NRA

NATIONAL RIVERS AUTHORITY

MEASURES TO SAFEGUARD PUBLIC WATER SUPPLIES

A Second Report to the Secretary of State for the Environment
on The Drought of 1995

NRA Head Office
December 1995

ACKNOWLEDGEMENTS

The NRA wish to acknowledge the co-operation of the various water companies & organisations associated with the water industry for their assistance with the preparation of this report.

SECOND DROUGHT REPORT TO THE SECRETARY OF STATE FOR THE ENVIRONMENT

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SECOND DROUGHT REPORT TO THE SECRETARY OF STATE FOR THE ENVIRONMENT

EXECUTIVE SUMMARY

1. This report has been prepared in response to a request from the Secretary of State for the Environment on the adequacy of the water companies' plans and the measures they are taking to safeguard supplies for next summer. This request follows an exceptional summer and autumn drought which has left many reservoirs at unprecedented low levels in many Regions. In general, only limited storage recovery has taken place to date and the continued depletion of groundwater resources is now showing a similarity with the onset of the 1989-1992 groundwater drought.

2. The NRA is the environmental regulator and is the licensing authority for water abstraction. It is also notified by water companies of all proposals to take additional water from rivers and underground sources and advises the Secretary of State on whether an appropriate balance is being taken between the need to conserve resources for the environment and the need to make additional water available for supplies. The NRA also undertakes routine monitoring of resources and is in an effective position to advise on the prospects for next summer and the water conservation measures which need to be taken.

3. Prospects for next summer will clearly depend on the extent to which rainfall enables resources to recover in the next few months and whether the winter is followed by a dry spring and summer in 1996.

4. All water companies are now following strategies to conserve resources to safeguard supplies for next summer. In general this means that companies are taking as much water from rivers as possible over the winter when river flows are naturally higher. This is carried out within the constraints of their abstraction licences and also under Drought Orders. Other measures will include reducing compensation water discharges from reservoirs, supplying problem areas from less stressed resources and enhanced leakage control. Hosepipe bans and bans on non-essential use also remain in force in many companies to conserve supplies.

5. These conservation measures are an appropriate response to the current situation, but do not guarantee uninterrupted supplies should a dry winter be followed by a further dry summer. These measures will also reduce the risk of widespread and possibly environmentally damaging Drought Orders next summer at a time when flows are naturally low and the impacts of Drought Orders more serious.

6. The NRA has assessed the adequacy of water company plans using scenario based planning. Water companies have generally provided an assessment of their resource situation for next April on the basis of their current plans against scenarios of 80% and 100% of the Long Term Average rainfall over the winter months. The resulting position and key issues for each of the ten Water Service Companies which together make up the majority of public supplies are given below. Additional comments on the water supply only companies are also given in the report where significant.

Water Resources Outlook for 1996 Based on Planning Scenarios

COMPANY	OUTLOOK - KEY ISSUES*
Anglian Water	Reservoirs unlikely to fully recover under the 80% scenario, but should be within previous operating levels and sufficient to maintain supplies. No supply restrictions are anticipated.
Northumbrian Water	No restrictions have been applied on the use of water during the current drought and no problems are expected next summer.
Yorkshire Water	The Company have indicated that there is a significant risk that some reservoir groups will not refill this winter. A number of measures are being actively promoted by the company to provide an additional 130Ml/d to meet the shortage experienced this year. Additional measures to improve refill prospects and further augment resources are expected during December. Based on presently available information the key reservoirs at risk of not refilling under the 80% scenarios are: - Nidd/Barden Group - Grimwith Group - Southern Pennines - Winscar Group - Calder Group Of these reservoirs only Winscar and Grimwith are at significant risk of not refilling assuming average rainfall. The NRA is in continuous discussion with the company on the implementation of proposals and the identification of further measures.

COMPANY	OUTLOOK - KEY ISSUES*
North West Water	Assuming 80% of Long Term Average winter rainfall, a number of key strategic reservoirs and some smaller Pennine sources are unlikely to refill. NWW are currently applying for a Drought Order to maintain abstraction from the R.Lune to assist refill. Further measures to improve recovery have been identified and are being implemented where necessary.
Severn Trent Water	The main concern is the series of reservoirs in the Peak District at Derwent Valley and Tittesworth near Stoke. The need for Drought Orders to assist refill has been identified and should be implemented shortly.
Southern Water	The company is heavily dependant on groundwater, but also relies on surface water supplies from rivers and surface reservoirs including Darwell and Bewl Water reservoirs. Drought Orders are likely to be needed to assist refill and meet supplies elsewhere.
South West Water	Attention is focused on the recovery of the region's strategic reservoirs, Roadford, Wimbleball and Colliford. The company has already identified options to help secure adequate water resources in their strategic reservoirs for next summer and these are being urgently progressed. Despite planned measures, demand restrictions are likely in the Roadford supply zone assuming 80% of average winter rainfall and a dry summer. The company and the NRA will also be discussing drought operating arrangements for the regional reservoirs in time for next summer.
Wessex Water	The company is dependent mainly on groundwater and was able to meet demands during 1995 without restrictions. No difficulties are expected even under the 80% scenario next summer.
Thames Water	Reservoirs are expected to be full under the 80% scenario and although groundwater sources will not fully recover under this scenario no supply problems due to shortage of resources are thought likely.
Welsh Water	No supply restrictions were imposed during 1995. However, a number of key reservoirs are not expected to refill even with average rainfall. The company is following a water conservation strategy to minimise the risk to supplies next summer. Drought Orders may be needed to conserve resources.

* - N.B. The NRA scenarios are used as a reference level for assessment purposes, whereas detailed plans for individual companies may assume a different level of risk.

7. The late onset of winter recharge of underground sources means that the drought experienced over much of the north, west and south-west this summer could affect the east and south of England next year where there is a heavy reliance on groundwater for supplies. This would suggest that water companies may need to take steps to restrict demand in these areas in the event of a dry spring and summer. This could include appeals for voluntary restraint and hosepipe bans in the worst affected areas, but is most unlikely to include bans on non-essential use.

8. Although companies are generally adopting water conservation strategies to reduce the risk to supplies next summer, there is still a risk that there could be restrictions on supplies due to a shortage of resources and that further measures may be needed. Key amongst these are:

- For Yorkshire Water; the need to implement the improvements to resources and infrastructure in time for next summer.
- For South West Water; a range of options to enhance refill of strategic reservoirs and to conserve water resources has been discussed with the NRA. Selected options are now being progressed by the company. Measures to enhance refill need to be progressed urgently in order to gain the maximum benefit during the winter months.
- For North West Water; where reservoirs are not expected to be full by spring 1996 the company have identified actions to assist refill and these are now being progressed.

9. The NRA will continue to keep the developing situation under review, provide advice as necessary and assist with the early implementation of further conservation measures.

10. In conclusion, this report suggests that with 80% of the Long Term Average winter rainfall and timely actions by water companies to conserve supplies, the number of reservoirs which will be in an unsatisfactory position by April 1996 can be kept to a minimum. However, the NRA considers the present water resources situation in many parts of the country to be finely balanced, and it is essential to avoid any complacency or undue risk taking on the part of water companies. Moreover, given the meteorological extremes experienced during 1995, together with the general lack of any *widespread and sustained* recovery of resources to date, it appears almost inevitable that resource problems will continue into the summer of 1996 in a number of areas unless there is above average rainfall in the next few months. These problems may well become more widespread if groundwater recovery continues to be slow.

11. Responsibility for the preparation and implementation of recovery plans rests with the water companies and it is essential that these are regularly reviewed and updated to ensure the security of supplies. Such plans should recognise that the winter could be drier than has been assumed in the scenarios examined by this report. The NRA is reassured to note that since the inception of this report, water companies have responded to the continuing drought by developing plans to safeguard supplies. It is now imperative that these plans are implemented as a matter of urgency.

SECOND DROUGHT REPORT TO SECRETARY OF STATE

1. INTRODUCTION

This report has been prepared in response to a request from the Secretary of State for the Environment for details of the adequacy of the water companies' plans and the measures they are taking to safeguard supplies for next summer. Consideration is only given to water companies short term plans to deal with the drought as longer term arrangements for supply will be addressed elsewhere.

The Secretary of State's request follows a period of well below average rainfall which started in March and has continued into the winter. Reservoir contents are now low in several areas and there is serious concern that water companies could have problems in maintaining public water supplies next summer if the dry winter continues. A dry winter will also raise the prospect of a continued drought affecting groundwater next year in addition to the surface sources which are already under threat.

It is therefore important that all the necessary precautionary measures are taken this winter to ensure that resources are in the best possible position for next summer. This will also ensure that widespread and possible environmentally damaging Drought Orders may be less likely next summer, at a time when flows are naturally low and the impacts of Drought Orders more serious.

This report describes the present state of water resources across all regions of England and Wales, outlines and assesses the plans for each of the main water companies and presents a timetable for further key actions to conserve resources in the short to medium term.

Arrangements for managing water resources in the longer term will follow in the coming months from a review of the lessons from the water shortages this summer.

The organisations involved in the management of the drought are described below together with an overview of relevant powers.

1.1 National Rivers Authority

The NRA is the water environmental regulator and is the licensing authority for water abstraction.

Licences are granted to water companies and others to meet their reasonable needs taking into account the environmental impact of new developments and the impact on existing users. This system of licensing and the associated planning framework is the principal means of performing the NRA's general duties to conserve, redistribute and

augment water resources and to secure their proper use. Specifically these duties do not relieve water companies from any obligation to develop water resources for the purpose of maintaining their water supply systems.

The NRA is also responsible for a number of raw water transfer schemes which make extra resources available for water companies, industry and agriculture. The schemes often use rivers as natural pipelines to take water closer to centres of population. Major examples include regulation of the River Severn from Clywedog reservoir, regulation of the Tyne, Tees and Wear from Kielder reservoir, regulation of the River Dee in Wales and the Ely-Ouse to Essex river transfer.

1.2 Water Companies

The day to day management of water supplies is the responsibility of Water Companies. Companies are required to manage supplies in accordance with an operating licence granted by the Director General of Water Services and are responsible for maintaining an efficient and economical system of water supply. Water Companies are responsible for making supplies available to customers who demand them in accordance with the conditions of their operating licences. The Law requires Water Companies to take water only in accordance with their water abstraction licences unless special arrangements have been made using Drought Orders as described below.

1.3 Office of Water Services (OFWAT)

OFWAT is the financial regulator responsible for Water Company prices, standards of service and performance with further duties towards the customers of Water Companies.

1.4 Powers for Drought Management

There are a number of powers and various measures which can be taken to manage both the demand on water resources and the amount of water available for supply during periods of drought. Demand management measures include:

- appeals for restraint;
- improved leakage control;
- hosepipe and sprinkler bans;
- ordinary Drought Orders to restrict non-essential use such as watering of public gardens, filling swimming pools, washing all types of vehicles;
- emergency Drought Orders to restrict the supply of water using standpipes, or rota cuts.

Drought Orders can also be used to make additional water resources available by the following means:

- authorising abstraction from unlicensed sources;
- changing conditions of existing abstraction licences;
- reducing compensation flows from reservoirs and prescribed flows in rivers.

These powers to manage demand and resources are described in more detail in Appendix 1.

1.5 Resource Management Options

The powers described above can be considered within the context of the range of resource management options which are:

Source Management Measures including:

- resting sources at most risk;
- temporary pipelines;
- tankers.

Authorisations Management Measures including:

- Drought Orders to reduce compensation or prescribed flows;
- temporary licences for increased abstractions.

Demand Management Measures including:

- hosepipe bans;
- bans on non-essential use;
- publicity campaigns;
- pressure reduction;
- leakage reduction, especially to prevent increased leakage due to bursts resulting from freezing conditions this winter. In the medium term improved leakage control should reduce the overall demand on resources.

Proposals are made in this report for the use of these options to safeguard supplies next summer where key resources are considered to be at risk.

1.6 Drought Order Applications

The need to apply for Drought Orders for additional resources is normally a decision for Water Companies, though the NRA may also apply for Drought Orders for its own river regulation or transfer schemes.

One of the NRA's main concerns is that Drought Orders should not allow river flows or levels to drop so low that fish and wildlife are permanently affected. The NRA would normally support applications made by water companies where adequate steps

had been taken to manage demand and the impact on the environment is acceptable or could be mitigated. When serious impact is likely then the NRA would object to the proposal and put the case for the environment. The Secretary of State would then make a decision taking all relevant factors into account.

In extreme situations where there is a serious threat to continued supplies which is likely to impair the economic or social well-being of people in the area and all reasonable measures have been taken to manage demand, the NRA accepts that Drought Orders may be necessary which have significant impact on the environment. In these cases the NRA will seek measures to monitor and mitigate the environmental effects and if these measures are agreed, will not object to the Drought Order.

In situations where there is a strong possibility that reservoirs will not refill satisfactorily the NRA will usually support applications by water companies to reduce compensation discharges or prescribed flows during the winter months or to abstract excess winter flows to help refill critical reservoirs in order to safeguard supplies for the following summer. The environmental impact of these measures is normally more acceptable during winter months, when higher natural flows and lower temperatures tend to reduce the adverse effects and are preferable to risking similar measures during the spring and summer. As a further compensatory measure, the NRA would require companies to take all practical steps to reduce the demand on the resource to improve the likelihood of reservoir refill.

The NRA also has new powers under the Environment Act 1995 to apply for Drought Orders to protect flora and fauna. These powers have already been used to protect fish and other wildlife from the effects of the drought.

2. PRESENT WATER RESOURCES SITUATION

2.1 General Overview

The drought conditions which characterised the summer months were interrupted by brief but notable rainfall during September. However, although this was above the Long Term Average (LTA) for England and Wales (163%), the following months of October and November have again been drier than average with October being significantly drier. Some areas including the Pennine catchments have received well below average rainfall in October and November and these dry conditions have continued into December. Prolonged rainfall is now required in the next few months in order to refill reservoirs and recharge aquifers.

The following sections give a brief resumé of the drought as it developed through the summer, and also consider the hydrological situation in more detail.

2.2 Development of the Drought

The present drought followed a notably wet winter featuring extensive flooding over much of the country. In February groundwater levels were generally well above

average and reservoir stocks were uniformly high. In February 1995 the water resources outlook for the summer appeared good.

March and April however, saw the onset of drier than average weather and the start of extended recessions in river flows. Associated with this were the first reports of stresses on water company distribution systems attributed to heavy garden watering. Reservoir stocks began to decline in some smaller reservoirs, but the general resource outlook remained satisfactory.

In May and June significantly below average rainfall, high temperatures and sunshine hours meant that river flow recessions continued unabated and substantial soil moisture deficits began to build in most areas. Rapid declines in runoff occurred in impermeable river catchments, though rivers with base flows fed from groundwater held up well. The resource outlook remained generally satisfactory across England and Wales despite surges in peak demand.

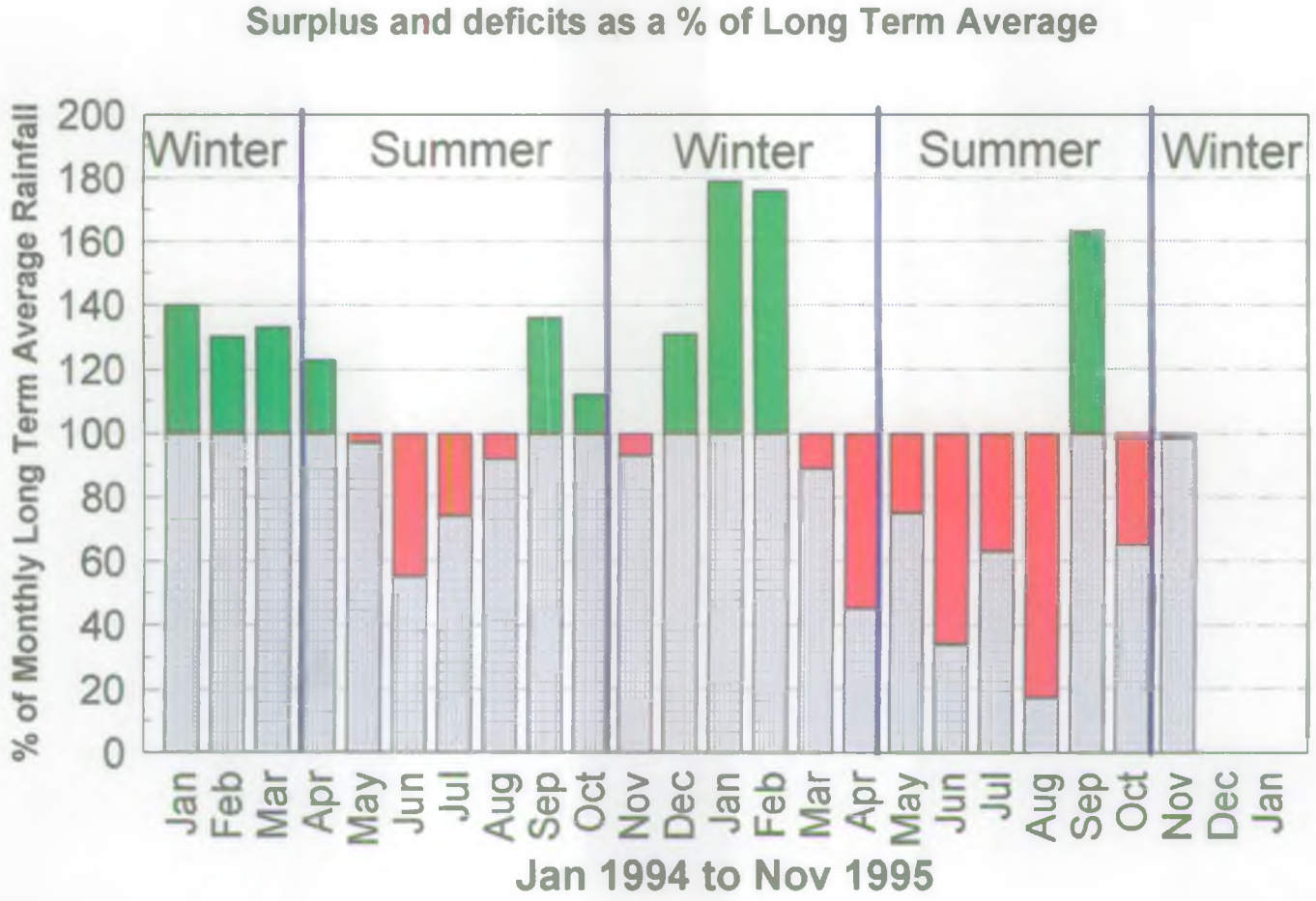
Very low rainfall and high temperatures were experienced during July and August. Only 13mm of rainfall was recorded across England and Wales in August. This gave exceptional declines in many small reservoirs (notably in parts of the North West, Yorkshire and Cornwall), and significant reductions in many strategic reservoir systems. At the end of August hosepipe bans were in force for seven water companies, which reflected the impact of garden watering on distribution systems as well as continued pressure on resources. In many areas the levels of peak demand this summer were in excess of those experienced in previous drought years.

September saw a change to more unsettled weather patterns, and is the only month since March this year that has benefitted from above average rainfall, (see Figure 2.1). A total of 126mm (163% of LTA) was recorded across England and Wales, which did much to moderate the short term stress on water resources. However, pockets of lower rainfall tended to coincide with strategically important catchment areas and much of the potential runoff was taken up by soils with exceptionally high soil moisture deficits. As a result, many important reservoir systems in North West, Yorkshire and South Western Regions continued to decline.

Below average rainfall and seasonally high temperatures returned in October, (see Figure 2.1). Indeed, October is likely to be the warmest since the Central England Temperature Records began in 1659. Only 55mm (65% of LTA) of rain was recorded across England and Wales, and together with high temperatures this caused soil moisture deficits to rise again.

November has been a variable month, dry in the first week, and wetter for the rest of the month. Meteorological Office figures indicate 89mm of rain (99% of LTA) has fallen across England and Wales during November. However dry conditions are now continuing into December.

Figure 2.1 NATIONAL AVERAGE RAINFALL BETWEEN JANUARY 1994 AND 30 NOVEMBER 1995



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A notable feature of autumn rainfall has been its spatial distribution. In South Western Region, for example, drier than average conditions have continued in Cornwall, and wetter than average conditions in Devon, thus reversing the usual pattern. Similar unusual rainfall patterns have also occurred in Yorkshire.

2.3 Hydrological Overview of the Present Situation

2.3.1 *Rainfall*

Winter rainfall to date (October and November) in most regions has been significantly below average. This follows a summer where rainfall was also well below average. Figure 2.2 shows the resulting rainfall deficits for summer and winter 1995 in each NRA Region. (Local areas within each region may however be wetter or drier than these average figures, e.g. the Pennine catchments received only 46% of the October - November average rainfall). Notwithstanding the wet September, the April to October rainfall total is the second lowest in the 229 year England and Wales rainfall record (only 1921 was drier). Figure 2.3 shows the development of the cumulative rainfall deficit over the April to November period. This deficit now stands at approximately 160mm at 29/11/95. In real terms this means that rainfall since April has been nearly 30% less than that which would be expected in an average year.

2.3.2 *Riverflows*

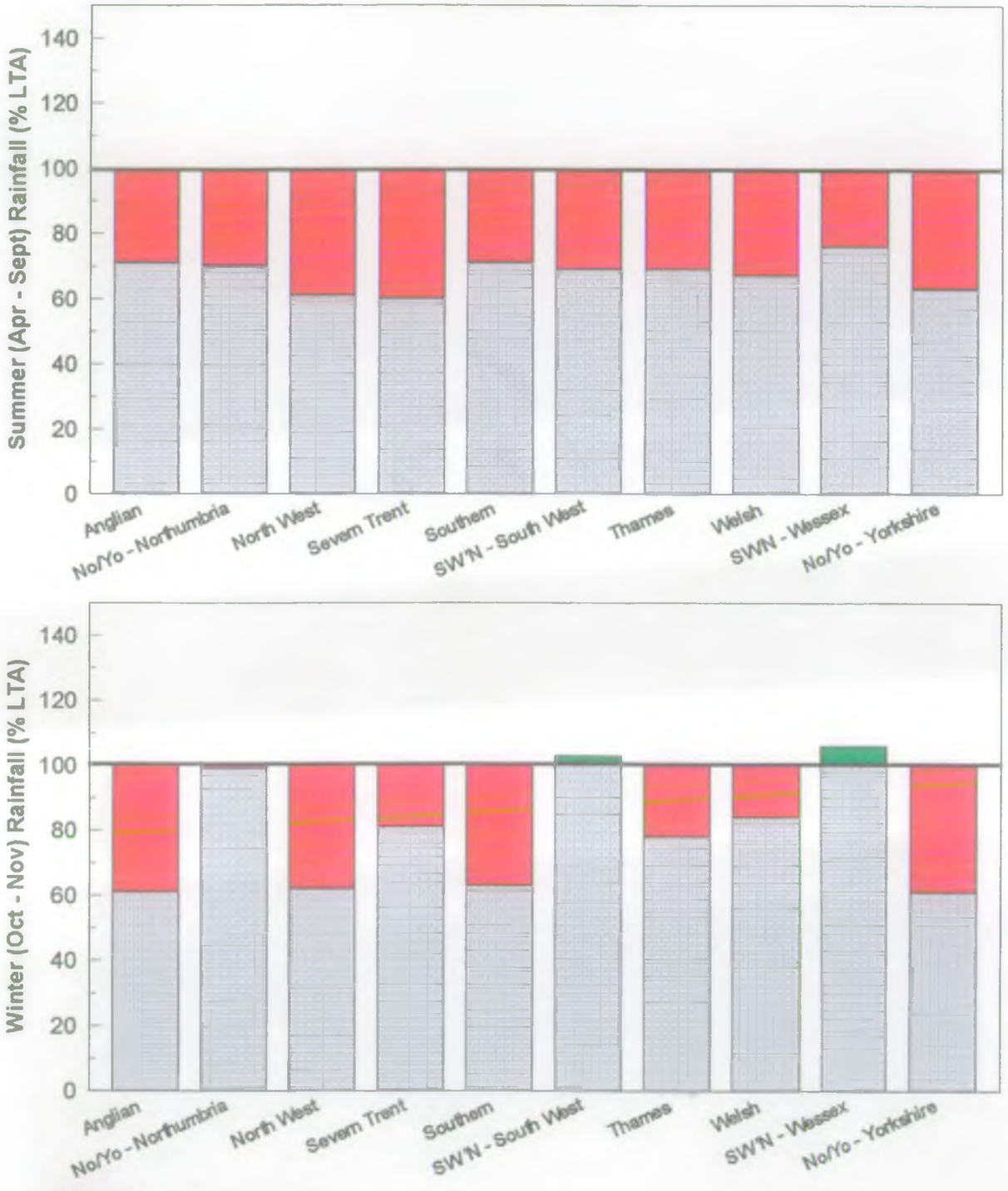
Appendix 2 and Figure 2.4 show November riverflows for major rivers in England and Wales. Most of these are still well below average for the time of year. Following the wet September a recovery in riverflows began in early October but this recovery has fallen off due to the continuing dry weather. High soil moisture deficits (SMDs) have tended to limit runoff following rainfall. The high SMDs also prevent the onset of groundwater recharge and consequently groundwater fed rivers are generally still in decline.

2.3.3 *Soil Moisture Deficits (SMDs)*

Soil moisture deficits still remain in all regions, although a number are approaching zero. The point at which SMDs are eliminated is also the point when significant groundwater recharge starts, and is known as the *Return To Field Capacity*. Figure 2.5 shows current SMD for each NRA Region, together with the average date for return to field capacity in each region. In most regions there has been or is likely to be a significant delay in the return to field capacity, and this may have implications for the extent and duration of groundwater recharge.

FIGURE 2.2. SUMMER & WINTER RAINFALL 1995

For each NRA Region



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Winter figures include rainfall to the end of November

Figure 2.3 CUMULATIVE LONG TERM AVERAGE & ACTUAL 1995 RAINFALL

For England & Wales in 1995

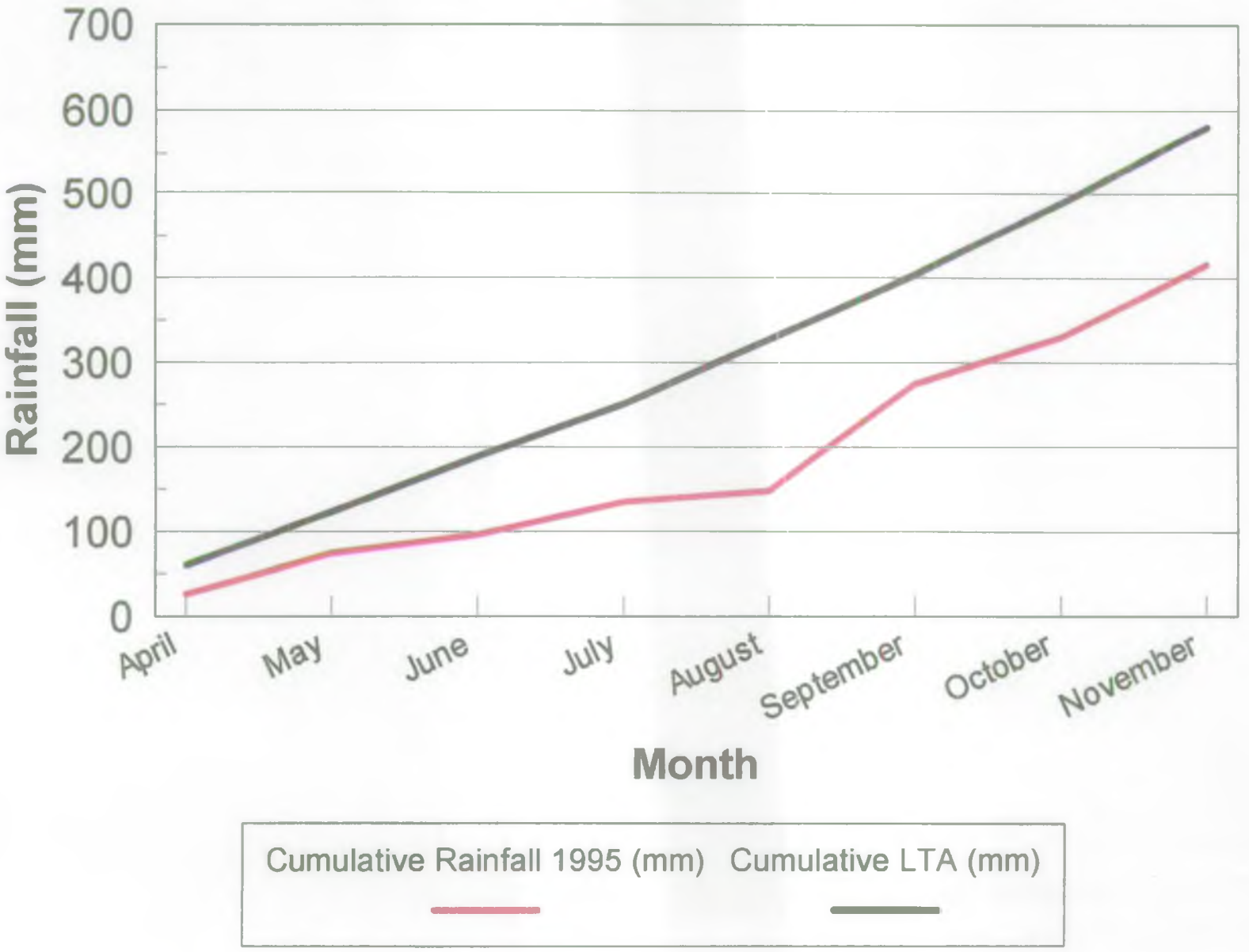

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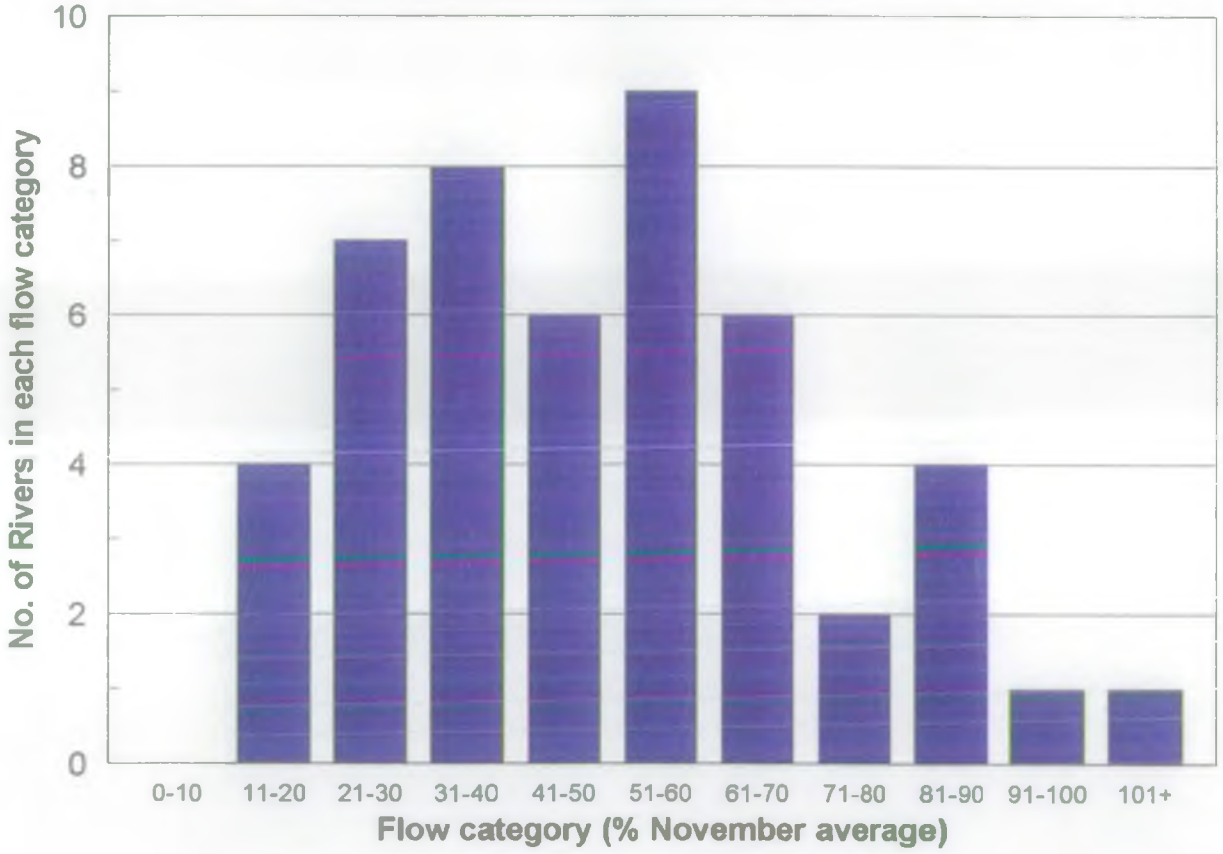
Figure 2.4 RIVERFLOW DISTRIBUTION

Distribution of November flow (as % November Average)
in selected major rivers in England & Wales



Number of rivers = 48

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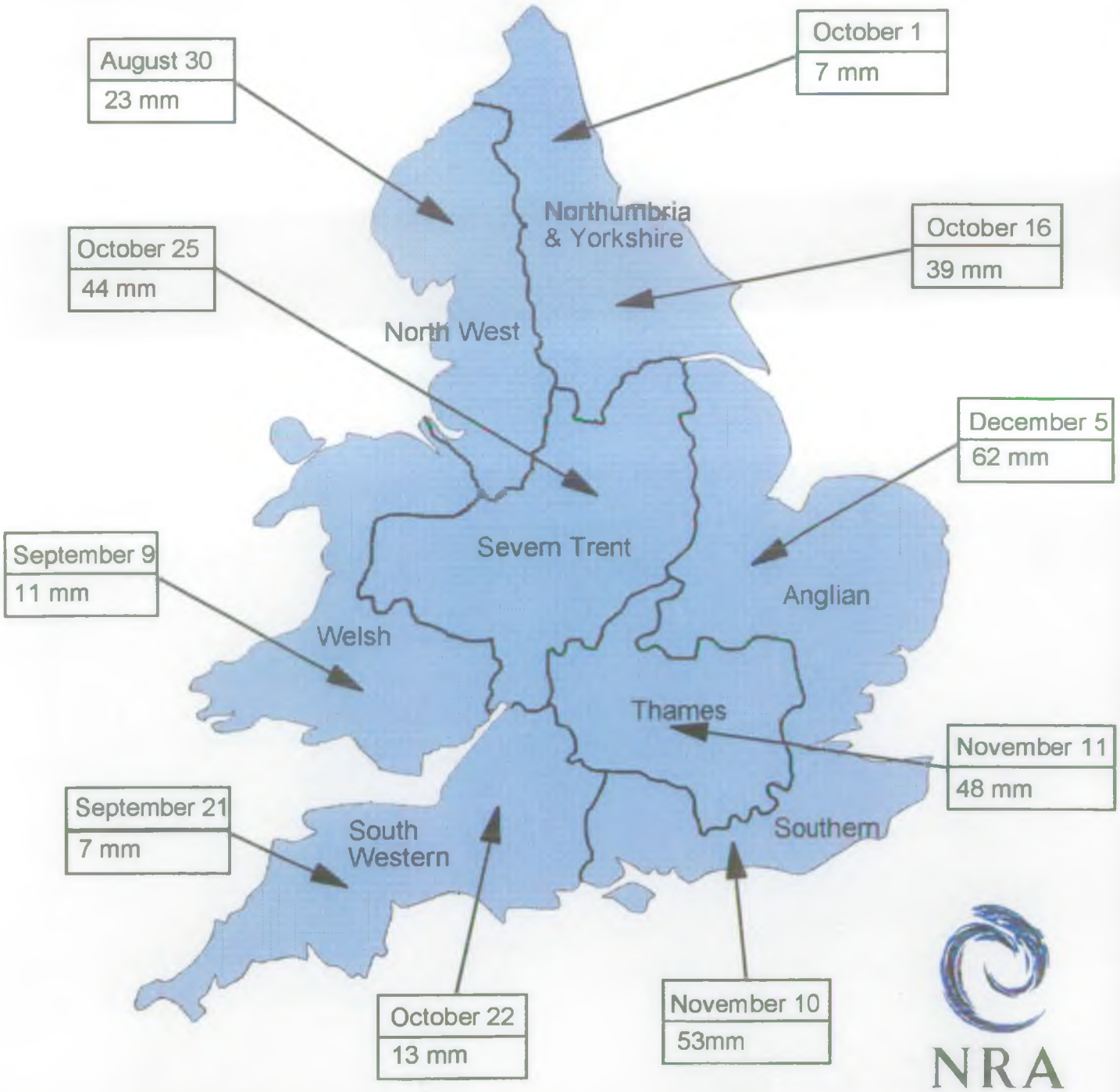
Figure 2.5 MEDIAN DATE OF RETURN TO FIELD CAPACITY AVERAGED FOR NRA REGIONS

Based on the period 1941-1970 for grass growing in soil with 125mm soil availability.

KEY:

Median date of return to field capacity

Soil Moisture Deficit on 30 November



2.3.4 *Groundwater Levels*

Given the state of SMDs over the last month, it is not surprising that no substantial seasonal groundwater level recovery has yet occurred. Groundwater recessions now extend over almost ten months in some areas and show similarity with the onset of the 1989 to 1992 groundwater drought. A very healthy groundwater resources outlook at the beginning of the year has now been transformed into a much more finely balanced situation.

The implications of limited winter recharge of groundwater resources is now a cause for concern. The effects of this summer's drought were ameliorated to some extent by the exceptionally healthy groundwater situation at the start of spring and regions currently unaffected by major drought problems are those which rely heavily on groundwater sources. The combination of developing groundwater shortages and continuing surfacewater drought could lead to more widespread problems in the event of a dry summer next year, with the possibility of appeals for voluntary restraint or hosepipe bans to conserve resources.

2.3.5 *Reservoir Levels*

Appendix 3 shows reservoir storage at the end of November for major sources in England and Wales. These data clearly demonstrate the depressed nature of the current storage situation. In the majority of cases only limited storage recovery has occurred and most sources are well below the average for the time of year. Water supply stresses remain severe in areas reliant on the South Pennine reservoirs in Yorkshire. Further detail on reservoir stocks is contained in Section 3.

Those reservoirs giving cause for concern are typically ones which are significantly drawn down, and have small catchments or are designed as *multi-season critical*, that is to say they may take more than one season to refill if heavily drawn down during the previous summer.

3. PROSPECTS FOR RESOURCE RECOVERY - OVERVIEW

3.1 General Approach and Summary

In looking at the prospects for resource recovery most attention is now focusing on reservoir sources since it is these which are giving most cause for concern. As outlined in section 2.3.5 above, many reservoir sources are currently well below average levels for the time of year. Ensuring that measures are in place to maximise reservoir refill over the winter months is now an important objective of both water companies and the NRA. The following section therefore deals mainly with reservoirs, although assessments of groundwater recharge prospects are also given, where appropriate, in the sections dealing with region and company detail.

In highlighting the various actions, the NRA has consulted water companies and agreement on the general approach has been sought for the majority of measures presented. This winter, the NRA will actively monitor implementation and recommend further measures where these prove to be necessary.

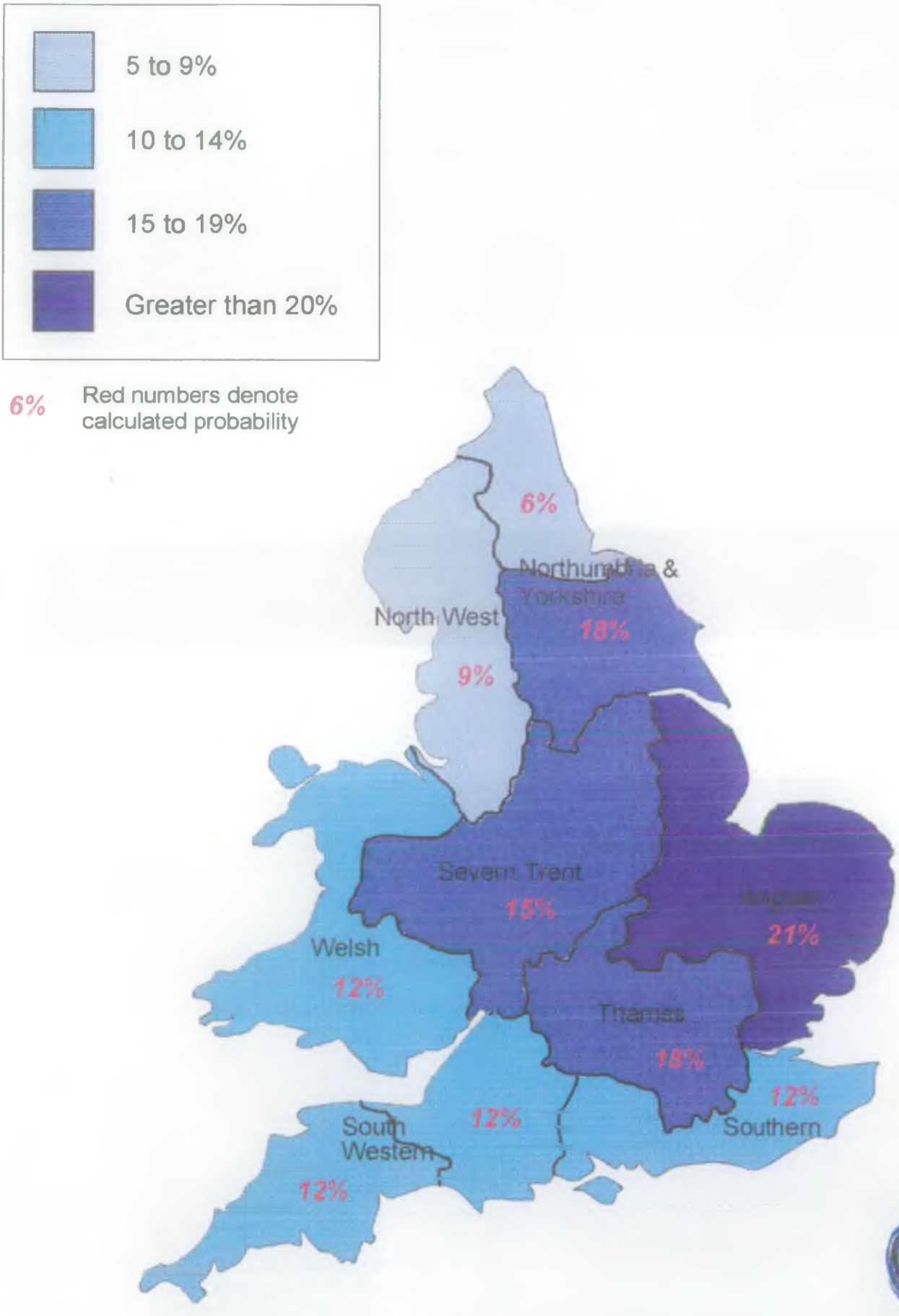
3.2 Scenario Based Planning

The timescale for the production of this report has precluded a detailed hydrological analysis of the probabilities of winter refill and reservoir states for the numerous water resource/supply systems throughout England and Wales. Instead, estimates of the resource situation have generally been based on two rainfall scenarios, namely, 80% and 100% of average rainfall during the months of November to March inclusive.

The 100% rainfall scenario is a fairly obvious choice in that the results would indicate the average state of resources to be expected. The 80% rainfall scenario was selected as a reference scenario representing a relatively dry winter. For England and Wales as a whole the chance of having winter rainfalls of less than 80% of average is about 13%. Figure 2.6, based on historic data processed by the Meteorological Office, shows the regional distribution of the chances of having less than 80% of average winter rainfall, and range from 21% in Anglian Region to 6% in Northumbria.

Clearly there is a possibility that less than 80% of winter rainfall will arise and it is important that more detailed assessments of resource recovery is carried out for those supply systems where an 80% rainfall scenario indicates an unsatisfactory situation next year. In addition close monitoring of the state of resources is required this winter so that timely actions can be taken to alleviate any worsening situation.

Figure 2.6 CHANCES OF EXPERIENCING 80% OR LESS OF THE LONG TERM AVERAGE WINTER RAINFALL



Footnotes:
1. Winter period, November to March
2. Probability based on analysis of rainfall records for 1961-1995

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3.3 Analysis of Key Sources

3.3.1 *Detailed Schedules*

Those sources most at risk of not refilling before next summer are given in detailed schedules, region by region, in Appendix 4. These schedules have been produced by the NRA in consultation with the relevant water companies and will be used by the NRA to assess the adequacy of water company plans and actions until the situation improves.

The schedules are also summarised in Table 3.1. The table indicates whether actions to achieve a satisfactory storage are required for each source under a 100% and 80% rainfall scenario, whether the actions are required in the next 1-2 months and finally whether the current measures in place are sufficient to avoid the need for further actions. Key points to note are:

- of the 30 sources identified throughout the regions 19 are likely to require further action within 1-2 months
- in 11 of the 30 sources identified, the measures currently in place are likely to be sufficient to negate the requirement for further actions even under the more unlikely 80% scenario;
- the strategic sources most at risk should only 80% of the LTA rainfall occur over the winter are in Yorkshire, North West and South Western Regions.
- Thames, Anglian, Wessex and Southern companies' reservoirs are mainly unaffected by the drought due to a reliance on groundwater sources or groundwater fed rivers;
- most sources are expected to reach a satisfactory state provided the measures are implemented in good time and at least 80% of the Long Term Average rainfall is received.

3.3.2 *Reservoir Storage at April 1st 1996*

Assuming the actions necessary to ensure adequate storage identified in the detailed schedules are in place, the storages which will have been achieved given 100% and 80% rainfall scenarios are shown in Table 3.2. This table shows that most of the key sources should be close to full under both 100% and 80% rainfall scenarios if the current measures and additional actions identified in the schedules are in place.

Table 3.1 Summary of Key Strategic Sources Where Winter Refill Difficulties Could be Encountered

NRA Region	Company	Source or Group of sources	Actions required under a 100% of LTA rainfall scenario	Actions required under an 80% of LTA rainfall scenario	Actions required (within 1 - 2 months)	Current actions or measures in place which are likely to be sufficient to avoid the need for further action
North/ Yorks	Yorkshire Water	Nidd/Barden Group	✓	✓	✓	
North/ Yorks	Yorkshire Water	Washburn/Eccup		✓	✓	
North/ Yorks	Yorkshire Water	Grimwith	✓	✓	✓	
North/ Yorks	Yorkshire Water	Calder Group		✓	✓	
North/ Yorks	Yorkshire Water	Winscar	✓	✓	✓	
North/ Yorks	Yorkshire Water	Southern Pennines	✓	✓		
North West	North West Water	Blackburn Reservoirs*				✓
North West	North West Water	Goyt Reservoirs*				✓
North West	North West Water	Oldham Reservoirs*	✓	✓	✓	

NRA Region	Company	Source or Group of sources	Actions required under a 100% of LTA rainfall scenario	Actions required under an 80% of LTA rainfall scenario	Actions required (within 1 - 2 months)	Current actions or measures in place which are likely to be sufficient to avoid the need for further action
North West	North West Water	Rochdale Reservoirs*				✓
North West	North West Water	Longdendale				✓
North West	North West Water	Burnley Reservoirs*				✓
North West	North West Water	Haweswater & Thirlmere	✓	✓	✓	
North West	North West Water	Rivington	✓	✓	✓	
North West	North West Water	Vyrnwy				✓
North West	North West Water	Lamaload*				✓
Severn Trent	Severn Trent Water/Welsh Water	Elan Valley		✓	✓	
Severn Trent	Severn Trent Water	Clywedog				✓
Severn Trent	Severn Trent Water	Derwent Valley		✓	✓	

NRA Region	Company	Source or Group of sources	Actions required under a 100% of LTA rainfall scenario	Actions required under an 80% of LTA rainfall scenario	Actions required (within 1 - 2 months)	Current actions or measures in place which are likely to be sufficient to avoid the need for further action
Severn Trent	Severn Trent Water	Carsington		✓	✓	✓
Severn Trent	Severn Trent Water	Tittesworth	✓	✓	✓	
Severn Trent	Severn Trent Water	Staunton Harold/Foremark				✓
Southern	Southern Water	Darwell Reservoir	✓	✓	✓	
South Western	South West Water Limited	Roadford Zone	✓	✓	✓	
South Western	South West Water Limited	Wimbleball Zone	✓	✓	✓	
South Western	South West Water Limited	Colliford Zone	✓	✓	✓	
Thames	Thames Water	All surface water sources				✓
Welsh	Welsh Water	SE Wales conjunctive use	✓	✓	✓	
Welsh	Welsh Water/NRA	Dee; Celyn, Brenig		✓	✓	
Welsh	Welsh Water	Alwen		✓	✓	

* - Local Sources

Table 3.2 Possible April 1st 1996 Storages for Key Sources under 100% and 80% of LTA Rainfall Scenarios

Region	Rainfall Scenario	Number of *key sources highlighted in this report* with a given capacity at 1st April 1996 assuming the actions to maximise refill identified in Appendix 4 schedules are taken.			
		Full	80% - 99%	60% - 79%	<60%
Northumbria/ Yorkshire	100%	3	2	2	
	80%	1	2	3	1
North West	100%	5	3	2	1
	80%	3	3	2	3
Severn Trent	100%	5	1		
	80%	1	4	1	
Southern	100%	1			
	80%		1		
South Western	100%		1	2	
	80%			2	1
Welsh	100%	2	1	1	
	80%	2		1	1

Only 6 sources will be less than 60% full by April 1996 given 80% of average rainfall. This position should not however lead to complacency. A number of the actions identified in the detailed schedules (particularly Drought Orders) will require swift action in order to ensure that the measures are in place in sufficient time to allow them to have an effect. The NRA will continue to pro-actively monitor the situation and the implementation of the actions appropriate to both rainfall scenarios and recommend further actions as circumstances dictate.

Assessment of the position for next summer indicates that a number of sources will be in an unsatisfactory position next year, even with all identified alleviation measures in place. With 100% of average winter rainfall the following sources are expected to be in an unsatisfactory state for next year despite the fact that currently planned measures will have been deployed:

Northumbria/Yorkshire Region:

- Nidd/Barden Group
- Grimwith Reservoir
- Winscar Group

With only 80% of average winter rainfall then the following *additional* strategic sources would be expected to be in an unsatisfactory state next year:

Northumbria/Yorkshire Region:	• Southern Pennines • Calder Group
South Western Region:	• Roadford Strategic Supply Zone
North West Region:	• Haweswater • Thirlmere • Rivington • Vyrnwy

Further options have been identified by Yorkshire Water, North West Water and South West Water to help secure adequate water resource next summer. These now require urgent implementation by the companies.

3.4 Overview of Company Plans

3.4.1 *General Situation*

The exceptional summer and autumn drought has left many reservoirs at unprecedented low levels in many Regions. In the majority of cases only limited storage recovery has occurred and the continued depletion of groundwater reserves is now showing a similarity with the onset of the 1989-1992 groundwater drought.

The possible development of a groundwater drought across the south and east during next summer would suggest that voluntary appeals for restraint or the imposition of hosepipe bans could be needed to limit demand in these areas.

The prospects for next summer will clearly depend on the extent to which rainfall enables resources to recover in the next few months and whether the winter is followed by a dry spring and summer in 1996.

As a precautionary measure, all water companies are now managing resources to conserve water in readiness for next summer. In general this means that companies are 'resting' their reservoirs by taking as much water from rivers as possible within the constraints of their abstraction licences and Drought Orders.

A number of hosepipe bans and bans on non-essential use remain in force as additional measures to conserve supplies.

These water conservation strategies are an appropriate response to the current situation, but do not guarantee uninterrupted supplies should a dry winter be followed by a further dry summer.

3.4.2 Key Issues

Water companies have provided an assessment of their resource situation for next April on the basis of their current plans against scenarios of 80% and 100% of the Long Term Average rainfall over the winter months. The resulting position and key issues for each company are given below:

COMPANY	OUTLOOK - KEY ISSUES
Anglian Water	Reservoirs unlikely to fully recover under the 80% scenario, but should be within previous operating levels and sufficient to maintain supplies. No supply restrictions are anticipated.
Northumbrian Water	No restrictions have been applied on the use of water during the current drought and no problems are expected next summer.
North West Water	Assuming 80% of Long Term Average winter rainfall, a number of key strategic reservoirs and some smaller Pennine sources are unlikely to refill. NWW are currently applying for a Drought Order to maintain abstraction from the R.Lune to assist refill. Further measures to improve recovery have been identified and are being implemented where necessary.
Severn Trent Water	The main concern is the series of reservoirs in the Peak District at Derwent Valley and Tittesworth. The need for Drought Orders to assist refill has been identified and should be implemented shortly.
Southern Water	The company is heavily dependant on groundwater, but also relies on surface water supplies from rivers and surface reservoirs including Darwell and Bewl Water reservoirs. Drought Orders are likely to be needed to assist refill and meet supplies elsewhere.
South West Water	Attention is focused on the recovery of the region's strategic reservoirs, Roadford, Wimbleball and Colliford. The company has already identified options to help secure adequate water resources in their strategic reservoirs for next summer and these are being urgently progressed. Despite planned measures, demand restrictions are likely in the Roadford supply zone assuming 80% of average winter rainfall and a dry summer. The company and the NRA will also be discussing drought operating arrangements for the regional reservoirs in time for next summer.

COMPANY	OUTLOOK - KEY ISSUES
Wessex Water	The company is dependent mainly on groundwater and was able to meet demands during 1995 without restrictions. No difficulties are expected even under the 80% scenario next summer.
Thames Water	Reservoirs are expected to be full under the 80% scenario and although groundwater sources will not fully recover under this scenario, no supply problems due to shortage of resources are thought likely.
Welsh Water	No restrictions were imposed during 1995. However, a number of key reservoirs are not expected to refill even with average rainfall. The company is following a water conservation strategy to minimise the risk to supplies next summer. Drought Orders may be needed to conserve resources
Yorkshire Water	The Company have indicated that there is a significant risk that some reservoir groups will not refill this winter. A number of measures are being actively promoted by the company to provide an additional 130Ml/d to meet the shortage experienced this year. Additional measures to improve refill prospects and further augment resources are expected in early December. Based on presently available information, the key resources at risk of not refilling under the 80% scenarios are: - Nidd/Barden Group- Grimwith Group - Southern Pennines - Winscar Group- Calder Group Of these reservoirs only Winscar and Grimwith are at significant risk of not refilling assuming average rainfall. The NRA is in continuous discussion with the company on the implementation of proposals and the identification of further measures.

* - N.B. The NRA scenarios are used as a reference level for assessment purposes, whereas detailed plans for individual companies may assume a different level of risk. (See section 3.2).

3.4.3 *Summary*

Water companies have generally adopted appropriate water conservation strategies to reduce the risk to supplies, but there is still a risk that there could be restrictions on supplies in the event of a dry summer. Key amongst these are:

- For Yorkshire Water; the need to implement the improvements to resources and infrastructure in time for next summer.
- For South West Water; a range of options to enhance refill of strategic reservoirs and to conserve water resources has been discussed with the NRA. Selected options are now being progressed by the company. Measures to enhance refill need to be progressed urgently in order to gain the maximum benefit during the winter months.
- For North West Water; where reservoirs are not expected to be full by spring 1996 the company have identified actions to assist refill and these are now being progressed.

It is essential that steps are taken by companies in order to avoid restrictions on supply in the event of a dry spring or summer. The need for voluntary restraint or hosepipe bans cannot be ruled out in several companies and will depend on refill and recharge during the winter.

In some instances urgent actions are required and these should be implemented as soon as possible.

4. PROSPECTS FOR RESOURCE RECOVERY - REGION & COMPANY DETAIL

As part of the process of preparing this report the NRA invited water companies to submit details of their plans for securing and safeguarding supplies for next summer. Information from company responses, and subsequent discussions, are given in the following sections together with more detailed commentary on the schedules contained in Appendix 4, where appropriate.

4.1 Anglian Region -Anglian Water

4.1.1 *General Situation*

The current water resource situation is satisfactory with all resources (reservoir stocks, river flows, groundwater levels). The situation is well within historic operating levels and sufficient to maintain supplies well into next year with existing stocks. However, it is anticipated that replenishment of water resources will be delayed with sustained recovery unlikely before January 1996 under a 80% rainfall scenario. The critical factor at present is a regional soil moisture deficit of around 62mm (at the end of November).

4.1.2 *Key Issues*

The prospects for 1996, under an 80% rainfall scenario suggests that although some direct river intakes, reservoirs and groundwater sources may not recover, they should all be within previous operating levels and sufficient to maintain supplies and no supply restrictions are anticipated. These sources include:

- Lincolnshire Limestone (Northern, Central, Southern units)
- Lincolnshire Chalk (Northern and Southern units)
- River Wensum (Costessey-Norwich)
- River Nar (Marham-Norfolk)
- Rutland} Reservoir levels predicted to be below
- Pitsford} target but with sufficient storage to
- Alton } maintain supplies.
- Ravensthorpe }

Investment in strategic link mains and conjunctive use with surface reservoirs (Covenham reservoir and Trent-Witham-Ancholme Transfer) will be sufficient to maintain supplies.

Conjunctive use with local groundwater (as undertaken during the 1989 - 1992 drought) will be adequate to maintain supplies.

Anglian Water invested £25M in drought related schemes during the 1989 - 1992 drought including strategic link mains and additional boreholes. These are expected to put the company in a good position to satisfy demands next year.

Local liaison with the NRA on drought related issues is taking place and the agreed position to date is that under an 80% rainfall scenario no problems are anticipated. Anglian Water currently have several licence variations with the NRA for determination. The majority of these are associated with the company's continuing programme of securing flexibility and security of supplies generally within existing licensed quantities. Determination dates have been agreed and these will be adhered to by the NRA since they are associated with the security of supplies for next summer.

The company intends to maximise refill of the reservoirs within existing licence conditions as soon as river flows recover. Despite reduced flows at present some reservoir refill is taking place as rivers recover above their Minimum Residual Flows.

Anglian Water are currently drilling and testing six boreholes at existing sources to improve security of supply. It is anticipated that they will be authorised by the usual abstraction licence procedure. The majority of the

direct river intakes can be used conjunctively with groundwater sources and no problems are anticipated.

Anglian Water will maintain or reduce leakage levels which currently are the lowest of all the water service companies. Targets for individual zones are currently being appraised but it is intended that leakage next year will reduce compared with 1995/96. Anglian Water will continue with its metering policy and although this will not have a significant bearing on next year's demand the company considers it will play a large part in helping conserve resources in the future.

The company experienced extremely high demands over a prolonged period this summer and daily, weekly and monthly water into supply peaks exceeded those previously experienced. In the event that similar demands may be experienced next summer £10M of extra capital investment is already being directed towards reinforcement of the supply and distribution system. These schemes include mains replacement, booster pumping and a new borehole source. A licence application is with the NRA for the new source and the determination date has been agreed.

At this stage the company do not see the need to consider applications for Drought Orders.

4.1.3 ***Other water companies in the region.***

Cambridge, Tendring Hundred and Three Valleys Water Companies

No problems anticipated. The Companies are dependant on groundwater, predominantly from the chalk aquifers. Water levels in November were at or slightly below the Long Term Average and the situation in summer 1996 is now dependant on the aquifer recharge this winter.

Essex & Suffolk Water Company

The NRA Ely-Ouse-Essex Transfer Scheme, backed by abstraction from NRA augmentation boreholes, is currently in operation to support pumping into Abberton and Hanningfield reservoirs. With a 100% rainfall scenario there will be some natural riverflow in Essex to pump into the reservoirs but it is anticipated that the transfer scheme will still be operated. Drought Orders and demand management measures will not be required, and the reservoir will be 100% full in May at the start of the drawdown season.

With an 80% rainfall scenario, the operation of the Ely-Ouse-Essex Transfer Scheme might require additional augmentation and a possible source would be a transfer from the Bedford Ouse. There is a small chance that a Drought Order would be required to reduce the Minimum Residual Flow (MRF) for

the Ely-Ouse-Essex Transfer (the Denver MRF) which is an NRA licence. This would only be required if the exceptionally low rainfall continues or if abstraction is constrained by operational incidents or failures. This situation will be reviewed in January.

4.2 Northumbria/Yorkshire Region - Northumbrian Water Limited

4.2.1 *General Situation*

Northumbrian Water (NW) has not had to apply restrictions on the use of water during the current year and the company does not envisage having to do so next year whatever the weather during the winter period.

4.2.2 *Key Issues*

This year the company's upland reservoirs were severely affected by the drought. However the availability of the back up from the Kielder system, together with the other measures that have been taken within the operational network to reinforce those local areas where water from Kielder cannot be input directly, have meant that all demands from customers could be met without restriction.

Kielder water was used extensively to support the Rivers Tyne and Wear, and to augment supplies to Derwent Reservoir. In the latter part of the summer NW also took out a new licence to abstract from the Waskerley air shaft on the Kielder Transfer Tunnel to allow additional input to the Wear Group of reservoirs. The availability of this will continue to reinforce these reservoirs in any future dry years if necessary.

Reservoirs are now beginning to fill after the recent wetter weather and the company are confident that most will fill during the winter. In any event the overall availability of resources in this Region, coupled with the flexibility that has now been developed in the water supply system, will mean that no restrictions are expected next year.

Kielder, Durham, Cow Green and Lune/Balder groups will all refill fully under the 100% scenario, but Cow Green and the Balder reservoirs will be at 80% and 70% capacity respectively under an 80% rainfall scenario.

4.2.3 *Other Companies in the Region*

North East Water

North Tynedale group will be between 80% & 100% full under both scenarios. This is not of concern because the group can be supported by River Tyne sources, which in turn are supported by Kielder. Derwent

Reservoir will not refill, but this is not of concern since it can be supported as necessary by Kielder.

Hartlepool Water Company

Water supplies are largely from groundwater. Under the two rainfall scenarios there will be adequate recharge to meet the likely demand in 1996.

4.3 Northumbria/Yorkshire Region - Yorkshire Water Services

4.3.1 *General Situation*

The summer drought has left most reservoir levels across the region at unprecedented low levels. Early autumn rainfall has been below average and has therefore exacerbated an already difficult situation.

Yorkshire Water has carried out an interim review of the possible source yield/demand situation for next summer. This has included an initial re-assessment of design yields to take account of customers' aspirations for a higher standard of service in relation to the reference levels set by OFWAT and the effect of 1995 runoff sequences (which are drier for the period April to October than previous records).

Yorkshire Water Services (YWS) problems with refill are in the west - Grimwith, Winscar, Calder and Southern Pennines. However there is likely to be a limited supply available in the east from the River Derwent. The main constraint remains the Grid links to move this water from east to west but works are now underway to increase the link capacity above 65 Ml/d for Derwent water to be more effectively utilised. Yorkshire Water are also planning a link between the Leeds and Bradford zones and this will help with refill assuming the abstraction from the Ouse is increased.

The pipeline constraint from the Derwent to Leeds and Wakefield are planned to be increased

4.3.2 *Key Issues*

Measures need to be taken to safeguard supplies for 1996 and beyond. The best long term solutions will require time to evaluate, but an interim and preliminary package of proposals has been assembled by Yorkshire Water Services which is aimed at safeguarding supplies for 1996 and includes:

- applications to the NRA for time-limited licence variations permitting additional river abstractions on the rivers Wharfe, Ouse and possibly Ure;

- applications to the NRA for new abstraction licences at a number of minor sources understood to be mainly in North Yorkshire;
- major capital schemes involving increases in river abstraction, treatment and transmission capacities;
- capital schemes to convert temporary installations established this summer into permanent installations;
- additional expenditure on new approaches to leakage control in six zones in Bradford and Calderdale.

Further details are given in Appendix 5. Where these measures require new or varied abstraction licences, the applications will be considered in the normal way. If granted they will be time limited without prejudice for any subsequent application for permanent licences.

As a result of the very dry Autumn, there is now a significant risk that reservoirs will not fill this winter and as a consequence, additional measures may be required to fully safeguard supplies next year. Investigations by YWS are now in hand to:

- seek ways in which winter refill may be augmented;
- augment resources next summer over and above the measures described above.

The outcome of this work will be known in detail during December. Measures proposed will endeavour to refill reservoirs as far as possible in the event of the driest winter. The company have used computer modelling to forecast percentage stocks for key reservoir groups against 100% and 80% December to April LTA rainfall scenarios. With a dry weather pattern, it will be impossible to guarantee filling reservoirs and additional abstraction licences and transmission links will be necessary to maintain supplies in the event of a dry summer.

An additional package of proposals will be assembled which is likely to include:

- extension of Drought Orders for river abstractions and compensation discharges;
- additional Drought Orders for river abstractions to aid refill;
- time-limited licence variations to enable additional abstractions to be made through next summer;
- further capital schemes to increase transmission capacities.

The company report that their position regarding the Tees-Ouse transfer has not changed since their statement to the recent 'rota cuts' Public Hearings. Appendix 6 gives the details.

The options identified below for assisting refill will need environmental assessments and appraisals for technical feasibility, and, in some cases, further Drought Orders if they are to be implemented.

Nidd/Barden Group

Under 100% rainfall this group of reservoirs would be greater than 90% full in April 1996. With 80% rainfall this would fall to approximately 70% full.

These reservoirs supply Bradford. To achieve this refill, the Drought Orders on the Wharfe have to be utilised to their maximum and the total demand in Bradford has to be kept below 180 Ml/d. YWS have also assumed an increased abstraction from the Wharfe over and above the current drought orders. There is no compensation flow to cut.

Options to increase refill:

- reduce exports to Calderdale, within grid constraints, from these reservoirs. To achieve this, support will have to come from the Grid via a new link proposed by YWS from Eccup to Graincliffe. This is unlikely to be completed in time to assist with refill.
- keep tight control of the normal leakage rise in the winter.

Washburn/Eccup

Under both 100% and 80% rainfall scenarios this group would be full by April 1996. This is assuming that only 40 Ml/d is withdrawn, which is well below the design yield of 195 Ml/d. The compensation flow is assumed to continue at its full rate of 18 Ml/d.

To achieve this refill, the existing Drought Orders on the Ouse and Wharfe have to be fully utilised and YWS have assumed additional abstractions from the Ouse.

Grimwith

Under the 100% rainfall scenario Grimwith will be 75% full and with 80% rainfall, 60% full. This is assuming very little use through the winter, just the 5 Ml/d compensation release, which is a requirement of the current Drought Orders.

To achieve the small draw-off from the reservoir, the Wharfe has to remain unsupported by Grimwith by utilising the existing and proposed Drought

Orders on the Wharfe. Normally refill can be supported by spare water from the Nidd reservoirs, but they will have no spare water under these rainfall scenarios without the additional Drought Order modifications to the abstractions from the Wharfe.

It is imperative that the normal winter increase in demand due to leakage is contained.

Options to increase refill:

- there are no simple options to increase refill without transferring the problem to other reservoirs;
- install pumps and temporary pipeline to pump water from Wharfe;
- accept lack of refill and find alternative sources for next summer

Calder Group

Under the 100% rainfall scenario the Calderdale and Kirklees groups (which make up the Calder Group) will be 100% and 90% full respectively. Under the 80% rainfall scenario they will be 75% and 85% full respectively.

Support from the Grid is assumed to be at the maximum possible, given the need to support Leeds. It is also assumed that compensation flows remain at 50% of normal until the storages exceed 80%.

Options to increase refill:

- leakage levels must be kept down in the winter.

Winscar

Under the 100% rainfall scenario Winscar will be just below 60% capacity and under 80% rainfall, only 40%. This is assuming that compensation is at 9 Ml/d, which is the normal compensation flow in the winter.

To reduce the draw on the reservoir, water for Calderdale would have to be found from elsewhere. Clearly there is little opportunity to draw further from the Calderdale reservoirs without causing them to have refill problems. However, the reservoir is a two season critical reservoir and would not necessarily be expected to fill each year. Reducing compensation would cause significant environmental problems.

Option to increase refill:

- accept the poor refill and find alternative sources for next summer, should this be necessary

Southern Pennine Group

Under a 100% rainfall scenario the reservoirs will be full, and under the 80% scenario 90% full. This is assuming reductions in compensation releases as proposed in the recent Drought Order.

Options to increase refill:

- increase the supply from the river Derwent via the Grid

Harrogate Group

Under 100% rainfall scenario the reservoirs will be close to full. Under the 80% scenario the group will be > 80% full. This is assuming the full demand and compensation releases.

Options to increase refill:

- reduce compensation flows following the recent Drought Order;
- new pipeline to bring water from the River Ure to the north, currently under construction.

Aquifers

There are two main aquifers linked to the grid - the chalk and the Sherwood sandstone. For both aquifers recharge will be sufficient to maintain the licensed abstractions under the 100% rainfall scenario. However, for the 80% scenario, the aquifer will not be able to sustain the abstractions made in 1995. As both can be adequately supported from the River Derwent via the Grid, no further measures need to be taken at this time.

4.3.3 *Other Companies within the Region*

York Water Company

Water supplies are taken from the River Ouse at York. The licence does not have a prescribed flow restriction and so there will be no difficulty with supplies in 1996 whatever the rainfall scenario.

4.4 North West Region - North West Water Limited

4.4.1. *General Situation*

Many of North Water Water's (NWW) reservoirs are currently at very low levels following the exceptionally dry summer and autumn period. There is a marked difference between sources in Cumbria, where substantial rainfall

in October and November has led to an improvement in stocks, and those in the Pennine areas where dry conditions have continued without any break.

4.4.2 Key Issues

NWW's regional network is highly integrated with connections from regional aqueducts into all centres of population, so that all local sources can be supported to a large extent by the regional system. The company have Drought Orders in place to reduce the statutory compensation water discharges from 10 reservoirs in Pennine areas, and further Drought Orders to vary the abstraction conditions from Ullswater and Windermere. NWW are currently preparing two further applications for Drought Orders to reduce compensation water.

The company have provided additional capacity to deliver water from the regional aqueducts into all Pennine areas by installing extra pumps, emergency pipelines, and other system reinforcements. The company have commissioned several disused reservoir and borehole sources, and have maximised transfers from the west of the region to the more seriously affected eastern areas.

These actions have reduced the abstraction from almost all reservoirs to well below normal reliable yields. Contingency plans have been drawn up for all areas to ensure that supplies could be maintained even if the dry weather were to continue for a further six weeks.

Restrictions on supply are in force over much of the region. NWW have continued their high profile publicity campaign which is aimed at keeping customers fully informed of the situation and achieving maximum savings in water use. NWW have stated that all these measures will continue for as long as is necessary to safeguard supplies for next year.

NWW have assessed the prospects for reservoir storages over the winter period under conditions of average rainfall and of 80% average rainfall. These have been discussed with the NRA. Where reservoirs are not expected to be full by spring 1996 the company have identified actions required to assist with refill. The reduced outputs from most local sources will be maintained for as long as is necessary to ensure refill.

<u>Lake District Reservoirs (Haweswater & Thirlmere)</u>
<u>(Windermere and Ullswater drought orders continuing in place)</u>

With average rainfall, storage will reach 100% and with 80% average rainfall, storage will reach 80%.

If the River Lune is not available in the event of a severe cold dry spell, demand on the Lake District sources will increase, resulting in a lower spring

storage. Additional actions include continuation of Windermere and Ullswater Drought Orders and application for a Drought Order to ensure availability of River Lune throughout the winter.

Stocks Reservoir

Fills with 80% of average rainfall.

Longdendale Reservoirs (Drought Order remains in force to reduce compensation water).

At the current rate of abstraction the reservoirs will fill before the end of March assuming 80% average rainfall, and continuation of reduced output and reduced compensation water discharge.

Vyrnwy Reservoir

With average rainfall, storage will reach 100% and with 80% of average rainfall, storage will reach 81%. This assumes a continuation of the present reduced output. This will be kept under review and reduced further if rainfall remains below average by increasing groundwater abstractions.

Rivington Reservoirs - (Drought Order in effect to reduce compensation water)

At current reduced rate of abstraction and with average rainfall, storage will reach 91%. With 80% of average rainfall, storage will reach 73%. This assumes continued reduced abstraction. This will be kept under review and reduced further by increased transfers from the Thirlmere Aqueduct if necessary. Continuation of current Drought Orders at Rivington, Ullswater and Windermere will also be necessary as will discussion of options to ensure availability of River Lune throughout the winter.

NWW are currently installing further connections from the regional aqueducts into Rochdale, Oldham, Tameside and Stockport to enable the further reductions in the demand on local sources. At the current very low rates of abstraction, the majority of local sources will refill under dry conditions (80% rainfall), with only a few exceptions.

4.5 Severn Trent Region - Severn Trent Water

4.5.1 *General Situation*

Severn Trent Water has a hosepipe ban in force across the whole of the Company. This ban will stay in force until the major sources have shown signs of recovery. This will almost certainly take several weeks, if not months.

Severn Trent's general policy is to take as much water from rivers and aquifers whilst staying within licence conditions. The Company have two reservoirs which they have effectively stopped drawing water from, namely Tittesworth in the Stoke area and Cropston in the Leicester area.

There are no plans for temporary pipelines, but the company are laying an extra 100 miles of permanent pipeline in order to prevent a recurrence of low pressure problems that were experienced last summer.

Severn Trent have no specific plans for pressure reductions, but are closely monitoring all aspects of distribution management, including pressure reduction, as part of an immediate leakage reduction initiative. This aims to achieve a 200Ml/d saving by May 1996.

Severn Trent has also announced a package of measures costing £130M to go a substantial way to preventing the Company having supply problems in 1996. Severn Trent have also announced the compulsory metering of households using sprinklers.

4.5.2 *Key Issues*

The greatest source of concern to Severn Trent is the series of reservoirs in the Peak District at Derwent Valley. Storage is still only 23% and despite showers and some rain in recent weeks this suite of reservoirs shows no signs of recovery. Severn Trent Water are in discussion with the NRA regarding the possibility of a Drought Order for reduced compensation flow, possibly from early January onwards. This situation is under regular review. Severn Trent are also discussing with the NRA the issue of reduced compensation flows from Tittesworth reservoir. Severn Trent Water are also looking at improving the refill prospects of Carsington pumped storage reservoir. This may require a Drought Order to reduce the prescribed flow restriction which applies to abstractions from the River Derwent.

4.5.3 *Other Companies within the Region*

No problems envisaged.

4.6 Southern Region - Southern Water Services

4.6.1 *General Situation*

The storage reservoirs in Southern are below the level expected for this time of year with Darwell reservoir, near Hastings, being at just 17% full. River levels at two surface water abstraction sites are below average and not enabling recharge of the company's surface water reservoirs. Groundwater levels are also below average for the time of year. Southern Water depends on groundwater supplies for some 70% of its water.

Southern Water is preparing a comprehensive 'Use Water Wisely' campaign for the winter and spring in order to prepare customers, and the public in general, for spring/summer 1996 should adequate recharge not occur. A general 'awareness' campaign, alerting customers to the continuing dry weather and its potential consequence has already started.

4.6.2 *Key Issues*

East Sussex/Bewl Water

The East Sussex supply area of Hastings is the most difficult and depends in the main on the Darwell reservoir. A Drought Order currently exists, which enables the company to abstract up to 20 Ml/d from Bewl Water reservoir in Kent and transfer this to the River Limden for subsequent re-abstraction from the River Rother at Robertsbridge to feed Darwell. At the present time a temporary overland pipeline capable of transferring 12 Ml/d has been installed and this has enabled the company to maintain the level in Darwell. A second temporary pipeline is in the course of construction and will be completed in mid December. This will enable the re-filling of Darwell, but unless there is a 'normal' winter, it is unlikely that complete filling will occur before the summer commences.

The permanent transfer pipeline (authorised under an abstraction licence recently issued by the NRA) from Bewl Water to Darwell will be completed in spring, but this will only enable up to 10 Ml/d to be transferred (with a lower licensed capacity). Should the dry winter continue, it is expected that the present Drought Order should be extended (currently expires 16/03/96) to enable transfer of sufficient water to fill Darwell, using a combination of the temporary pipelines and the permanent pipeline. Obviously the hosepipe ban will remain in force and it may be necessary to consider a further Drought Order to contain demand in order to conserve water in Bewl Water as far as possible.

Whilst the Medway area of Kent is not expected to have particular difficulty next summer, the continued transfer of water to Darwell will cause a further

decline in level (currently standing at 61% full and dropping at about 1.5% per week). At the moment refilling of Bewl Water by way of either Smallbridge pumping station or the new Yalding pumping station is not possible due to the flow in the River Medway being below the Minimum Residual Flow (MRF). Discussions with the NRA are about to take place to determine what scope exists for a temporary licence to permit re-filling of Bewl Water despite the low river flows this winter. A Drought Order may be necessary to enable this to occur.

West Sussex

The second area of concern is the West Sussex supply area which serves an area north of the South Downs extending from near Petersfield in the west to Steyning in the east and to Horsham and Crawley in the north. Significant improvements to the distribution system are being undertaken presently to overcome the low pressure problems experienced this summer. In addition, a groundwater source is being rehabilitated which on completion (before next summer) will provide around another 4 Ml/d.

This area is heavily dependent upon Hardham (combined river abstraction from Western River Rother and boreholes) and Weirwood reservoir (currently at 42% full against long term average for this time of year of 72%). Given a dry winter there is likely to be a need for a re-introduction of a hosepipe ban in early spring 1996. This may need to be coupled with a Drought Order to reduce the river MRF to enable continued abstraction at Hardham from the river and a Drought Order to contain demand by April 1996. These Drought Orders could be required from the end of April.

Sussex Coastal Area

This supply area of some 450,000 population is entirely dependent upon groundwater sources. Groundwater levels are presently low compared with long term average. It is likely that hosepipe restrictions will be required in early spring 1996 and a Drought Order will be needed to contain demand by April 1996. Investigations are underway to identify treatment needed at Burpham/Warningcamp sources and Madehurst source to maximise use of existing licences.

Thanet, Kent Area

This area is predominantly reliant upon groundwater sources and transfers via the 31km Selling/Thanet main which was used to its full potential this year. Negotiations are about to commence with the NRA to enable the enhanced flow in the River Stour, due to discharge of final effluent from Herne Bay wastewater treatment works, to be re-abstracted at Plucks Gutter water

treatment works downstream. This will enabling additional water to be provided during the summer from that treatment works.

It may be necessary to apply hosepipe restrictions in this area in early spring 1996 to be followed by a Drought Order to control demand in April 1996.

Other Local Areas of Concern

In the western Isle of Wight, groundwater levels have rapidly fallen leading to concerns for this area should dry weather continue. Water can be transferred from the mainland to the Isle of Wight but there would be a need to lay a distribution main to transfer the water to the West Wight area. This is currently under investigation.

In North Hampshire/South Berkshire around Kingsclere and Woodhay, an area entirely dependent upon local groundwater sources, there is some concern for next summer should the dry weather continue. Investigations are currently underway regarding provision of a pipeline linking to an adjacent supply area.

4.6.3 ***Other Companies within the Region***

South East Water

The main area of concern is Mid Sussex where Ardingly Reservoir is currently 45% full. It would not refill under the 80% scenario and consideration may have to be given to a Drought Order to ban non-essential use and relax the prescribed flow in the River Ouse if the drought continues through December. There is also increasing concern about Arlington reservoir which supplies the Eastbourne area and is presently at only 37% of capacity. A hosepipe ban was introduced company wide at the end of August and it remains in force. The NRA will discuss appropriate measures to take for Ardingly and the Company's other sources over the next few weeks.

Mid Kent Water

The Company depends on groundwater for 95% of supplies and has access to only one surface source, Bewl Water which is shared with Southern Water. A hosepipe ban was introduced in stages through August to reduce record high peak demands but the Company has so far not experienced resource difficulties because of the healthy groundwater levels following winter 1994/95 recharge. If the drought continues then actions will need to be taken to reduce demand including possible re-introduction of hosepipe bans, perhaps followed by Drought Orders in the spring and summer. The hosepipe ban was lifted on 15 September as demand eased.

Folkestone & Dover

The Company was able to meet demands through the summer without restriction due to its reliance on groundwater for 100% of its supplies. Groundwater levels have continued to fall and in some boreholes are now approaching their lowest levels since the start of the 1990 drought. If the drought continues the only option will be some from of demand management in the early spring followed by a Drought Order banning non-essential use.

Portsmouth Water Company

No problems are expected this spring but the Company may experience difficulty meeting demand if the drought continues through the summer and high temperatures recur. In the short term this could require voluntary appeals for restraint or a local hosepipe ban.

4.7 South Western Region - South West Water

4.7.1 *General Situation*

The summer drought has left most reservoir levels across the region at unprecedented low levels. Since then, autumn rainfall has varied widely across the region, but the rainfall on the key regional reservoir catchments has been limited.

The signs of recovery in many smaller reservoirs has meant that the immediate problems of supply to customers have diminished. However, the lack of heavy sustained rainfall across the region has increased focus on the recovery of key reservoirs. Indeed, the three major reservoirs continued to fall over the autumn.

Planning and actions are well underway to minimise the impact on customers next summer of what are likely to be lower than normal levels in the three key reservoirs, should low winter rainfall be followed by a hot and dry summer similar to this year.

4.7.2 *Key Issues*

Following the summer drought, a comprehensive plan is being developed for the summer of 1996 and beyond. A five stage review is being progressed for the key regional reservoirs, as follows:

- Stage 1 Winter refill projections, using alternative weather scenarios.
- Stage 2 Estimation of target levels at March 96, with and without drought measures, assuming a dry summer and 10% storage remaining in autumn 96.

- Stage 3 Identification of projected shortfall in regional resources.
- Stage 4 Evaluation of costs, benefits and priorities for operational and capital options available to close any shortfall of projections against targets.
- Stage 5 Review capital schemes to secure resources after Summer 96.

Stages 1 to 3 of the strategy were completed in mid November, producing reservoir projections for each of the three regional reservoirs. A number of capital options have also now been evaluated as part of stage 4. The options which offer significant resource benefits for 1996 are being progressed and the refill projections produced in mid November have been revised to make allowance for their effect.

The latest projections indicate that, with average winter rainfall and assuming all proposed drought measures are implemented successfully, all South West Water reservoirs are likely to be able to provide sufficient storage to avoid any customer related drought restrictions next year. However, should only 80% or less of average winter rainfall occur, some customer related restrictions may be required.

The operational options which are either already being progressed or under review as part of the strategic review process include;

- hydroelectric generation from Roadford to be restricted to releases required for water supply use and compensation releases.
- eliminate enhanced flow releases from Roadford and review allowances for losses on the Roadford releases.
- negotiation with other users for temporary transfer of abstractions
- maximise use of alternative river abstractions rather than regional reservoirs
- continued use of approved emergency abstraction Drought Orders
- consideration of additional Drought Orders to aid reservoir recovery
- maintenance of current use restrictions and review extensions, depending on the refill experienced over the winter period
- continue to inform the public of the developing resource situation and the measures which may become necessary to help ensure supplies next year
- review the level of leakage control
- review enhanced promotion of customer related water conservation options.

Action has already been taken to accelerate some critical water supply projects. These include the duplication of the Cornwall Spine Main, necessary to provide security of supply to the West of Cornwall, schemes to increase the through-put of key water treatment works and action to increase the through-

put of key water treatment works and action to progress the Wimbleball Pumped Storage Scheme.

A wide range of other capital works options are now being developed following initial assessment during stage 4 of the strategic review process. These include temporary pumped storage schemes for both Roadford and Wimbleball, renovation of water treatment works and boreholes to provide increased capacity and negotiations to acquire alternative sources of water.

A condition for implementation of many of the proposed capital and operational measures will be the approval of the necessary Drought Orders or licence variations. To facilitate this, close liaison is being maintained with the NRA to ensure that environmental and other concerns are addressed as part of the planning process. This will ensure that expedient actions can be implemented as necessary over the coming months to conserve resources and maximise winter refill.

4.8 Wessex Water

4.8.1 *General Situation*

Wessex Water report that the company was able to meet record levels of demand for water without customer restriction. At the same time a range of measures have been carried out to help protect rivers that were vulnerable to the effects of abstraction including curtailing abstraction from sensitive sources and pumping water into rivers.

4.8.2 *Key Issues*

Since September rainfall has been 134% of LTA and reservoir levels are now rising. With 80% of normal winter rainfall, the company considers that storage will increase sufficiently to enable the same standard of customer service and environmental protection to be provided next year. To further strengthen security of supplies however, a number of measures are being undertaken. These include:

- £5M expenditure this winter on improving source security and reinforcing the trunk and distribution system;
- discussion with South West Water on the fast-tracking of the Wimbleball pumped storage scheme which will ensure that Wimbleball reservoir fills each winter;
- a major increase in investment to meet the target of reducing leakage to 20% by the year 2000 and 15% by 2005. Next year the company plans to spend £13.5 million on mains and company service pipe replacement, around three times the amount spent in 1994;

- planned extension to the programme of helping low flow rivers so that licensed resources can be utilised for supply purposes without harming the water environment;
- public relations initiative to promote the wise use of water.

In the longer term Wessex Water are confident that future demand for water will continue to be met be means of a strategy that combines leakage reduction, demand management and environmentally sound resource development. This includes examining with neighbouring water companies the benefits to be gained from the sharing of water resources.

4.8.3 ***Other Companies within the Region***

Bristol Water

The company has a well integrated supply system which enables resources to be used flexibly. A major strategic abstraction can be made from the Sharpness Canal at Purton to make up any local shortfall in resources, so no supply difficulties are expected next summer under the 80% winter rainfall scenario.

Bournemouth & West Hants Water

The company relies on major abstractions from the rivers Hampshire Avon and Stour, as well as borehole sources. Though river flows next summer would be lower than normal, no supply difficulties are expected under the 80% winter rainfall scenario.

Cholderton & District Water Company

This small supply area is served by a borehole source and supplies are not expected to be affected next summer.

4.9 **Thames Region - Thames Water Utilities**

4.9.1 ***General Situation***

The Region's reliance on groundwater together with a well integrated surface water supply system has meant that significant supply difficulties have not been encountered.

4.9.2 ***Key Issues***

Assuming not less than 80% of average rainfall November to March all the company's storage reservoirs will be full by 31 March 1996. Groundwater resources will be dependent on this season's recharge and a further four weeks

of 100% rainfall is required before significant recharge commences across the region. Critical areas have been highlighted and are being monitored weekly by soil moisture deficit mapping. If 80% rainfall occurs groundwater will be a higher risk next year than in 1995, but not sufficient to cause resource problems. Less than 80% would increase risks significantly.

With regard to resource management measures the company will be resting sources at most risk this winter. This will centre around resting key Cotswold sources and maximising the use of Farmoor surfacewater source near Oxford and major groundwater sources at Gatehampton near Goring-on-Thames via the existing south/north and east/west trunk transfer mains.

No temporary pipelines are envisaged other than the recirculation of washwater at the large surfacewater works such as Farmoor.

Regarding pressure reduction, extensive network modelling has been carried out and where excessive pressure has been confirmed pressure reduction is being introduced particularly as part of a leakage control programme.

Tankers were used to good effect this summer as mobile service reservoirs transporting potable water from treatment works to supplement zones under stress from high demand. This will be an option in 1996 triggered by risk assessment similar to that used during 1995.

One of the Authorisation Management Measures is to seek increased peak daily abstraction at Harpsden and Bourne End groundwater sources. A package of measures to allow peak abstraction increase is being prepared.

Thames Water are considering where Authorisations Management Measures may assist in meeting peak demands but have yet to discuss any proposals with the NRA.

4.9.3 *Other Companies within the Region*

Some of the companies have undertaken works to improve the flexibility and resilience of their resource-supply system, particularly in those areas where weaknesses have been identified during the recent drought and the last two summers. A number of the companies have active leakage control programmes in place which they have discussed with the NRA. Mid-Southern's new surface water source at Bray on the River Thames should be operational for 1996.

Where possible, companies will be resting key groundwater sources and using surface water during the winter period. The groundwater situation is generally similar to that described in Section 4.9.2 above and resource problems, with the exception of the Sheet source (Mid Southern Water, NRA

Southern Region), are not anticipated with rainfall in excess of 80% of average during the winter months.

In order to increase the reliability of surface resources for the summer, East Surrey Water Company are planning to apply for a winter Drought Order (up to April) to relax licence conditions at Bough Beech (located in NRA Southern Region) so additional water can be abstracted from the river to fill the reservoir.

Supply restrictions experienced during this summer (North Surrey & Mid Southern) were demand and not resources led. However, the resource situation is being monitored closely and the need for any further actions should the low rainfall be prolonged will be reviewed with the NRA.

4.10 Welsh Region - Dwr Cymru (Welsh Water)

4.10.1 *General Situation*

The main sources are reservoirs, used either for direct supply or for river regulation. There is a high degree of conjunctive use and source integration and this flexibility has helped to maintain supplies throughout the drought. It also assists with ensuring refill, with the exception of those sources detailed in 4.10.2 below.

4.10.2 *Key Issues*

Some of Welsh Water's reservoir systems (in common with those owned by other water companies), are designed to have such a large storage that they do not refill in the first winter after a drought. Those which will not fill with average rainfall for the rest of the winter are:

Usk	This will not refill even with maximising the pumping at Manorafon.
Cynwch	An increase in active leakage reduction is being carried out to decrease the take from this reservoir.
Alwen	Take from Alwen is being minimised by using other sources to supply some areas normally fed from Alwen.
Celyn & Brenig	These sources are used to regulate the River Dee. A Dee Consultative Committee meeting is to be held in early December to review what further measures can be implemented to assist refill.

Additionally there are reservoirs that will not fill with 80% of average rainfall:

Tecwyn Uchaf	Supplies to Porthmadoc are being taken from Dolbenmaen to assist refill of this reservoir.
Egnant	Some re-zoning is being achieved coupled with an ongoing work on leakage control, including installation of pressure reduction valves.

The remainder will refill with 80% of average rainfall, but even so action is being taken to maximise refill.

Further regional NRA details are given below:

S.W. AREA

The two key sources, Llyn Brianne and Llys y Fran, are low for the time of year. However, refill analysis has shown that both should be full by the end of March, even under an 80% rainfall scenario.

S.E. AREA

The Southeast Wales conurbations are supplied largely from the "Big Five" reservoirs; Usk, Llandegfedd, Talybont, Taf Fawr and Taf Fechan. The Taf Fechan system (essentially Pontsticill reservoir) may not refill, if the winter is dry and Usk Reservoir may be similarly depleted. The NRA and Dŵr Cymru are monitoring the situation closely.

N. AREA

The River Dee is regulated by the NRA for the benefit of abstractions and the river environment. The regulation is carried out through an operating agreement with Dŵr Cymru, who own the reservoirs in the headwaters of the catchment.

The operation of the system is carried out by the NRA under the Dee and Clwyd River Authority Act 1973. This Act provides for the setting up of a consultative committee which comments on and assists the NRA in formulating the operating rules of the system, known as "Dee General Directions".

During droughts, the committee can approve changes in prescribed flows and abstractions without the need for Drought Orders.

In response to the continuing drought the NRA has already taken steps to reduce the residual flow over Chester Weir, in order to conserve stocks. Llyn Tegid (Bala Lake) is being operated so as to capture spates which would otherwise not be stored. The main abstractor, North West Water Ltd, has a hosepipe ban in force in order to limit demand on resources.

Notwithstanding the measures already in place, the two main reservoir sources Celyn and Brenig, will not refill even with average rainfall between 1 December 1995 and 1 May 1996. Average rainfall would, however, give the volume required to maintain supplies, based on the 1933/34 drought sequence. Under an 80% rainfall scenario there would be only 91% of the required volume. This would require water companies to reduce their demand from the commencement of river regulation, and the river would be regulated to natural flows.

The necessary action required this winter would depends on the resource volume on 1 December 1995. The NRA has called a meeting of the Dee Consultative Committee to consider what action might be appropriate. This might include a reduction in compensation discharge from Llyn Celyn (the NRA is currently assessing the potential impact on fish spawning) and efforts by the water companies to reduce their abstraction, in the unlikely event that the Dee is still being regulated.

Dŵr Cymru are also taking steps to maximise the refill potential of Alwen reservoir and also Cynwch and Tecwyn Uchaf.

4.10.3 ***Other Companies within the Region***

Wrexham & East Denbighshire Water Company's main source is an abstraction from the river Dee. The degree of recovery of the Dee reservoirs (see 4.10.2) will determine the outlook for next summer. The company also operates a number of smaller sources, of which only Pendinas/Llyn Cyfynwy Reservoir Group may struggle to refill. The company is using other sources as far as possible.

Chester Waterworks' main source is an intake on the River Dee. The same comments apply as to Wrexham.

5. PLANNING FOR THE FUTURE

In the longer term, the Secretary of State has already announced that there will be a review of the lessons to be learnt from this drought and of the action to be taken. This will ensure that the framework for water management will enable a sensible balance to be struck between the customers' expectations, the cost of providing the service and protecting the environment. This review will be in consultation with the NRA, the Office of Water Services, the Drinking Water Inspectorate, the Water Companies and other interested organisations.

The review will consider changes in the pattern of demand and the approach to demand management, (including leakage control), the implications of climate change, planning standards for water resources, capital investment requirements and legislation in relation to drought management.

The Secretary of State has also stated that the water companies must set themselves, and achieve, demanding targets for the reduction of leakage, and that if they do not, then the statutory powers to do so will be used (under the Water Industry Act 1991). The Director General of Water Services has been requested to look at what has been done so far in this field and to advise the Secretary of State on future action, in consultation with the NRA and the Department of Environment.

This review will clearly have an impact on the ongoing process of updating the NRA's National and Regional water resources strategies, as well as Water Company investment plans.

The NRA considers that further work needs to be done to ensure that there are well documented arrangements in place for managing water supply resources under normal and drought conditions. Such procedures need to be prepared in accordance with the principles of water conservation and should include:

- Drought action control curves which act to trigger timely actions early in developing drought situations
- Pre-planned arrangements to help avoid delays in key decisions which increase the risk of unacceptable measures should the drought continue.

It is the NRA's view that companies which have complex strategic supply systems should consider active promotion of such arrangements in consultation with the NRA. Where such plans are not in place already or where, in the view of the NRA, these are not satisfactory, the NRA will wish to work with the company to develop them as a matter of urgency.

In conclusion, this report suggests that with 80% of the Long Term Average winter rainfall and timely actions by water companies to conserve supplies, the number of reservoirs which will be in an unsatisfactory position by April 1996 can be kept to a minimum. However, the NRA considers the present water resources situation in many parts of the country to be finely balanced, and it is essential to avoid any complacency or undue risk taking on the part of water companies. Moreover, given the meteorological extremes experienced during 1995, together with the general lack of any *widespread and sustained* recovery of resources to date, it appears almost inevitable that resource problems will continue into the summer of 1996 in a number of areas unless there is above average rainfall in the next few months. These problems may well become more widespread if groundwater recovery continues to be slow.

Responsibility for the preparation and implementation of recovery plans rests with the water companies and it is essential that these are regularly reviewed and updated to ensure the security of supplies. Such plans should recognise that the winter could be drier than has been assumed in the scenarios examined by this report. The NRA is reassured to note that since the inception of this report, water companies have responded to the continuing drought by developing plans to safeguard supplies. It is now imperative that these plans are implemented as a matter of urgency.

National Rivers Authority
Head Office
December 1995

APPENDIX 1

Powers for Drought Management

POWERS FOR DROUGHT MANAGEMENT

1 Hosepipe Bans

Under Section 76 of the Water Industry Act 1991, water companies are entitled to impose temporary hosepipe bans, without having to obtain third party sanction, subject only to giving public notice in the local press. These may apply to the whole or only part of the water company's area, and prohibit the use of hosepipes for, say watering private gardens or washing private motor cars.

Contravention of a ban is a summary offence carrying a maximum fine of £1,000.

2. Drought Orders

Drought Orders are made by the Secretary of State for the Environment, under Sections 73-80 of the Water Resources Act 1991, on the application of either the NRA or a water company.

There are two types of order: Ordinary Drought Orders and Emergency Drought Orders.

Ordinary Drought Orders

If the Secretary of State is satisfied that, due to an exceptional shortage of rain, a serious deficiency of water in an area exists or is threatened, he may make an Ordinary Drought Order authorising the abstraction of water not otherwise permitted or varying an existing abstraction licence.

A Drought Order may also authorise the water company to prohibit or limit the use of water for any purpose specified in order. This will typically include such activities as the watering of public parks, filling of swimming pools, the washing of all types of vehicles, the cleaning of buildings, etc. 72 hours notice of the bans must be given in the local press.

An Ordinary Drought Order may initially be made for a period of six months, and may not be extended to run for more than a year.

Emergency Drought Orders

If the Secretary of State, in addition, is satisfied that the deficiency of water is likely to impair the social or economic well-being of the population, he may make an Emergency Drought Order authorising water companies to supply water by means of standpipes and water tanks Such an Order may only be made initially for three months and may only be extended to run for a maximum period of five months.

Environmental Drought Orders

The NRA also has new powers under the Environment Act 1995 to apply for Drought Orders to protect flora and fauna

APPENDIX 2

November River Flow Data for Major Rivers

Appendix 2 November river flow data for major rivers in England and Wales as % of November Average

Region/River	Gauging Station Location	% November Average
ANGLIAN		
Bedford Ouse	Offord	61
Witham	Claypole	148*
Waveney	Needham	22
Welland	Tinwell	39
Stour	Langham	86*
Nene	Orton	40
NORTH WEST		
Ribble	New Jumbles Rock	12
Derwent	Camerton	34
Eden	Sheepmount	30
Lune	Caton	15
Mersey	Ashton Weir	32
NORTHUMBRIA & YORKSHIRE		
Yorkshire Ouse	Skelton	54
Aire	Fleet	56
Calder	Methley	54
Wear	Chester-le-Street	45
Derwemt	Buttercrambe	41
Wharfe	Flint Mill	23
Tees	Low Moor	86
Tyne	Bywell	38
Swale	Crakehill	66
SEVERN TRENT		
Trent	Colwick	53
Teme	Tenbury	56
Severn	Bewdley	40
Avon	Evesham	41
Dove	Marston	48
Derwent	Derby	27

Region/River	Gauging Station Location	% November Average
SOUTHERN		
Stour	Horton	30
Medway	Teston	16
W Rother	Iping	41
Test	Chilbolton	78
Itchen	Easton	73
SOUTH WESTERN		
Exe	Thorverton	42
Tamar	Gunnislake	18
Bristol Avon	Bathford	58
Dart	Austins Bridge	41
Stour	Throop	60
Axe	Whitford	61
Hampshire Avon	Knapp Mill	59
Taw	Umberleigh	28
River Tone	Bishops Hull	70
THAMES		
Thames	Kingston	63
Kennet	Theale	85
Coln	Bibury	52
Lee	Fieldes Weir	38
WELSH		
Wye	Redbrook	88
Dee	Manley Hall	23
Tywi	Capel Dewi	61
Usk	Trostrey	97

* - High due to river support schemes.

APPENDIX 3

Reservoir Storage as at End of November

Appendix 3 Reservoir Storage as at End of November 1995

Region/Reservoir	% Full
ANGLIAN	
Abberton	57
Hanningfield	71
Rutland	46
Grafham	57
NORTHUMBRIA/YORKSHIRE	
Nidd/Barden	19
Calder Group	13
Washburn/Eccup Group	12
Don Group	24
Grimwith	15
Winscar	32
Lune/Balder	37
Cow Green	28
Durham Group	45
Kielder	90
NORTH WEST	
Haweswater	61
Thirlmere	56
Longendale	16
Macclesfield	16
Carlisle	96
Burnley Reservoirs	5
Rivington	22
Vyrnwy	32
Bolton	15
Pendle	22
Blackburn	22
Preston	36
Rossendale	14
Rochdale	9
Oldham	8

Region/Reservoir	% Full
Tameside	13
Stockport	13
SEVERN TRENT	
Clywedog	49
Derwent Valley	23
Tittesworth	17
Elan Valley	45
Carsington	40
Staunton Harold/Foremark	47
SOUTHERN	
Bewl Water	61
Ardingly	45
Weir Wood	42
Darwell	17
SOUTH WESTERN	
Wimbleball	34
Roadford	19
Colliford	42
Stithians	31
Burrator	45
THAMES	
Farmoor	100
Lee Valley	62
Thames Valley	73
WELSH	
Celyn	23
Brenig	81
Brianne	67
Llys y fran	43
Ystradfellte	100
Elan Valley	43
Big Five	53
Alwen	39

APPENDIX 4

Region Specific Schedules of Critical Sources - NRA assessments as at end of November

Northumbria/Yorkshire Region

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Nidd/Barden Group

Summary of Measures Currently in Place:

- Hosepipe ban in force, demand reduction & TV advertising
- Drought Orders in Force to increase abstraction form R.Wharfe and restriction of non essential use

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Use unsupported river sources as much as possible • Investigate increasing pump capacity at Lobwood to take more water from R Wharfe • Install link to transfer water from the Ouse to Bradford	Currently ongoing Before January As soon as possible
80%	*Source Management Measures* • Use unsupported river sources as much as possible • Increase pump capacity at Lobwood to take more water from R Wharfe • Install link to transfer water from the Ouse to Bradford	Currently ongoing Before January As soon as possible
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • To be considered	N/A
100%	*Demand Management Measures* • Continue increased leakage control measures	Ongoing
80%	*Demand Management Measures* • Further increased leakage control measures	Through the winter
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Greater than 90% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Approximately 70% capacity	

Responsibility for Actions:

Yorkshire Water

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Calder Group (Calderdale/Kirklees)

Summary of Measures Currently in Place:

- Hosepipe ban in force, demand reduction & TV advertising
- Drought Orders in Force to eliminate compensation discharge, and restriction of non essential use
- Tankering supplies

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Use grid sources as much as possible	Currently ongoing
80%	*Source Management Measures* • Use grid sources as much as possible	Currently ongoing
100%	*Authorisations Management Measures* • No further measures	
80%	*Authorisations Management Measures* • No further measures	
100%	*Demand Management Measures* • Continue increased leakage control measures	Ongoing
80%	*Demand Management Measures* • Further increased leakage control measures	Through the winter
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Calderdale 100%, Kirklees 90%	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Calderdale 75%, Kirklees 85%	

Responsibility for Actions:

Yorkshire Water

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Washburn/Eccup

Summary of Measures Currently in Place:

- Hosepipe ban in force, demand reduction & TV advertising
- Drought Orders in Force (Ouse & Arthington), restriction of non essential use
- Tankering of supplies

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Use river sources as much as possible • Maximise grid exports from East where possible • Use Arthington to maximum licensed value where possible	 Currently ongoing Ongoing Ongoing
80%	*Source Management Measures* • Use river sources as much as possible • Maximise grid exports from East where possible • Use Arthington to maximum licensed value where possible	 Currently ongoing Ongoing Ongoing
100%	*Authorisations Management Measures* • None	
80%	*Authorisations Management Measures* • None	
100%	*Demand Management Measures* • Continue increased leakage control measures	Ongoing
80%	*Demand Management Measures* • Continue increased leakage control measures	Winter
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	

Responsibility for Actions:

Yorkshire Water

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Southern Pennines

Summary of Measures Currently in Place:

- Hosepipe ban in force
- Drought Order application made for restrictions on use and compensation arrangements

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • Use river sourcesand grid as much as possible	Currently ongoing
100%	*Authorisations Management Measures* • None	None
80%	*Authorisations Management Measures* • Drought Order for compensation reduction	Decision awaited
100%	*Demand Management Measures* • Continue leakage control measures	Ongoing
80%	*Demand Management Measures* • Increased leakage control measures	Winter
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Approximately 90% capacity	

Responsibility for Actions:

Yorkshire Water

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Winscar

Summary of Measures Currently in Place:

- Hosepipe ban in force, demand reduction & TV advertising
- Drought Orders in force on linked sources; restriction of use and compensation reduction
- Tankering supplies

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Use grid sources as much as possible	Currently ongoing
80%	*Source Management Measures* • Use grid sources as much as possible	Currently ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Continue increased leakage control measures	Ongoing
80%	*Demand Management Measures* • Further increased leakage control measures	Winter
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 60% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 40% capacity	

Responsibility for Actions:

Yorkshire Water

Region:	*Source or Group of Sources:*
Northumbria/Yorkshire	Grimwith

Summary of Measures Currently in Place:

- Hosepipe ban in force, demand reduction & TV advertising
- Drought Orders in force on R.Wharfe
- Drought Orders in force to abstract water from non YWS sources

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Use unsupported river sources as much as possible • Investigate installation of pumps & temporary pipeline from R.Wharfe	Currently ongoing December
80%	*Source Management Measures* • Use river sources as much as possible • Investigate installation of pumps & temporary pipeline from R.Wharfe • Use Nidd reservoirs for refill	Currently ongoing December
100%	*Authorisations Management Measures* • Possible pumped refill option	Ongoing
80%	*Authorisations Management Measures* • Possible pumped refill option	Ongoing
100%	*Demand Management Measures* • Continue increased leakage control measures	Ongoing
80%	*Demand Management Measures* • Further increased leakage control measures	Through December to March
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 75% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 60% capacity	

Responsibility for Actions:

Yorkshire Water

North West Region

Region:	*Source or Group of Sources:*
North West	Blackburn Reservoirs

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Emergency pumping from Haweswater Aqueduct

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Reduce demand further as Stocks reservoir recovers	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Reduce demand further as Stocks reservoir recovers	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Goyt Reservoir (Stockport)

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Support from boreholes

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct via Audenshaw, and use of other Stockport sources as available	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct via Audenshaw, and use of other Stockport sources as available	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 60% capacity without additional support - Multi-season source	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 40% capacity without additional support - Multi-season source	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Oldham Reservoirs

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Emergency support from Haweswater Aqueduct

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct via Rochdale	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct via Rochdale	Ongoing
100%	*Authorisations Management Measures* • Drought Orders to reduce compensation from Piethorne and Castleshaw Reservoirs being applied for	Immediate
80%	*Authorisations Management Measures* • Drought Orders to reduce compensation from Piethorne and Castleshaw Reservoirs being applied for	Immediate
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Piethorne 40% capacity - needs further supply reduction by aqueduct transfer Castleshaw 90% capacity - may need further supply reduction by aqueduct transfer	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Piethorne 30% capacity - needs further supply reduction by aqueduct transfer Castleshaw 80% capacity - may need further supply reduction by aqueduct transfer	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Rochdale Reservoirs

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Emergency pumping from Haweswater Aqueduct

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct (work in hand)	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Haweswater Aqueduct (work in hand)	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Longdendale

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Drought Order in place for reduced compensation from Bottoms Lodge Reservoir

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain supply balancing to reduce demand on high risk sources	Ongoing
80%	*Source Management Measures* • Maintain supply balancing to reduce demand on high risk sources	Ongoing
100%	*Authorisations Management Measures* • Maintain Drought Order in line with refill policy	Ongoing
80%	*Authorisations Management Measures* • Maintain Drought Order in line with refill policy	Ongoing
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Burnley reservoirs

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Drought Orders in place to reduce compensation water from Hurstwood, Cant Clough, Swinden/Lee Green, Coldwell reservoirs
- Emergency pumping from Haweswater Aqueduct

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Reduce demand further as Pendle sources recover	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Reduce demand further as Pendle sources recover	Ongoing
100%	*Authorisations Management Measures* • Maintain Drought Orders in line with refill policy	Ongoing
80%	*Authorisations Management Measures* • Maintain Drought Orders in line with refill policy	Ongoing
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 92% capacity - does not include planned further reductions in demand above	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 70% capacity - does not include planned further reductions in demand above	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Haweswater & Thirlmere

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Drought Orders in place to allow additional pumping from Windermere & Ullswater
- Utilise full licensed pumping capacity

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain supply balancing to reduce demand on high risk sources	Ongoing
80%	*Source Management Measures* • Maintain supply balancing to reduce demand on high risk sources	Ongoing
100%	*Authorisations Management Measures* • Discuss options (including Drought Order) to ensure availability of R.Lune abstraction through refill period thus reducing demand on Lake District • Maintain Drought Orders in line with refill policy	Ongoing Ongoing
80%	*Authorisations Management Measures* • Discuss options (including Drought Order) to ensure availability of R.Lune abstraction through refill period thus reducing demand on Lake District • Maintain Drought Orders in line with refill policy	Ongoing Ongoing
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 80% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Rivington

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Drought Order in place to reduce compensation discharge

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain supply balancing to reduce demand • Increase support when available from Thirlmere Aqueduct	Ongoing
80%	*Source Management Measures* • Maintain supply balancing to reduce demand • Increase support when available from Thirlmere Aqueduct	Ongoing
100%	*Authorisations Management Measures* • Discuss options (including Drought Order) to ensure availability of River Lune abstraction through refill period thus reducing demand on Lake District • Maintain Drought Orders in line with refill policy	In Progress Ongoing
80%	*Authorisations Management Measures* • Discuss options (including Drought Order) to ensure availability of River Lune abstraction through refill period thus reducing demand on Lake District • Maintain Drought Orders in line with refill policy	Ongoing Ongoing
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 91% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 73% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Vyrnwy

Summary of Measures Currently in Place:

- Minimise Vyrnwy supply and balancing using groundwater
- Hosepipe ban in force

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain supply balancing to reduce demand	Ongoing
80%	*Source Management Measures* • Maintain supply balancing to reduce demand (unregulated Dee available later)	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy	Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 81% capacity	

Responsibility for Actions:

North West Water

Region:	*Source or Group of Sources:*
North West	Lamaload Reservoir (Macclesfield)

Summary of Measures Currently in Place:

- Distributing demand & resting sources to maximise refill
- Hosepipe ban in force
- Non essential use ban in place
- Support from boreholes

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Stockport system	Ongoing
80%	*Source Management Measures* • Maintain current supply balancing measures to reduce demand on these sources. Increase transfer from Stockport system	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
80%	*Demand Management Measures* • Maintain hosepipe ban in line with refill policy • Maintain non essential use ban in line with refill policy	Ongoing Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 60% capacity without additional support - Multi-season source, failure to refill can be accommodated	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 45% capacity without additional support - Multi-season source, failure to refill can be accommodated	

Responsibility for Actions:

North West Water

Severn Trent Region

Region:	*Source or Group of Sources:*
Severn Trent	Elan Valley

Summary of Measures Currently in Place:

- Minimise supply output
- Regionwide hosepipe ban
- Maximise abstractions from R. Severn to substitute Elan supplies

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • Transfer R.Severn licence quantity from Hampton Loade to Trimpley (by agreement with STW & South Staffs) • Vary Trimpley licence to increase winter abstraction from R.Severn	Initiate process in December Initiate process in December
100%	*Demand Management Measures* • Maintain hosepipe ban	N/A
80%	*Demand Management Measures* • Maintain hosepipe ban	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Elan Valley would be full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Elan Valley would be at 80% - 90% capacity	

Responsibility for Actions:

Severn Trent Water

Region:	*Source or Group of Sources:*
Severn Trent	Clywedog

Summary of Measures Currently in Place:

- Release kept to a minimum according to control rules

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • None	N/A
80%	*Demand Management Measures* • None	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Clywedog would be full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Clywedog would be full	

Responsibility for Actions:

Severn Trent NRA

Region:	*Source or Group of Sources:*
Severn Trent	Carsington Pumped Storage

Summary of Measures Currently in Place:

- Maximisation of opportunities for refill pumping over the winter

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Ensure full pumping capacity is available over the winter	Ongoing
80%	*Source Management Measures* • Ensure full pumping capacity is available over the winter	Ongoing
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • Consider Drought Order development to reduce winter river prescribed flow and maximise refill potential • Drought Order to reduce the R Derwent prescribed flow constraint	Within one month Within one month
100%	*Demand Management Measures* • None	N/A
80%	*Demand Management Measures* • None	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** >90% full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Carsington would be at 85 % capacity	

Responsibility for Actions:

Severn Trent Water

Region:	*Source or Group of Sources:*
Severn Trent	Derwent Valley

Summary of Measures Currently in Place:

- Minimise supply output
- Regionwide hosepipe ban

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • Drought Order development to reduce compensation discharge	Within one month
100%	*Demand Management Measures* • Maintain hosepipe ban	N/A
80%	*Demand Management Measures* • Maintain hosepipe ban	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Derwent Valley would be full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Derwent Valley would be at >90% capacity	

Responsibility for Actions:

Severn Trent Water

Region:	*Source or Group of Sources:*
Severn Trent	Tittesworth

Summary of Measures Currently in Place:

- Minimise supply output
- Regionwide hosepipe ban
- Use groundwater sources to make up supply deficit

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Cut supply output to zero	Ongoing
80%	*Source Management Measures* • Cut supply output to zero	Ongoing
100%	*Authorisations Management Measures* • Obtain licence variation to temporarily increase 5 year abstraction limit for groundwater sources	Within 1 month
80%	*Authorisations Management Measures* • Obtain licence variation to temporarily increase 5 year abstraction limit for groundwater sources • Drought Order to reduce compensation discharge and bring other potential compensation sources into use	Within 1 month Within 1 month
100%	*Demand Management Measures* • Maintain hosepipe ban	N/A
80%	*Demand Management Measures* • Maintain hosepipe ban	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Tittesworth would be full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Tittesworth would be at 90% capacity	

Responsibility for Actions:

Severn Trent Water

Region:	*Source or Group of Sources:*
Severn Trent	Staunton Harold/Foremark Pumped Storage

Summary of Measures Currently in Place:

- Minimise supply output
- Regionwide hosepipe ban
- Maximise opportunities for refill

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Ensure full pumping capacity available over the winter	Ongoing
80%	*Source Management Measures* • Ensure full pumping capacity available over the winter	Ongoing
100%	*Authorisations Management Measures* • No measures required as there is a reservoir storage dependent reduced prescribed flow clause in abstraction licence from R.Dove	N/A
80%	*Authorisations Management Measures* • No measures required as there is a reservoir storage dependent reduced prescribed flow clause in abstraction licence from R.Dove	N/A
100%	*Demand Management Measures* • Maintain hosepipe ban	N/A
80%	*Demand Management Measures* • Maintain hosepipe ban	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 70% - 75% capacity	

Responsibility for Actions:

Severn Trent Water

Southern Region

Region:	*Source or Group of Sources:*
Southern	Darwell Reservoir

Summary of Measures Currently in Place:

- Hosepipe ban currently in force in Sussex East Supply area
- Temporary transfer scheme from Bewl Water

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • Extension of present DO to permit temporary transfer from Bewl Water beyond March 1996 • Consideration of permanent transfer pipeline from Bewl to Darwell at 10 Ml/d. • Consideration of abstraction from R Medway below the present MRF to enable refill of Bewl Water	Over the winter Over the winter Over the winter
80%	*Authorisations Management Measures* • Extension of present DO to permit temporary transfer from Bewl Water beyond March 1996 • Consideration of permanent transfer pipeline from Bewl to Darwell at 10 Ml/d. • Consideration of abstraction from R Medway below the present MRF to enable refill of Bewl Water	Over the winter Over the winter Over the winter
100%	*Demand Management Measures* • Maintain hosepipe ban	N/A
80%	*Demand Management Measures* • Maintain hosepipe ban	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 80-90% capacity	

Responsibility for Actions:

Southern Water

South Western Region

Region:	*Source or Group of Sources:*
South Western	Roadford Strategic Supply Zone

Summary of Measures Currently in Place:

- Hosepipe ban in SW Devon
- Maximising the use of alternative river abstractions to rest reservoir sources
- Operational works at Littlehempston WTW to enable reuse & increase supplies
- Reviewing operational options to further aid Roadford refill
- Abandon 'Enhanced Flow' programme of releases
- Ceasing specific HEP releases

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures*	
	• Revise regulation release arrangements to minimise losses	In time for next summer
	• Identify drought recovery source operating arrangements	December
	• Maximise use of Upper Tamar lake over winter	Over the winter
	• Consider Lower Tamar Lake refill & use	December
	• Arrangements to transfer Morwellham HEP for PWS use	3 months
	• Assess and promote emergency pumped storage scheme(s)	December
	• Refurbish radial collectors (R Dart)	Within 3 months
	• Discuss and document drought operating arrangements for strategic sources in 1996	In time for next summer
80%	*Source Management Measures*	
	• Revise regulation release arrangements to minimise losses	December
	• Identify drought recovery source operating arrangements	December
	• Maximise use of Upper Tamar lake over winter	Over the winter
	• Consider Lower Tamar Lake refill & use	December
	• Arrangements to transfer Morwellham HEP for PWS use	3 months
	• Assess and promote emergency pumped storage scheme(s)	1 month
	• Refurbish radial collectors (R Dart)	Within 3 months
	• Discuss and document droght operating procedures for strategic sources in 1996	In time for next summer

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Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Authorisations Management Measures* • Drought Order to increase annual abstraction from R.Taw @ Newbridge • Drought Order to reduce compensation releases when supply releases are made • Drought Order to reduce R.Tamar PF @ Gunnislake to 246 Ml/d • Consider Drought Order to transfer Meldon resources to Roadford • Drought Order to maximise Morwellham HEP for PWS • Consider Drought Order to reduce compensation flows • Consider Drought Order to abstract from Torridge @ Torrington • Reduce release transmission losses allowance • Drought Order(s) for emergency pumped storage scheme(s)	 December In time for summer In time for summer December In time for summer December December In time for summer December
80%	*Authorisations Management Measures* • Drought Order to increase annual abstraction from R.Taw @ Newbridge • Drought Order to reduce compensation releases when supply releases are made • Drought Order to reduce R.Tamar PF @ Gunnislake to 246 Ml/d • Consider Drought Order to transfer Meldon resources to Roadford • Arrangements to limit Morwellham HEP use • Drought Order(s) for emergency pumped storage scheme(s) • Drought Order to maximise Morwellham HEP use for PWS • Consider Drought Order to reduce compensation flows • Consider Drought Order to abstract from Torridge @ Torrington • Reduce release transmission losses allowance	 In time for summer In time for summer In time for summer December 3 months December December December December In time for summer
100%	*Demand Management Measures* • Review leakage control activities	 December
80%	*Demand Management Measures* • Prepare for hosepipe ban in Roadford supply zone area • Prepare for ban of non essential use in Roadford supply zone area • Review leakage control activities	 In time for summer In time for summer December
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 65% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 45% capacity. Despite taking measures above additional actions will be necessary to further conserve resources before next summer. These measures are currently being discussed between NRA & SWW.	
Responsibility for Actions: South Western NRA & South West Water		

Region:	*Source or Group of Sources:*
South Western	Colliford Strategic Supply Zone

Summary of Measures Currently in Place:

- Hosepipe ban in Cornwall
- Non essential use ban in Cornwall
- Drought Order Leswidden Pool, abstraction from unlicensed source (now exhausted)
- Drought Order Hawkstor Pit to, abstraction from unlicensed source
- Drought Order to reduce compensation at Stithians reservoir
- Drought Order on R.Hayle @ St Erth, PF reduction
- Drought Order Drift reservoir compensation reduction (not implemented)
- Maximising the use of alternative river abstractions to rest reservoir sources
- Ongoing review of capital works options to improve distribution and transfer system
- Continuing publicity
- Maximise use of Kennal Vale pump storage abstraction over the winter to aid Stithians refill

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • Capital works to link spine main to Stithians • Additional spine main duplication works • Revise regulation release arrangements to minimise losses	 In time for summer In time for summer December, in time for summer
80%	*Source Management Measures* • Capital works to link spine main to Stithians • Additional spine main duplication works • Revise regulation release arrangements to minimise losses	 In time for summer In time for summer December, in time for summer
100%	*Authorisations Management Measures* • Drought order to reduce compensation releases when supply releases are made • Consider Siblyback/Trekeivesteps drought order for winter pumped storage to Colliford • Review feasibility & benefits of winter compensation flow reduction Drought Order • Drought Order to use Hawkstor Pit source to pump store Colliford reservoir this winter	 In time for summer December December December
80%	*Authorisations Management Measures* • Drought order to reduce compensation releases when supply releases are made • Consider Siblyback /Trekeivesteps drought order for winter pumped storage to Colliford • Review feasibility & benefits of winter compensation flow reduction drought order • Drought Order to use Hawkstor Pit source to pump store Colliford reservoir this winter	 In time for summer December December December

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Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Demand Management Measures* • Investigate high demands in mid Cornwall • Review need for summer hosepipe ban • Review need for summer non essential use ban	 December By March By March
80%	*Demand Management Measures* • Investigate high demands in mid Cornwall • Prepare for summer hosepipe ban • Prepare for summer non essential use ban	 December By March By March
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 62% capacity.	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 61% capacity.	
Responsibility for Actions: South Western NRA & South West Water		

Region:	*Source or Group of Sources:*
South Western	Wimbleball Strategic Supply Zone

Summary of Measures Currently in Place:

- Review of operational measures & capital works options
- Publicity campaign
- Arrangements to implement Wimbleball pumped storage scheme by 11/96

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures*	
	• Revise regulation releases to minimise losses	December, in time for summer
	• Fast track Exebridge transfer improvements	December, in time for summer
	• Discuss Wessex Water conservation options to aid Wimbleball refill	December
	• Fast track Exebridge transfer improvements	December, in time for summer
	• Discuss Wessex Water conservation options to aid Wimbleball refill	December
	• Refurbish Exe Valley borehole sources	March, in time for summer
	• Discuss and document drought operating arrangements for strategic sources in 1996	December, in time for summer
	• Consider emergency pumped storage scheme	December
80%	*Source Management Measures*	
	• Revise regulation releases to minimise losses	December, in time for summer
	• Review target refill level requirements	December, in time for summer
	• Fast track Exebridge transfer improvements	December, in time for summer
	• Discuss Wessex Water conservation options to aid Wimbleball refill	December
	• Fast track Exebridge transfer improvements	December, in time for summer
	• Discuss Wessex Water conservation options to aid Wimbleball refill	December
	• Refurbish Exe Valley borehole sources	March, in time for summer
	• Discuss and document drought operating arrangements for strategic sources in 1996	December, in time for summer
	• Consider emergency pumped storage scheme	December

Continued on next page

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
80%	*Authorisations Management Measures* • Drought Order to reduce compensation releases when supply releases are being made • Drought Order to reduce compensation flows this winter • Drought Order to reduce R.Exe PF @ Thorverton • Drought Order for emergency pumped storage scheme from R.Pulham • Obtain authorisation to continue use of Otterton boreholes next summer • Obtain authorisation to increase abstraction from Pinhay springs	In time for summer December In time for next summer December December, in time for summer December, in time for summer
100%	*Demand Management Measures* • Implement publicity campaign • Review leakage control activity	December December
80%	*Demand Management Measures* • Prepare for possible hosepipe ban in Wimbleball strategic supply zone • Prepare for possible non essential use ban in Wimbleball strategic supply zone • Discuss need for demand management measures in Wessex Water area • Implement publicity campaign • Review leakage control activity	In time for next summer In time for next summer In time for next summer December December
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 99% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 64% capacity.	
Responsibility for Actions: South Western NRA, South West Water & Wessex Water		

Thames Region

Region:	*Source or Group of Sources:*
Thames	All Surface Water Sources

Summary of Measures Currently in Place:

- Maximising abstraction for refill subject to operating agreements and licence conditions

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • None	N/A
100%	*Demand Management Measures* • Water Companies to continue with leakage detection programmes • NRA to continue publicising wise use of water	N/A N/A
80%	*Demand Management Measures* • Water Companies to continue with leakage detection programmes • NRA to continue publicising wise use of water	N/A N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100% capacity	

Responsibility for Actions:

Thames NRA & Water Companies

Welsh Region

Region:	*Source or Group of Sources:*
Welsh	South East Wales Conjunctive Use area

Summary of Measures Currently in Place:

- Vulnerable sources are being mamanged so as to reduce demands put upon them

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • Drought Order for Usk reservoir - compensation reduction	Review need for in December
80%	*Authorisations Management Measures* • Drought Order for Pontisticill - compensation reduction • Drought Order for Usk reservoir - compensation reduction	Review need for in December Review need for in December
100%	*Demand Management Measures* • None	N/A
80%	*Demand Management Measures* • None	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Usk 75% capacity Pontsticill - Full	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** Usk 55% capacity Pontsticill - Full	

Responsibility for Actions:

Welsh Water

Region:	*Source or Group of Sources:*
Welsh	Dee; Celyn & Brenig

Summary of Measures Currently in Place:

- Reduced residual flow to estuary
- Revised operation of Llyn Tegid
- Hosepipe ban in North West Water area

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • Dee & Clwyd Act 1973 permits changes to conserve resource, e.g. reduced residual flow	In place
80%	*Authorisations Management Measures* • Dee & Clwyd Act 1973 permits changes to conserve resource • Drought Order to reduce Celyn compensation	In place Review need for in December
100%	*Demand Management Measures* • 5% reduction in intake from R.Dee	Ongoing
80%	*Demand Management Measures* • 5% reduction in intake from R.Dee	Ongoing
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 90% capacity	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 78% capacity - additional demand reduction measures required.	

Responsibility for Actions:

NRA & relevant Water Companies.

Region:	*Source or Group of Sources:*
Welsh	Alwen

Summary of Measures Currently in Place:

- None

Scenario	*Actions Necessary Given Rainfall Scenarios*	*Urgency of Actions*
100%	*Source Management Measures* • None	N/A
80%	*Source Management Measures* • None	N/A
100%	*Authorisations Management Measures* • None	N/A
80%	*Authorisations Management Measures* • Drought Order to reduce compensation flow	Review need for in December
100%	*Demand Management Measures* • None	N/A
80%	*Demand Management Measures* • None	N/A
100%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100%	
80%	***Position at Start of Drawdown Season Given Actions Above in Place:*** 100%	

Responsibility for Actions:

Welsh Water

APPENDIX 5

Yorkshire Water Capital Programme to Alleviate Drought

YORKSHIRE WATER CAPITAL PROGRAMME TO ALLEVIATE DROUGHT

The programme will be complete by the spring of next year. It will make more water available in the region, and increase the ability to transfer it from east to west. As a result, an additional 132 thousand cubic metres (28 million gallons) per day would be available to West Yorkshire if needed.

Six major pumping stations will be built, and a total of 29 km of pipeline will be added to Yorkshire Water's grid network. The major water transfer scheme involves bringing water from the River Ouse to Leeds, and then transferring it by a new 22 km pipe linking Eccup reservoir to Graincliffe water treatment works near Bradford. This will allow extra raw water to be brought in to supplement supplies in the Bradford, Kirklees and Calderdale areas.

The granting of abstractions licences will be necessary for the additional investment to be fully effective, and discussions continue to take place with the National Rivers Authority. Initially, the company will be seeking time limited licences in order to deal with the short/medium term situation while the longer term is being assessed.

Some £13M has been spent since April on a range of capital projects to help maintain supplies to customers in West Yorkshire, and improve the capacity of the grid to move water from the rest of the region where supplies were more plentiful to the badly affected areas of Calderdale, Kirklees and Bradford. These included the installation of pumps and pipelines to transfer more water from the grid into the affected areas; the installation of pumping stations and mains to transfer water from the Bradford system to Halifax; increased leakage reduction activity, and provision of facilities to mount the tanker operation.

This will now be supplemented with a further £50M worth of projects to be completed by the spring of 1996. The projects will utilise new and existing abstraction licences on the Rivers Ouse and Wharfe and allow additional water to be transferred by pipeline to the areas badly affected by this years' exceptionally low rainfall.

They include:

A £6.6M scheme to uprate the transfer capacity between the Ouse at Moor Monkton and Eccup reservoir.

A £3.5M scheme to upgrade the company's pumping station at Arthington on the river Wharfe, to maximise the company's existing abstraction licence.

A £13M scheme to bring water in to the west from Leeds. A 22km pipeline will be laid to link Eccup reservoir near Leeds to Graincliffe water treatment works near Bradford. This link will allow extra raw water to be provided if necessary to supplement supplies in the Bradford, Kirklees and Calderdale areas. Orders have already been placed for the construction of this scheme which will be completed in March 1996.

Other schemes totalling £16M which will improve the ability to transfer water around the region.

Finally, work begins shortly on the pilot projects costing £12M in Bradford and Calderdale announced last month, to assess new ways of reducing leakage from the mains system. The project will provide valuable information to help identify future work in this area, and supplement the £330M long term investment programme to renew or refurbish 1770 km of mains which will reduce leakage.

A further package of proposals is expected to be announced by Yorkshire Water during December.

NB: Reproduced from statements by Yorkshire Water.

APPENDIX 6

Proposed Tees/Ouse Link

PROPOSED TEES/OUSE LINK - THE YORKSHIRE WATER VIEW

There is potential to augment the water resources available to Yorkshire Water by constructing a link from one of Northumbrian Water's installations on the River Tees in the Darlington area. Such a link could make use of existing abstraction licences on the Tees. These abstractions are supported during low flows by releases from reservoirs in the Tees catchment, augmented when necessary by pumped transfers from the River Tyne, augmented by releases from Kielder Reservoir.

This note describes the broad options available and the potential benefits to Yorkshire Water.

Alternative Options

The link could take the form of a relatively short pipeline and pumping station to transfer water to one of the tributaries of the River Ouse - either the River Swale (c 30 Km) or the River Wiske (c 15 Km). In either case, the transfers would be used to augment low flows in the River Ouse and thus enable increased abstractions to be made from the river at Moor Monkton. There are significant environmental considerations associated with discharging Tees water into either river which will need substantial investigation work.

As an alternative, a pipeline could be constructed from the Tees to the existing Ouse/Eccup pipeline at Moor Monkton (c 50Km). Such a transfer would only be operated when flows in the River Ouse were below a prescribed value which limited abstractions. Whilst this would be a much larger scheme to engineer, there would be no environmental implications associated with transferring water from one river to another.

Relationship with Short-term Drought Situation

There is no surplus pumping and pipeline capacity available at present to transfer additional water from the River Ouse to the Leeds area. Plans are in place to increase this transfer capacity, but design and construction of the scheme will take several months. In addition, treatment facilities in the Leeds area will need augmentation, in particular, treatment processes will have to cope with an increased proportion of river water with the attendant problems of pesticides, taste and odour.

Taken together, the engineering implications of this work mean that even if work on a Tees link were started immediately, it would be of no practical benefit in the short-term drought situation.

The short-term situation in the Leeds area is being safeguarded by additional abstractions from the Ouse and the Wharfe facilitated by Drought Orders together with major transfers into the area by road tanker.

No further relief could be given to the Calderdale and Kirklees areas at present if a link from the Tees were available.

Further tankers and accessible tankering points are being investigated with urgency, however further volumes of water will not be available within the short timescales covered by the emergency Drought Order.

Benefit for Winter Refill

The reservoirs in Yorkshire will fill over the winter in the event of average rainfall. If, however, rainfall is exceptionally low, it will be necessary to seek extensions to Drought Orders for river abstractions and compensation discharges to safeguard supplies for next summer.

Benefits in Future Years

Yorkshire Water is reviewing its resources strategy to safeguard supplies for next summer and thereafter in the event of a repeat of this summer's drought. One of several options being considered is a Tees link together with the works necessary to treat and transmit the additional water in Yorkshire.

Preliminary discussions have been held with Northumbrian Water and the NRA. A final decision on the viability of this option will be taken in January 1996 and with this timescale, it would be possible to safeguard increased abstractions from the River Ouse during low flows in summer 1996.