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Early drought prospects 2007

November 2006

Early drought prospects for 2007

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Summary

The drought continues in south east England, despite wetter weather in August, September and October 2006. In some places groundwater levels are exceptionally low. Even average rainfall through the winter will leave some aquifers at very low levels. Water companies in Kent and Sussex cannot rule out restrictions on water use next year unless the winter is wet.

Water companies must make sure that they take steps to cope with a dry winter. While the Met Office's long range weather forecast suggests that the winter will have average or higher rainfall, there is considerable uncertainty associated with this forecast. It remains possible that this winter could be dry.

Another winter like last year, with about 80% of average rainfall, would lead to hosepipe restrictions across much of south east England. Water companies would consider non-essential use drought orders in parts of the south east, though most believe that they would be able to avoid using these restrictions unless the summer is hot and dry.

A very dry winter, with about 60% of average rainfall, would give widespread water supply problems across the south east and spreading into the south west. Hosepipe bans would be extensive and some water companies would need to use non-essential use drought orders to manage demand. Such a winter is very unusual but has been seen before. For example, the Thames catchment had less than half of average rainfall in the winter of 1975-76.

All water companies are taking the risk of a dry winter very seriously and are taking steps to make sure that water supplies are secured. These include campaigns to save water, additional leakage control, and the preparation of drought permit and drought order applications to use if the winter is dry.

We recommend that water companies at risk from a dry winter should:

- Keep their customers informed of the risk so that people can help to save water.
- Put extra effort into leakage control, so that they save as much water as possible.
- Make sure that arrangements for bulk supplies from neighbouring companies are agreed in advance.
- Maximise supplies this winter, pumping water into reservoirs and resting groundwater sources wherever possible.
- Apply for drought permits or orders to take more water from the environment as soon as it is clear that these are necessary: in general, winter drought permits and orders cause less environmental damage and help to secure summer water supplies.
- Bring forward engineering schemes to improve the robustness of their supply networks, even if these are not planned until later in the funding cycle.
- Make sure that they have enough steps planned to deal with a very dry winter so that they can avoid serious supply restrictions later in the year.

Other abstractors should also be aware of the risk to their sources of water. If the winter is dry, prospects for spray irrigation could be poor in some places. We will work with farmers to evaluate the risk and to plan any irrigation restrictions that are necessary next year.

We will monitor prospects through the winter and report again in February.

1 Introduction

This report is the Environment Agency's first look at prospects for water resources in England and Wales in 2007.

Parts of England have been suffering from drought since 2004. Groundwater levels and river flows have been very low, leading to environmental damage including dry river headwaters, fish deaths and algal blooms. In the summer of 2006, eight water companies in south east England banned hosepipe use by 15.6 million people: for 3.4 million this was the second consecutive summer of water restrictions. Four water companies applied to the Secretary of State for the Environment for powers to restrict other uses of water. Sutton and East Surrey Water used these drought powers to restrict the watering of playing fields, some commercial car washes and some other uses.

Prospects for 2007 depend on this winter's rainfall. The drought is not over yet, but wetter weather in August, September and October has improved river flows and groundwater levels have started to increase in some places.

This report looks first at the position at the end of October 2006, and then considers the impact of different winter rainfall scenarios on prospects for 2007.

2 Water resources – October 2006

2.1 Rainfall

In the two years between October 2004 and September 2006 large parts of England and Wales had below-average rainfall (figure 1). The driest areas are spread across the south of England, from Cornwall in the west to Kent in the east. South Wales, the East and West Midlands and the Fens have also been dry. Only parts of northern England, north Norfolk and north Wales have had above average rainfall over the last two years.

The year from October 2005 to September 2006 was not as dry as the same period in 2004-05 (figure 2), but large parts of southern and eastern England had below average rainfall in this period. The 12 months from October to September are generally accepted to be the “water year” in the UK. Groundwater levels and river flows are normally at their lowest in September, with recovery starting in October.

Some months have been exceptionally dry. In January 2006 nowhere in England or Wales had above half of average rainfall, and many areas had only a third of the average for the month. June and July 2006 were also exceptionally dry across England and Wales, and July was the hottest on record. In contrast, August and September had average rainfall or above across most of England. In parts of Wales and south west England the dry weather continued through August and September. In October 2006, the whole of England and Wales had average rainfall or above.

Cumulative rainfall over the two years from October 2004 to September 2006 shows that in south east England this drought is similar to the worst droughts of the last hundred years (figure 3).

2.2 River flows

By the end of October river flows had risen following the rainfall of early autumn, with most in the normal range for the time of year (figure 4). Some groundwater-fed rivers and streams in southern England are still very low and some stream heads remain dry.

2.3 Groundwater levels

There is some evidence that groundwater levels are starting to respond to the autumn rain, but the picture is patchy (figure 5). Some boreholes are approaching normal levels for the time of year, but others are still extremely low. Levels are especially low in the chalk of the Thames Valley and along the south coast.

2.4 Reservoirs

Reservoir levels have started to increase, and levels at all of the reservoirs of south east England are in the normal range for the time of year (figure 6). Reservoirs in Wales are approaching normal levels for the time of year. Some reservoirs in the south west of England are at low levels.

3 Long-range weather forecast

The UK Met Office has revised the long-range weather forecast to predict that this winter is most likely to be average or warmer than average across the UK, with rainfall levels also average or above-average from December to February.

If this forecast proves accurate, the winter should be wetter than last year. It is important to remember that long-range weather forecasting is very difficult and the Met Office identifies several sources of uncertainty in this year's winter forecast. These include a weak El Niño that could lead to colder and drier weather for northern Europe.

We must continue to consider a full range of possible weather conditions over the winter. South east England had between 80% and 90% of average rainfall last winter (October 2005 to March 2006) and about 85% of average rainfall in the winter of 2004-05. Low rainfall is very unusual but possible: for example, the Thames catchment had under half of average rainfall in the winter of 1975-76 and about 60% of average rainfall in the winter of 1992-93.

Figure 1 Rainfall October 2004 to September 2006

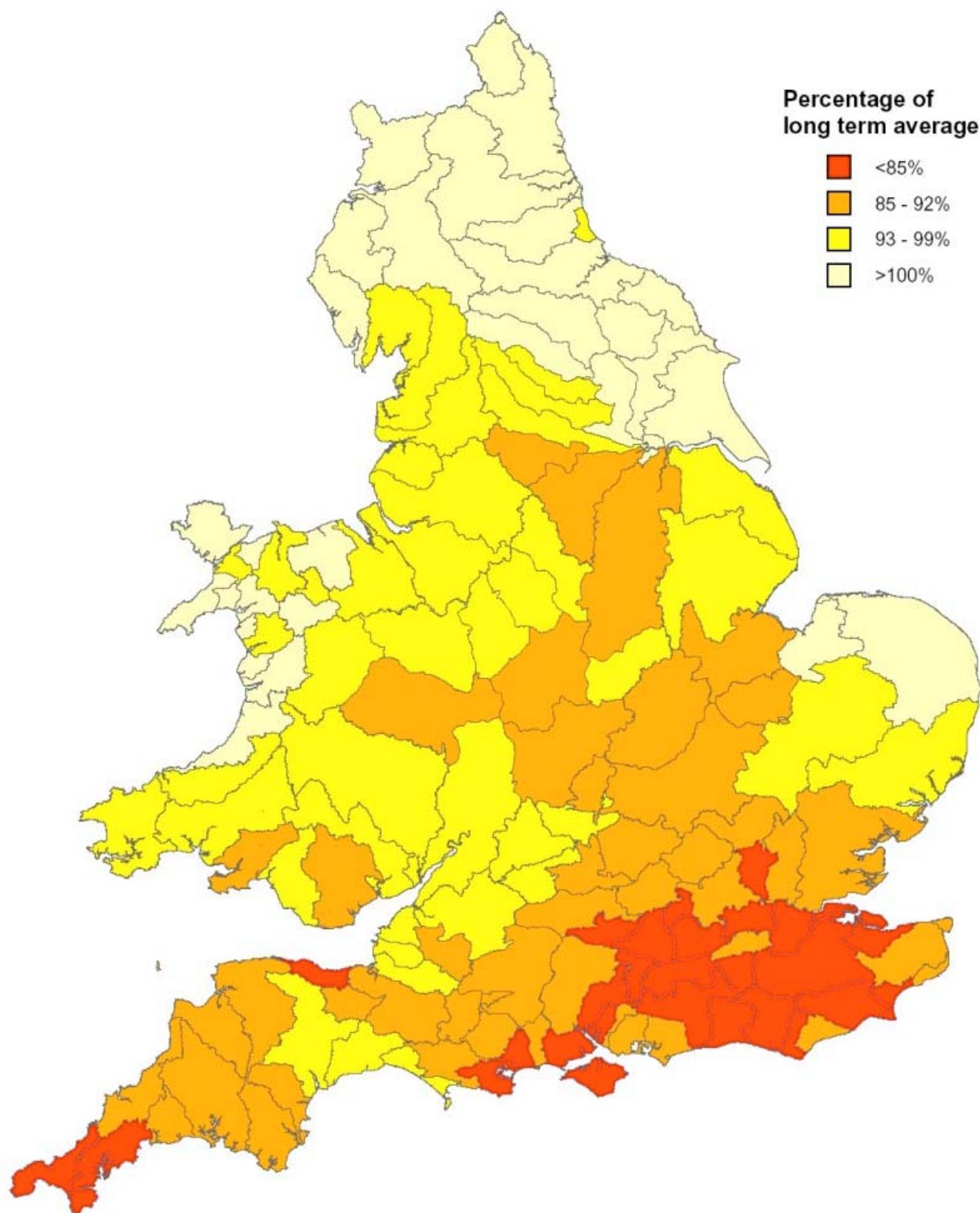
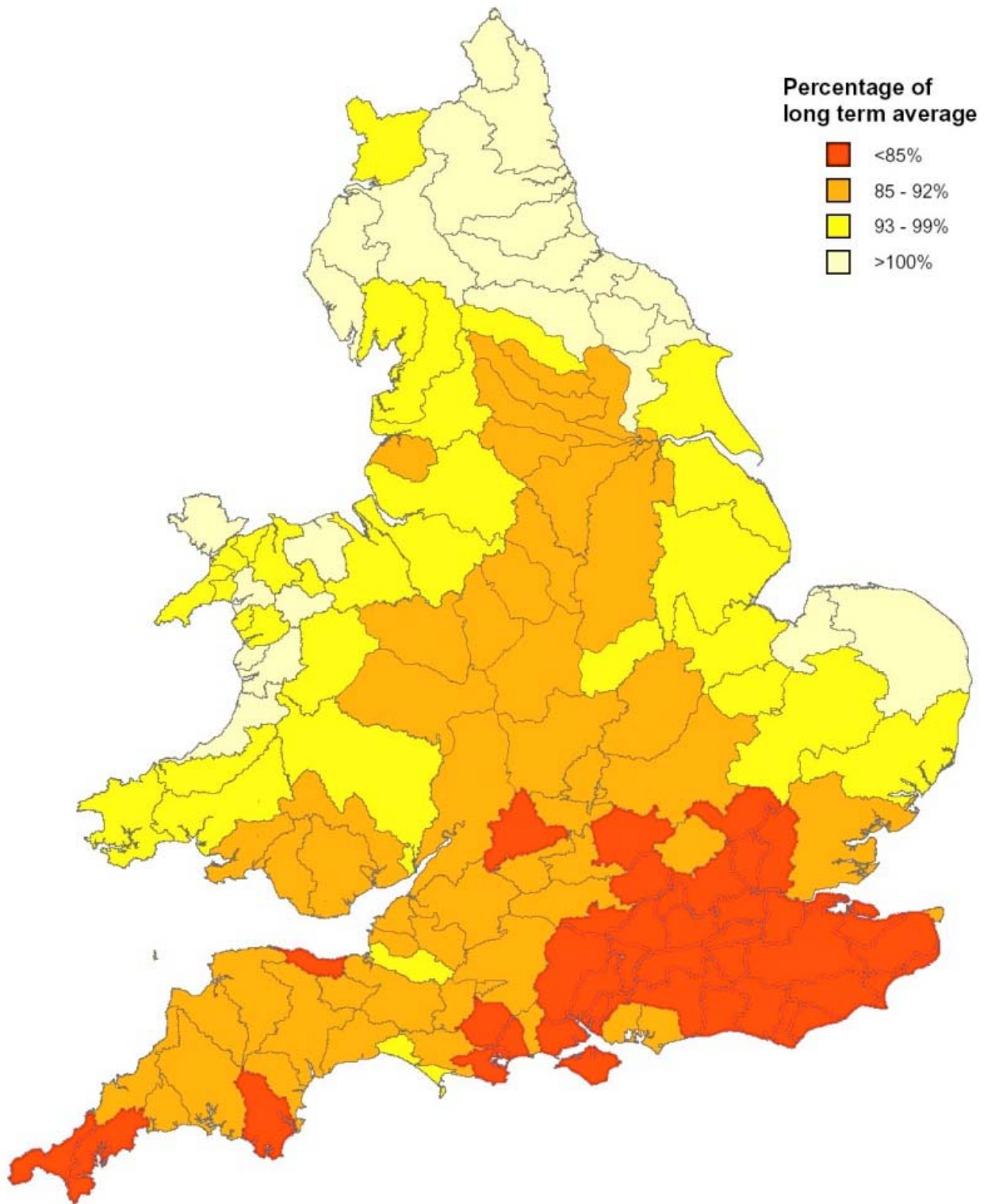


Figure 2 Rainfall October 2004 to September 2005



Rainfall October 2005 to September 2006

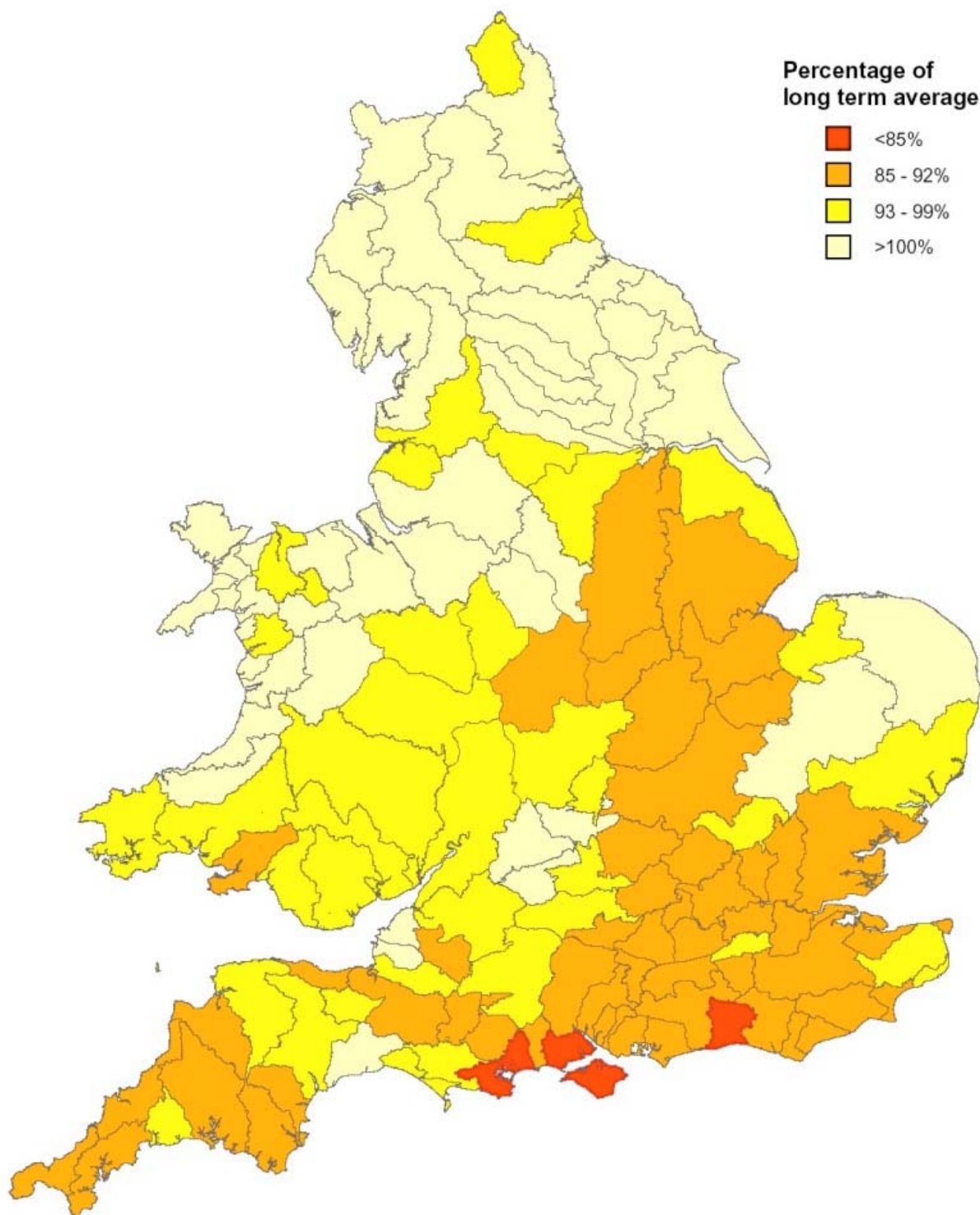
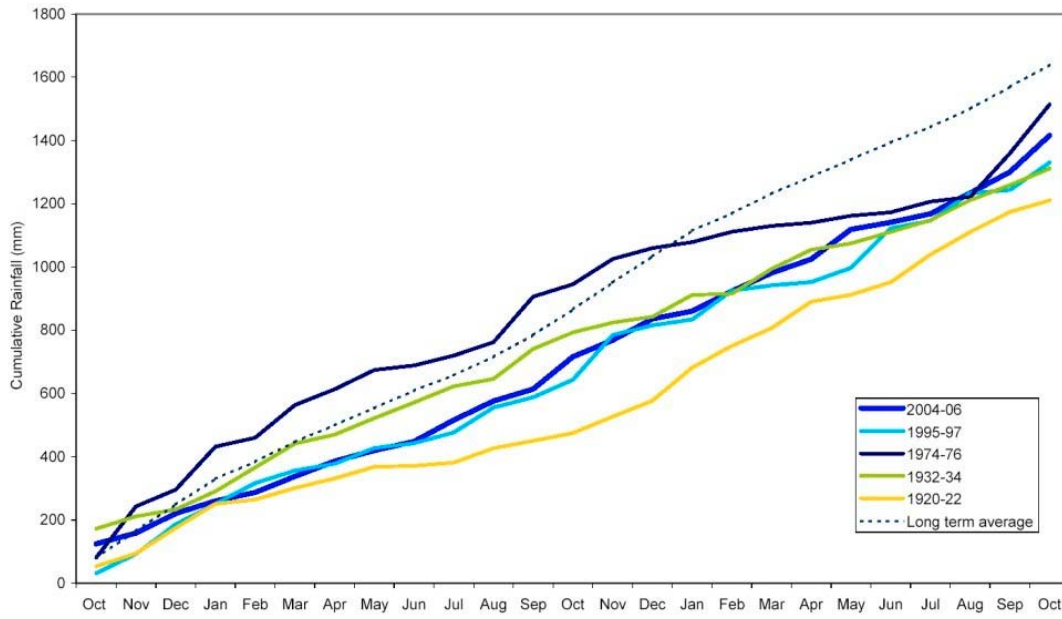


Figure 3 25-month cumulative rainfall for different drought years: Southern Region



25-month cumulative rainfall for different drought years: Thames Region

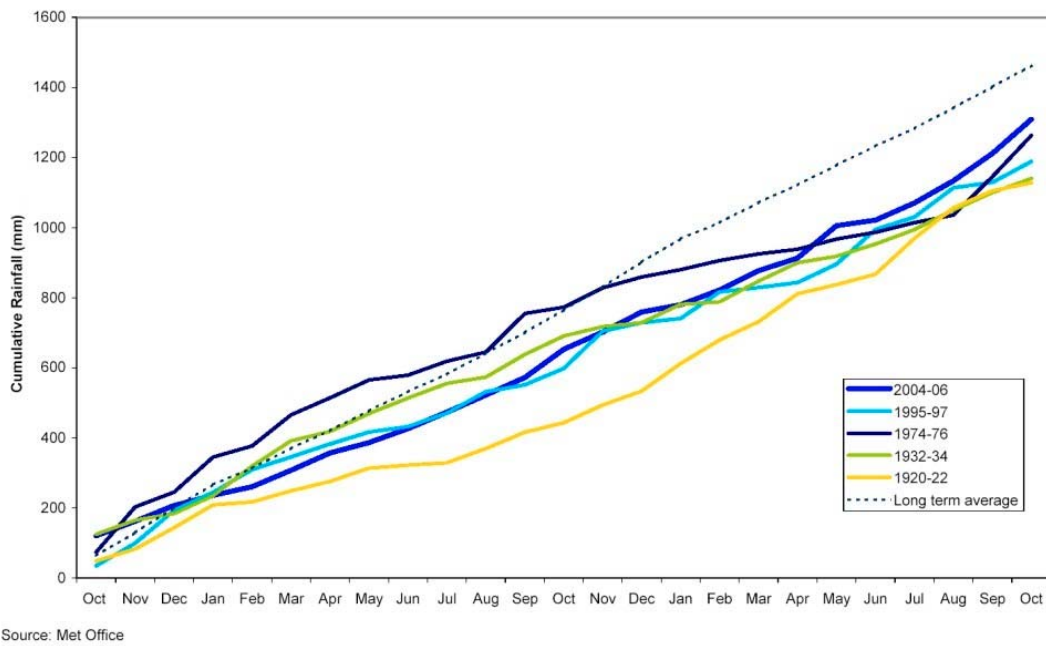


Figure 4 Average monthly river flows in England and Wales for October 2006

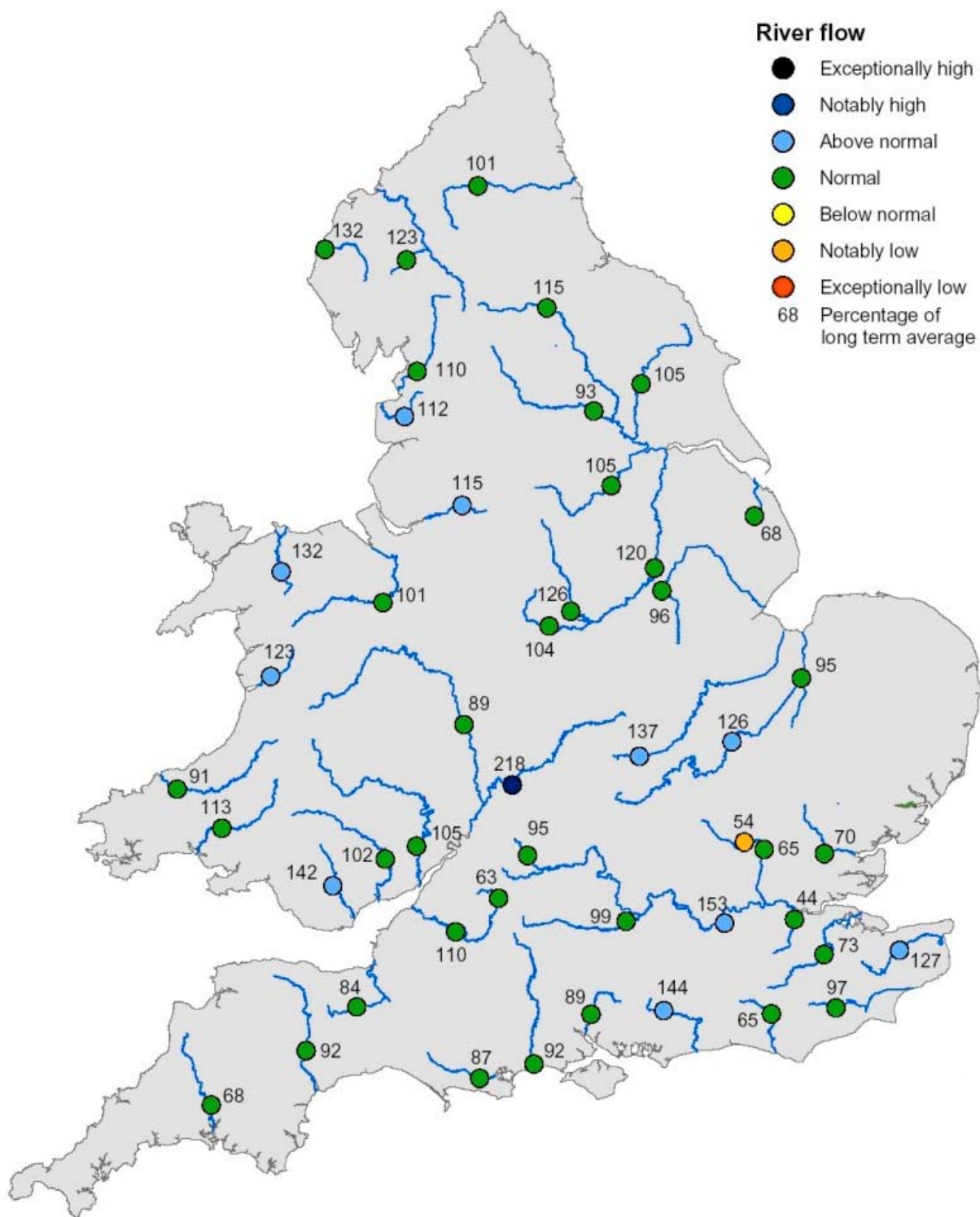


Figure 5 Groundwater levels in England and Wales at the end of October 2006

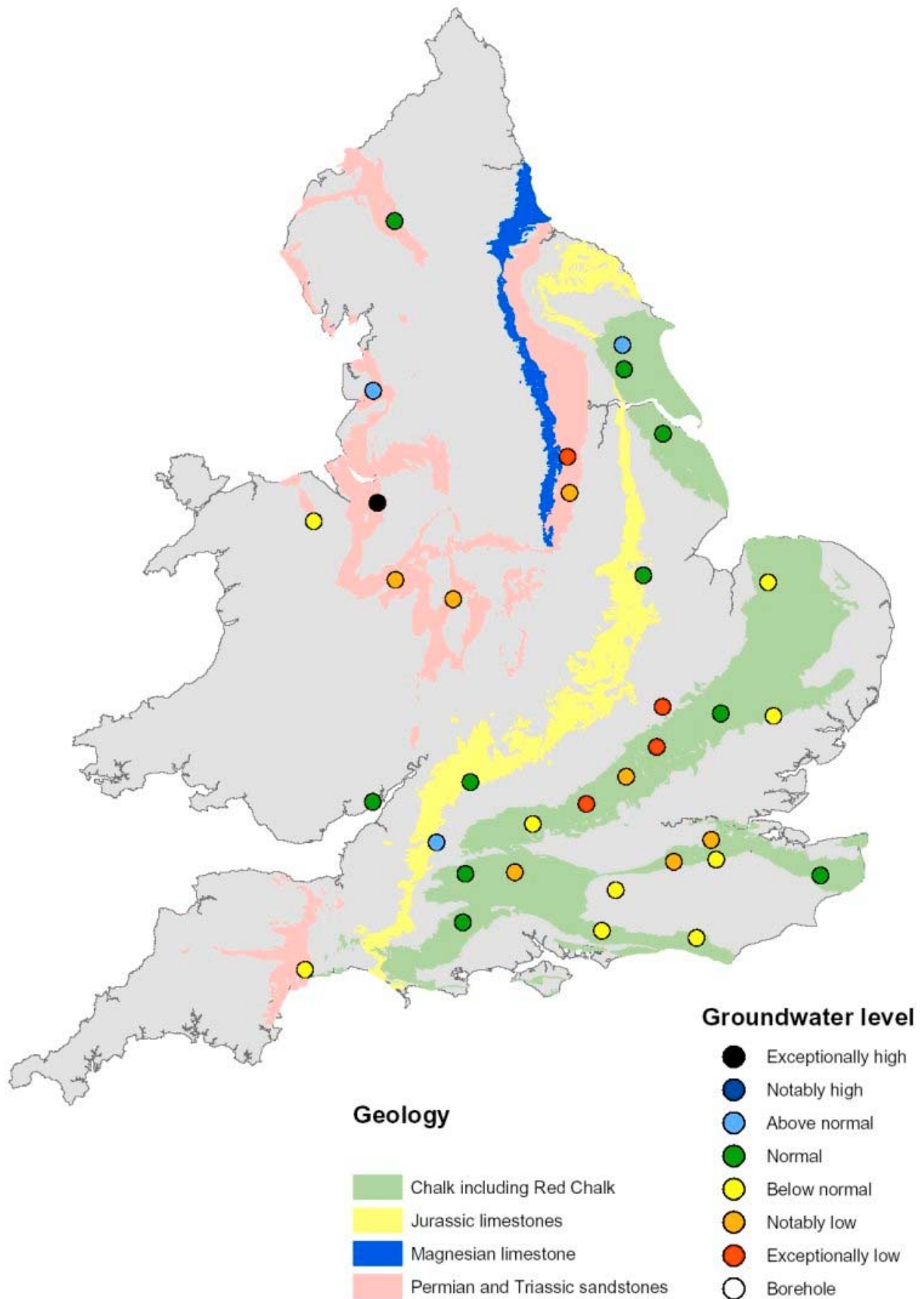
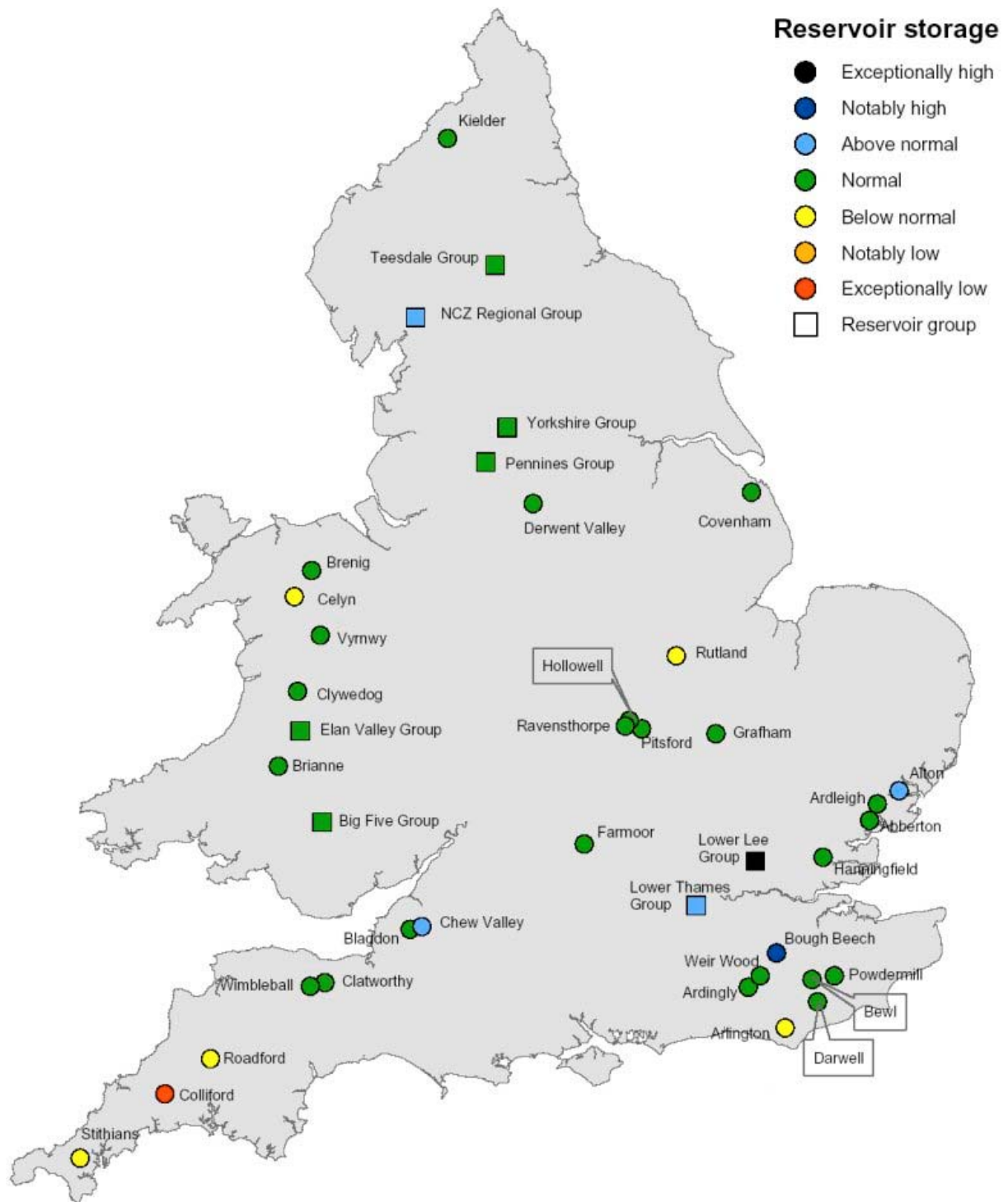


Figure 6 Reservoir levels in England and Wales at the end of October 2006



4 Prospects for groundwater levels and river flows in 2007

The extent of drought in 2007 depends greatly on the rainfall this winter. Winter rainfall fills reservoirs and replenishes groundwater. Groundwater is especially important in south east England, where nearly three-quarters of public water supply is drawn from underground sources.

The Environment Agency has a variety of numerical groundwater models for the major aquifers of south east England. These allow us to look at future groundwater levels under a series of different rainfall scenarios. This lets us evaluate the impact of a dry winter on river flows and the environment. We have also passed this information to water companies to use in their own assessments of the impact on public water supply.

Using these computer models, we have looked at groundwater levels in 2007 with three different rainfall scenarios: 60% of average rainfall from October to March, 80% of average rainfall from October to March, and average rainfall. Our detailed modelling allows us to predict both the increase in groundwater levels through the winter and the time at which this increase will start to show in boreholes and wetlands.

We have summarised groundwater prospects for 2007 under these three rainfall scenarios (figures 7, 8 and 9). In summary:

- With average rainfall, most aquifers will recover to close to normal levels by the end of the winter. Some aquifers in Kent and the Thames Valley will end the winter with levels that are low but higher than last year.
- With 80% of average rainfall, most aquifers will recover but many parts of south east England will still have low groundwater levels by the end of the winter. Levels will be similar to those in spring 2005.
- With 60% of average rainfall, recovery of groundwater resources will be limited. Across south east England groundwater levels will be low or exceptionally low by the end of the winter. Some boreholes may be at or near record low levels, particularly in parts of Kent and the Thames Valley.

In most catchments, river flows can respond quickly to rainfall. Even in a dry winter there are usually periods of heavy rainfall, and these lead to rapid increases in river flow and sometimes flooding.

Many of the chalk streams and rivers of southern England are dependent on groundwater to maintain flows through dry periods. If groundwater levels are low at the end of the winter, we expect to see dry stream heads and low river flows through the spring and summer. This year, low flows led to fish deaths and algal blooms. With 80% of average rainfall, we would expect to see similar levels of fish death and algal blooms in the summer of 2007. With 60% of average rainfall over the winter, we would expect to see significantly more environmental damage next spring and summer.

Figure 7 Projected groundwater levels at the end of March 2007 with 60 per cent of average rainfall.

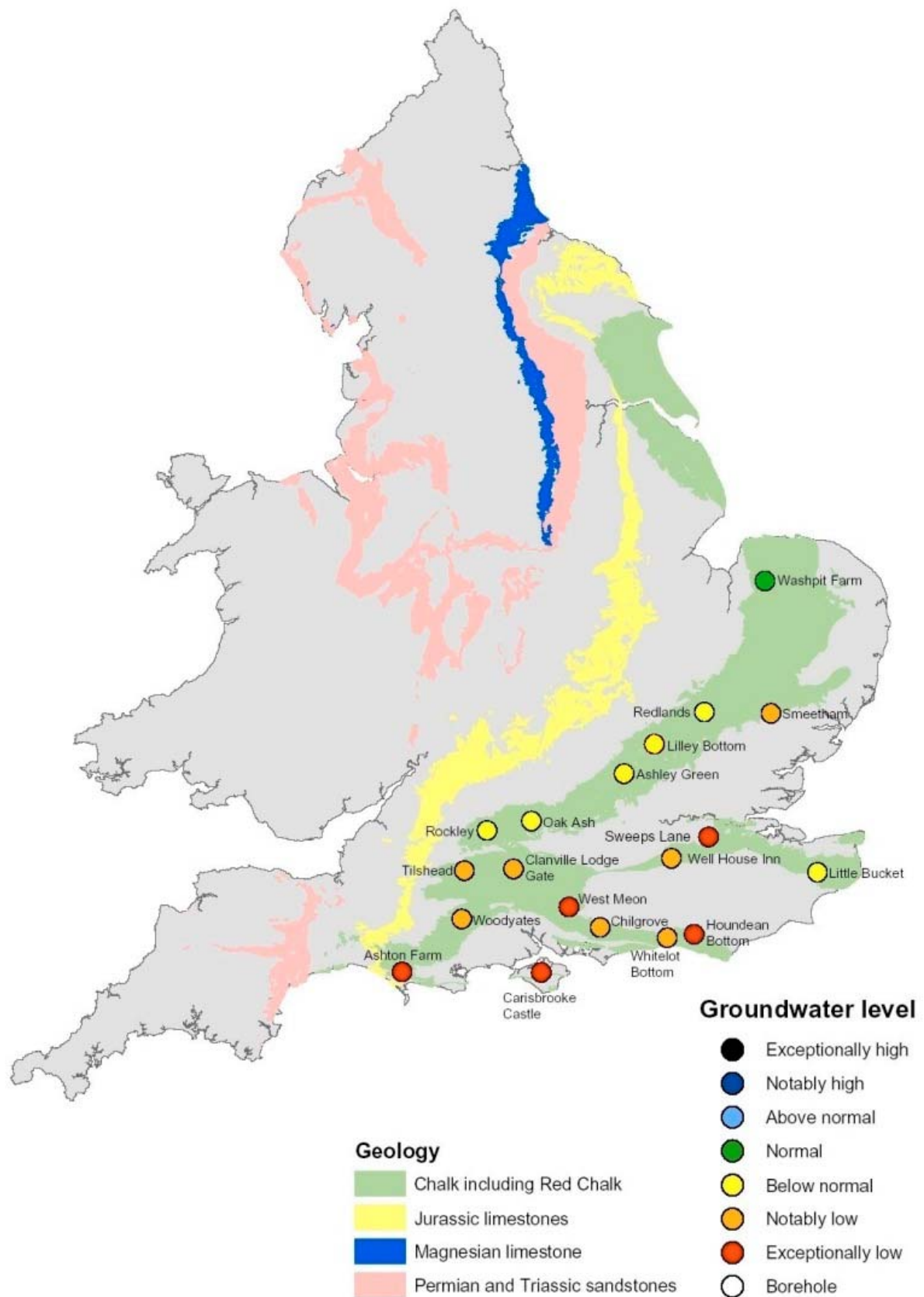


Figure 8 Projected groundwater levels at the end of March 2007 with 80 per cent of average rainfall.

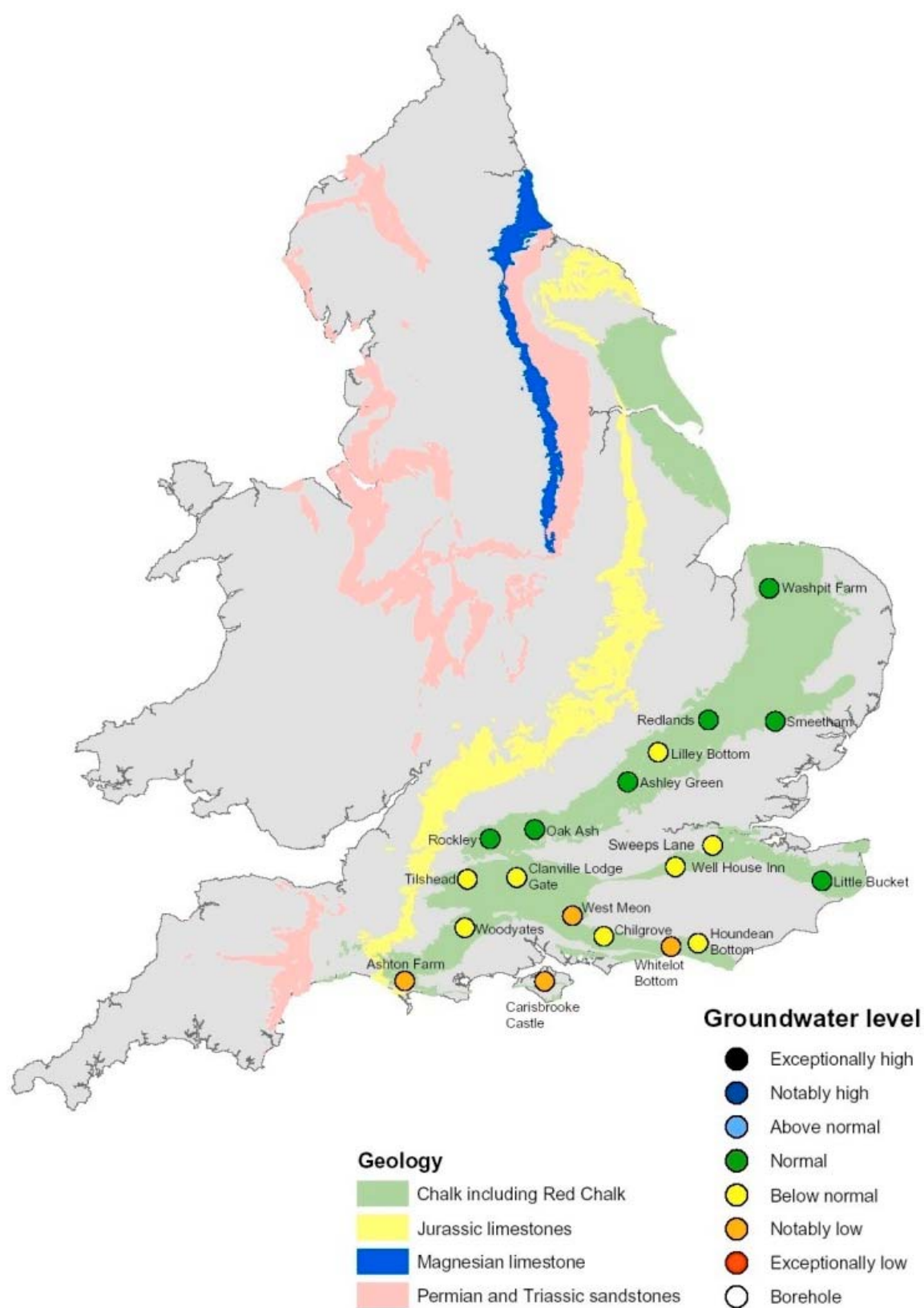
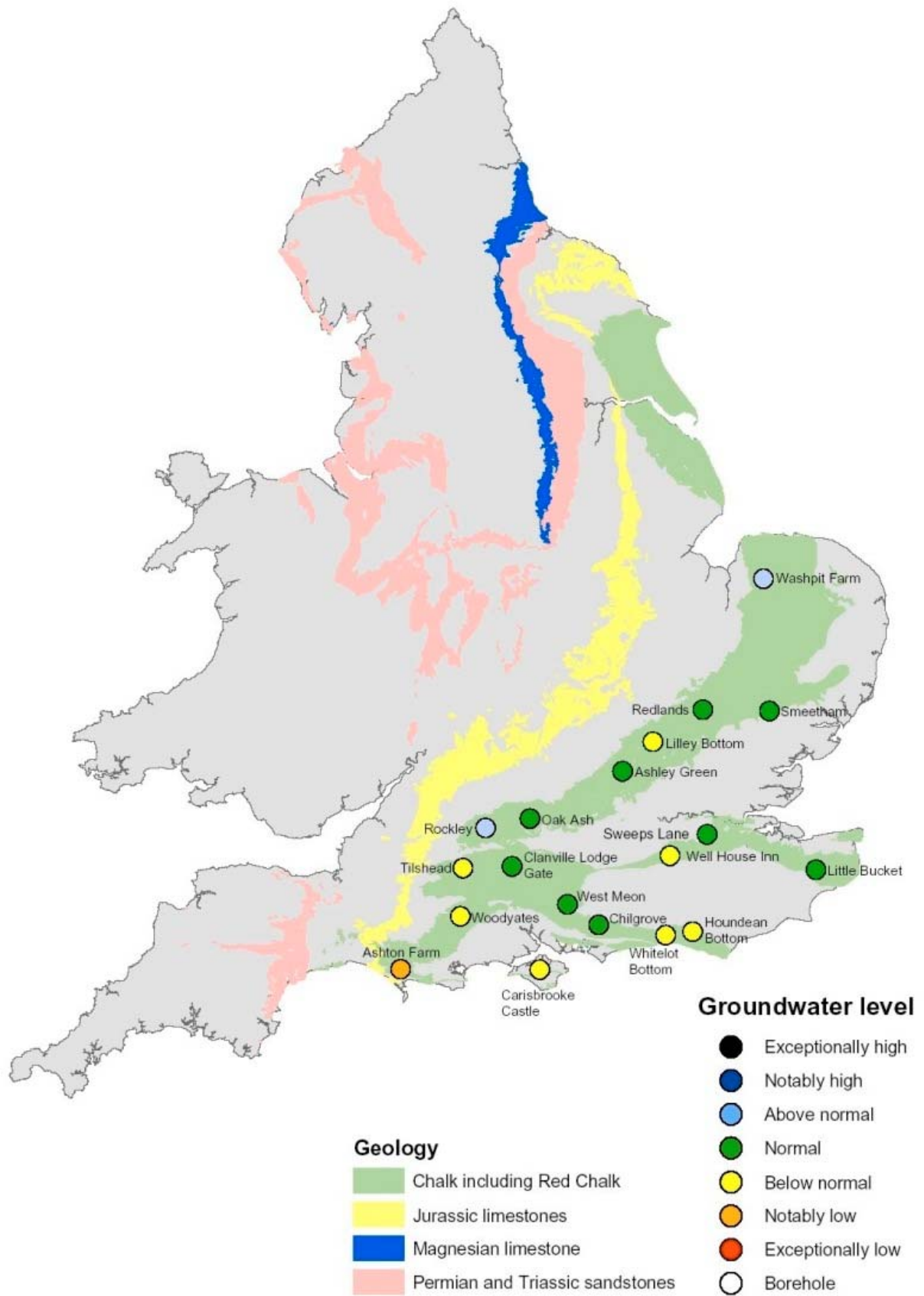


Figure 9 Projected groundwater levels at the end of March 2007 with average rainfall.



4 Prospects for public water supply

In August we asked all the water companies of England and Wales to forecast their water supply prospects for 2007 with different rainfall scenarios. The companies considered the impact of 60% of average rainfall, 80% of average rainfall, and average rainfall. To help with this, we provided results from our groundwater models to companies that depend heavily on groundwater for water supplies.

All companies reported their results in mid-October, with useful reports that provide considerable detail and show that all companies are taking the prospect of a further dry winter very seriously.

In this part of the report we summarise the results across England and Wales.

4.1 Average rainfall

Most water companies report that average rainfall this winter should be sufficient to avoid water supply problems next spring and summer. A few of the companies worst hit by drought this year believe that even average rainfall will leave some residual problems next year (figure 10). In the parts of the south east that have the lowest groundwater levels now, even average rainfall will leave low groundwater levels next year. Much depends on the way that these levels recover, but some companies are warning that hosepipe bans may be necessary even with average rainfall. These companies are Mid Kent Water, South East Water, Three Valleys Water and Sutton and East Surrey Water. None of these companies says that restrictions are inevitable, as much depends on the timing of rainfall and local conditions.

Everywhere else average rainfall over the winter should be sufficient to avoid further restrictions next year.

4.2 Eighty percent of average rainfall

For south east England and London, this roughly equates to a winter similar to last year. Elsewhere this would be a drier winter than last year.

With 80% of average rainfall, 2007 could look similar to 2006 across much of the south east (figure 11). Hosepipe restrictions would be maintained or reintroduced and water companies would seek drought permits to take more water from rivers and groundwater. Water companies in south east England and London would consider non-essential use restrictions, though most believe that it would not be necessary to use these unless the summer proved exceptionally hot and dry.

4.3 Sixty percent of average rainfall

An exceptionally dry winter would lead to widespread water supply problems across southern England (figure 12). Hosepipe bans would be at least as extensive as this year, and many drought permits would be used to try to keep reservoirs as full as possible. There would also be problems in parts of the south west. Some water companies would need non-essential use restrictions and many companies would have to take many steps to avoid more serious restrictions later in the year, especially with a hot, dry summer.

Sixty percent of average rainfall would be a very unusual winter. We have already seen above average rainfall in October, but one wet month does not provide an indication of the whole winter's weather. It is still possible that this winter could be extremely dry, so water companies must monitor the situation carefully.

Figure 10 Water company areas at risk of drought in summer 2007 following a winter with average rainfall.



Figure 11 Water company areas at risk of drought in summer 2007 following a winter with 80 per cent rainfall.

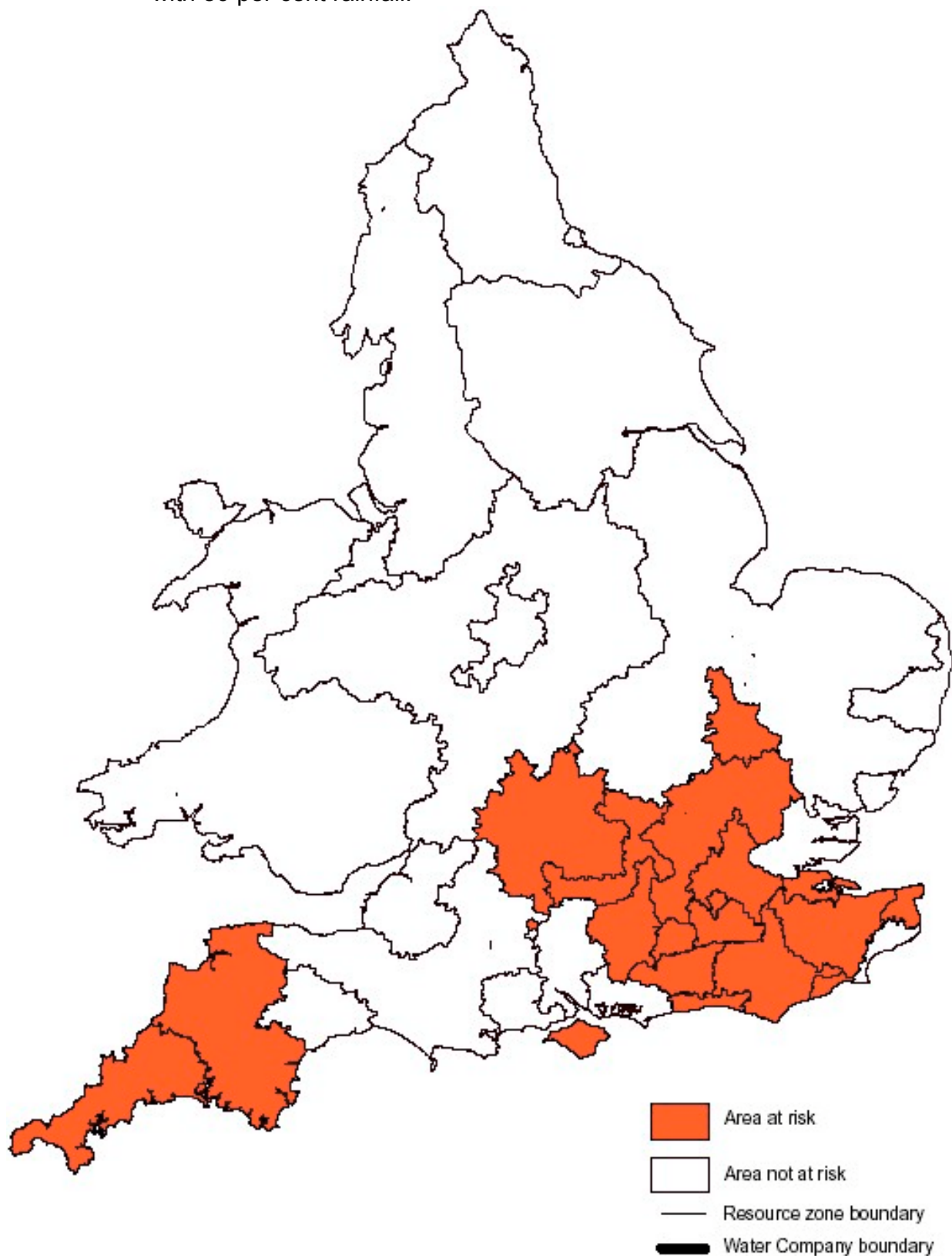


Figure 12 Water company areas at risk of drought in summer 2007 following a winter with 60 per cent rainfall.

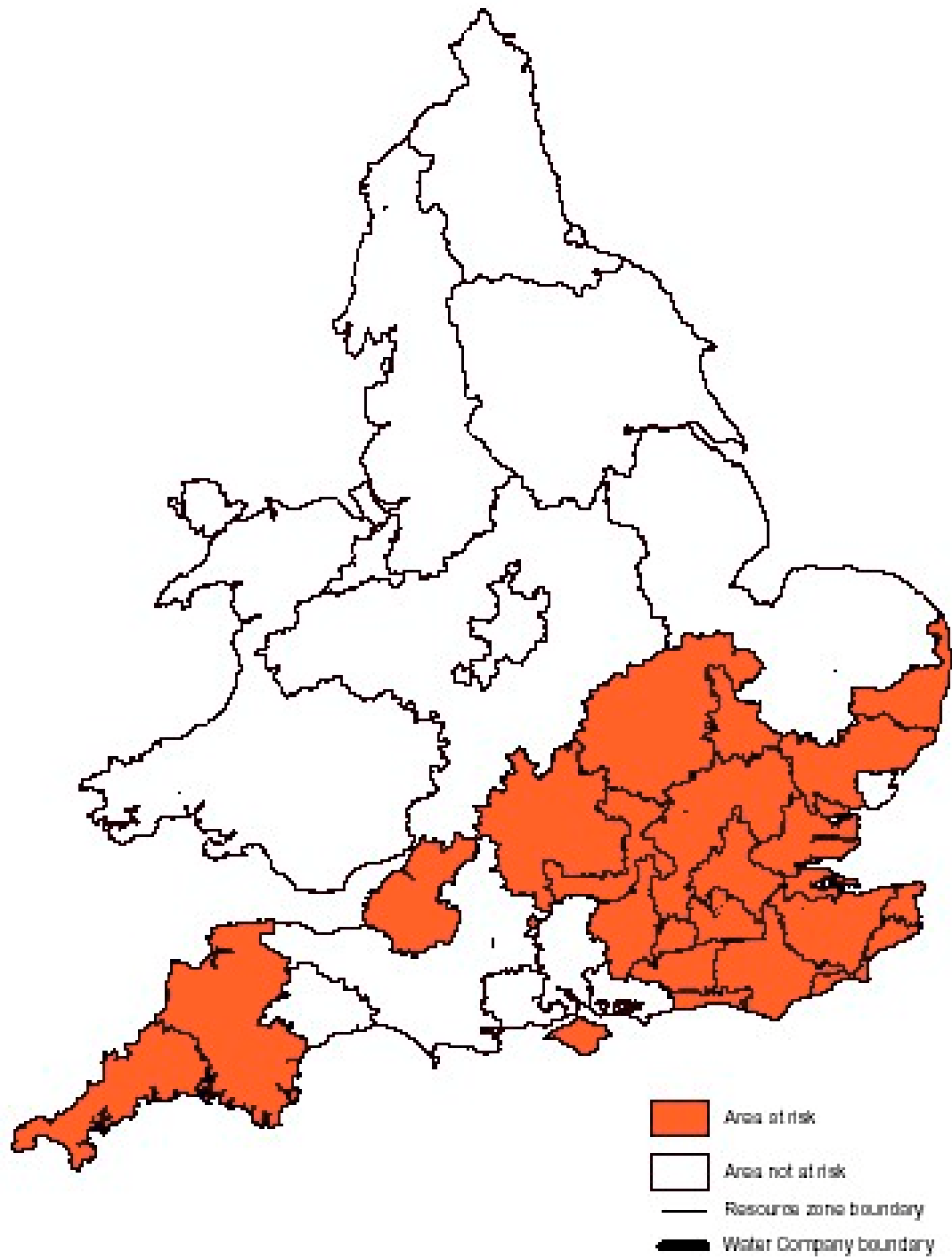
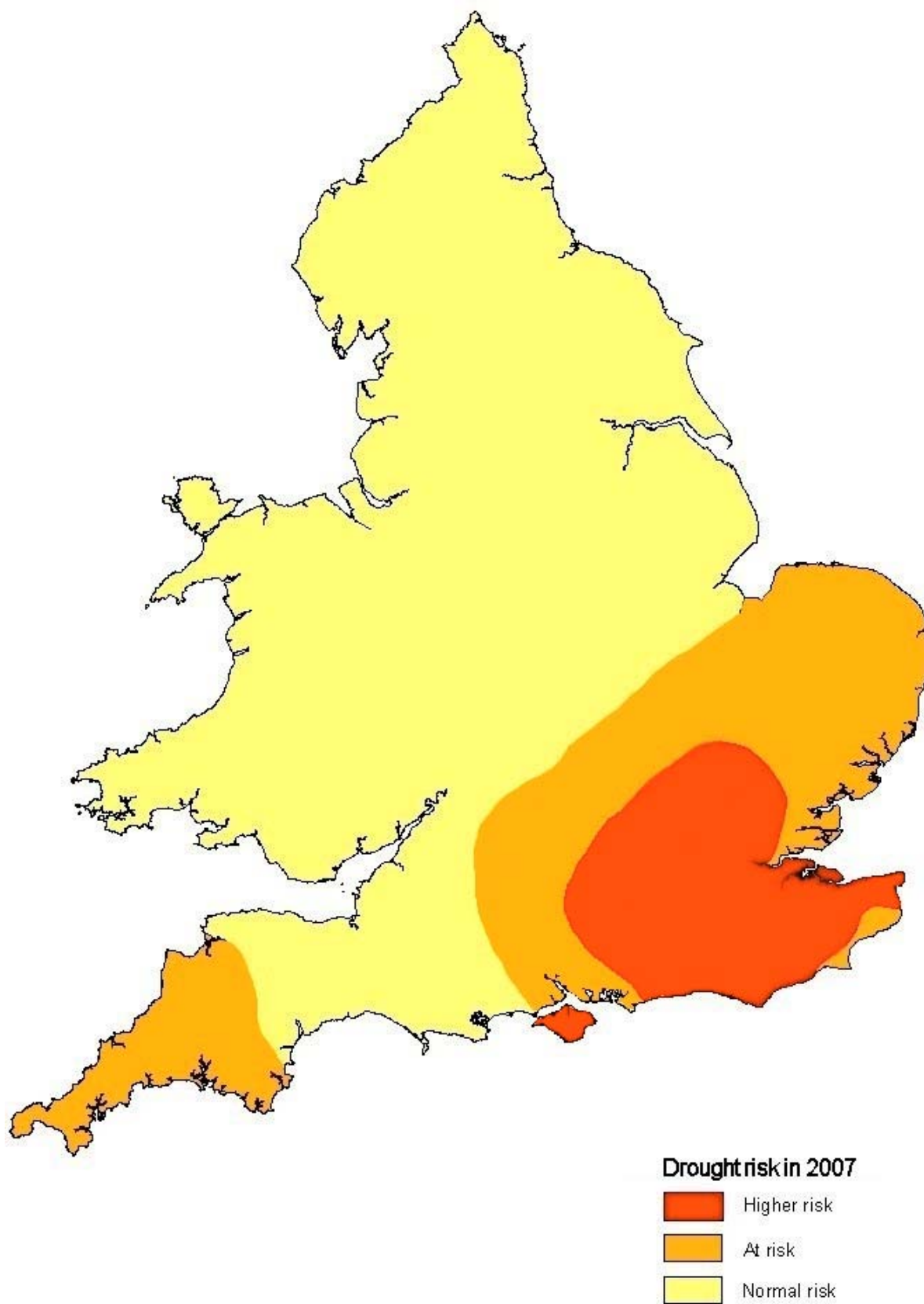


Figure 13 Areas at risk from drought in summer 2007



4.4 Water company actions

All water companies tell us that they will monitor water resources carefully through the winter. In south east England, water companies plan a series of further actions.

4.4.1 Campaigns to save water

All water companies in south east England tell us that they are committed to taking extra action to make sure that people understand the possible impact of drought next year. Overall, appeals to save water have been successful this year, with companies reporting savings of between 5% and 15%. Water companies plan to maintain awareness of the need to save water throughout the winter.

4.4.2 Restrictions on water use

No water company plans to use non-essential use restrictions this winter, though several companies warn that they may need to apply for non-essential use drought orders early next year if the winter is dry. Some companies are considering lifting hosepipe bans, though many warn that bans may be needed again next year if the winter is dry. The water companies at greatest risk from drought next year plan to maintain hosepipe bans until it is clear that resources are recovering adequately.

4.4.3 Additional leakage control

All water companies tell us that they will work hard on leakage control this winter. Some companies have given a strong commitment to drive leakage down below their long-term economic level of leakage, recognising that leakage control is especially important in dry years.

Some companies in south east England intend only to reach their long-term economic level of leakage this year. These companies must think again about the effort they put into leakage control this winter. Leakage increases in cold weather: as frozen ground thaws, the soil moves, damaging pipe joints. Cold periods are usually dry, so additional effort on leakage control will be particularly valuable if the winter is cold.

4.4.4 Additional abstraction during the winter

All water companies plan to make the best possible use of increased river flows during the winter. In south east England this will be particularly important because it will allow groundwater sources to be used more sparingly, giving the best possible chance for groundwater levels to increase during the winter.

Water companies at risk from drought in 2007 want to fill their reservoirs as quickly as possible this year. All intend to make maximum use of pumps to help fill reservoirs – in some years, water companies let reservoirs fill naturally from direct rainfall, reducing the cost of pumping.

Some water companies in south east England have already applied for drought permits to help refill reservoirs. Others tell us that these could be necessary if the winter is dry. In principle we support the use of winter drought permits to increase available

resources, provided that they are in line with drought plans and companies have carried out proper environmental investigations to show that the impact on the environment will be minimal.

4.4.5 Engineering schemes

All water companies have long-term plans to maintain and enhance their supply networks. Some companies are planning to complete schemes earlier than planned, so that they are in place before next summer. Other companies should make sure that they are making good progress on planned supply system enhancements and are ready to bring forward schemes planned for future years if this winter proves dry.

5 Prospects for other abstractors

Many businesses depend on direct abstraction from rivers or groundwater. In south east England, a dry winter could leave these supplies at risk. Much depends on the reliability of the source in question. Some boreholes are reliable even in extended droughts. Surface water abstractions from rivers and streams are not usually reliable in dry weather. Abstractors should make sure that they understand the reliability of their own sources of water, and if necessary make contingency plans to deal with possible shortage of water.

Farmers in the south east and East Anglia suffered from spray irrigation restrictions this year. Another dry winter could lead to similar widespread restrictions next year, particularly in areas where groundwater levels are predicted to remain low. We will work with local farming groups, the NFU and CLA to make sure that farmers understand the prospects for next year. Our aim is to maximise the water available for irrigation while protecting the environment. We can achieve this aim most effectively by working with farmers through the spring and summer.

6 Environment Agency actions

The Environment Agency has its own drought plans. These set out the actions we will take during extended periods of dry weather. Our role includes:

- Monitoring the impact of drought on river flows and groundwater levels.
- Monitoring and reducing the impact of drought on the environment.
- Forecasting groundwater levels and river flows.
- Reporting to Ministers on drought prospects.
- Helping people to understand the possible extent of drought.
- Working with water companies to make sure that they are taking the right steps to manage water supplies.
- Working with other abstractors to help them to understand the possible effects of drought on their own activities.

We have drought managers for each of our 26 areas, our seven English regions and for Environment Agency Wales. We have established dedicated drought teams in Southern, Thames and Anglian Region, as well as at our Head Office. We expect to maintain these drought teams until it is clear that the threat of drought has diminished. We will review the position early in 2007. If the winter is dry and the drought spreads beyond the south east, we may need to establish formal drought teams in other parts of England and Wales in accordance with our drought plans.

We also own and operate several schemes to maintain river flows for the benefit of the environment and abstractors. We will keep all these schemes under review and operate them as necessary through the winter and into the spring.

7 Recommendations and conclusions

The drought in south east England is far from over. Another dry winter would give further water resources problems next spring and summer. Even average winter rainfall will leave groundwater levels low in parts of the south east, with a risk to water supply and the environment. Other abstractors are also at risk from low groundwater levels next summer.

Maintaining reliable water supply is vital for people's health and the economy. We know that all water companies are taking the threat of another dry winter very seriously and are taking steps to make sure that water supplies are as secure as possible. We recommend that water companies across England and Wales should continue to monitor their water resources carefully so that they can act in good time if the winter is dry.

Water companies across southern England tell us that a dry winter could make next year difficult. We recommend that these water companies:

- Make sure that they keep customers informed of the continuing risk from drought. It would be easy for people to think that the drought is over now that winter has arrived, especially as restrictions start to be lifted. Continued good co-operation in saving water will be an essential part of reducing the impact of drought next year.
- Make sure that they are putting extra effort into leakage control. People think that water companies should reduce leakage further, particularly when customers are asked to save water. Water companies must be seen to be playing their part in reducing water use if they are to retain the co-operation of their customers.
- Make sure that they are talking to neighbouring water companies about bulk supplies in good time, so that water can be shared effectively between companies next summer.
- Take steps to maximise supplies this winter. This includes making sure that as much water as possible is being pumped into reservoirs and resting groundwater sources where possible.
- Apply for drought permits to fill reservoirs or rest groundwater sources as soon as it is clear that these are necessary. By law, drought permits are allowed only if an exceptional shortage of rain threatens water supply. Water companies should have identified these circumstances in their drought plans and carried out studies to demonstrate that the impact on the environment and other abstractors will be acceptable. In principle, winter drought permits are good practice as in most cases they present lower environmental risk and can improve prospects for the summer.
- Be aware of the time that it takes to grant drought permits or drought orders. If there are objections from members of the public or other abstractors it can take ten to twelve weeks for a drought permit or drought order to be determined. Water companies must make sure that they apply early enough, even if this means applying for permits and orders that subsequently prove to be unnecessary.

- Bring forward engineering schemes to improve the robustness of their supply networks, even if these are not scheduled until later in the funding cycle. These could help to avoid more serious restrictions on water use if the winter proves dry.
- Make sure that their action plans have sufficient steps to deal with a very dry winter. If this winter is particularly dry, some companies will need to apply for many drought permits and drought orders. Later in the year these could include drought permits that could damage the environment, as well as drought orders for non-essential use and to reduce or stop other abstractors from taking water. Many companies do not have detailed plans for the measures they will take to avoid serious supply restrictions. Companies that are at risk from a dry winter should work on these steps as a matter of urgency.

The Environment Agency will continue to work with water companies, sharing information and forecasts and making sure that companies act to secure water supplies next year. We will also work with farming groups to manage spray irrigation if the winter is dry.

We will report again with prospects for the summer in February 2007.