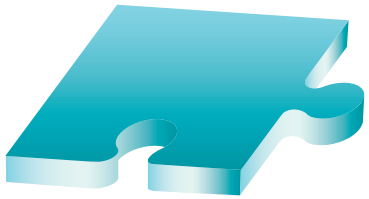


Section 3 : Supply Forecast

In this section we explain how we have calculated the supply forecast and how things could change in the future.

Introduction

3.1 The production of a supply forecast is an important part of our planning process. The forecast considers the volumes of water currently available to us to meet demand; how these volumes are distributed, and how they might change during the course of the planning period from 2015 to 2040 before any new resource options are included.

3.2 Our assessment of the supply forecast is set out in the sections below and the detailed calculations can be found in Appendix 3.

3.3 Throughout the preparation of the WRMP14 we have engaged with the Environment Agency to make sure it is satisfied with our approach, the methods we have used, and our final conclusions.

3.4 Our supply area covers around 5,700km^2 and is classified by the Environment Agency as 'water stressed'. Over 250 boreholes and wells result in around 73% of our supply being reliant on groundwater sources. 19% of our supply comes from surface water, which includes six river intakes and three reservoirs. The remaining 8% is from transfers from neighbouring companies.

3.5 Figures 3.1 to 3.8 provide an overview of resources for each WRZ, setting out the key characteristics.

Determining the water available for use

3.6 The supply of water that is available at any one time is called the water available for use (WAFU), the key components of which are set out in Figure 3.9. The WAFU is the amount of water we expect to be able to supply under the demand conditions set out in the levels of service.

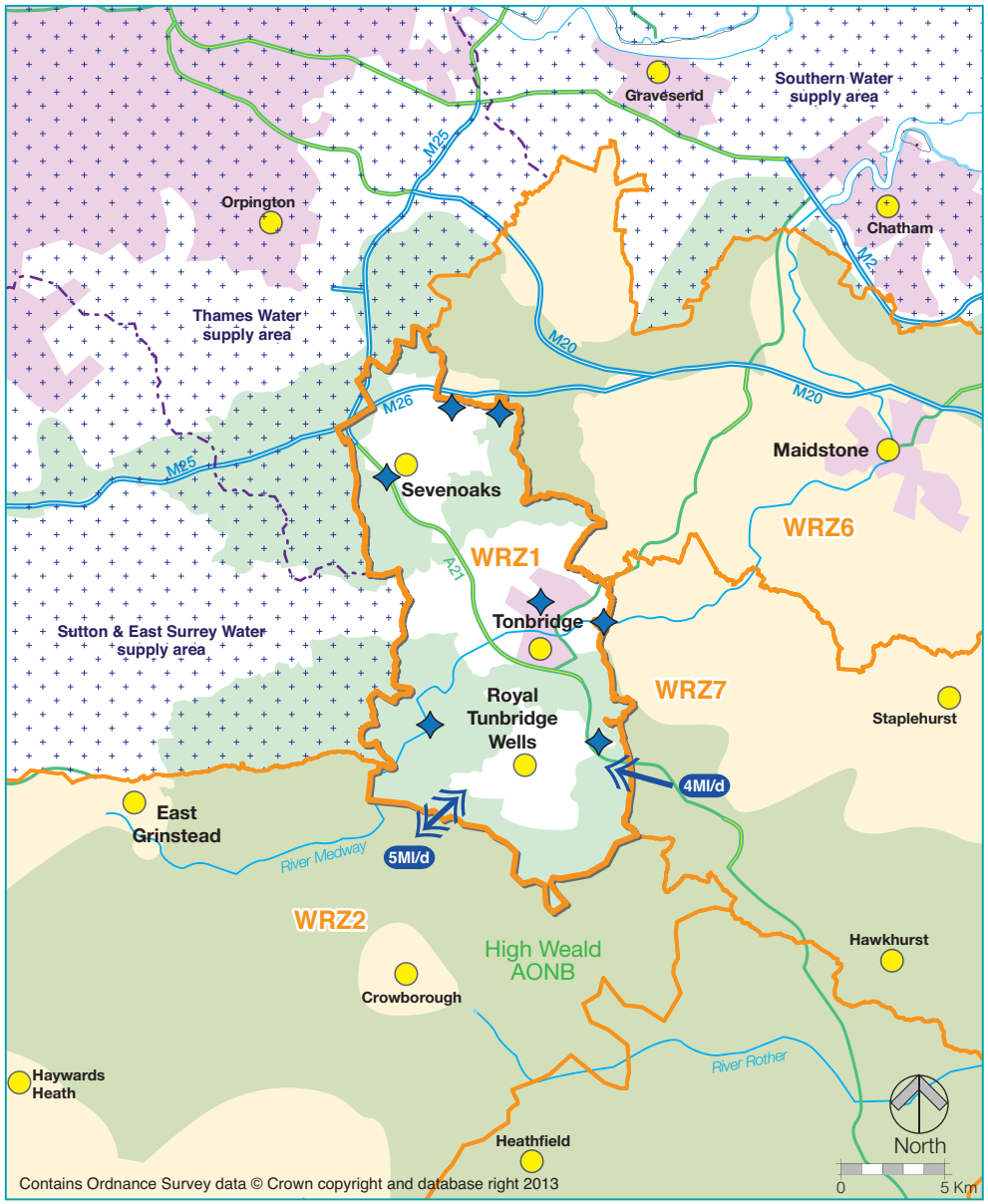


Figure 3.1 : Water Resource Zone 1

- Key urban areas include Sevenoaks, Tonbridge and Tunbridge Wells
- Average daily demand approximately 39 Ml/d

Surface Water

- No surface water supplies

Groundwater

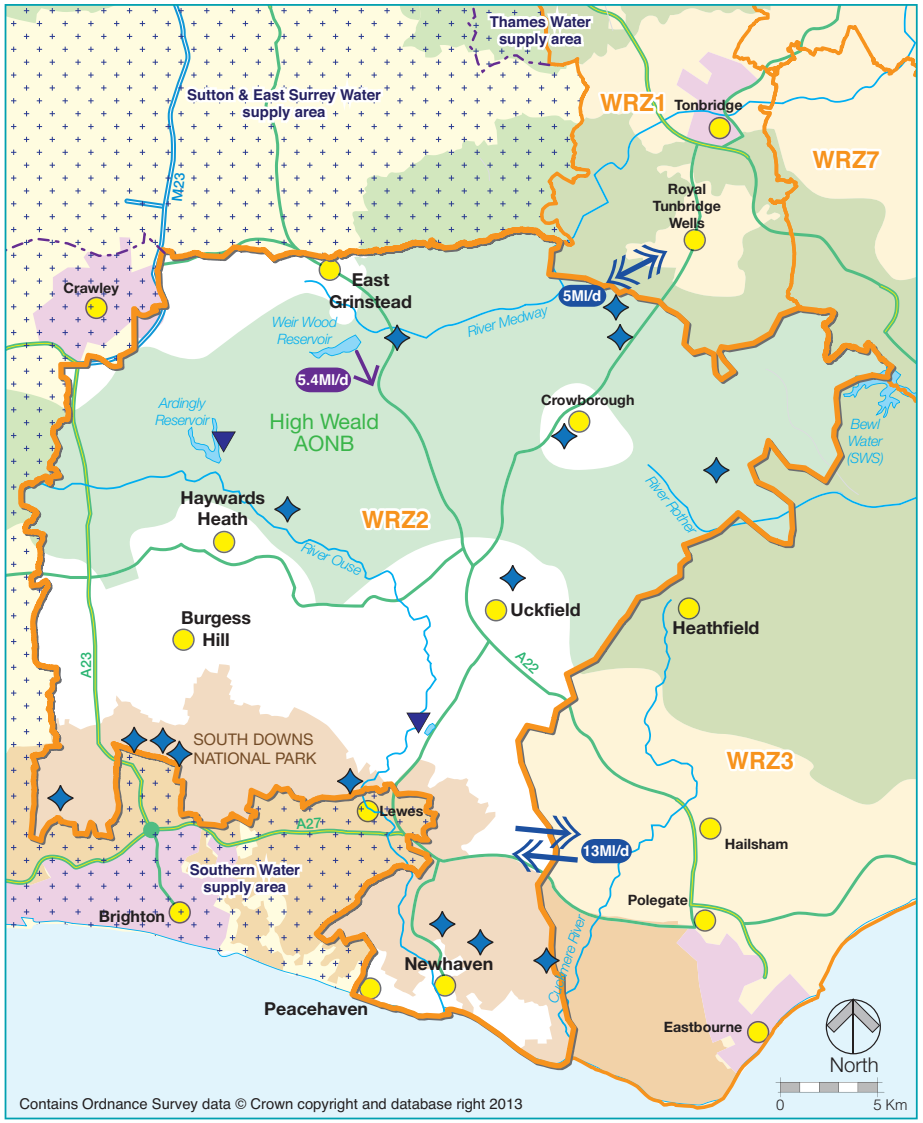
- 100% of water is supplied by 7 groundwater sources

Inter-zonal Transfers

- Transfer capability from WRZ7 and WRZ2

Inter-company Transfers

- None



South East Water Resource Zone
Groundwater source
Surface Water Supply
Inter-zonal transfer
Inter-company bulk transfer
Other Water Company Areas

Figure 3.2 : Water Resource Zone 2

- Key urban areas include Haywards Heath, East Grinstead, Uckfield and Newhaven
- Average daily demand approximately 71 Ml/d

Surface Water

- 55% of water is supplied by 2 surface water sources

Groundwater

- 38% of water is supplied by 14 groundwater sources from the Ashdown Beds and Chalk

Inter-zonal Transfers

- Transfer with WRZ1 and WRZ3

Inter-company Transfers

- 7% of water is supplied by inter-company transfer from Southern Water Services
- Contract is due to be next reviewed in 2021

South East Water Resource Zone
Groundwater source
Surface Water Supply
Inter-zonal transfer
Inter-company bulk transfer
Other Water Company Areas

Figure 3.3 : Water Resource Zone 3

- Key urban areas include Eastbourne, Heathfield and Bexhill
- Average daily demand approximately 60 Ml/d

Surface Water

- 30% of water is supplied by 3 surface water sources

Groundwater

- 59% of water is supplied by 10 groundwater sources from the Ashdown Beds, Eastbourne and Seaford Chalk blocks

Inter-zonal Transfers

- Transfer with WRZ2

Inter-company Transfers

- 11% of the water is supplied from imports from Southern Water Services
- Contract next due for review in 2023

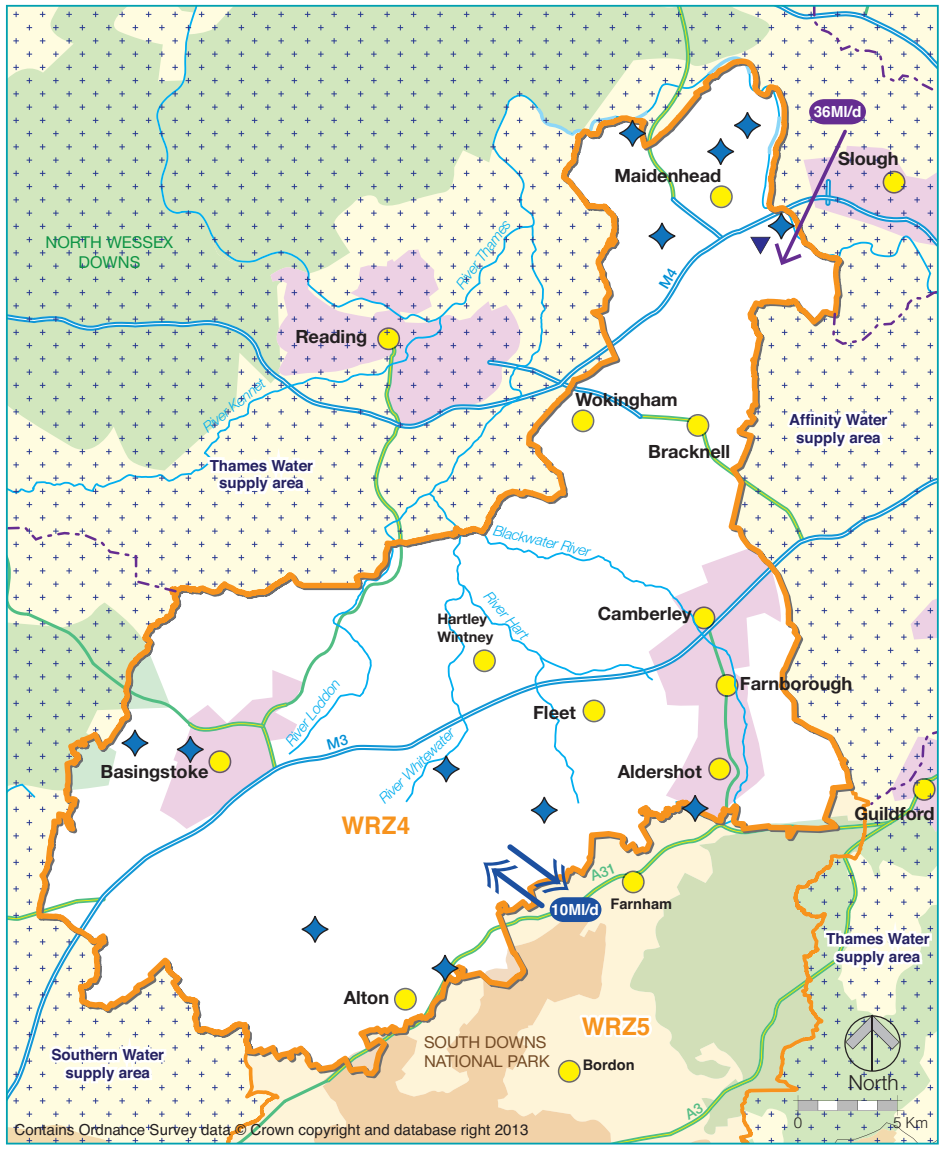


Figure 3.4 : Water Resource Zone 4

- Key urban areas include Maidenhead, Farnborough, and Basingstoke
- Average daily demand approximately 181 Ml/d

Surface Water

- 20% of water is supplied by 1 surface water source

Groundwater

- 65% of water is supplied by 12 groundwater sources from Chalk, Greensand and Hythe aquifers

Inter-zonal Transfers

- Transfer with WRZ5

Inter-company Transfers

- 15% of water is from bulk supplies.
- Transfer from Affinity Water

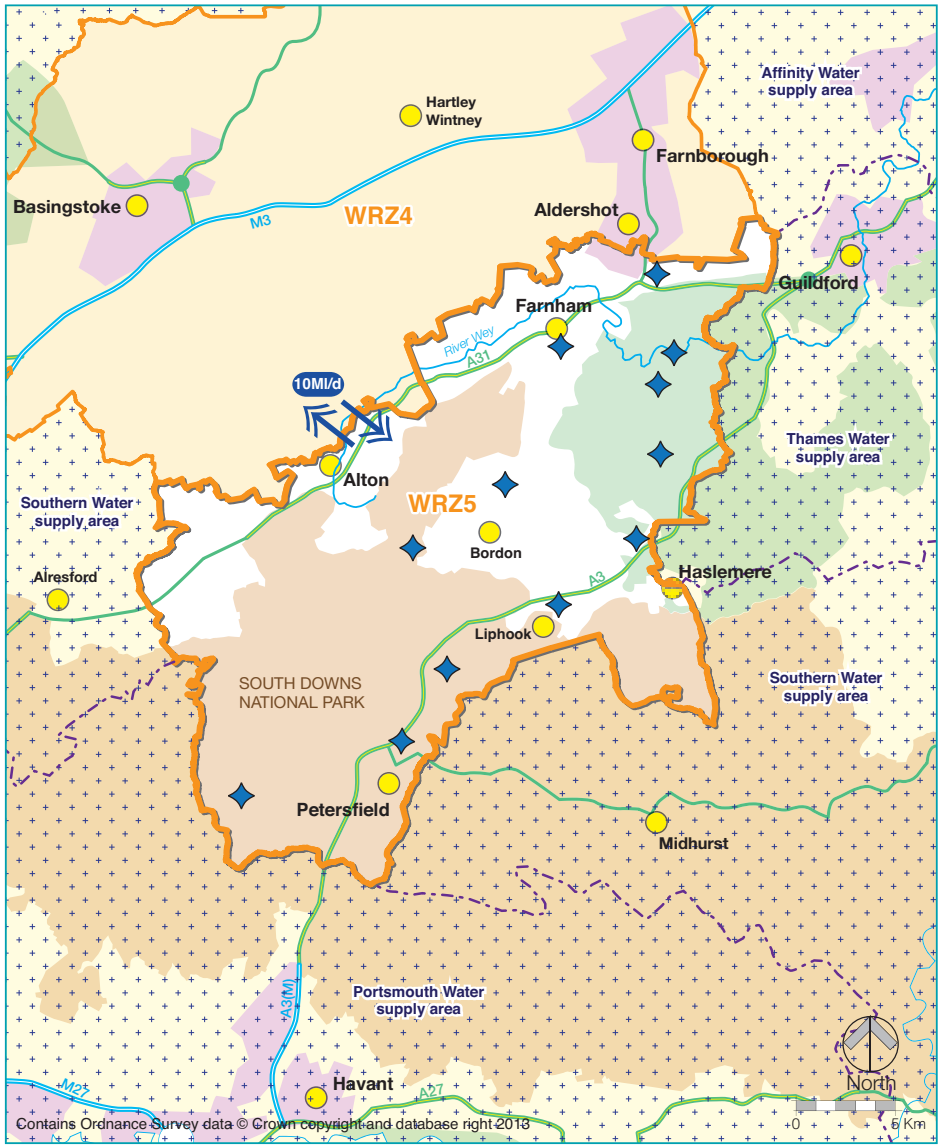


Figure 3.5 : Water Resource Zone 5

- Key urban areas include Farnham, Petersfield and Bordon
- Average daily demand approximately 37 Ml/d

Surface Water

- No surface water supplies

Groundwater

- 100% of water is supplied by 12 groundwater sources

Inter-zonal Transfers

- Transfer with WRZ4

Inter-company Transfers

- None

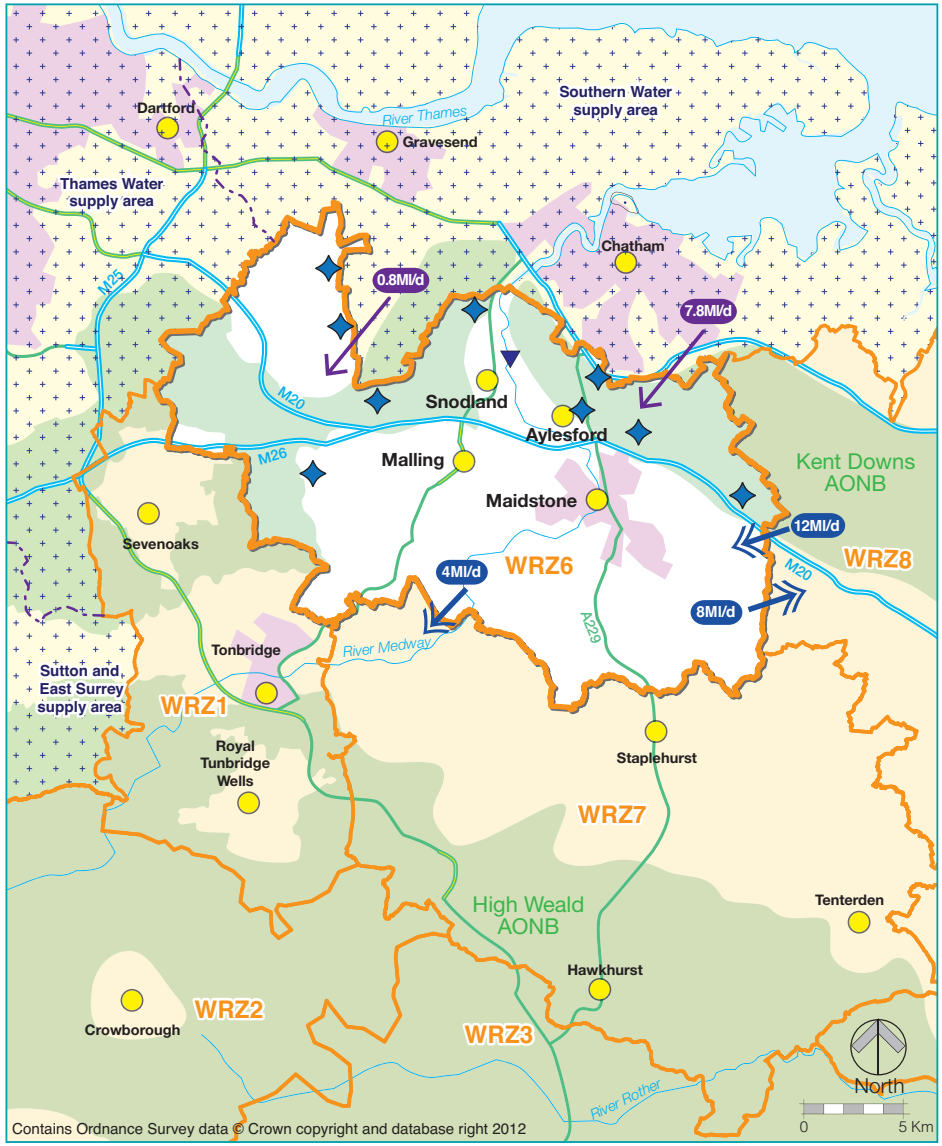


Figure 3.6 : Water Resource Zone 6

- Key urban areas include Maidstone and West Malling.
- Average daily demand approximately 61 Ml/d

Surface Water

- 12% output from one surface water source shared with Southern Water Services

Groundwater

- 78% of water is supplied by 9 groundwater sources

Inter-zonal Transfers

- Transfers between WRZ7 and WRZ8

Inter-company Transfers

- 10% Imports from Southern Water Services

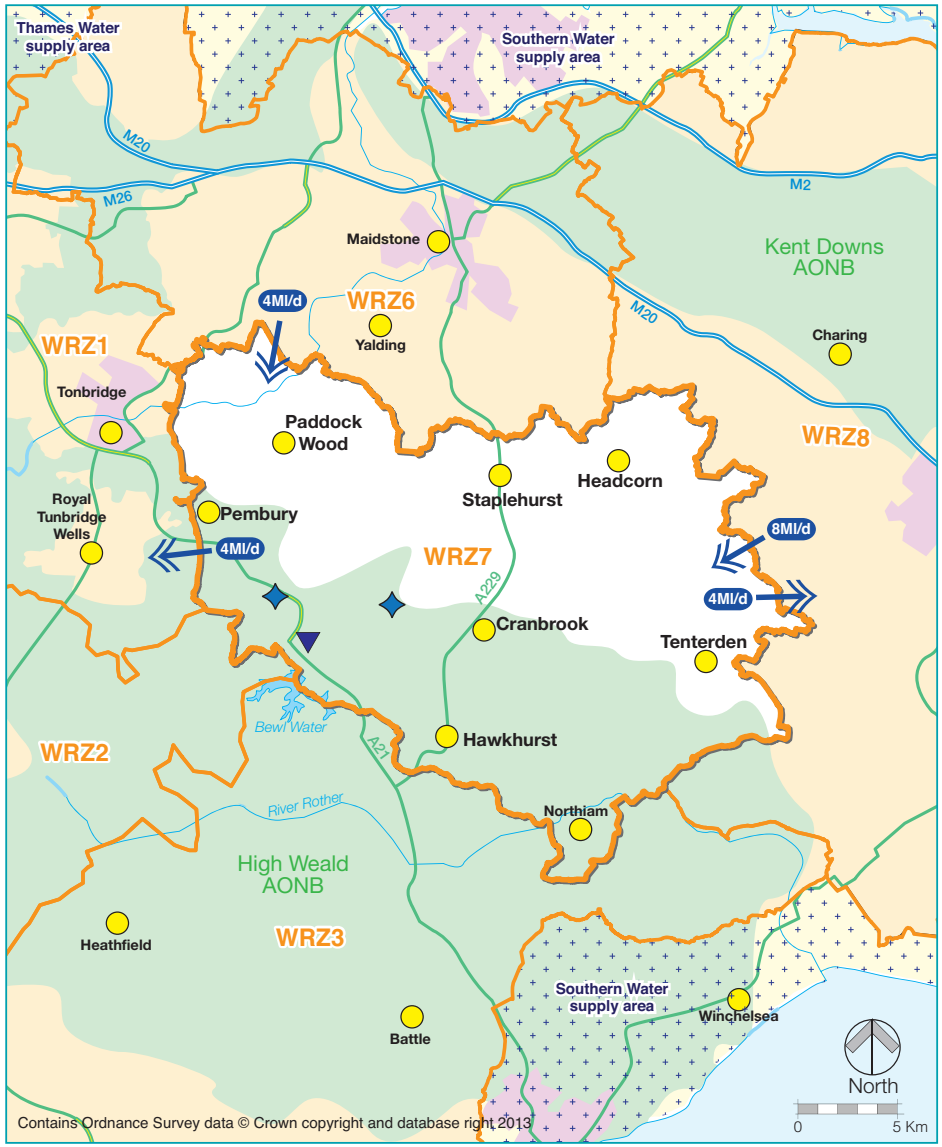


Figure 3.7 : Water Resource Zone 7

- Key urban areas include Paddock Wood, Staplehurst, Cranbrook and Tenterden.
- Average daily demand approximately 20 Ml/d

Surface Water

- 49% of water is supplied by 1 surface water source shared with Southern Water Services

Groundwater

- 51% of water is supplied by 3 groundwater sources

Inter-zonal Transfers

- Transfers between WRZ1, WRZ6 and WRZ8

Inter-company Transfers

- None

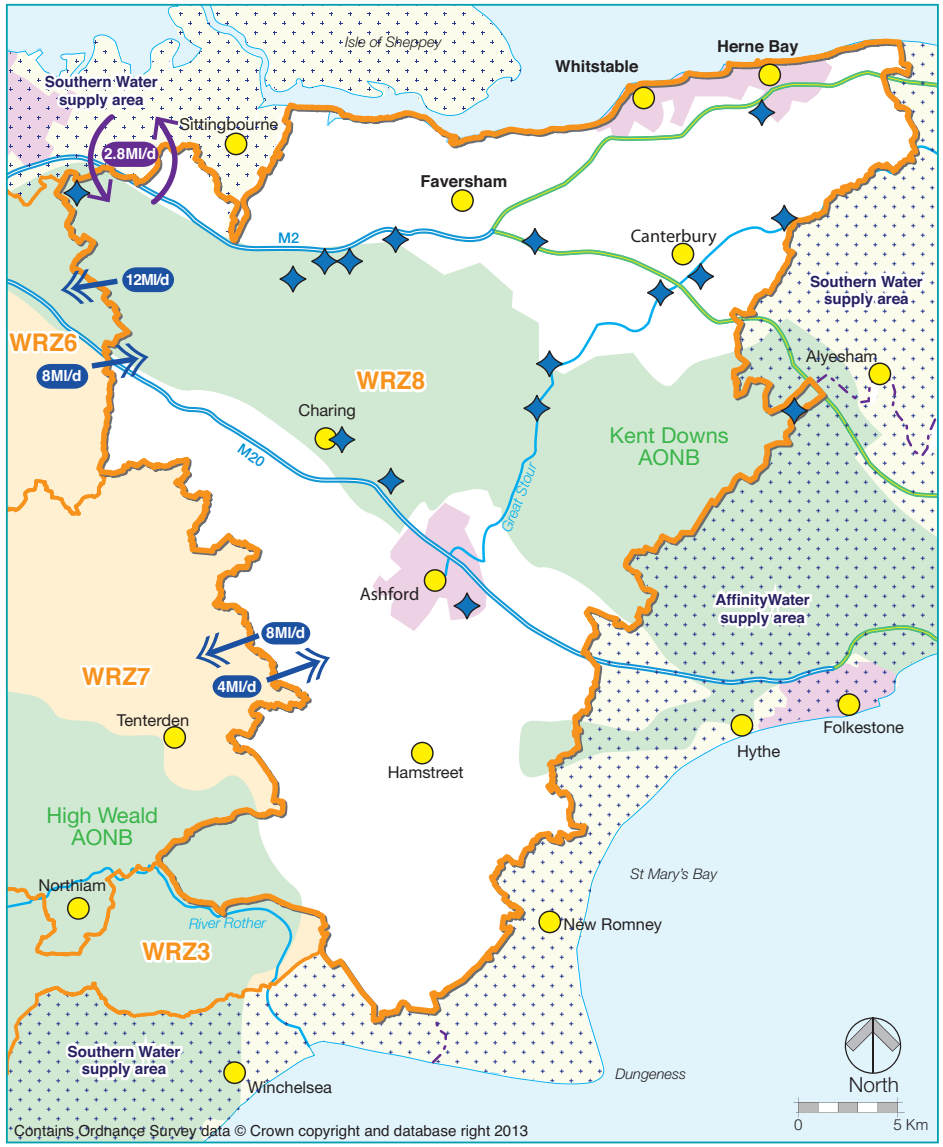


Figure 3.8 : Water Resource Zone 8

- Key urban areas include Ashford, Canterbury, Faversham, and the coastal towns of Whitstable and Herne Bay
- Average daily demand approximately 80 Ml/d

Surface Water

- There are no surface water resources in the zone.

Groundwater

- 100% of water is supplied by 16 groundwater sources

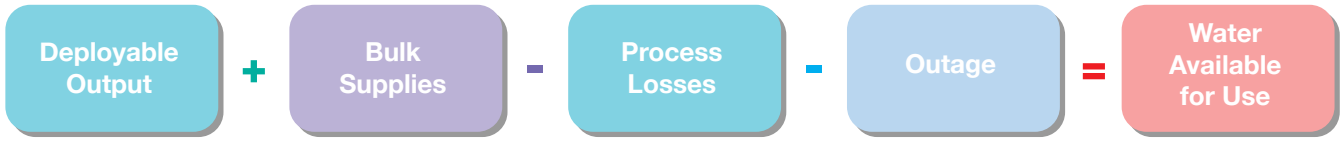
Inter-zonal Transfers

- Transfer with RZ6 and RZ7

Inter-company Transfers

- Import arrangement with Southern Water Services to balance with our output at one groundwater source

Figure 3.9 : Key components of water available for use (WAFU)



3.7 The starting point for determining the WAFU is how much water is available from our own sources, both individually and cumulatively, known as the deployable output. This is calculated for both annual average conditions over a dry year, and the peak week, or critical period (summer peak), conditions in a dry year. This starting point therefore represents our best estimate of the current deployable output. Our baseline year is set at the start of the planning period, 2014/15.

3.8 We know that deployable output alone is not a true reflection of the water we have available.

- Firstly, we have transfers with neighbouring water companies which allows us to import and export water.

- Secondly, our water sources are subject to outages, both planned and unplanned events, when they are not available, for instance because of power failures.

- Thirdly, because we have complex treatment processes some of the water we abstract cannot be put into supply, and we call these process losses.

These are all factored into our calculations of WAFU and are discussed below.

3.9 Finally, we take into account how climate change and sustainability reductions imposed by the Environment Agency might affect the WAFU in the future.

3.10 All of this results in our supply forecast, or the WAFU available before we develop any new resources.

3.11 Table 3.1 summarises the deployable output and WAFU we presented in WRMP09 and how this has been adjusted for WRMP14. Details of the review and new forecasts are described in the following sections and within Appendix 3.

Deployable output

3.12 The guidelines make it clear that we must explain

- How we have assessed deployable output;
- How we have incorporated our planned level of service; and
- Describe changes to the deployable output.

Also, we must gain agreement with the Environment Agency on our assumptions in the assessments.

How we have assessed deployable output

3.13 The full details of the calculation of deployable output for both our surface water and groundwater sources are presented in Appendix 3 and should be referred to for further information. This section explains how we have complied fully with these requirements. We have discussed our approach with the Environment Agency and they support our assessment.

3.14 The deployable outputs calculated for our WRMP14 include the use of both historic information from previous droughts back as far as the 1920s, as well as the information derived from the recent drought in 2010 to 2012. We have used historic data for both our surface water and groundwater deployable output estimates.

Table 3.1 Changes in water available for use (WAFU) since 2010

Average Supply (WAFU)	Dry Year Annual Average (Ml/d) WRMP09 2010	WRMP09 2015	WRMP14 2015
2010 Base Deployable Output	615.5	612.7	622.7
Bulk Supplies (Net)	54.1	54.1	56.3
Outage	-19.0	-19.0	-27.4
Process Losses	-0.0	-0.0	-12.3
Total Average WAFU	**650.6**	**647.8**	**639.3**
Peak Supply (WAFU)	**Summer Peak Period (Ml/d) WRMP09 2010**	**WRMP09 2015**	**WRMP14 2015**
Peak Deployable Output	722.2	719.6	727.2
Bulk Supplies (Net)	56.0	56.0	57.3
Outage	-20.5	-20.5	-36.7
Process Losses	0.0	0.0	-12.3
Total Average WAFU	**757.7**	**755.1**	**735.5**

3.15 This gives us a clear understanding of how our sources respond under different drought conditions, and helps us to determine the amount of water available from each of our sources that can be relied upon in a dry year that would occur once in every 50 year period.

How it incorporates our planned level of service

3.16 This 1 in 50 year drought year, or 2% probability, matches our current and planned level of service, and also matches our previously reported figures in WRMP09. This has been described in Section 1 of this report. Section 8 further describes the modelling we have carried out to present how our preferred plan is impacted when we apply the guidelines required 'reference level' and 'no restriction' scenarios.

Changes in the deployable output

3.17 Table 3.1 shows the changes in WAFU from the WRMP09 assessment, and this includes revisions to outage and the inclusion of process losses. Bulk supplies are also included and there have been some minor changes since WRMP09 following discussions and agreement with neighbouring companies.

3.18 The changes in the deployable output are discussed in detail in Appendix 3. These changes are from the following:

- A review of source outputs, which includes the impact of the recent drought event as well as other new information, and reflects the current impact of climate change at 2015 on source outputs;
- A review with neighbouring water companies leading to some marginal changes to existing bulk supply volumes;
- The inclusion of new source development; and
- Improvements and changes to source operations which provide for increases in plant output.

3.19 Overall, it can be seen that our deployable output has not changed significantly from WRMP09, with a small increase of 7.2 Ml/d, or 1.2% on average, and 5 Ml/d, or 0.7% on peak.

New investment

3.20 Since WRMP09 there have been no changes to WRZ boundaries. However, we have

made high levels of investment to increase local connectivity within our WRZs, improving overall operational resilience and our ability to move water to areas where it is needed. A WRZ Integrity Report is contained in Appendix 1.

3.21 In WRMP09 we identified the requirement for the delivery of an additional 1.9 Ml/d on average and 2 Ml/d on peak by 2015 from two groundwater schemes at Saints Hill and Eridge. In response to drought and fluctuations in demand we have carried out additional work including improvements to existing treatment works at Pembury, Tonbridge and Crowhurst Bridge, allowing the total new water developed to amount to 5.0 Ml/d on average and 6.7 Ml/d on peak by 2015.

Bulk supplies

3.22 We are the highest net importer of drinking water of any water company in England and Wales. Some 8% of our supplies, or 56.3 Ml/d, come from water transferred from sources owned and operated by other companies (Southern Water and Affinity Water), under joint rights or bulk supply agreements. We no longer include an export of 2 Ml/d to Affinity Water (formerly Folkestone and Dover Water) as it is not required. Bulk supplies are summarised in Table 3.2.

3.23 During the drought of 2011/12 we were concerned about the reliability of these bulk supplies and have reviewed these bulk supplies with Affinity Water and Southern Water to establish the extent to which water will be available in the future and how we would manage these transfers during drought events. Through these discussions we have ensured that the amount of water available from bulk transfers will be maintained consistently across the whole planning period in all the companies' WRMPs.

Table 3.2 Company bulk supplies at 2015

Resource Zone	Company	Contracted Maximum Capacity	Contract Details
WRZ2	Southern Water Services – Import	Ave. 5.4 Ml/d Peak 5.4 Ml/d	Contract review 2021
WRZ3	Southern Water Services – Import	Ave. 8.0 Ml/d Peak 8.0 Ml/d	Contract review 2025
WRZ4	Southern Water Services – Import	Ave. 36.0 Ml/d Peak 36.0 Ml/d	No review date
WRZ6	Southern Water Services – Import	Ave. 6.85 Ml/d Peak 7.39 Ml/d	Contract review 2023
WRZ6	Southern Water Services – Import	Ave. 0.1 Ml/d Peak 0.5 Ml/d	No review date

3.24 On the basis of these discussions, we are satisfied that water currently available from bulk transfers, as laid out in Table 3.2 should be available to us up to 2040. However, our reliance on bulk supplies does involve some risk about whether water would always be available, and so there remains some residual risks that have been legitimately accounted for as part of our assessment of target headroom uncertainty. This is described in Section 5.

Outage

3.25 Unplanned outages can occur at sites due to a variety of reasons, such as power failures, mechanical failures, quality issues, etc. Planned outages occur when a source has to be turned off, or treatment processes at a treatment works temporarily stopped, to allow maintenance to be carried out.

3.26 WRMP09 estimated outage as 19.0 Ml/d on average and 20.5 Ml/d on peak periods. Since WRMP09 we have implemented more robust

Table 3.3 Changes in water available for use (WAFU) since 2010 at WRZ level

	WRMP09 2010		WRMP14 2015		Change	
Ml/d	Average	Peak	Average	Peak	Average	Peak
WRZ1	42.5	48.4	40.1	48.7	-2.4	0.3
WRZ2	82.4	106.5	70.4	95.0	-12.0	-11.5
WRZ3	63.9	77.7	68.2	77.3	4.3	-0.4
WRZ4	234.8	240.7	216.0	224.9	-18.9	-15.8
WRZ5	39.0	53.4	53.4	61.6	14.4	8.2
WRZ6	72.6	89.5	76.2	89.0	3.6	-0.5
WRZ7	21.7	28.0	15.5	21.6	-6.2	-6.4
WRZ8	93.6	113.7	99.6	117.5	6.0	3.8
TOTAL	**650.5**	**757.9**	**639.3**	**735.5**	**-11.2**	**-22.4**

monitoring and reporting of unplanned and planned outages which provides data that has been used to inform a re-assessment of outages.

3.27 The recent re-assessments of the outage allowance, based on improved operational data and capital maintenance planning, has led to the adoption of more realistic outage allowances in this WRMP14 of 27.4 Ml/d on average and 36.7 Ml/d on summer peak. This has the effect of reducing the WAFU.

3.28 The details of our outage assessment are included in Appendix 3.

Table 3.4 Summary of WAFU changes for sustainability reductions, the River Medway Scheme (RMS) and climate change

	Dry Year Annual Average (Ml/d)					Summer Peak Period (Ml/d)				
	2015	Sustainability Reductions 2020 to 2025	RMS Reductions 2020 to 2025	Climate Change 2040	Total at 2040	2015	Sustainability Reductions 2020 to 2025	RMS Reductions 2020 to 2025	Climate Change 2040	Total at 2040
Deployable Output										
Groundwater	496.1	-6.8	0.0	-6.0	483.3	571.5	-6.8	0.0	-2.5	562.2
Surface Water	126.6	0.0	-5.5	-6.7	114.4	155.7	0.0	-6.0	-6.0	143.7
Bulk Imports	56.3	0.0	0.0	0.0	56.3	57.3	0.0	0.0	0.0	57.3
Bulk Exports	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	**679.0**	**-6.8**	**-5.5**	**-12.7**	**654.1**	**784.5**	**-6.8**	**-6.0**	**-8.5**	**763.2**
Process Losses	-12.3	0.0	0.0	0.0	-12.3	-12.3	0.0	0.0	0.0	-12.3
Outage	-27.4	0.0	0.0	0.0	-27.4	-36.7	0.0	0.0	0.0	-36.7
Total (WAFU)	**639.3**	**-6.8**	**-5.5**	**-12.7**	**614.4**	**735.5**	**-6.8**	**-6.0**	**-8.5**	**714.2**

Process losses

3.29 Some water treatment works processes produce a waste stream which means that not all the water abstracted is put into supply. As noted above, we have reviewed the process losses since WRMP09. Due to a lack of available data at that time, the WRMP09 did not include process losses in the supply forecast. Work has since been undertaken to enable robust estimates of process losses to be made, which leads to a reduction to existing deployable output totalling 12.3 Ml/d (equivalent to 2% of the total deployable output). This has the effect of reducing the WAFU. The details of the assessment are included in Appendix 3.

3.30 Process losses are reported as being the same for average and peak use conditions. This is because these relate to continuous plant operation losses, and not volume of water processed.

The overall starting position

3.31 Table 3.3 summarises the changes in WAFU by resource zone and shows the main impact of the changes at the zonal level, with WRZ2 and WRZ4 particularly affected.

Changes to the water we will have available to use in the future

3.32 We expect there will be reductions in our supply forecast in the future as a result of three factors; the first is sustainability reductions, second is reductions from climate change and the third is changes to the River Medway Scheme (see Figure 3.10). These changes are summarised in Table 3.4.

Sustainability reductions

3.33 The Environment Agency's National Environment Programme (NEP) is tasked with investigating the sustainability of abstractions across England and Wales. A number of our sources have been investigated during 2010 to 2015 under the NEP programme. One of these investigations concluded that our existing operation is having an unacceptable impact on the environment, and is likely to require action to mitigate this impact. The result of this investigation is a reduction from 2020 of 6.8 Ml/d on dry year annual average and summer peak at the Greywell source in WRZ4. Full details are included in Appendix 3.

3.34 Further sustainability reductions may occur in the future as a result of Environment Agency investigations during the next period. The studies required under the NEP for the 2015 to 2020 period have been finalised by the Environment Agency and are included in Appendix 9 of this WRMP14. None of these studies require further sustainability reductions to our deployable output in WRMP14.

River Medway Scheme

3.35 While we do take account of uncertainties in the estimation of deployable output in the supply demand balance, as described in Section 5 (target headroom), it is worthwhile highlighting specific risks associated with a major shared resource in WRZs 6 and 7.

3.36 We share a major surface water resource in these two zones with Southern Water which uses

Figure 3.10 : Calculating our supply forecast

water from the River Medway. The River Medway Scheme allows us to either draw water directly from Bewl Reservoir or take a supply from the Southern Water WTW plant at Burham which abstracts from the river.

3.37 In the last plan we included deployable output figures for the River Medway Scheme which aligned with our 1 in 50 year level of service. However, in its WRMP09 Southern Water revised its approach adopting a lower set of deployable outputs to improve resilience that were based on a more extreme drought. This has left the companies out of step, resulting in the companies reporting different outputs in the WRMP09, although both plans were subsequently approved by the Secretary of State.

3.38 After our dWRMP14 was published we consulted with Southern Water on the yield of the River Medway Scheme. In our dWRMP14 we committed between 2015 to 2020 to incorporate 25% of the DO of the RMS that Southern Water calculated for WRMP09 (i.e. our volume in a dry year would be 16.4Ml/d). For their dWRMP14 Southern Water has undertaken more work and our entitlement of the dry year yield has been reduced to 10.7Ml/d. We have agreed this change and included the further reductions in our WRMP14, but not until the 2020 to 2025 period. This is to allow time for alternative supplies to meet the shortfall created by this reduction to be developed. We acknowledge that further work needs to be done to understand the yield of the scheme in the summer peak period.

3.39 The risk of retaining our existing deployable output value for the River Medway Scheme at 2015, and deferring adoption of the lower numbers to align with Southern Water in the 2020 to 2025 period (once alternative supplies can be delivered to offset those reductions), is very small. In practice, it would only materialise during a drought, and require us to request a drought permit (earlier than Southern Water would otherwise need to) to support winter refill of Bewl Reservoir. This level of risk is no different to that experienced by us currently.

3.40 Therefore, as discussed with Southern Water and with the consent of the Environment Agency, the output of the River Medway Scheme for ourselves, has been retained as per WRMP09 for the period 2015 to 2020, moving to the lower value consistent with Southern Water between 2020 to 2025. This is a reduction of 5.5 Ml/d on average and 6 Ml/d at peak. This reduces our output post 2020 and will impact our total deployable output, but we have time to develop alternatives to replace this output.

Climate change

3.41 It is predicted that the most likely climate change scenario is that there will be less rainfall in Summer and increased rainfall in Winter, together with greater variability of weather, which could adversely impact our current levels of surface and groundwater supply. There is considerable uncertainty relating to the timing and magnitude of climate impacts.

3.42 The characteristics of each of our WRZs are different and therefore they will respond differently to climate change. Each catchment and aquifer type, source, treatment and licence conditions influence how deployable outputs respond to changes in climate change. To understand this complex picture, we commissioned HR Wallingford to model how temperature and rainfall changes in the future might impact our deployable outputs.

3.43 For WRMP14 we have produced vulnerability assessments which help classify zones as Low, Medium or High vulnerability to climate change. We used our knowledge of our WRZ's and deployable outputs, along with the evidence we gathered for WRMP09 and Drought Plan, to assess vulnerability. Our vulnerability assessment indicated that zones 1-5 are high, zone 7 is medium and zones 6 and 8 are low (see Figure 3.11).

Figure 3.11 : WRZs and their vulnerability to climate change

3.44 The guidelines require us to consider climate change impacts on surface and groundwater using hydrogeological, hydrological and water resources zone models. For the HR Wallingford study the latest United Kingdom Climate Projections (UKCP09) scenarios were used and current guidance was followed in order to present clear evidence of the impacts of climate change. The work also updated the groundwater models used for the previous climate change impact assessment for WRMP09. The detailed methodology is included in Appendix 3.

3.45 We are satisfied that the work carried out by HR Wallingford meets the requirements of the guidelines, especially given that they were involved in drawing up the best practice approach to this assessment, and that we have liaised with the Environment Agency throughout the preparation of this plan.

3.46 All the WRZs were subject to a detailed assessment using UKCP09 data and the Environment Agency's Future Flows project.

3.47 The modelling produces three scenarios: a Low impact (or wet scenario), a Mid-range impact (or central case scenario), and a High impact (or dry scenario). This provides estimates of the most likely impacts of climate change and also a range of more extreme possible changes for our sources.

3.48 Discussions with Southern Water and Affinity Water indicate that there will be no climate change impacts on bulk supply agreements. However, it is worthwhile noting that there is a substantial impact of climate change on our surface water abstraction from the River Ouse in WRZ2, which accounts for half of the impact on average and nearly three-quarters of the impact on peak.

3.49 We have applied the Mid-range climate change impacts to our forecast of deployable output. The values applied are very similar to those adopted in WRMP09.

3.50 We have used the Low and the High impact scenarios drawn from the modelling output

within our target headroom calculation (see Section 5).

3.51 The detailed results of the climate change assessment are included at Appendix 3 and are summarised in Table 3.4.

3.52 We have shared this information with the Environment Agency and the EFG and incorporated their views and comments in our work.

Overview of water available for use

3.53 We have set out above our approach to calculating the amount of water we have available in the baseline forecast. We have started with the analysis from WRMP09 and refined it using our recent operational experience, and this gives us confidence that the output figures are resilient in a 1 in 50 year drought. This matches our planned level of service.

3.54 As required by the guideline, as a minimum we have included an assessment of how baseline deployable output on average and at summer peak condition (both without climate change) is impacted for the following levels of service scenarios: no restrictions, water company planned levels of service and a reference levels of service.

3.55 The outcomes from our assessment are summarised in Table 3.5. Further information is included in Appendix 3

Table 3.5 Assessment outcomes

	Deployable Output DYAA	DYCP
No restrictions	615.3	719.1
Water company level of service	622.7	727.2
Reference levels of service	622.7	727.2

3.56 We have included the outcomes of our discussions with neighbouring companies to confirm our bulk supply arrangements and our approach to shared resources.

3.57 Finally, we have included losses from our treatment works, and also analysed occasions when outages have occurred to improve our outage allowance.

3.58 In combination, these factors mean that overall for our WRMP14 baseline there will be less WAFU in 2015 than we predicted in WRMP09; a reduction of 8.5 Ml/d on average and 19.6 Ml/d at peak.

3.59 We have included reductions in our planned forecast between 2015 and 2040, due to climate change impacts, sustainability reductions and reductions to the River Medway Scheme, which mean WAFU reduces from 639.3 Ml/d to 614.4 Ml/d (3.9%) for the dry year average, and from 735.5 Ml/d to 714.2 Ml/d (2.9%) for the summer peak.