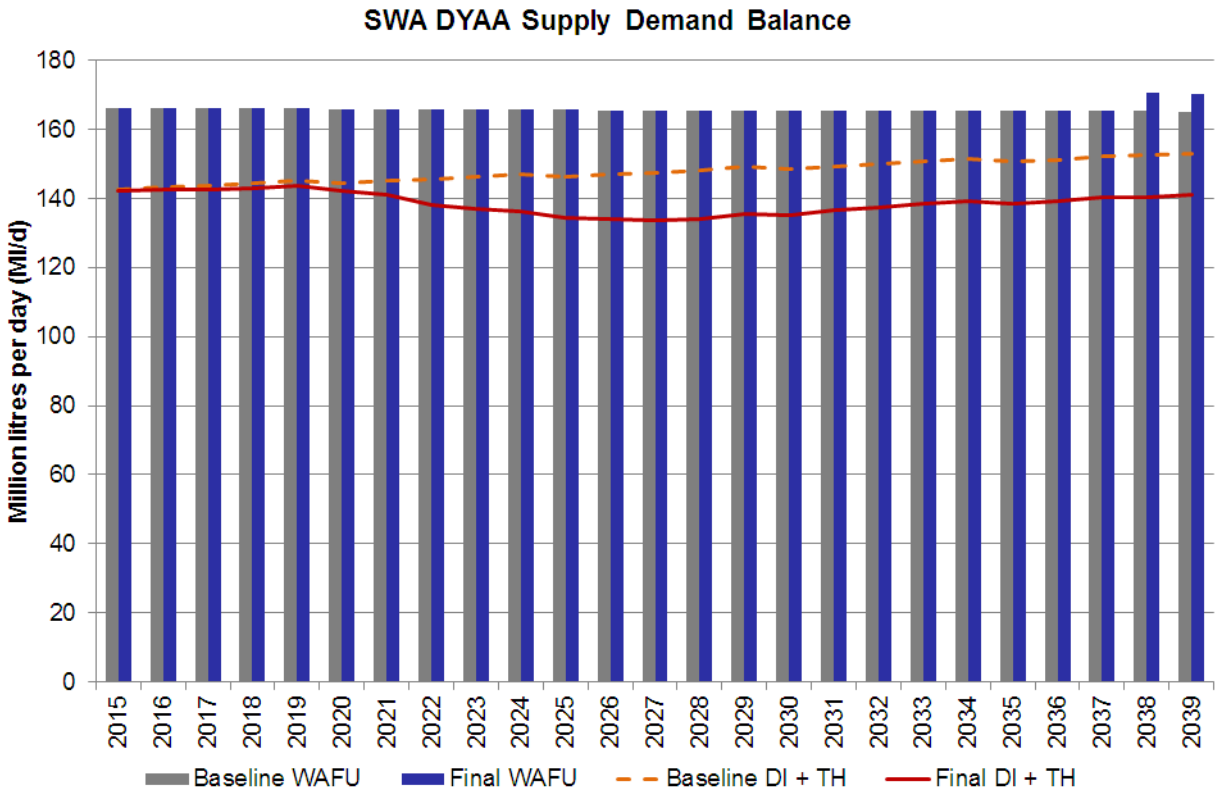
*This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-10: SWA Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
SWA	35.6	35.6	35.1	34.1	34.1	34.1

Table 9-11: SWA Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
SWA	52.6%	75.3%	87.7%	88.0%	88.4%


SWA DYAA Supply Demand Balance
Million litres per day (Ml/d)
180
160
140
120
100
80
60
40
20
0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
Baseline WAFU
Final WAFU
Baseline DI + TH
Final DI + TH

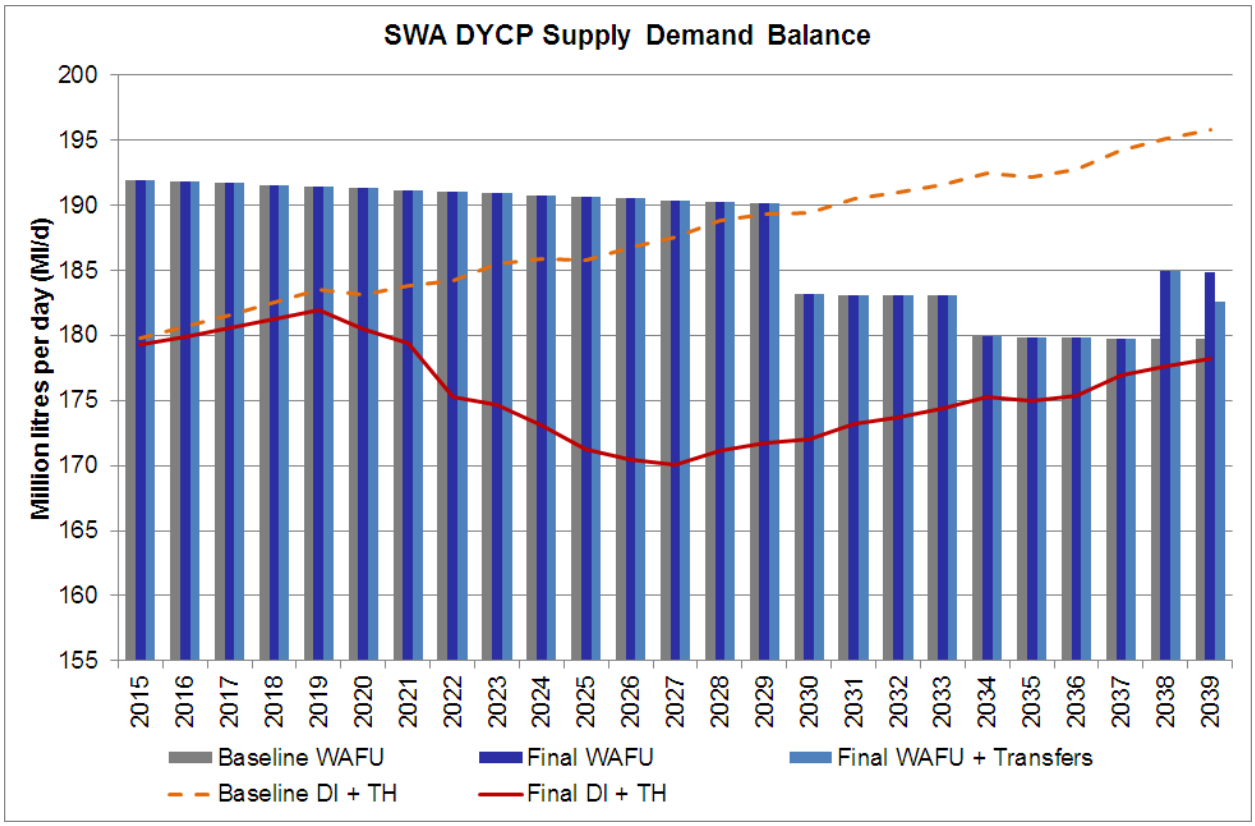

SWA DYCP Supply Demand Balance
Million litres per day (Ml/d)
200
195
190
185
180
175
170
165
160
155
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025
2026
2027
2028
2029
2030
2031
2032
2033
2034
2035
2036
2037
2038
2039
Baseline WAFU
Final WAFU
Final WAFU + Transfers
Baseline DI + TH
Final DI + TH

Figure 9-4: SWA Final Plan – Supply-Demand Balance (DYAA & DYCP)

9.4.2 Building the preferred plan

Our preferred plan is built from programme 3 in the programme appraisal and we have followed the same stakeholder and governance process outlined above for London in developing our preferred plan.

As stated above, our preferred plan is not the least cost plan for Thames Valley. The least cost plan would include two new schemes within SWA - one network constraint scheme (Datchet) and one groundwater scheme (Medmenham).

Taking all factors into account, and taking an holistic view using the results of the programme appraisal, we consider that a plan based on demand management mid-way through the planning period is the most appropriate, balanced plan. Specific reasons for why we did not take forward the least cost plan were:

- it does not reduce demand or contribute to sustainable development
- it does not give a consistent message on water efficiency in our supply area
- environmental sensitivity in SWA
- little or no opportunity to reduce network operating costs

We consider the preferred plan aligns better to government policies and aspirations, improves the environment and also allows the company to respond flexibly to future uncertainties to deliver the best results for customers and the wider water environment.

The issue of environmental sensitivity for SWA, as for SWOX, is important. There have been significant sustainability reductions implemented in the Chilterns and more may be required in the catchment of the River Wye. Abstraction increases should be constrained where possible and we need to demonstrate our commitment to avoiding increased impact on the sensitive chalk stream environment. Therefore widespread metering is an important requirement to demonstrate our commitment matches that of our customers and avoids stress on environmental systems in the future despite population growth and the impact of climate change.

The wider roll-out of metering will also provide benefit for our management of droughts in the future. With the impact of climate change the climate is forecast to become more variable with the occurrence of drought also likely to increase. Widespread metering is important for the benefits it will bring for management of demand under future climate uncertainty.

Higher cost plan

As for the SWOX WRZ the main higher cost plan would be to bring forward metering into AMP6.

Earlier rollout of metering would give a consistent message on water efficiency across the region. However, there is less justification for bringing forward metering in SWA than there was in SWOX as there is no supply demand deficit to remove in 2015-2020. Implementing metering to the same programme as in the SWOX WRZ enables a consistent message on water use through our Thames Valley supply area, avoiding confusion for our customers.

9.4.3 Risks and Uncertainties in the Preferred Plan

The preferred programme for SWA ensures that security of supply is maintained throughout the planning period.

Although we are confident that our preferred plan is appropriate for the SWA WRZ there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Planning Guideline[19] these are described below.

Risk: Metering Plan is not accepted post 2020

The key risk in the plan is that wholesale household metering is not accepted as the right way forward for a sustainable water supply system.

Given the timing of the proposed metering, the plan is flexible and alternative, but potentially less sustainable options can be implemented instead.

Uncertainty: Long-term sustainability reductions

There is some uncertainty over the long-term level of sustainability reductions that affect the SWA WRZ. Data from the Environment Agency suggest potential losses of up to 5.3Ml/d. The approach of focussing on demand management in the short-term helps mitigate this long-term uncertainty.

Other uncertainties include climate change and more frequent droughts, or more intense droughts. These risks are discussed in detail in Section 10.

[19] Water Resources Planning Guideline, The technical methods and instructions, Section 7.1

9.4.4 SWA - Preferred Plan Summary

The above sections summarise the preferred plan for the SWA WRZ. From the work we have undertaken we consider the preferred plan is the right overall balance, aligns to customer research, is flexible to future uncertainties and makes a positive contribution to sustainable development.

We consider the strategy underlying our plan at company level to reduce the demand for water and understand where and when water is being used is the correct long-term strategy if we are to meet future challenges.

9.5 Kennet Valley

9.5.1 The final plan for Kennet Valley

As set out in Section 6, in Kennet Valley there is no forecast supply-demand deficit over the planning period for either dry year annual average or dry year critical period.

The least cost plan as shown in Section 8 would be to implement one new network constraint removal scheme as a replacement for existing assets (East Woodhay).

However, such a plan results in the same level of demand on the system and the environment.

Our preferred plan is based on programme 3 from our programme appraisal. Our preferred plan for the Kennet Valley is to adopt a programme of progressive household metering from 2020 together with a programme of water efficiency.

The key features of the preferred plan are:

Short-term (2015-2020)

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast.

Medium to Long-term (2020-2040)

- Start rollout of 'full' meter penetration of household customers from 2020 with 46,345 progressive household meters in the period 2020-30. Total household meter penetration in Kennet Valley WRZ of 93.2% by 2030. We propose to use smart meter technology as this gives the best ratio of cost to benefit[20].

[20] Specifically Automatic Metering Infrastructure. This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

- Rollout of innovative tariffs in the period from 2020 to 2025 to promote water efficiency

The plan will put customers in control of their water bills. The plan is presented in Tables 9-12 to 9-14 and Figure 9-5.

Plan Narrative

Our recommended plan is to rollout a programme of household metering across Kennet Valley starting from 2020-2030, supported by a water efficiency programme and introduction of innovative tariffs. The water resource zone would stay in surplus over the whole period.

As with SWA this is integrated with a comprehensive water efficiency programme, in line with the metering programme customer education, engaging and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. We would promote this from 2015 to give a consistent message across our customer base on the need for water efficiency.

Tariffs are introduced in AMP7. As stated above for SWA this gives sufficient time to trial different tariff options.

The preferred plan reduces leakage by 1.0Ml/d through metering and reduction in customer supply pipe leakage. There is no mains replacement in the preferred plan.

The plan assumes that capital maintenance expenditure will ensure levels of mains leakage are maintained through active leakage control during the planning period.

Resource development is not required in addition to demand management activity to maintain security of supply.

Available headroom by the end of the period is approximately 19Ml/d by 2040 (DYCP).

Impact of the plan on Customer Bills

There is no planned investment in AMP6 other than for optant meters.

Performance of the Preferred Plan

The preferred plan for Kennet Valley ensures that security of supply is maintained throughout the planning period as shown in Figure 9-5 below.

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Table 9-12: Kennet Valley Final Plan – Overall Plan (DYCP)

Final Plan	Delivery date and ongoing supply demand benefit [Ml/d]				
Kennet Valley	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Leakage reduction	-	0.4	0.5	0.1	-
Pressure Management	-	-	-	-	-
Progressive Household Metering • 32,358 households in 2020-25, • 13,987 households in 2025-30	0.5	2	1.6	0.3	0.3
Optant meters (inc in baseline forecast) (AMP6: 8,018, AMP7: 8,719 AMP8: 3,285)					
Water Efficiency	0.0	1.3	0.1	-0.9	-0.3
Tariffs and behaviour change*	0.3	5.1	1.7	0.2	0.2

*This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-13: Kennet Valley Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
Kennet Valley	24.6	24.6	24.2	23.7	23.6	23.6

Table 9-14: Kennet Valley Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
Kennet Valley	55.9%	80.3%	93.2%	93.5%	93.8%

Figure 9-5: Kennet Valley Final Plan – Supply-Demand Balance (DYAA & DYCP)

9.5.2 Building the preferred plan

Our preferred plan is built from programme 3 in the programme appraisal and we have followed the same stakeholder and governance process outlined above for London in developing our preferred plan.

Taking all factors into account, and taking an holistic view using the results of the programme appraisal, we consider that a plan based on demand management mid-way through the planning period is the most appropriate, balanced plan. Specific reasons for why we did not take forward the least cost plan were:

- it does not reduce demand or contribute to sustainable development
- it does not give a consistent message on water efficiency in our supply area
- environmental sensitivity in Kennet Valley
- little scope for better network management and future cost savings
- the least cost plan options are spend-to-save schemes and therefore fit better within our overall business plan

We consider the preferred plan aligns better to government policies and aspirations, improves the environment and also allows the company to respond flexibly to future uncertainties to deliver the best results for customers and the wider water environment.

However as for SWA and SWOX it is important to note the issue of environmental sensitivity for the Kennet Valley as sustainability reductions are being implemented here as for the other WRZs, in this case to protect sensitive European designated sites from potential damage due to abstraction. Once again we need to demonstrate our commitment to avoiding increased impact on the sensitive chalk stream environment of the River Kennet and metering should play its part.

The wider roll-out of metering will also provide benefit for our management of droughts in the future. With the impact of climate change the climate is forecast to become more variable with the occurrence of drought also likely to increase. The Kennet Valley WRZ would be potentially heavily reliant on Drought Permit options in the event of a drought of greater severity than has been experienced in the period of record and so widespread metering is important for the benefits it will bring for management of demand under future climate uncertainty.

Higher cost plan

As for SWA, the main higher cost plan is to bring forward metering into AMP6.

Earlier rollout of metering would give a consistent message on water efficiency across the region. However, there is no supply demand deficit to remove in Kennet Valley. Implementing metering to the same programme as in the SWOX WRZ from 2020 – 2030 enables a consistent message on water use throughout our Thames Valley supply area, avoiding confusion for our customers.

The earlier rollout of metering – or other investment - would also not allow time to take advantage of new opportunities (water trading or third party schemes).

9.5.3 Risks and Uncertainties in the Preferred Plan

The preferred programme for Kennet Valley ensures that security of supply is maintained throughout the planning horizon.

Although we are confident that our preferred plan is appropriate for the Kennet Valley WRZ there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Planning Guideline[21] these are described below. These were also discussed with our Executive and Board prior to submission.

Risk: Metering Plan is not accepted post 2020

The key risk in the plan is that wholesale household metering is not accepted as the right way forward for a sustainable water supply system.

Given that the supply demand balance remains is surplus throughout the whole of the 25 year planning period this risk is not material.

Uncertainty: climate change

Other uncertainties include climate change and more frequent droughts, or more intense droughts. These risks are discussed in detail in Section 10.

9.5.4 Kennet Valley - Preferred Plan Summary

The above sections summarise the preferred plan for Kennet Valley. From the work we have undertaken we consider the preferred plan has the right overall balance, aligns to the customer research, is flexible to future uncertainties and makes a positive contribution to sustainable development.

We consider the strategy underlying our plan at company level to reduce the demand for water and understand where and when water is being used is the correct long-term strategy if we are to meet future challenges.

[21] Water Resources Planning Guideline, The technical methods and instructions, Section 7.1

9.6 Guildford

9.6.1 The final plan for Guildford

As set out in Section 6, in Guildford there is a baseline supply-demand deficit on dry year critical period starting in 2021/22 increasing to -3.8Ml/d by 2039/2040.

The least cost plan for Guildford is to adopt a programme of household metering from 2020 together with a programme of water efficiency.

This is the same as our preferred plan for SWOX, based on programme 3 from our programme appraisal (Section 8), except that for our preferred plan a groundwater scheme (ASR Guildford) is also required in 2039 to support the planned 2.7Ml/d WRSE regional transfer to Affinity Water (Guildford to Ladymead) starting in 2036.

The key features of the preferred plan are:

Short-term (2015-2020)

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast.
- Medium to Long-term (2020-2040)
- Start rollout of 'full' meter penetration of household customers from 2020. 15,445 household meters in the period 2020-30. Total household meter penetration in Guildford WRZ of 86.5% by 2030. We propose to use smart meter technology as this gives the best ratio of cost to benefit[22].
- Rollout innovative tariffs in the period 2020-2025 to promote water efficiency.
- ASR Abbotswood (Guildford) scheme in 2037 to meet planned WRSE transfer to Affinity Water starting in 2036.

The plan will put customers in control of their water bills. The plan is presented in Tables 9-15 to 9-17 and Figure 9-6.

Plan Narrative

Our preferred plan is to rollout a programme of full household metering across the Guildford WRZ starting from 2020, supported by a water efficiency programme and introduction of innovative tariffs. The water resource zone will stay in surplus over the whole period.

Available headroom by the end of the period is approximately 4Ml/d by 2040 (DYCP).

[22] Specifically Automatic Metering Infrastructure. This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

The plan includes for 2,817 optant meters in AMP6, followed by 15,445 progressive meters installed between 2020 and 2030. As with Kennet Valley this is integrated with a comprehensive water efficiency programme as, in line with the metering programme, customer education, engagement and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. We would promote this from 2015 to give a consistent message across our customer base on the need for water efficiency.

Tariffs are introduced in AMP7. As stated above for Kennet Valley this gives sufficient time to trial different tariff options.

The preferred plan reduces leakage by 0.7Ml/d as a result of the metering programme and reduction in customer supply pipe leakage. There is no mains replacement in the preferred plan.

The plan assumes that capital maintenance expenditure will ensure levels of mains leakage are maintained will be conducted through active leakage control during the planning period.

A new groundwater scheme (ASR Guildford) is required in 2039 to support the proposed 2.7Ml/d potable water transfer to Affinity Water starting in 2036.

Impact of the plan on Customer Bills

The plan has no impact on customer bills in AMP6 other than from optant metering.

Performance of the preferred Plan

The preferred plan for Guildford ensures that security of supply is maintained throughout the planning horizon as shown in Figure 9-6 below.

Table 9-15: Guildford Final Plan – Overall Plan (DYCP)

Final Plan	Delivery date and ongoing supply demand benefit [Ml/d]				
Guildford	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Leakage reduction	-	0.3	0.3	0.1	-
Pressure Management	-	-	-	-	-
Progressive Household Metering • 10,909 households in 2020-25, • 4,536 households in 2025-30	0.3	1.5	0.8	0.1	0.2
Optant meters (inc in baseline forecast) (AMP6: 2,817, AMP7: 3,058 AMP8: 1,088)					
Water Efficiency	0.0	0.5	0.0	-0.3	-0.1
Tariffs and behaviour change*	0.1	1.5	0.5	0.0	0.0
Regional water transfers	-	-	-	-	-2.7
Ground water and artificial recharge schemes	-	-	-	-	4.5

*This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-16: Guildford Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
Guildford	12.8	12.8	12.5	12.4	12.3	12.3

Table 9-17: Guildford Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
Guildford	53.0%	75.0%	86.5%	86.7%	86.9%

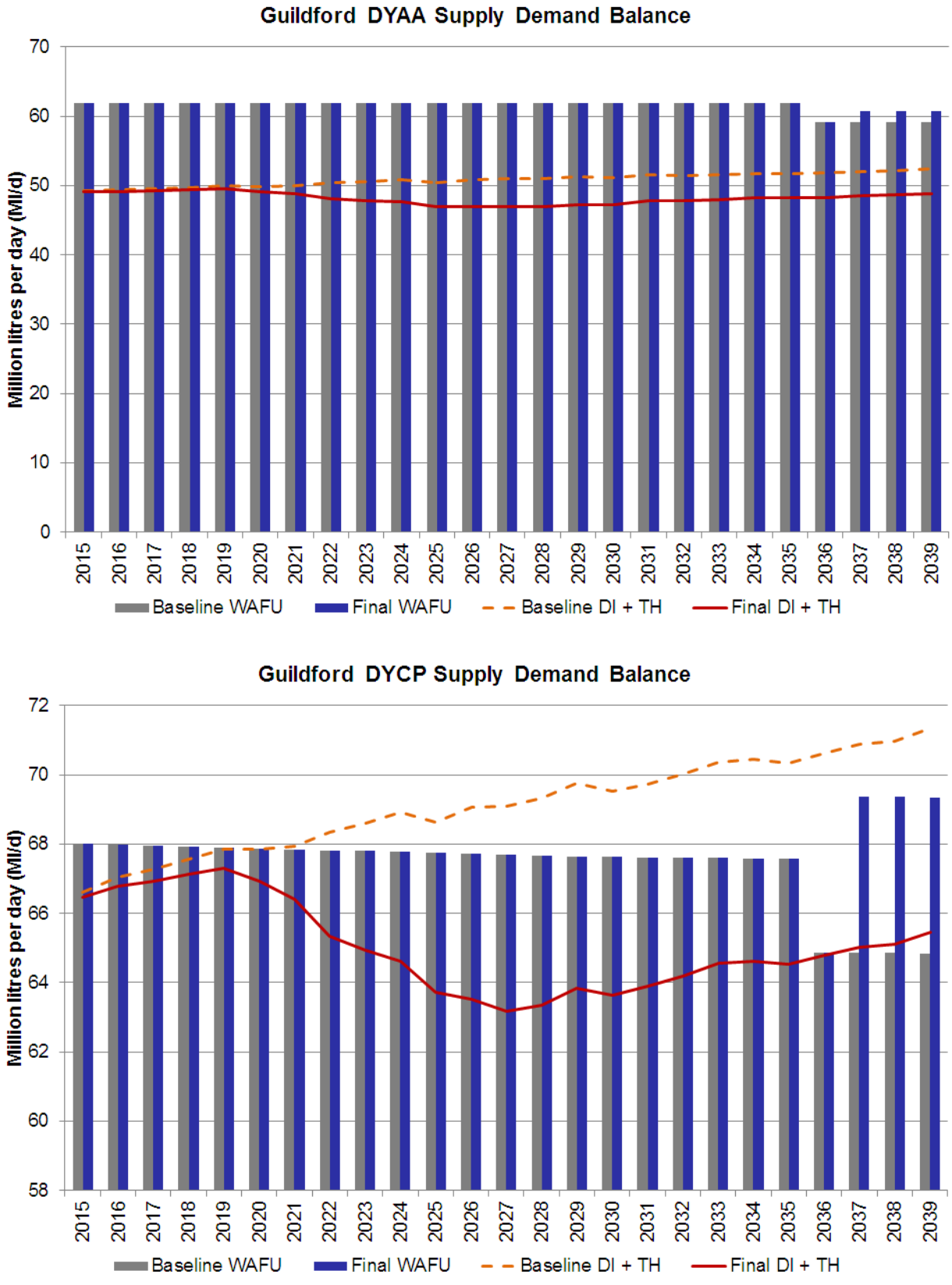


Figure 9-6: Guildford Final Plan – Supply-Demand Balance (DYAA & DYCP)

9.6.2 Building the preferred plan

Our preferred plan is built from programme 3 in the programme appraisal and we have followed the same stakeholder and governance process outlined above for London in developing our preferred plan.

Taking all factors into account, and taking an holistic view using the results of the programme appraisal, we consider that a plan primarily based on demand management mid-way through the planning period is the most appropriate, balanced plan. The reason why we did not take forward the strict least cost plan for Guildford was that it would not support the planned WRSE transfer to Affinity Water from 2039 onwards.

We consider the preferred plan aligns to government policies and aspirations, improves the environment and also allows the company to respond flexibly to future uncertainties to deliver the best results for customers and the wider water environment.

The wider roll-out of metering will also provide benefit for our management of droughts in the future. With the impact of climate change the climate is forecast to become more variable with the occurrence of drought also likely to increase. The Guildford WRZ would be potentially heavily reliant on drought permit options in the event of a drought of greater severity than has been experienced in the period of record and so widespread metering is important for the benefits it will bring for management of demand under future climate uncertainty.

Higher cost plan

As for Kennet Valley the main higher cost plan is to bring forward metering into AMP6.

Earlier rollout of metering would give a consistent message on water efficiency across the region. However, there is no supply demand deficit to remove within Guildford in 2015-2020. Implementing metering to the same programme as in the SWOX WRZ from 2020 – 2030 enables a consistent message on water use throughout our Thames Valley supply area, avoiding confusion for our customers.

9.6.3 Risks and Uncertainties in the Preferred Plan

The preferred plan for Guildford ensures that security of supply is maintained throughout the planning horizon.

Although we are confident that our preferred plan is appropriate for the Guildford WRZ there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Planning Guideline[23] these are described below. These were also discussed with our Executive and Board prior to submission.

We confirm that our plan is deliverable, however, there are a number of key risks and uncertainties in the plan.

[23] Water Resources Planning Guideline, The technical methods and instructions, Section 7.1

Risk: Metering Plan is not accepted post 2020

The key risk in the plan is that wholesale household metering is not accepted as the right way forward for a sustainable water supply system.

Given the timing of the proposed metering, the plan is flexible and alternative, but potentially less sustainable options can be implemented instead.

9.6.4 Guildford - Preferred Plan Summary

The above sections summarise the Preferred Plan for Guildford. From the work we have undertaken we consider the preferred plan has the right overall balance, aligns to the customer research, is flexible to future uncertainties and makes a positive contribution to sustainable development.

We believe the underlying strategy behind the plan to reduce the overall demand for water and understand where and when water is being used is the correct long-term strategy if we are to meet the future challenges.

9.7 Henley

9.7.1 The final plan for Henley

As set out in Section 6, in Henley there is no forecast supply-demand deficit over the planning period for either dry year annual average or dry year critical period.

The least cost plan would be for no investment over the planning period.

However, such a plan results in the same level of demand on the system and the environment.

Our preferred plan for Henley is based on programme 3 from our programme appraisal. Our preferred plan is to adopt a programme of household metering from 2020 together with a programme of water efficiency.

The key features of the preferred plan are:

Short-term (2015-2020)

- Promotion of water efficiency activity to help customers use water wisely (direct response to the customer research findings) and promote behavioural change that will stem the underlying increase in water use in our baseline forecast.

Medium to Long-term (2020-2040)

- Start rollout of 'full' meter penetration of household customers from 2020. 3,897 progressive household meters in the period 2020-30. Total household meter penetration in Henley WRZ of 93.7% by 2030. We propose to use smart meter technology as this gives the best ratio of cost to benefit[24].

- Rollout innovative tariffs in the period 2020-2025 to promote water efficiency

The plan will put customers in control of their water bills. The plan is presented in Tables 9-18 to 9-20 and Figure 9-7.

Plan Narrative

Our preferred plan is to rollout a programme of full household metering across the Henley WRZ starting from 2020, supported by a water efficiency programme and introduction of innovative tariffs. The water resource zone will stay in surplus over the whole period.

Available headroom by the end of the period is approximately 4.5Ml/d by 2040 (DYCP).

[24] Specifically Automatic Metering Infrastructure. This will allow real-time provision of water use data if needed. We have included the benefits of this technology (e.g. opex reductions) in our plan. Our analysis shows that this metering is the most cost-effective technology compared to existing mechanical or automatic meter read technology.

The plan includes for 1,059 optant meters in AMP6, followed by 3,897 progressive meters installed between 2020 and 2030. As with Guildford this is integrated with a comprehensive water efficiency programme as, in line with the metering programme, customer education, engagement and empowering customers to reduce demand will be an integral part of delivering the benefits. Behavioural change benefits are anticipated as a function of the high profile metering and water efficiency campaign. We will promote this from 2015 to give a consistent message across our customer base on the need for water efficiency.

Tariffs are introduced in AMP7. As stated above for Guildford, this gives sufficient time to trial different tariff options.

The preferred plan reduces leakage by 0.2Ml/d as a result of metering and reduction in customer supply pipe leakage. There is no mains replacement in the preferred plan.

The plan assumes that capital maintenance expenditure will ensure levels of mains leakage are maintained through active leakage control during the planning period.

Resource development is not required.

Impact of the plan on Customer Bills

Our plan has no impact on customer bills in AMP6 other than for optant meters.

Performance of the preferred Plan

The preferred plan for Henley ensures that security of supply is maintained throughout the planning horizon as shown in Figure 9-7 below.

Table 9-18: Henley Final Plan – Overall Plan (DYCP)

Final Plan	Delivery date and ongoing supply demand benefit (Megalitres per day)				
Henley	2015-2020	2020-2025	2025-2030	2030-2035	2035-2040
Leakage reduction	-	0.1	0.1	-	-
Pressure Management	-	-	-	-	-
Progressive Household Metering • 3,063 households in 2020-25, • 834 households in 2025-30	0.1	0.5	0.2	0.1	0
Optant meters (inc in baseline forecast) (AMP6: 1,059, AMP7: 1,135, AMP8: 287)					
Water Efficiency	0.0	0.2	0.0	-0.1	0.0
Tariffs and behaviour change*	0.0	0.5	0.1	0.0	0.0

*This element includes both the impact of tariffs from their introduction from 2022/23 and the ongoing impacts of behaviour change brought about by building developers installing low water use fittings and the government encouraging water conservation.

Table 9-19: Henley Final Plan - Annual Average Leakage Forecast (Table 10b Equivalent) [Ml/d]

	End AMP5	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2014–15	2019–20	2024–25	2029–30	2034–35	2039–40
Henley	3.3	3.3	3.2	3.1	3.1	3.1

Table 9-20: Henley Final Plan – Meter Penetration

Household Meter Penetration (%)					
	End AMP6	End AMP7	End AMP8	End AMP9	End AMP10
	2019–20	2024–25	2029–30	2034–35	2035–39
Henley	67.2%	86.5%	93.7%	94.0	94.3

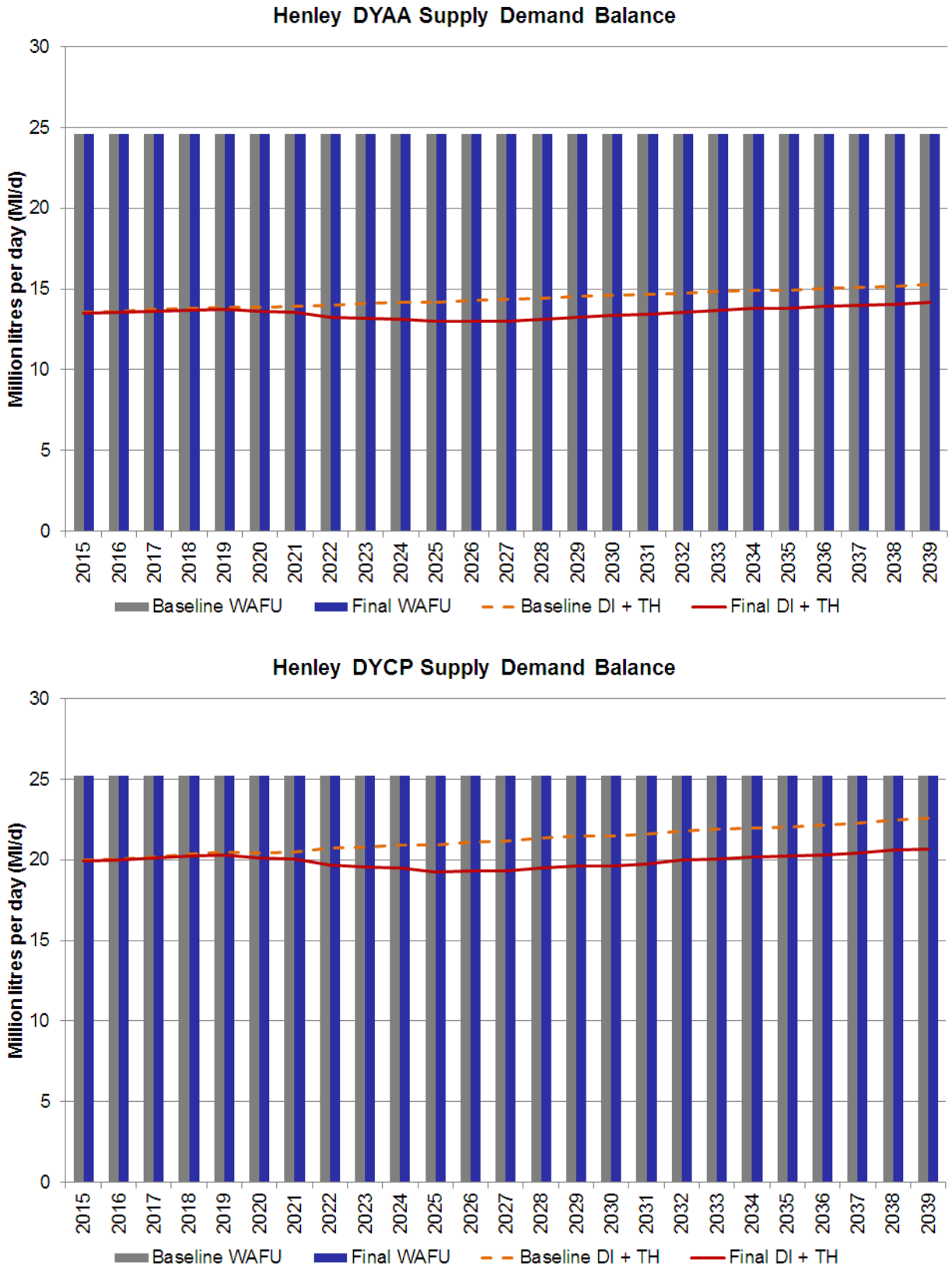


Figure 9-7: Henley Final Plan – Supply-Demand Balance (DYAA & DYCP)

9.7.2 Building the preferred plan

Our preferred plan is built from programme 3 in the programme appraisal (Section 8) and we have followed the same stakeholder and governance process outlined above for London in developing our preferred plan.

Taking all factors into account, and taking an holistic view using the results of the programme appraisal, we consider that a plan based on demand management mid-way through the planning period is the most appropriate, balanced plan. Specific reasons why we did not take forward the least cost plan were:

- it does not reduce demand or contribute to sustainable development
- it does not give a consistent message on water efficiency in our supply area
- there is little scope for better network management and future cost savings

We consider the preferred plan aligns better to government policies and aspirations, improves the environment and also allows the company to respond flexibly to future uncertainties to deliver the best results for customers and the wider water environment.

Based on the programme appraisal analysis work we believe that a plan based on demand management mid-way through the planning period is the most appropriate, balanced plan. The reasons for selecting this as our preferred plan are the same as those for other TV WRZs.

The wider roll-out of metering will also provide benefit for our management of droughts in the future. With the impact of climate change the climate is forecast to become more variable with the occurrence of drought also likely to increase. Widespread metering is important for the benefits it will bring for management of demand under future climate uncertainty.

Higher cost plan

The main higher cost plan is to bring forward metering into AMP6.

Earlier rollout of metering has a number of advantages as it gives a consistent timing message across our region however, there is no immediate supply-demand driver in 2015-2020.

9.7.3 Risks and Uncertainties in the Preferred Plan

The preferred programme for Henley ensures that security of supply is maintained throughout the planning horizon.

Although we are confident that our preferred plan is appropriate for the Henley WRZ there are a number of key risks and uncertainties in the plan which have been considered further. In line with the Water Resources Management Planning Guideline[25] these are described below. These were also discussed with our Executive and Board prior to submission.

We confirm that our plan is deliverable however, there are a number of key risks and uncertainties in the plan.

Risk: Metering Plan is not accepted post 2020

The key risk in the plan is that wholesale household metering is not accepted as the right way forward for a sustainable water supply system.

Given that the supply demand balance does not fall into deficit throughout the 25 year planning period this risk is not material.

Uncertainty: climate change

Other uncertainties include climate change and more frequent droughts, or more intense droughts. These risks are discussed in detail in Section 10.

9.7.4 Henley - Preferred Plan Summary

The above sections summarise the Preferred Plan for Henley. From the work we have undertaken we consider the preferred plan has the right overall balance, aligns to the customer research, is flexible to future uncertainties and makes a positive contribution to sustainable development.

We believe the underlying strategy behind the plan to reduce the overall demand for water and understand where and when water is being used is the correct long-term strategy if we are to meet the future challenges.

[25] Water Resources Management Plan Guideline, Technical Guidelines, Section 7.1

9.8 Summary Supply-Demand Balance

The total supply-demand balance for all Water Resource Zones for our preferred plan is summarised in Table 9-21. Figure 9-8 displays the surplus in the individual Thames Valley WRZs.

Table 9-21: Preferred plan supply demand balances by WRZ

WRZ	Item	Volume (Ml/d)								
		AMP6					End AMP7	End AMP8	End AMP9	End AMP10
		2015-16	2016-17	2017-18	2018-19	2019-20	2024-25	2029-30	2034-35	2039-40
London (DYAA)	Demand + Headroom	2,107.7	2,097.0	2,086.9	2,088.8	2,086.5	2,056.5	2,120.7	2,160.7	2,192.1
	WAFU	2,107.8	2,104.0	2,100.1	2,095.5	2,089.2	2,066.0	2,205.9	2,197.4	2,195.4
	Surplus/Deficit	0.1	7.0	13.2	6.7	2.7	9.5	85.1	36.7	3.3
SWOX (DYCP)	Demand + Headroom	333.1	334.9	338.9	340.0	343.5	332.1	331.8	337.0	341.5
	WAFU	361.4	360.9	350.9	350.4	346.2	343.6	340.9	340.1	344.2
	Surplus/Deficit	28.4	26.0	12.0	10.4	2.6	11.5	9.1	3.0	0.0
SWA (DYCP)	Demand + Headroom	179.3	179.9	180.6	181.2	181.9	173.2	171.8	175.3	178.2
	WAFU	192.0	191.8	191.7	191.6	191.4	190.8	190.1	179.9	179.9
	Surplus/Deficit	12.6	11.9	11.1	10.3	9.5	17.6	18.3	4.6	4.6
Kennet Valley (DYCP)	Demand + Headroom	125.7	126.5	127.1	128.1	128.6	123.8	123.5	126.9	128.6
	WAFU	152.4	152.2	151.9	151.7	151.4	150.1	148.8	148.3	147.9
	Surplus/Deficit	26.8	25.7	24.8	23.5	22.8	26.3	25.3	21.4	19.3
Guildford (DYCP)	Demand + Headroom	66.5	66.8	66.9	67.1	67.3	64.6	63.8	64.6	65.5
	WAFU	68.0	68.0	68.0	67.9	67.9	67.8	67.6	67.6	69.3
	Surplus/Deficit	1.6	1.2	1.0	0.8	0.6	3.2	3.8	3.0	3.9
Henley (DYCP)	Demand + Headroom	20.0	20.0	20.1	20.2	20.3	19.5	19.6	20.2	20.7
	WAFU	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3	25.3
	Surplus/Deficit	5.3	5.3	5.2	5.0	4.9	5.7	5.7	5.1	4.6

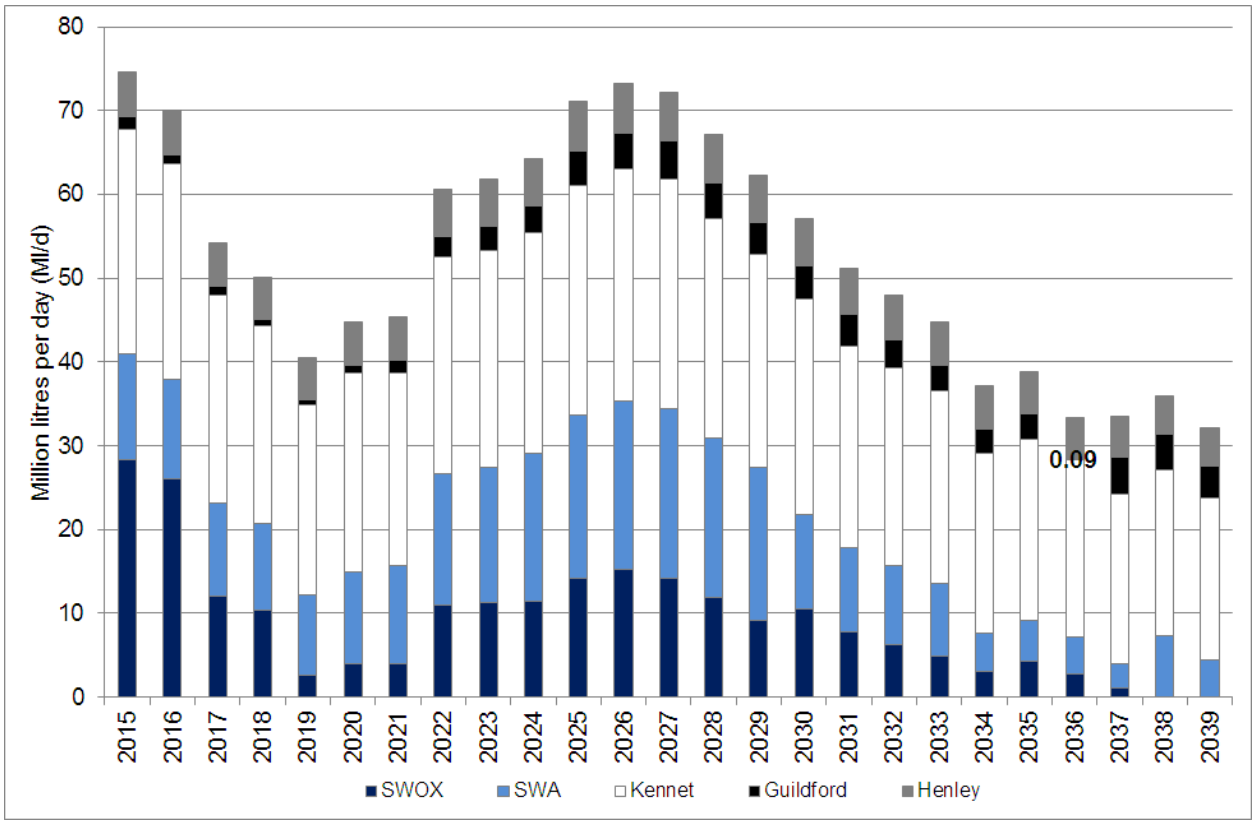


Figure 9-8: Thames Valley Water Resource Zones Surplus, DYCP

Note In 2036 the 0.09 Ml/d is noted to identify the surplus in Guildford which is too small to be visible on the graph.

9.9 AMP6 Studies - large scale water resource scheme development

In the long-term we forecast a deficit between supply and demand not just for our region but for the South East as a whole, and a new large resource scheme is highly likely to be required. Our final Plan shortlists wastewater re-use as the preferred long term option on the basis of current knowledge, however a large number of uncertainties remain including cost, technology choice, performance and resilience in the face of future drought. Furthermore, there may be further sustainability reductions in our supply area and the wider South East to meet the requirements of the Water Framework Directive which will drive the need for additional resources in the long term.

For the final WRMP we have undertaken a thorough review to identify the areas where uncertainty exists in our current understanding of large water resource schemes. This uncertainty has been monetised by applying an 'optimism bias' to each water resource option, including large schemes. The optimism bias is a percentage adjustment to the base cost estimate based upon the confidence grade and consequent uncertainty level of the option. Optimism bias is based on the uncertainty surrounding the engineering scope and deliverability of each proposed scheme.

Large schemes characteristically carry a greater level of uncertainty, and therefore optimism bias, than smaller options. In order to determine whether our selection of large scale wastewater re-use as the water resources option for the future in the Thames Water supply area is robust we must determine the real likely costs associated with these uncertainties so that a fair and transparent comparison can be made between options. Further work is necessary to bring all options to a consistent level of understanding and allow a more conclusive decision to be made in WRMP19 on the best value large scale water resource option for Thames Water and the South East region more generally.

Furthermore, in Section 10 we examine a number of potentially different future scenarios to test the robustness of our preferred plan. Under one scenario, analysis of droughts in the Future Flows database demonstrates that the preferred plan is not robust and highlights the importance of continuing to examine all three long-term large water resource options to ensure the most robust, resilient solution is identified to deliver the 'best value' plan at WRMP19. For the final WRMP the performance of the wastewater re-use based preferred plan was assessed against alternative plans based on the River Severn unsupported transfer and the Upper Thames reservoir storage. These large water supply options were evaluated against a range of reliability, cost and environmental metrics, and future climate change and socio-economic scenarios. The analysis demonstrated that opting for the higher capital cost Severn-Thames transfer or Upper Thames Reservoir schemes improves reliability, reduces risk and enhances environmental flows. Furthermore, the reservoir reduces operating costs and carbon emissions compared to both the Preferred Plan and transfer solutions.

As clearer climate change trends and energy price signals emerge over the next five years the baseline costs and benefits, reliability and risks associated with the different large water resource options will change. It is vital therefore that Thames Water maintains an adaptive approach and avoids locking itself into a plan, which although least cost today may be very expensive and less reliable under some potential future scenarios.

Over the next 5 years we intend to undertake detailed studies to examine the longer term large water resource options to ensure the best 'value' solution is selected in time for WRMP19. These studies will cover the following areas:

- Wastewater re-use
- Reservoir storage
- Transfers, including potential third party water supply options

We intend to work in collaboration with other water companies, stakeholders, regulators and Government as we progress this work. We have provided an outline programme of work to examine the long-term resource options to enable informed decisions on the right selection of scheme to take forward to outline design.

Phase 1 April 2014 – April 2015 - Early start investigation and consultation with stakeholders:

- Critical review of constrained options list to ensure options are reappraised following the representations to the public consultation, inclusion of new options, and consideration of potential variants emerging from on-going work, such as the possible wastewater re-use option at Mogden.
- High level comparison of options considering engineering scope and risk, cost, frequency and duration of operation, environmental and recreational impacts and benefits, planning risk and 'promotability' and operational risk.
- Development of stakeholder engagement process.
- Consideration of customer perception of options.

Phase 2 April 2015 – August 2016 - Detailed scheme investigations:

- Main phase of investigation of strategic resource options (storage, transfers, wastewater re-use, third party schemes) to improve the understanding of the engineering scope of the schemes, operational risks and environmental impact.
- On-going engagement with stakeholders.

The currently planned detailed scheme investigations are set out in Table 9-22.

Table 9-22: Proposed detailed scheme investigations for AMP6 studies.

Work package	Resource type
Flood risk assessment/flood storage study	Reservoir
Watercourse diversions/WFD impact	Reservoir
Engineering studies for canal transfer options	Raw Water Transfer
Hydraulic modelling of canal options	Raw Water Transfer
Hydrogeological study canal transfers	Raw Water Transfer
Hydrological modelling of Severn abstraction	Raw Water Transfer
Engineering study for Sapperton tunnel	Raw Water Transfer
Review Grimsbury WTW upgrade - Oxford canal option	Raw Water Transfer
Review Thames Water pilot plant data for indirect potable reuse	Indirect Potable Reuse
Continuation of process development/ innovation for IPR	Indirect Potable Reuse
Options study to determine required energy supply, availability and cost	Indirect Potable Reuse
River Lee Catchment Management feasibility study	Surface water
Network modelling to determine required network enhancements	All options
Water quality modelling of reservoirs, raw water transfer and indirect potable reuse	All options
Review and update WFD assessment for all options	All options
Review and update flood risk assessments – all options	All options

Work package	Resource type
Review transport routes for all reservoir options	Reservoir
Compensatory habitat and recreational resource creation – reservoirs	Reservoir
Evaluation of cultural heritage and landscape effects - reservoirs	Reservoir
Invasive species surveys for canal and transfer schemes	Raw Water Transfer
Review of ecological mitigation measures for pipeline routes and compensation habitat	All options
Develop operating rules for all options and responsibility for operation and maintenance	All options
Review land cost estimates and land availability for new sites	All options
Further develop pipeline/tunnel section routes through London for indirect potable reuse	Indirect Potable Reuse
Bi-annual Water Resources Forum meetings with stakeholders/Phase 2	All options
Consultation with EA regarding abstraction, discharge and WFD/Phase 2	All options

Phase 3 August 2016 – August 2017 - Cost Estimating for dWRMP19:

- Update the cost estimates for all constrained options including capital, operating and environmental and social costs.

Phase 4 January 2018 – April 2020 - Outline Design and Planning for Preferred Option:

- Following completion of the investigations and consultation under Phases 1 to 3, and aligned to WRMP19 activity, a short list of options will be defined. WRMP19 will then indicate which preferred option will be taken to design stage and planning and further consultation.

The work programme is shown diagrammatically in Figure 9-9.

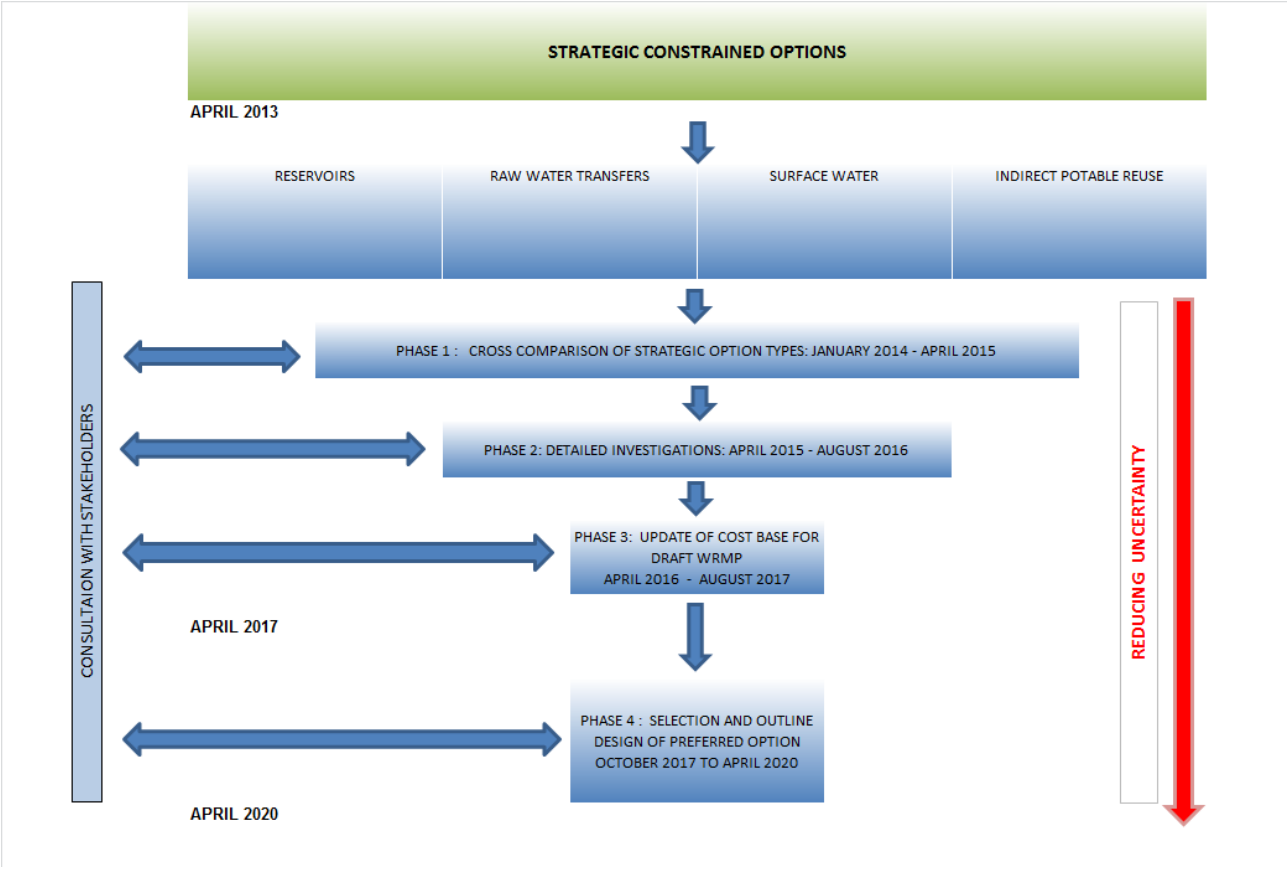


Figure 9-9: AMP6 Investigative Studies – Outline work programme

9.10 Alignment with PR14 Outcomes

Through our customer research we have developed a set of outcomes for the PR14 Business Plan.

Whilst many of the Outcome themes have been discussed above, the customer outcomes would be delivered by our preferred plan as presented in Table 9-23

Table 9-23: Outcomes and WRMP contribution

Outcome	WRMP Contribution
We will provide a safe and reliable water service that complies with all necessary standards and is available when our customers require it.	Our plan resolves our forecast supply demand deficits and gives a forecast Security of Supply Index of 100. Synergies between our proposals for water treatment and our WRMP proposals have been exploited to constrain our investment proposals in AMP6 on the water treatment area to those that are required to maintain water quality in the light of the assumed demand reductions.
We will provide a safe and reliable wastewater service that complies with all necessary standards and is available when our customers require it.	Wastewater services are not covered in the WRMP but are covered in the Business Plan.
We will demonstrate to our customers and stakeholders that they can trust us, that we are easy to do business with and that we care.	Our rollout programme of metering has been aligned to take into account customer affordability and reduce disruption to customers, stakeholders and councils (Appendix N). Our water efficiency activities are designed to help customers take control of their water use and actively manage their bills.
We will provide the level of service our customers require, in the most economic and efficient manner, to ensure their bills are no more than necessary	Our plan provides sufficient water to deliver our stated levels of service to the selected risk profile. Although slightly more expensive than the lest cost plan, our preferred plan gives additional benefits in later periods which outweigh the costs. There is no bill impact in AMP6.
We will provide our customers with a choice of easy-to-use contact options service	The introduction of new metering technology will provide customers information on their water use and how and when they use water.
We will limit our impact on the environment to achieve a socially responsible, sustainable business for future generations, including reducing levels of leakage.	Our plan has significant planned reduction in demand which will reduce our abstraction from the environment from that would otherwise be necessary. By reducing demand for water over the 25-year period, our Plan should cut the equivalent amount of carbon dioxide generated from 291k to 262k tonnes per year – an annual reduction of 29 tonnes. Leakage reduction is central to our plan and total company leakage is reduced from 665 Ml/d in 2015 to 556Ml/d in 2040.

9.11 Preferred Plan - Key Outputs

In this section we summarise some of the key outputs of the preferred plan.

9.11.1 Per Capita Consumption Forecasts

The water white paper “Water for Life” published by Defra in December 2011 set a clear target for water companies, who were either designated as being in a water stressed area or where their per capita consumption (PCC) was above the national average, to significantly reduce demand.

The integrated demand management approach outlined in Sections 9.2 to 9.7 allows us to realise this target. The combined influence of progressive metering, innovative tariffs and behavioural change results in the significantly downward PCC profiles shown in Figure 9-10 for London and the Thames Valley.

These graphs clearly show a substantial reduction in per capita water use across our entire water supply area and demonstrate the effectiveness of the integrated demand management approach in reducing usage. The total volume of water saved as a result of the integrated demand management programme is shown in Figure 9-10 for London and Thames Valley.

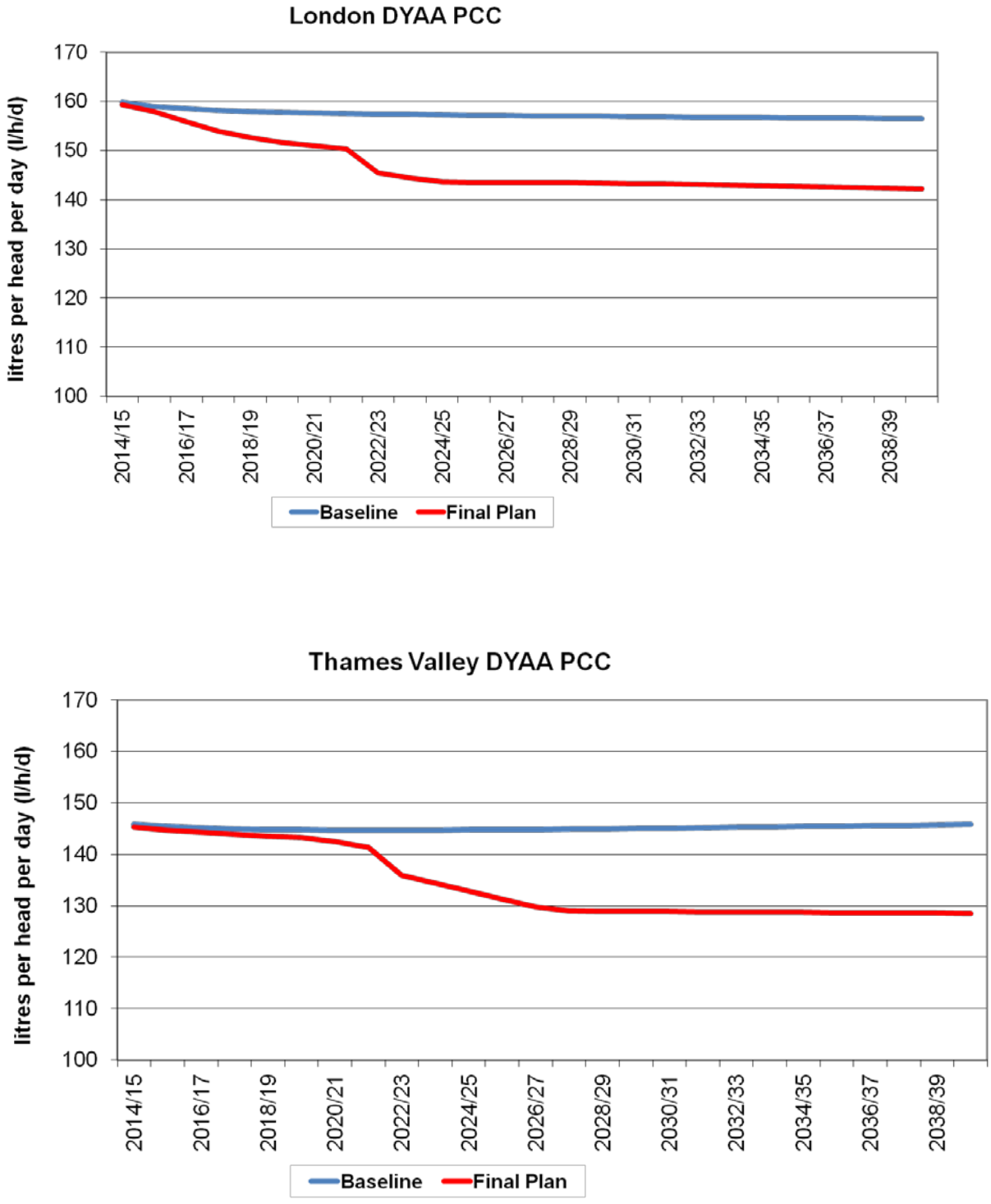


Figure 9-10: Final Plan – PCC Forecasts

9.11.2 Leakage Forecasts

Leakage reductions are achieved across all our water resource zones. In London this is achieved through a combination of customer supply side savings from the progressive metering programme, pressure management and mains replacement. In the Thames Valley this reduction is exclusively realised as a result of the progressive metering programme. The difference between the baseline and final plan leakage is shown in Figure 9-11 for both London and for the Thames Valley.

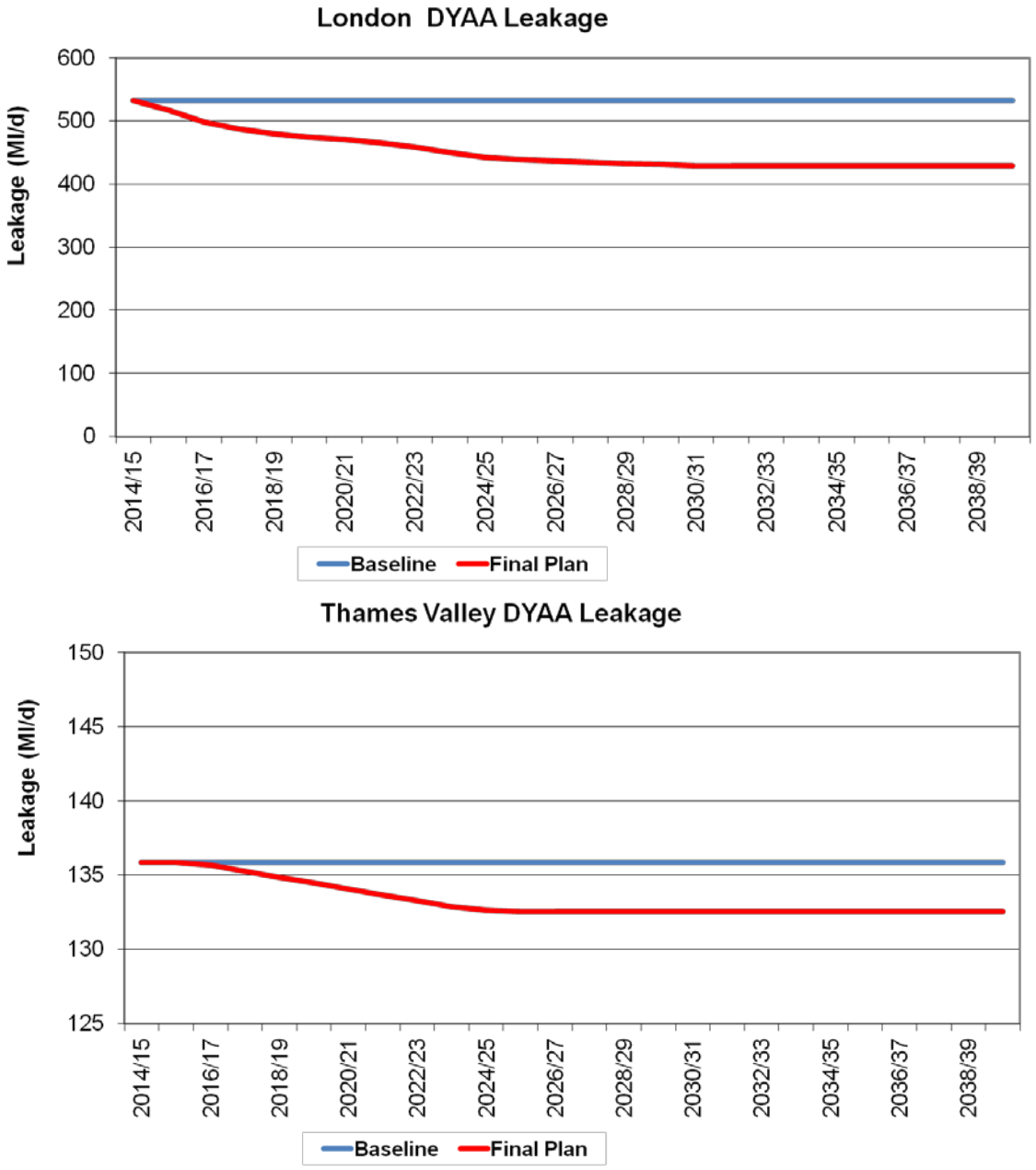


Figure 9-11: Final Plan – Leakage Forecasts

We have introduced a range of new tools as part of this Water Resources Management Plan to improve the analysis of the long-term supply-demand balance. This includes tools on targeting of mains replacement (See Section 7 and Appendix M), and we will continue to develop these tools to include further recommendations as and when necessary.

9.11.3 Metering Forecasts

The metering penetration for London and the Thames Valley is shown in Figure 9-12. In both graphs the effects of the progressive metering programme are evident. For London the maximum metering penetration for existing properties, is achieved in 2024/25 and for the Thames Valley maximum metering penetration is achieved in 2029/30. The continued increase in metering penetration seen after these dates is due to new properties being built, all of which have meters fitted. The metering programme takes levels more aligned to the rest of the industry.

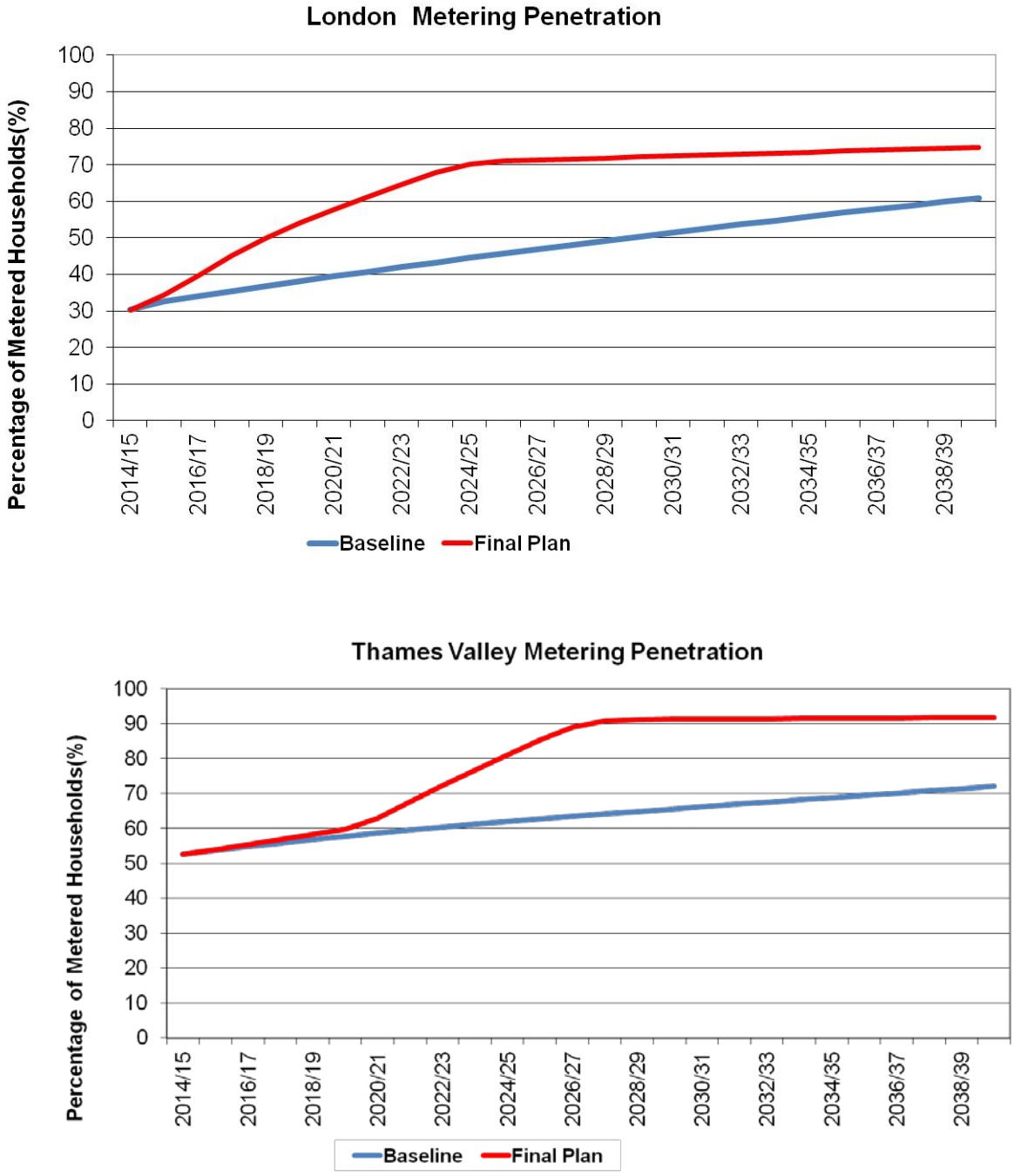


Figure 9-12: Final Plan – Meter Penetration Forecasts

Figure 9-13 shows the forecast locations for metering for the preferred plan direct from our modelling. The WRMP modelling produces the optimum locations based on costs and benefits. However, a number of important considerations need to be taken into account on an actual programme of delivery. Figure 9-14 shows our forecast locations for rollout. The rollout locations focus on geographic locations to:

a) improve the customer messaging by focussing on specific locations

b) improve the success of delivery

c) improve working with stakeholders and councils

Whilst a geographic based programme has a number of customer and stakeholder benefits the cost of the programme could be higher and the benefits lower as it moves away from the optimised model results. We have not allowed for this in our plan.

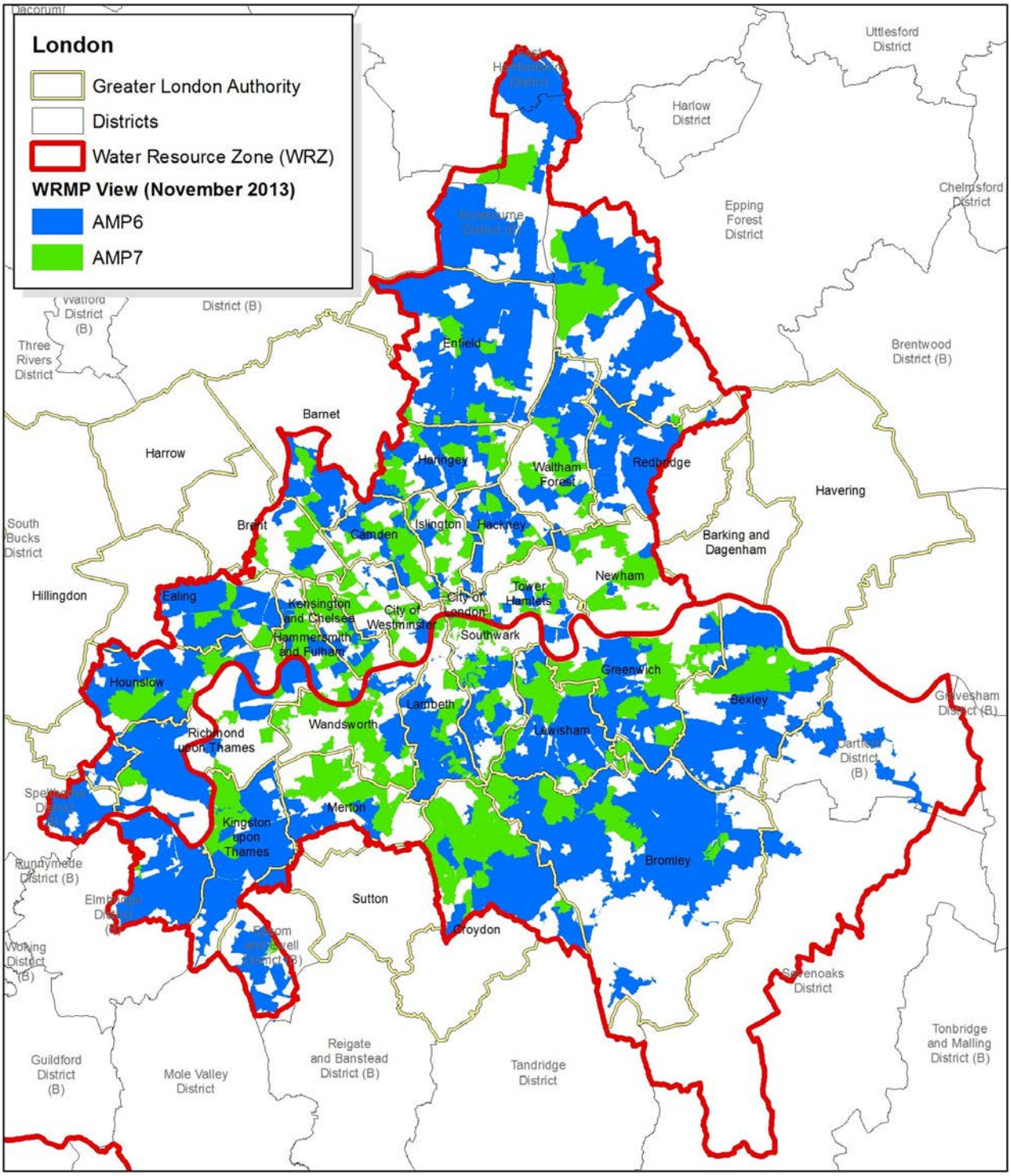
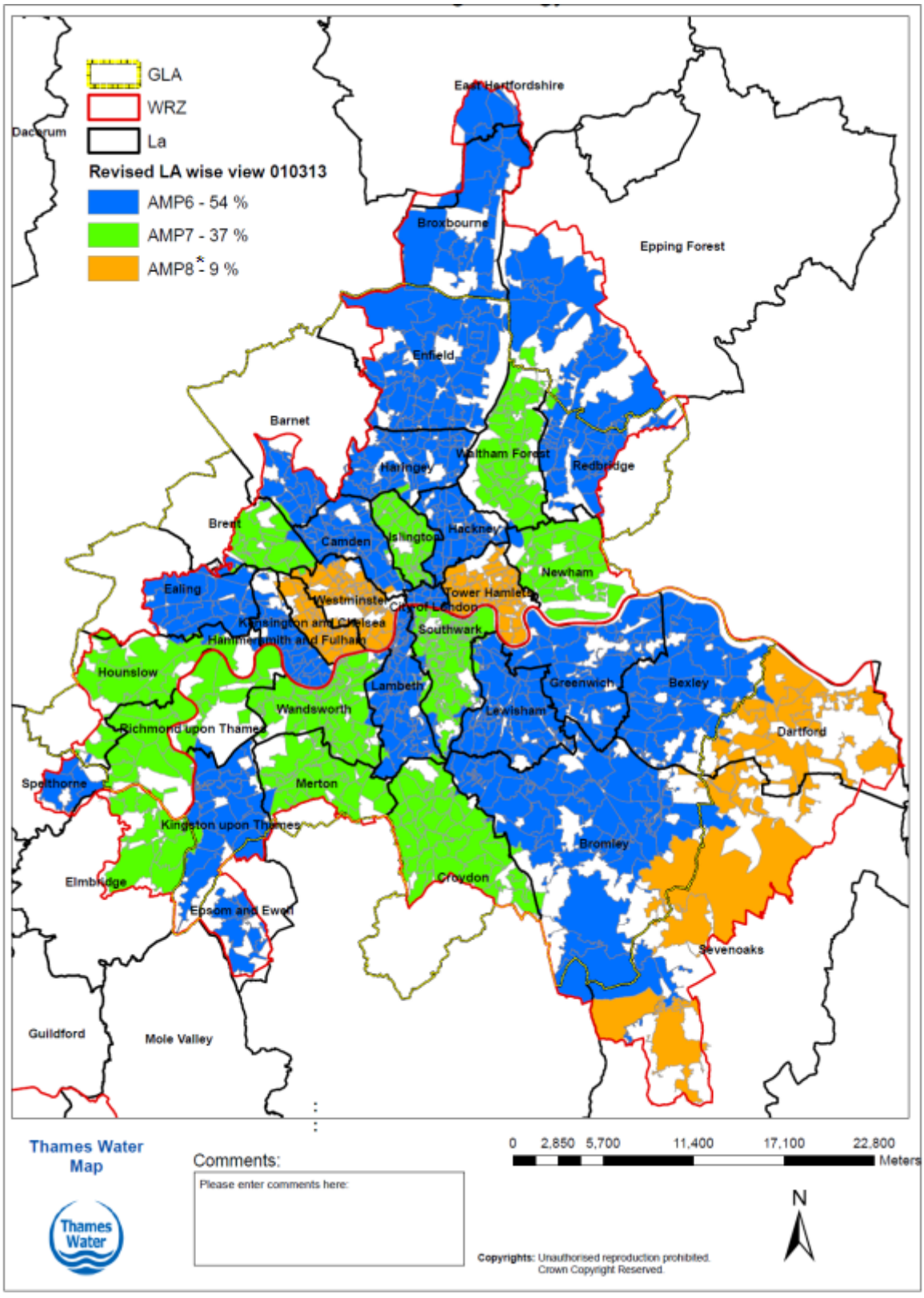


Figure 9-13: Final Plan – Forecast Meter Locations (optimisation model results)



*AMP8 programme of work has been moved to AMP7 in the final

Figure 9-14: Final Plan – Forecast Meter Locations (rollout programme – November 2013)

9.11.4 Water Efficiency Forecasts

Water efficiency forms a fundamental part of the integrated demand management programme. It is aligned with the progressive metering programme in order to achieve maximum benefit and to help customers. The water efficiency programme in rdWRMP14 is rolled out from 2015/16 to 2024/25 in London, and from 2020/21 to 2029/30 in the Thames Valley. Due to the decay in water efficiency savings after a programme is introduced, the forecast savings in Figure 9-15 decrease over time.

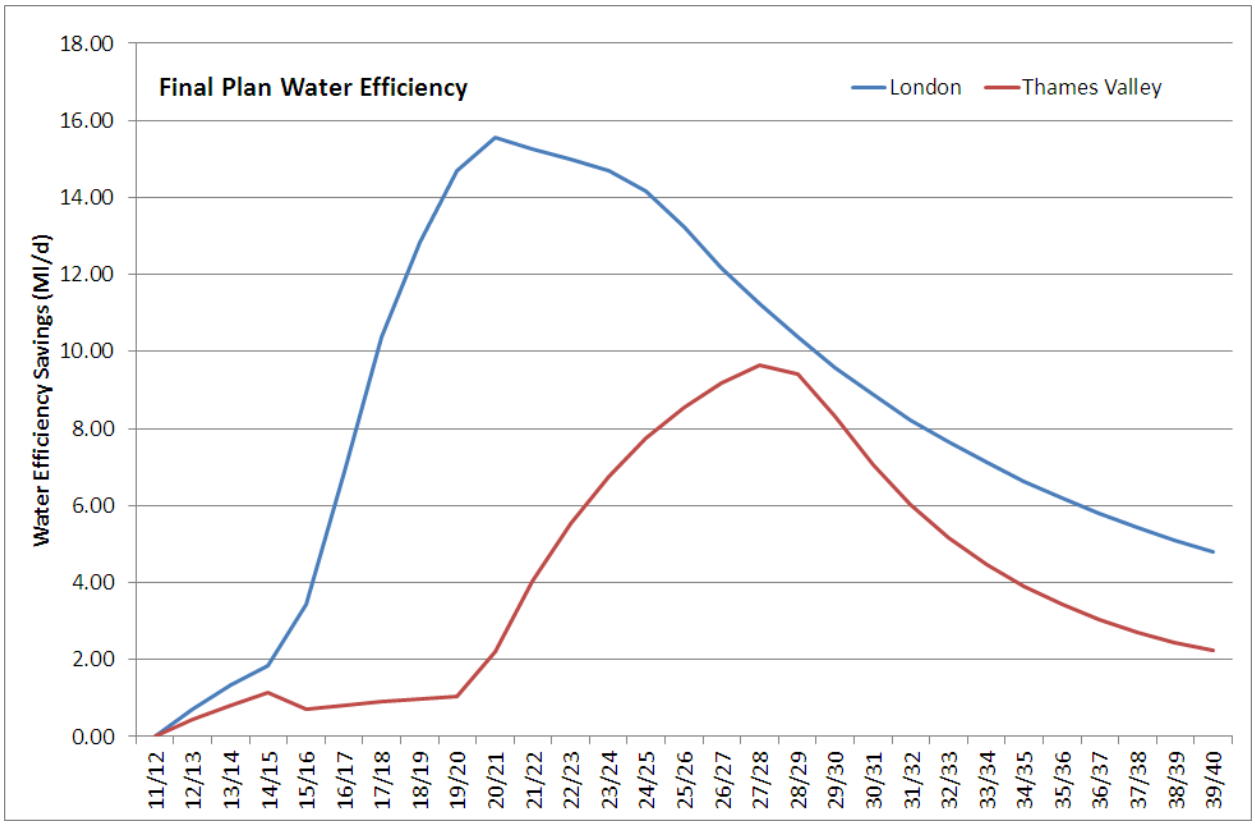


Figure 9-15: Final Plan – Water Efficiency Forecasts[26]

[26] Water efficiency savings decrease with a mean half-life of the products installed and advice followed

9.12 Greenhouse gas emissions and carbon accounting

As a part of the Annual Return process, we produce an estimate for the emission of greenhouse gases from our water supply activity.

Table 9-24 shows the greenhouse gas emissions associated with the treatment and supply of drinking water. The operational carbon calculation for the year 2011/12 uses the revised UKWIR (2011) Carbon Accounting Workbook (CAW) version 6.1 and the associated guidance document. This is the methodology supported by Ofwat for reporting operational greenhouse gases.

Table 9-24: Greenhouse Gas Emissions

Source	GHG Emissions tonnes (CO2e /annum) 2011-12	Emission factors 2011-12 kg CO2e conversions
Electricity	257,816	0.52462 kg CO2e / kWh
Natural Gas	2,849	0.1836 kg CO2e / kWh
Gasoil	1,407	3.0595 kg CO2e / litre
Diesel	974	2.6676 kg CO2e / litre
Kerosene	0	2.5422 kg CO2e / litre
Water treatment works sludge recycled to land	285	156.2 kg CO2e /tonne
Water treatment works sludge sent to landfill	0	n/a
Total	263,331	n/a
Volume of drinking water supplied (Ml)	933,658	n/a
GHG emissions per Ml drinking water treated	0.282	tonne CO2e/Ml

By applying the resultant 0.282 tonnes of CO2e per megalitre to the baseline and final planning forecasts, a long-term trend can be produced, Figure 9-16.

For the DYAA scenario in the base year, 2011/12, our estimate is 265,450 tCO2e. Under the baseline scenario demand continues to increase across the forecast period, primarily due to population growth, resulting in an emissions estimate of 290,801 tCO2e in the final year of the plan, 2039/40, 25,351 tCO2e higher than in the base year.

The reductions in demand, forecast as a result of the integrated demand management programme, contained within the final plan gives a final emissions figure of 262,187 tCO2e which is a reduction of 28,614 tCO2e compared to the forecast baseline in 2039/40.

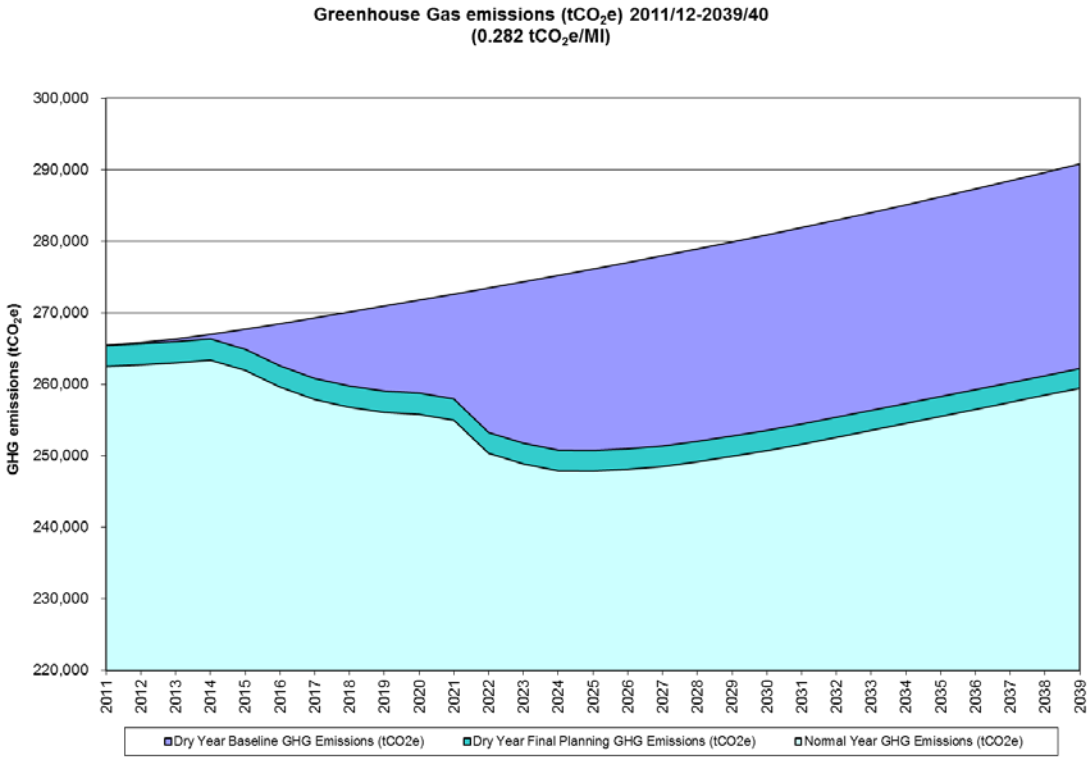


Figure 9-16: Greenhouse gas emissions for the base and final planning forecasts

9.13 Summary

This section has presented our preferred plan for the period 2015-2040.

We have used the programme appraisal process in Section 8 to develop our preferred plan following a step-by-step process and taking an holistic view of the water service.

Our preferred plan for London is to:

- Focus on demand management in the short-term followed by resource development.
- Rollout a progressive metering programme to all households over the 2015-2025 period to achieve a forecast meter penetration rate of 72% by 2030.
- Reduce leakage by 103Ml/d by 2030 through a combination of active leakage control, pressure management, metering and CSL benefits and mains replacement.
- Short-list a wastewater re-use plant in 2025-2030 to secure long-term resilience based on minimising cost.

The preferred plan for Thames Valley is to:

- Focus on water efficiency in the short-term.
- Rollout a programme of progressive metering starting in 2020 to achieve a forecast meter penetration rate of 90% by 2030.
- Reduce leakage by approximately 5 Ml/d between 2020-2035 and remove a network constraint to facilitate treated water transfer.

We have selected our programme by examining the financial, social and environmental factors and stakeholder and customer preferences. Our plans for Thames Valley are not the least cost but we consider that they give the best overall value without undue effect on customer bills.

The following section undertakes a range of scenario tests to determine how robust and flexible the plan is, what are the key uncertainties and how they impact on the plan. The following section also explores the work we have done on climate change to help plan for the future.