Floods Review July 2007

Letcombe Regis, Wantage, Grove and East Hanney

An investigation into the causes and flood risk management options

David McKnight February 2008

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Executive summary

Following the flooding of July 2007, which affected 137 properties in Letcombe Regis, Wantage, Grove and East Hanney, we have investigated options to improve the level of flood protection. This review aims to outline the extent of the recent floods, record the damage and document the response. Opportunities for any improvements that could reduce flood risk for local residents and businesses will be investigated.

The keys findings are that an unusually wet May and June with rainfall up to 195% of the long term average combined with an exceptional level of rainfall on 19 and 20 July created unprecedented levels of flow in the Letcombe Brook and the wider land drainage system. Water levels and flows exceeded the capacity of watercourses, culverts and bridges, forcing flood water over and/or around the structures, into roads and residential areas. This caused widespread flooding across the catchment which was worsened by surface and foul water flooding in places.

River flows during the July flooding were approximately 4 times the normal flow. Increased channel maintenance would not have significantly reduced the level of flooding experienced because the extra volume in the channel only equates to a very small proportion of the volume of water in the flood plain. However, it is recognised that channel maintenance will assist in flood risk reduction for smaller flood events and we will continue to work with landowners to offer guidance and advice.

A number of positive recommendations are made with the objective of reducing the consequences of future flooding. The key recommendations of the review are:

- we will work with riparian owners to increase awareness of riparian rights and responsibilities on watercourses and local land drainage system. This will include providing best practice advice, design, maintenance considerations and consent requirements, particularly in the vicinity of the Mill Lane, Wantage area where there are numerous trash screens, culverts and service crossings
- we will work with land owners (the Parish Council) at Sharland Close, Grove to build up the left bank of the Letcombe Brook, to even out the bank along this stretch and contain flows
- we will continue to raise public awareness to improve the uptake of Flood Warning Direct – the free access to all, warning service
- installation of a river level gauge on the Letcombe Brook to enhance the warning service (2008/2009)
- we will continue with the current maintenance programme
- being prepared - both at community (community flood plans) and householder level
- we will continue to work with the Vale of White Horse District Council (V.W.H.D.C.) to prevent inappropriate development in the flood plain
- Increased flood resistance and resilience for homes and businesses.

Contents

1 Background

Introduction

Following the flooding of July 2007, we have undertaken this flood review to understand the meteorological conditions that contributed to the flooding, the mechanism of flooding and the number of properties affected in order to identify works to reduce flood risk and its impacts. This review will also identify responsibilities for flooding, and provide guidance on other flood risk management tools such as flood warning, flood resistant construction and flood resilience. The reviews have been written in consultation with the Vale of White Horse District Council (V.W.H.D.C.).

The main river, (see glossary) extent of the Letcombe Brook runs from Locks Lane in Wantage to the Childrey Brook, main river approximately 1.5 km downstream of East Hanney.

The Letcombe Brook has a predominantly rural catchment. The headwaters of the brook are located in the villages of Letcombe Basset, Letcombe Regis, and at Manor Farm to the south of Wantage (Edgehill Springs), as shown in Figure 1. The Brook flows north through the town of Wantage where it is joined by the Humber Ditch in an steep valley. The brook continues through the town of Grove under the railway branch line to the village of East Hanney, after which it joins the Childrey Brook tributary of the River Ock. The Letcombe Brook catchment includes approximately 11.5 km of main river and has an area of 21.36 km2.

2 The problem

Flooding mechanism & history

Meteorology

May and June 2007 were unseasonably wet months across the UK with many areas receiving rainfall above the long term average (LTA) for the period 1961-1990. The Thames Region received 109mm of rainfall in May and 88mm in June (195% and 160% of the long term average respectively).

The unsettled weather continued into July 2007 as low pressure dominated across the UK. This was due to the abnormal southerly position of the Polar Jet Stream, a narrow band of fast moving air in the upper atmosphere which steers weather systems from west to east across the Atlantic. The jet stream is usually further north during the summer period, allowing high pressure to form across the UK more frequently.

In July the Thames catchment received 121mm over a 24 hour period, compared to the long term annual average rainfall amount of 49mm (247% of the long term average), as illustrated in Figure 2.

Figure 2: Rainfall totals compared to the long term average (LTA) (1961-90)

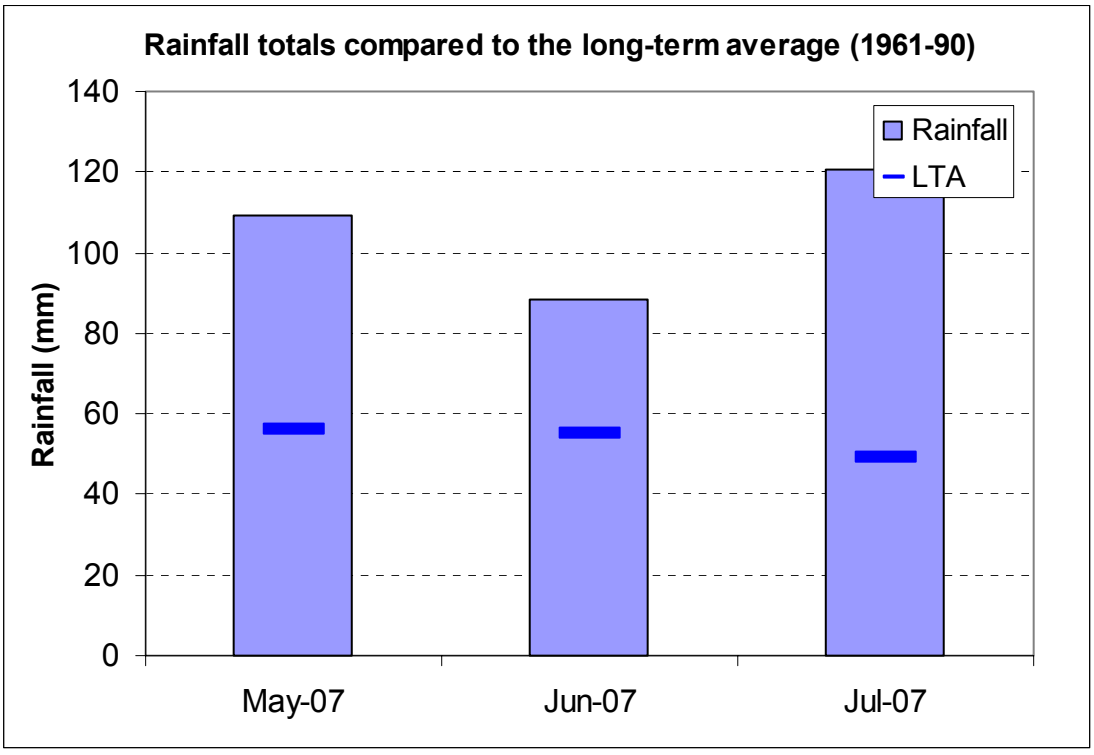


Table 1: Rainfall totals compared to the long term average (LTA) (1961-90)

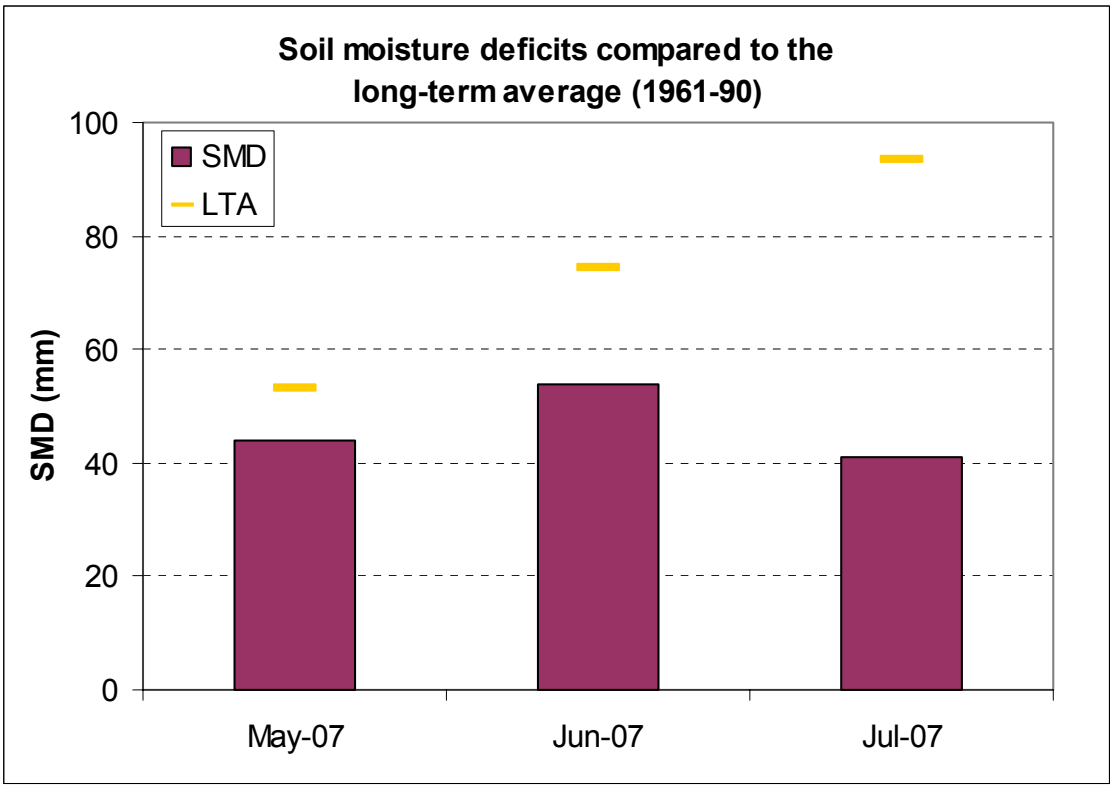
Month	Total rainfall for Thames Region (mm)	Long Term Average (1961-1990) (mm)	2007 rainfall as % of LTA
May 2007	109	56	195
June 2007	88	55	160
July 2007	121	49	247

Hydrology

Soil Moisture Deficit (SMD) is a measure of the saturation of the soil. SMD below the LTA means that the soil is wetter than usual, and SMD above the LTA means that it is dryer than usual. In Figure 3, the SMD in May and June 2007 are compared with long term averages for 1961-90. Extended periods of wet weather across much of the Thames Region resulted in lower than average SMD leading up to the July 2007 event. This means that less rainfall was needed for the soils to become fully saturated, increasing the potential for greater runoff into rivers.

The extremely high rainfall totals and intensities coupled with the low soil moisture deficits for the time of year caused flows (i.e. the volume of water in the river) at many locations to increase rapidly. By the end of July 2007 average monthly river flows at many sites were the highest on record for July.

Figure 3: Soil moisture deficits (SMD) compared to the long term average (LTA) (1961-90)



The combination of exceptional rainfall and low soil moisture deficit resulted in extremely high flow and levels along the Letcombe Brook.

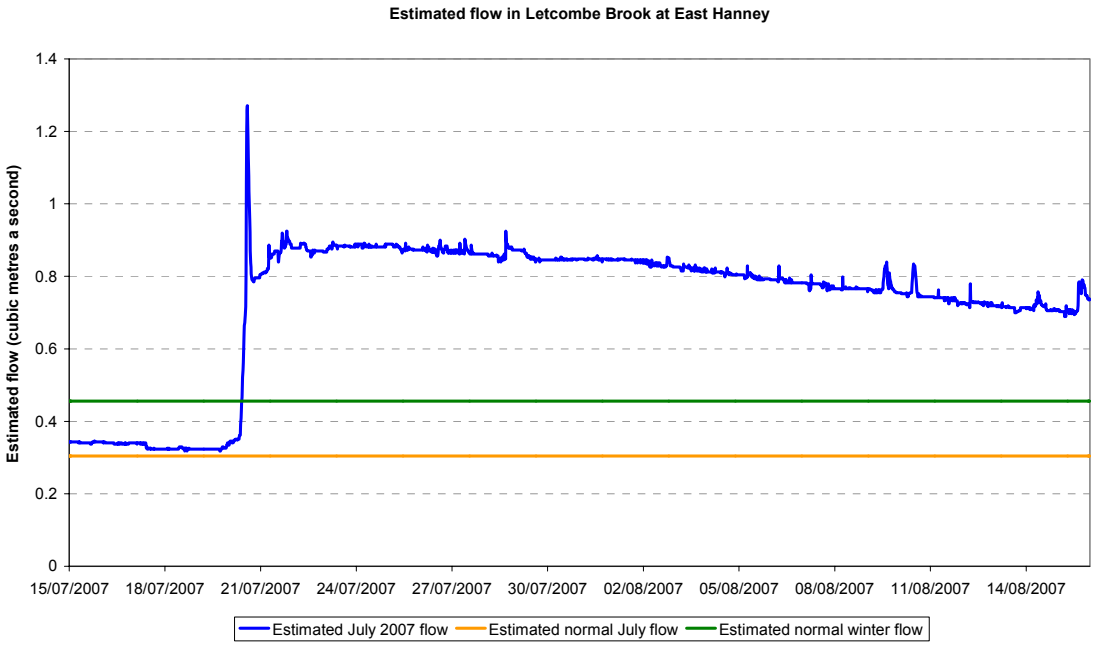


Figure 4 – Estimated flow in the Letcombe Brook.

Figure 4 shows the estimated flow data derived from gauging stations at the top end of the catchment (at Letcombe Basset and Letcombe Regis), which have been adjusted to represent the likely flow at East Hanney. The graph indicates that the peak in-channel flow during the July floods was at least 4 times the normal flow that would be expected in the Letcombe Brook at East Hanney in July. This shows that the magnitude of flow far exceeded the capacity of the river channel, which could not be managed by increased weed removal or maintenance.

Flood history

There have been a number of major floods in the River Thames catchment since records began, most notably in November 1894, March 1947, October/November 2000 and January 2003. All occurred during the winter months and affected the upper Thames tributaries as well as the River Thames itself.

Flooding in the Letcombe Brook Catchment has been identified as early as 1894. The extents of the floods have generally been limited to a few streets in the villages along the Brook. Wantage seems to be the catchment black spot for flooding. Major flood events have occurred in 1894, 1968, 1977, 2000, 2001 and 2003.

Historically, summer floods on the River Thames and larger tributaries are less common. However it is interesting to note that the highest levels at Thames locks upstream of Oxford since records began in the 1880s were generally recorded in the flood of June 1903. Also, the July 1968 floods caused severe flooding in the lower Thames tributaries and the highest flows on record in the neighbouring lower Severn catchment.

Table 2 gives a summary of the main historic flood events that have affected similar areas to those in the July 2007 event. It is by no means a comprehensive record of every flood in the Thames catchment.

Table 2: Historic flood events

Date	Description
November 1894	Catchment-wide flooding in the Thames catchment. Highest levels downstream of Oxford since records began. Numbers of properties affected unknown.
June 1903	Flooding on the upper Thames. Highest levels locks upstream of the Cherwell since records began. Numbers of properties affected unknown.
March 1947	Basin-wide flooding in the Thames, including the Lee catchment. Over 10,000 properties affected.
July 1968	Flooding in the mid to lower Thames and severe flooding in the Mole and Wey catchments. Approx 10,000 properties affected.
November 1974	Flooding in the lower Thames and its tributaries including Addlestone Bourne, Blackwater, Beam, Loddon, Emm Brook.
Easter 1998	Flooding in the Cherwell catchment – between 100 and 1000 properties affected.
October/November 2000	Catchment-wide flooding in the Thames. Approx 1100 properties affected.
January 2003	Catchment-wide flooding in the Thames. Over 500 properties affected.

More detailed information relating to historic flooding can be found in the Letcombe Brook Flood Study – Flood History Report by Mott MacDonald on behalf of the Environment Agency – June 2007.

Letcombe Regis

The Letcombe Brook rises in the small village of Letcombe Basset, at Arabella's Lake. The second headwater of the Letcombe Brook is located approximately 3km downstream of Letcombe Basset, at Sprint Lake, in the small village of Letcombe Regis. It forms a tributary which joins the Letcombe Brook in the centre of Letcombe Regis.

Wantage

Wantage is the largest settlement along the Letcombe Brook, and also the most prone to flooding. Two tributaries join the Letcombe Brook at Wantage: the stream coming from Manor Farm in the South- East of Wantage, and the Humber Ditch which rises to the East of Wantage and joins the Letcombe Brook north of Mill Street.

The area of Mill Street in Wantage suffers from flooding most frequently flooded from the Letcombe Brook. South of Mill Street, the Letcombe Brook is divided into the main stream and the bypass channel. The bypass channel returns to the Letcombe Brook via a culvert north of Mill Street.

The footpaths along the main stream and the bypass channel are regularly flooded (see figure 4 for the flood routes). In addition to the flooding from the Letcombe Brook and the bypass channel, there is regular serious foul drain flooding in Locks Lane, Betjeman Lane and Mill Street.

There are several reported reasons for the origin of the floods in the area of Mill Street:

- The flow to the bypass channel is controlled by a very restrictive stop board. The flow spills around the fixed sluice to the adjacent footpath during high flows and returns eventually to the back stream further downstream.

- The stop board is set almost closed for the reason that the bypass channel and culvert downstream have a very limited capacity. The flow is constrained by several undersized culverts and their trash screens. The last culvert which joins the Letcombe Brook to the north of Mill Street, causes particular problems due to blockages at its entrance, associated with a single bar trash screen. V.W.H.D.C report that they carry out regular clearance of the 3 trash screens using their permissive powers. Problems have arisen in maintaining the screens and culverts which are the responsibility of the riparian owners. When the screens block, water flows across the Lamb Inn car park and puts the public house and properties in Mill Street at risk of flooding. V.W.H.D.C is working with the owners of these structures to improve their design and maintenance regime.

- The old Mill represents a constriction for the main stream and during flood events the Letcombe Brook spills to the footpath on its left bank, between the Old Mill and the new Wessex Mill. The Letcombe Brook passes beneath the Old Mill through 3 pipes of limited capacity (approximately 300mm diameter each). There is also a sluice which when open, diverts the flow underneath the footpath to an outlet in Letcombe brook immediately to the north of the Old Mill. It is also known that the pipes leak, causing water to come up through the floor of the Old Mill in extreme cases. This has been the case for the past 25 years and has lead to the mill floor becoming structurally unsound.

Grove

Grove is located to the north of Wantage and is the second biggest settlement in the catchment after Wantage. Two areas in Grove are known to regularly flood:

- South of Grove, Cane Lane, downstream of the bridge, and the Upper Grove Mill.

- North of Grove, the Green and the Denchworth Bridge. Grove was reported to be flooded in 1894, 1968, 2000 and 2003.

East Hanney

East Hanney is a small village located approximately 2 km north-east of Grove. The places which are regularly flooded are:

- The Causeway between East and West Hanney, when the road ditch gets blocked and overflows. This happened in 1977 and 1982.

- The Main Street, when the drains are blocked (2000, 2001) or from the Letcombe Brook directly (2003), Snuggs Lane and The Green.

There have been a number of remarkable flood events in East Hanney. In 1947 the village was seriously flooded when a thaw occurred. '*The flood was exacerbated by the lack of maintenance due to the war'* explained the chairman of the Letcombe Brook Conservation Group. In January 2001, the Main Street was flooded for 2 months due to a drainage problem. In January 2003, 5 houses were flooded, 1 on the Main Street and 4 on the Green. This also led to some water logging in the fields north of East Hanney.

Examination of the rainfall data and river flows from the July flood event has enabled an estimation of the flood return period of the flood. Flows and levels in the Letcombe Brook at the 4 locations in July 2007 have been estimated as having a flood return period in excess of 1 in 100 years. (1% annual probability of occurrence). See reference for source of data.

Flood mechanism/source of flooding

The flooding in July was from several sources: rivers (fluvial), surface water (pluvial) and sewers. It is very difficult to distinguish the exact source of flooding due to the complex connection between rivers and drainage systems.

All of the areas considered in this review are subject to potential flooding from more than one source. Exceptionally heavy rainfall can accumulate where it falls and this can cause flooding

immediately. The smaller the area these systems serve the more rapidly they will respond: the larger the area they drain, it will take a longer time for the majority of the rainfall to reach any point. Flooding will often occur in a time sequence that reflects this e.g. first we see a puddle in the garden, then overflowing drains, ditches overspill, small river floods then finally large rivers flood.

The flooding of roads, roadside drains and gullies immediately after the exceptionally heavy rainfall from mid morning to late afternoon on Friday 20 July occurred due to insufficient capacity to cope with the volume of water. The ditches, streams and larger watercourses were already rising due to the runoff from fields and surface water from built development. The local drains and watercourses discharged into the Letcombe Brook and it started to flood between midday Saturday 21 July to midday Sunday 22 July.

In July, properties flooded as a result of river flows exceeding the capacity of the channel, causing inundation of the flood plain. In some locations, high river levels prevented the discharge of surface water sewers and drains, which surcharged and caused flooding, or added to flooding from main river or ordinary watercourses.

The local watercourses cover a large area with local variations in runoff rates, structures and catchment response to the rainfall, thus the timing of the various main rivers bursting their banks varied from location to location.

Letcombe Regis

From records available, there were 3 reported properties affected by flooding from the Letcombe Brook (ordinary watercourse at this location) during the July 2007 floods. Information available suggests that the culverts and bridges in the village were restrictions to the volume of water trying to pass through. Excess water backed up and either flowed around the structures or overtopped them causing flooding. (See figure 6 for a copy of our published flood plain outlines – Flood Zone 2 & 3).

Wantage

The Letcombe Brook burst its banks and flowed along the footpath from the Mills back to the sluice gates and to the Leat running to the north of the Lamb Public House and through the car park into Mill Street to flood properties. For the first time on records, flood water ran through Betjemin Park.

Highway drainage in this area discharges to the foul drainage system, which is also combined with the surface water system. Combined surface and foul drainage systems place further strain on available capacity within the pipe network, thus increasing flood risk.

Surface water also flowed down Limborough Road from the recently constructed Sainsbury's Store. The foul water drainage system at the bottom of Limborough Road also surcharged. Thames Water Utilities Ltd are investigating this matter further.

The area on Grove Street near the old sewage farm flooded from the road and excess water from the Humber Ditch (main river) also caused flooding. The highways drains were unable to cope with the water collecting in this area. The extent of the flooding to property was exacerbated by the bow waves of vehicles forcing their way through flood water, particularly along Mill Street. (See figure 7 for a copy of our published flood plain outlines – Flood Zone 2 & 3). Our records indicate that 19 properties flooded from the Letcombe Brook and Humber Ditch.

Grove

Due to the intense rainfall that fell on Friday 20 July, much of Grove suffered highway flooding. This was made worse by water running off fields to the south west trying to re-enter the Letcombe Brook in the vicinity of Cane Lane and from the east, across the A338. Areas with known property flooding include Bosleys Orchard, Sharland Close, Kingfishers, Cane Lane, Denchworth Road, Westbrook and Old Mill Close. Our records indicate that 70 properties flooded from the Letcombe Brook.

Vale Avenue also suffered flooding from the Pill Ditch (Portobello Ditch). An O.C.C drainage engineer has since visited the area and confirmed that the Pill Ditch behind Bosleys Orchard was blocked with debris which had caused the flooding along Vale Avenue (reported at both ends of the Avenue).

There is a low spot in the bank on the Sharland Close side of the Brook (left bank). This is the location where local residents witnessed flood water first coming out of the Brook.

4 properties in North Drive suffered from flooding from surcharging highway drains which could not cope with the volume of rainfall and started to flood properties at approximately 11am on Friday 20 July. The Fire Brigade attended and pumped flood water into a lower field behind the houses which alleviated the problem.

6 Vale of White Horse Housing Association bungalows for pensioners at the western end of North Drive came close to flooding in July. Property flooding has not occurred here before, however, the drains have surcharged on previous occasions following heavy rain. (See figure 8 for a copy of our published flood plain outlines – Flood Zone 2 & 3).

East Hanney

Our records indicate that 45 properties were affected by flooding in East Hanney. The road culvert downstream of Dandridge's Mill (Mill Orchard) was unable to cope with flood flows through the Mill. The bypass channel was also unable to cope with the excess water which flooded properties in the vicinity of Weir Farm. There appears to be problems with the flow from the bypass channel not being able to discharge adequately into the Letcombe Brook, this could be due to the angle of entry and the majority of flow from the Letcombe Brook forcing water back up the bypass channel.

Flood water flowed out of the Letcombe Brook at the Iron Bridge and flood water was also flowing into the Brook from the Village Hall area along a footpath and across the playing fields. Flood flows were crossing footpaths in the Medway area and Snuggs Lane as the flood flows headed towards Main Street and The Green. This area was also affected by foul water flooding when the pumping station failed and exacerbated the flooding.

There are 2 main drainage routes that carry water out of the village: The Ebbes Lane ditch and the A338 ditch, both watercourses did not adequately drain down after the rainfall and as a result caused flooding to the area. The restrictions could be due to the area being low lying with insufficient capacity and gradient of the channels and culverts, lack of maintenance and blockages.

Again. the extent of the flooding to property was exacerbated by the bow waves of vehicles forcing their way through flood water.

(See figure 9 for a copy of our published flood plain outlines – Flood Zone 2 & 3).

Planning controls and flood plain development

Current planning guidance contained in Planning Policy Statement 25 (PPS25 – published December 2006) states that flooding is a material planning consideration and explains how flood risk should be considered at all stages of the planning and development process. It places the onus on the developer to assess flood risk for a particular site and its impact on adjacent sites. It allows the planning authority (in Abingdon – the Vale of White Horse District Council) to adopt the precautionary principle when determining planning applications within the flood plain.

We are a statutory consultee in the town and country planning process. We have provided local planning authorities with maps identifying the flood plains to guide development away from these areas.

Prior to PPS25, planning authorities were not obliged to incorporate our comments or advice into their final decision, this may in certain circumstances have resulted in development going ahead against our recommendations.

Under the 'Flooding Direction' issued in conjunction with PPS25, where a local planning authority is minded to approve a planning application for major development yet we have objected to it on flood risk grounds, the application must be referred to the appropriate Government Office to consider, on behalf of the Secretary of State, whether it should be called in for determination.

We will object to any inappropriate development within the floodplain that may result in:

- increased resident population in the floodplain
- a loss of floodplain storage capacity
- impede flood flows routes
- result in increased flood risk elsewhere.

Upper Thames Major Recourse Development

Thames Water have developed proposals to construct a new reservoir near Abingdon. The proposed site of the new reservoir is to the west of Abingdon and would occupy an area of the River Ock floodplain. As part of the plans Thames Water plan to provide compensatory flood storage for the area that would be lost (approximately 500,000m^3). This a requirement of any development that occurs in the floodplain.

Grove Airfield

Developers have been discussing proposals to construct approximately 2000 houses on the west side of Grove on the former airfield site. The site does not lie within a statutory fluvial floodplain, however, the site is prone to surface water flooding after rainfall. We have requested a Flood Risk Assessment (FRA) to accompany any planning application. The FRA must focus on surface water drainage issues and will provide a Sustainable Urban Drainage System (SUDs) to ensure that as a minimum, surface water discharges do not exceed the present situation. Planning Policy Statement 25 (PPS25) advocates flood risk reduction through the planning process, this ensures that the current surface water drainage problems can be improved via the re-development of this site.

We have raised these issues with the developer and advised that this element of flood risk reduction will be a requirement of the planning application. Specifically, this must focus on addressing the surface water runoff flowing into Grove from the south in the vicinity of Cane Lane and the Caravan Parks.

Dandridges Mill

Dandridges Mill is currently being re-developed, we have met and are currently in discussions with the new owners regarding flood risk and permissions that are required to make alterations to the mill. We are working with the owners to identify opportunities to reduce flood risk locally via their proposals to install hydro electric power and an additional bypass channel. These works have the potential to increase the capacity of the mill to pass flows downstream, but will only be acceptable if flood risk is not increased elsewhere.

Flood warning

We offer a free flood warning service that is open to all business and residents within flood risk areas. This involves sending a warning via phone, fax, text or email. There are 4 flood warning codes:

Flood Watch
Flooding is expected. Be aware! Be Prepared! Watch Out!

Flood Warning
Flooding of homes, businesses and main roads is expected. Act now!

Severe Flood Warning
Severe flooding is expected. Extreme danger to life and property. Act now!

All Clear
Issued when flood watches or warnings are no longer in force. Check all is safe to return. Seek advice

We can provide a flood warning service using a variety of forecasting techniques. This is only possible where we are able to monitor river levels.

When a river comes out of banks, we will issue a flood watch. This means that flooding of low lying land is expected. From a land survey, we can also establish the lowest and nearest property to the river and potentially one of the first properties to flood. When we are aware that property flooding is going to occur, we will issue a flood warning. A flood warning will be elevated to a severe flood warning if the situation worsens and over 100 properties and or major infrastructure will be flooded.

To issue our warnings we have a 24-hour flood warning service called Flood Warnings Direct (FWD). We encourage members of the public who are at risk of flooding to register with us. Our professional and media partners are also all registered to receive warnings via FWD. Our professional partners include emergency planning officers from the Local Authorities, emergency services and utility groups. FWD is used to update our Floodline telephone service and our website.

Currently our flood warning areas are quite large and include long stretches of river which cover several towns or communities. Over the next 2 years we will be reducing the size of our flood warning areas into smaller community based areas. This will enable us to issue more accurate flood warnings.

In past years we have also made use of flood wardens as a method of warning people of imminent flooding. Flood wardens were volunteer residents who would help us issue messages to those members of the public who were not registered with FWD. However as more and more people have signed up to FWD, we no longer use flood wardens in the same way. Instead, a warden's role has become more of a neighbourhood advisor and we now encourage communities to produce their own self help community flood plan.

Floodline (not to be confused with Flood Warnings Direct – FWD) is our 24 hour telephone information service. When people are warned or become aware that a flood warning is in force, they should phone Floodline. They will then be able to hear what is happening locally in terms of river and flooding forecasts. When calling Floodline, the public need to know a second quick dial number which will take them to their local area information. For the 4 villages included in this report, the relevant quick dial code is:

River Ock – 0112313

Warnings issued

The first flood warning for the catchment was issued on 20 July 2007, once river levels had started to respond to the rainfall, and the first 'severe flood warning' was issued on the 21 July 2007. The last 'all clear' was issued on 6 August 2007.

The Letcombe Brook falls within the Flood Warning Area (FWA) for the lower Ock (FWA: Charney Bassett to Abingdon) which includes Letcombe Regis, Wantage, Grove and East Hanney.

- On Saturday 21 July, a flood warning was issued for the lower Ock FWA.
- On Sunday 22 July, A severe flood warning was issued to the FWA for the Lower Ock in Abingdon.

A full list of warnings issued for the FWA that covers the 4 review areas and the date and time of issue is given in the table below:

Area Name	**Issued**	**Date**	**Time**
Ock Catchment: Little Coxwell to Abingdon	Flood Watch	19 July 07	19:04
Ock Catchment: Little Coxwell to Abingdon	Flood Watch	19 July 07	21:08
Ock: Little Coxwell to Charney Bassett	Flood Warning	20 July 07	19:07
Ock: Charney Bassett to Abingdon	Flood Warning	21 July 07	21:58
Ock: Charney Bassett to Abingdon	Severe Flood Warning	22 July 07	14:33
Ock: Little Coxwell to Charney Bassett	Downgrade to Flood Watch	22 July 07	14:54
Ock: Charney Bassett to Abingdon	Downgrade to Flood Warning	27 July 07	07:15
Ock: Charney Bassett to Abingdon	Downgrade to Flood Watch	28 July 07	13:15
Ock Catchment: Little Coxwell to Abingdon	All Clear	30 July 07	11:42

We are currently unable to offer a full flood warning service to the residents at Grove, Wantage and East Hanney. This is because we have no river level gauges on the Letcombe Brook which are near enough to determine river levels within any of these areas. We have identified this general area as being a top priority for a river level gauge to be installed somewhere along the Letcombe Brook during next year (2008/09). We have a river level gauge at Letcombe Regis which allows us offer a flood warning service. This can be arranged for Letcombe Regis residents by calling our Floodline number (0845 9881188) and asking to be registered as an 'area of interest'.

3 Management of flood risk

Catchment Flood Management Plan

Catchment Flood Management Plans (CFMP's) provide an overview for managing the long-term flood risk over the next 50 to 100 years.

A reliance on flood defence is no longer sustainable and we are moving towards managing the risks of flooding. This can be achieved by putting in place a range of flood risk management policies that can react to change.

Letcombe Regis, Wantage, Grove and East Hanney lie within the undeveloped natural flood plain catchment area as defined by the CFMP. The approach to flood risk management in these areas is about working with the natural characteristics of the catchments. The aim is to manage flood risk by taking opportunities to maximise the potential of the flood plain to retain water. Specifically the messages are:

- The flood plain is our most important asset in managing flood risk
- Maximising the capacity of the flood plain to retain water in these areas can have many advantages for people and the natural environment
- Managed flooding of some areas of the natural flood plain will reduce the risk to some communities
- We will do all that we can to prevent inappropriate development which reduces the capacity of the flood plain to retain water. Future maintenance work on river channels should aim to increase the capacity of the flood plain.

Third party structures & maintenance

There are a number of sluice gates in private operation on the Letcombe Brook. We are not aware of the operating regimes, however, we would expect these structures to be fully open in times of high flows or floods. Riparian owners are legally obliged to maintain and operate their structures properly. Owners of river control structures must also fulfil any obligations they have under the Thames Region Land Drainage Byelaws, this includes opening sluices before flooding occurs. We can offer advice and best practice guidance to riparian owners and expect them to work together.

Additional obligations include:

- Keeping gates and screens clear of obstructions, so they work properly
- Maintaining structures in a proper state of repair
- Use structures in such a manner as not to affect the efficient working of the drainage system of the area.

Letcombe Regis

The Letcombe Brook is an ordinary watercourse at this location, we do not have information relating to structures on an ordinary watercourse. The mill is unlikely to have significant impact on flooding as normal full channel flows would pass through the mill without obstruction. This means that when the mill structures start to impede flood flows, the flood plain up and downstream is likely to already be operating. However, any mill is likely to have acted as a barrier to overland flood flows during flood events, as would local topography and other built development.

Wantage

There is a concrete side sluice with timber lifting gate, (see Photographs in Appendix A) upstream of Mill Street which takes flow into the bypass channel. This sluice is set in a fixed position so that the flow capacity is not greater than the culvert capacity downstream at the Lamb Public House.

Wantage Mill has 2 masonry culverts beneath it, each culvert has vertical trash screens on the upstream end, (see photographs in Appendix A). The design of these trash screens does not meet best practice, as such requires regular maintenance to avoid blockage. These would have had an impact during the start of the floods as once submerged they would be difficult to clear, thus holding back flows and elevating flood water levels locally. However, once the flows upstream had exceeded the culverts capacity, the trash screen blockage would have less of an impact as flood volumes would be significant and bypassing the structure.

There is a side sluice with timber lifting gate in timber frame which provided control for the mill, there is also a 500mm clay pipe to allow extra capacity to allow high flows to bypass the mill culverts. (See photographs in Appendix A).

There are 2 service pipes that cross the Letcombe Brook and the bypass channel downstream of Mill Street, (see photographs in Appendix A for the Letcombe Brook service crossings). There are further culverts downstream of Mill Street on the bypass channel which will affect flood risk due to their capacity and this risk is increased by debris and blockages.

Mill Street road bridge also requires maintenance as there is significant debris in the bed of the watercourse and beneath the bridge. Benefit from this work cannot be delivered until additional work is completed downstream.

The next bridge downstream and associated landscaping works, adjacent to the Sainsbury's development have not been completed. There is a large volume of rock and stone within the channel which is associated with the bridge and landscaping proposals which has increased the problem at Mill Street. This downstream obstruction to flow holds back flow and increases water levels upstream. This increases the likelihood and effect of debris being trapped on the service crossing upstream. Any maintenance work to the Mill Street bridge should therefore be programmed alongside the landscaping works at the downstream development site.

Grove

The Letcombe Brook passes through Grove Mill, via a culverted channel under the mill, (see photograph in Appendix A). Our records indicate that the mill suffered from flooding due to the culvert beneath it not being large enough to convey the flows. The proximity of the mill in relation to the watercourse forms a barrier to flood flows causing flood risk locally. We are not aware of any other properties that flooded in this locality.

East Hanney

There are 2 disused mills in East Hanney; Dandridges Mill and Lower Mill.

Dandridges Mill has an upstream bypass channel that was used to control flows to the Mill, capacity of this channel in limited by the drop board structure. This structure is not operated to ensure that high flows are limited downstream. The Letcombe Brook passes beneath the disused Mill in a brick culvert race with a single vertical sluice gate, (see photograph in Appendix A), the main water wheel race has been removed due to renovation works. At present, the sluice gate is operated by a local man who monitors and operates the gate on a daily basis dependant on water levels at weather forecasts. Prior to the flooding, on Thursday 19 July, the sluice was lifted partially and fully opened on Friday 20 July.

There is also a fixed crest overfall weir running down the side of the mill culvert which runs in its own brick wall channel around the side of the building and rejoins the culvert downstream. (see photographs in Appendix A).

Lower Mill has an upstream bypass channel controlled by 2 pipes. The channel is overgrown and takes access water around mill complex during flood conditions. (see photographs in Appendix A for of bypass pipes and Mill weir and sluice). Again, the proximity of the mill in relation to the watercourse forms a barrier to flood flows causing flooding locally.

Maintenance regime

The maintenance of all watercourses is legally the responsibility of the owner of the river (riparian owner). Many households own very small sections of the various watercourses and in many cases are also unaware of their responsibility for the watercourse.

All rivers, streams and ditches forming the natural drainage system fall into 2 categories. They are: main river and ordinary watercourses. We are the operating authority for all main rivers. V.W.H.D.C. are the operating authority for ordinary watercourses and have similar powers to us but only for ordinary watercourses. Oxfordshire County Council Highways Department are responsible for the maintenance of structures that they own, this will generally include road culverts, bridges, gullies and some ditches.

We would support riparian owners wishing to undertake maintenance of watercourses, subject to them gaining our consent where this is required. Our support could include guidance and advice on various aspects of maintenance. Further information and advice relating to the need to gain our consent can be obtained from our National Customer Contact Centre on: 08708 506 506.

Details of the rights and responsibilities of riparian landowners are provided on the our website:

http://www.environment-agency.gov.uk/subjects/flood/362926/

The same information is also available on request from us in a hard copy booklet entitled 'Living on the Edge'.

We have permissive powers to carry out maintenance on any river that is classed as main river. Our maintenance role is scheduled on the basis of flood risk priority and recourses. The primary main rivers that cause flood risk to Letcombe Regis, Wantage, Grove and East Hanney are the Letcombe Brook and Humber Ditch.

We carryout annual winter maintenance on a section of the Letcombe Brook from the main river limit at Locks Lane in Wantage to Grove Wick Farm at Grove. This work includes light trimming, selective weed removal and a scavenge to remove blockages and fallen trees and is usually undertaken late summer to avoid further excessive vegetation growth

We also maintain all 3 East Hanney Loops on a 3 yearly basis (see figure 10 in Appendix B), all 3 loops have been maintained this year (2007/2008) and will all be programmed for 2010, subject to available resources.

Structures such as bridges and culverts on the Letcombe Brook are also inspected twice a year to identify any possible issues. Structures are given a condition rating and any judged to be in poor state are investigated further and improved where necessary. We also provide an emergency response in times of peak flows to monitor and remove obstructions such as shopping trolleys and other illegally dumped waste when it poses a risk to flooding.

Our assessment of the Letcombe Brook is that increased maintenance would not deliver any further benefits to reduce flood risk.

Intervention options

Our aim is to reduce flood risk. For defended areas at flood risk we will inspect, maintain and improve flood risk management assets, on main rivers and the coast on the basis of risk (i.e. the likelihood and consequences of failure). In undefended areas we build and maintain assets where it is considered to be an appropriate use of our flood risk management resources and meets our risk-based criteria, subject to availability of funding.

Our decisions consider the long term view of the economic, social and environmental impacts of an area at risk from flooding, generally on a river catchment basis. We look at a hundred year timescale (including an allowance for climate change), when carrying out extensive studies to

assess, not only the physical and environmental impacts, but the overall costs and benefits of a scheme.

We consider a wide range of options to determine the best social, environmental and economic outcome for reducing flood risk. However we cannot construct flood alleviation schemes at every location and we target investment at greatest need. In assessing the viability of our schemes, we will always consider the resultant impacts on flood risk elsewhere.

The classification of the Letcombe Brook upstream (south) of Locks Lane in Wantage is an ordinary watercourse. We do not have powers or funding to carry out works on ordinary watercourses, therefore any investigations into flood alleviation works upstream (south) of Locks Lane in Wantage would be undertaken by V.W.H.D.C.

Previous work that we have undertaken (Letcombe Brook Inception Report – see references), has identified locations of natural storage areas which could provide additional flood storage. The flood attenuation value created using hydrological modelling software indicates that there will be very little flood storage benefit from increased storage within the catchment. It is therefore not a recommendation to look into these areas further as they are not likely to provide flood risk reduction for this magnitude of flood event when compared against the cost of construction.

Grove

There are 2 Flood Storage Areas (FSA) in Grove, these are maintained by Oxfordshire County Council. They were constructed to compensate for development which took place in the 1980's. (Located at: Wick Green Farm and Mary Green).

Due to existing residential development and limited land available, there are no viable options in Grove to construct flood storage areas or bypass channels. There is limited open space adjacent to Bosleys Orchard and existing FSA's as mentioned above, but these areas are already operating as either natural floodplain or FSA's. They could be lowered to provide additional flood storage capacity, but are unlikely to deliver flood risk benefit when compared to the cost of construction and the magnitude of the July flood event.

We are aware of a low point in the bank (left bank) in the Sharland Close. This is the location where local residents witnessed flood water first coming out of the Brook. We recommend that the low point in the bank be built up to even out the bank along this stretch. This will not provide any significant degree of flood protection, but will keep flows in the channel for longer, thus delaying the flood impact. We are working with the landowner (Grove Parish Council) to gain the necessary permissions in order to progress this work.

Wantage

The area of Mill Street in Wantage is the location which has been the most frequently flooded from the Letcombe Brook (main river). In addition to the flooding from the Letcombe Brook and the Bypass channel, there is regular foul drain flooding in Locks Lane, Betjeman Lane and Mill Street. Thames Water Utilities Ltd are responsible for foul water flooding.

There are numerous structures in the vicinity that affect flooding, they consist of trash screens, possible redundant service crossings and bridge abutments. Improvements to flood conveyance could be achieved locally via removal or re-design of some of these structures. We will work with landowners, providing advice on design, maintenance considerations and consent requirements.

East Hanney

There are no large structured engineering options available to reduce flood risk in East Hanney. However, as discussed in previous sections local flood risk improvements can be delivered via channel maintenance and via the re-development of Dandridges Mill.

Flood resilience

Flood resilience refers to measures that reduce the amount of damage caused by water entering properties. There are a wide range changes that can be made to a property and any changes would be very specific to each property in order to ensure that they are suitable.

At present our policy is not to provide financial assistance with any protection to individual properties, however the Department for Environment Food and Rural Affairs (DEFRA) are currently funding a pilot grant scheme to encourage flood resilience as part of the Making Space for Water strategy. The outcome of this study could influence the decision of funding for householders in the future.

In the 4 villages it is unlikely that flood defences can be provided for the majority of homes at risk of flooding. Individual flood protection and flood resilience measures are recommended.

In general if such measures are installed as part of repairs after the recent floods then insurance companies will expect the householder or business to meet the extra costs themselves. Possible measures include:

- Raised cupboards & electrical circuits
- Water resistant door frames
- Non-return valves on drainage pipes
- Water resistant plaster
- Air brick covers
- Tanking (waterproofing internal walls).

Flood defence products for individual properties are also widely available and we support the BSI kite mark standard which signifies that the product has been rigorously tested. (See references for links to further information).

Community flood plans

Following the July flooding we are working with affected communities to produce their own flood plans. We can assist by providing flooding advice and supplying maps and other relevant information. They can also be adapted to include other emergency situations, thus increasing the resilience of a community. The community flood plan contains information on:

- Setting up emergency management teams
- Flood event procedures
- Communications – useful numbers, local media, Environment Agency
- Flood Maps including vulnerable properties & residents
- Key community skills & equipment
- Emergency accommodation.

4 Conclusions & recommendations

The floods of July 2007 were an exceptional event, particularly in terms of the rainfall and the catchment response. The widespread flooding experienced was caused by the volume of water and inability of the overloaded drainage systems including, drains, ditches, streams and rivers to convey the flood water.

Examination of the rainfall data and river flows from the July flood event has enabled an estimation of the return period of the flood. Flood flows and levels in the main rivers in the 4 locations in July 2007 have been estimated as having a return period in excess of 1 in 100 years.

We worked with our professional partners throughout the flood event to ensure that residents and businesses were warned and then assisted where possible.

The main physical structures that effect flood flows are road culverts, bridges and built development. These structures affected the way in which the flood plain operated and in some locations increased flood risk as they became blocked with debris, but were not directly responsible for the flooding as the watercourses were already full to capacity due to the volume of water.

River flows during the flooding were approximately 4 times the normal flow, and therefore increased channel maintenance would not have significantly reduced the level of flooding experienced. This is because, any increased volume in the channel only equates to a very small proportion of the volume of water in the flood plain. However, it is recognised that channel maintenance will assist in flood risk reduction for smaller flood events and we will continue to work with landowners to offer guidance and advice.

An important element of flood risk management is to address the consequences of flooding. Communities should organise themselves with local initiatives, we can help here and we have provided parish councils with a template for a community flood plan. The Plans will:

- Identify the risks to the community and take action to mitigate them
- Identify vulnerable people in the community and develop plans to assist/protect them
- Identify resources in the community available to assist during an emergency
- Provide key contact details for the Emergency Management Team, key community recourses, the Emergency Services and local authorities.

In order to reduce the impact of any future floods there are several actions that should be taken forward as a matter of priority:

- we will work with riparian owners to increase awareness of riparian rights and responsibilities on watercourses and local land drainage system. This will include providing best practice advice, design, maintenance considerations and consent requirements, particularly in the vicinity of the Mill Lane, Wantage area where there are numerous trash screens, culverts and service crossings
- we will work with land owners (the Parish Council) at Sharland Close, Grove to build up the left bank of the Letcombe Brook, to even out the bank along this stretch and contain flows
- we will continue to raise public awareness to improve the uptake of Flood Warning Direct – the free access to all, warning service
- installation of a river level gauge on the Letcombe Brook to enhance the warning service (2008/2009)
- we will continue with the current maintenance programme
- being prepared - both at community (community flood plans) and householder level
- we will continue to work with the Vale of White Horse District Council (V.W.H.D.C.) to prevent inappropriate development in the flood plain
- increased flood resistance and resilience for homes and businesses.

Appendix A - Photographs

Concrete side sluice with timber lifting gate – the leat, Wantage

Wantage Mill - Twin masonry arch culverts under mill has trash screens on upstream end

Wantage Mill - Twin masonry arch culverts under mill has trash screens on downstream end

Wantage Mill, (upstream) - Side sluice (bypass for mill control) concrete channel sides with timber lifting gate in timber frame also has 500mm clay pipe to allow extra capacity.

Mill Street Road bridge

Twin service 600mm pipes across the Letcombe Brook - Wantage

Grove Mill, Grove

Dandridges Mill, East Hanney – Mill race

Dandridges Mill - Weir and side mill by-pass channel.

Lower Mill, East Hanney - Black plastic pipes feeding mill bypass channel.

Lower Mill, East Hanney – Fixed crest weir.

East Hanney, Lower Mill – Small wooden lifting weir

Appendix B – Maps

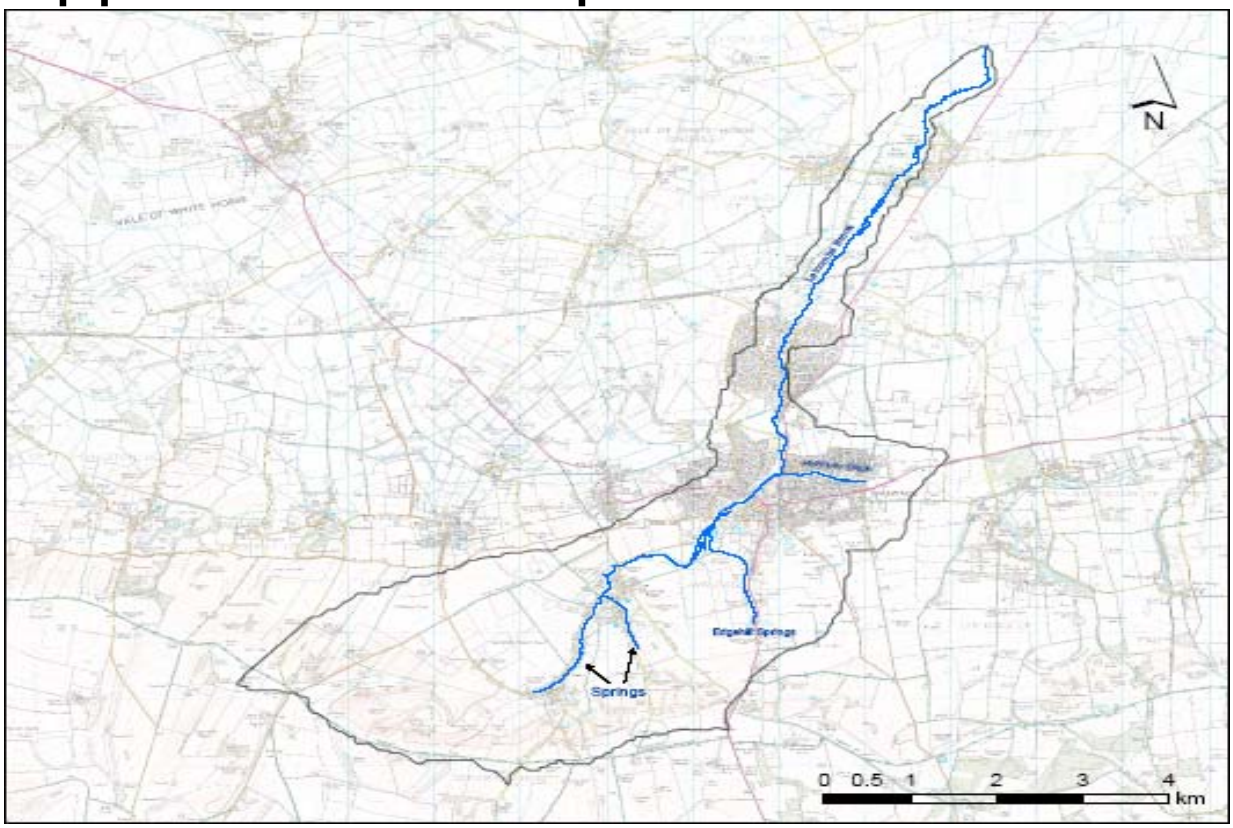


Figure 1 – Letcombe Brook catchment

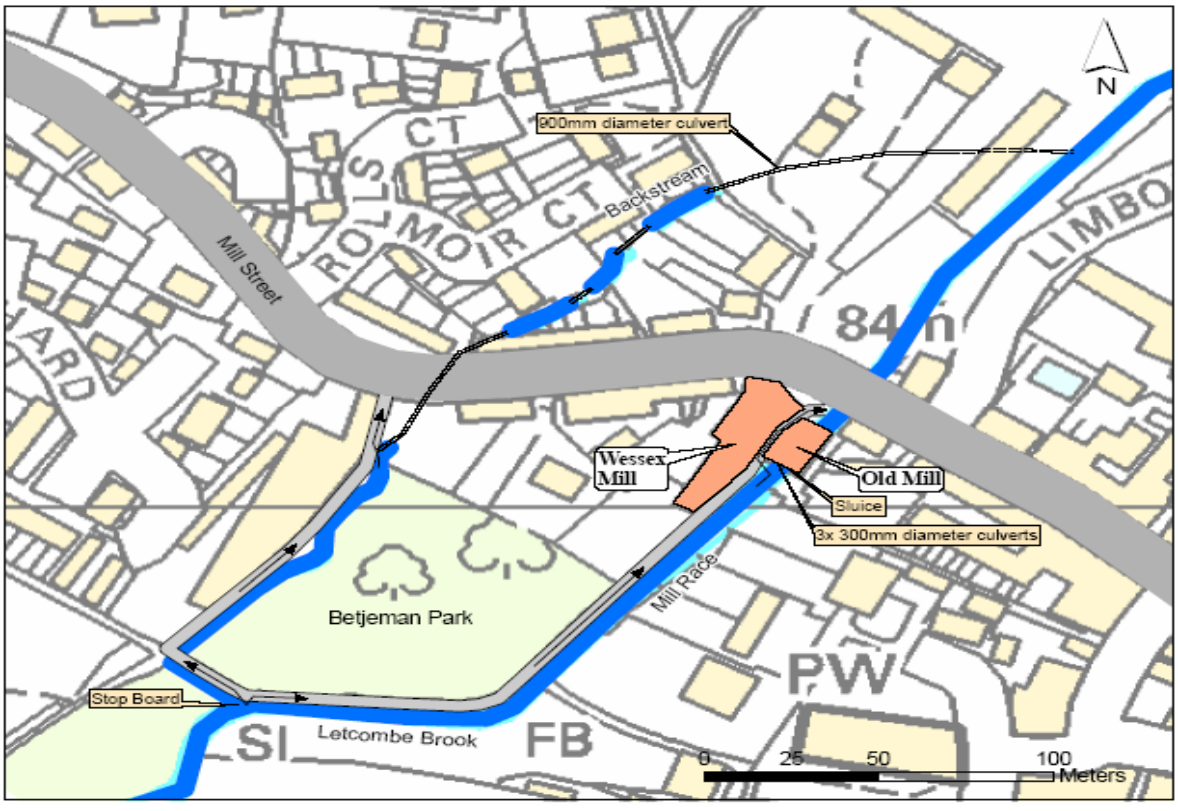


Figure 5 - Flood paths in the Mill Street area, Wantage. (location/alignment of the 900 mm culvert on the back stream is incorrect, for schematic purposes only).

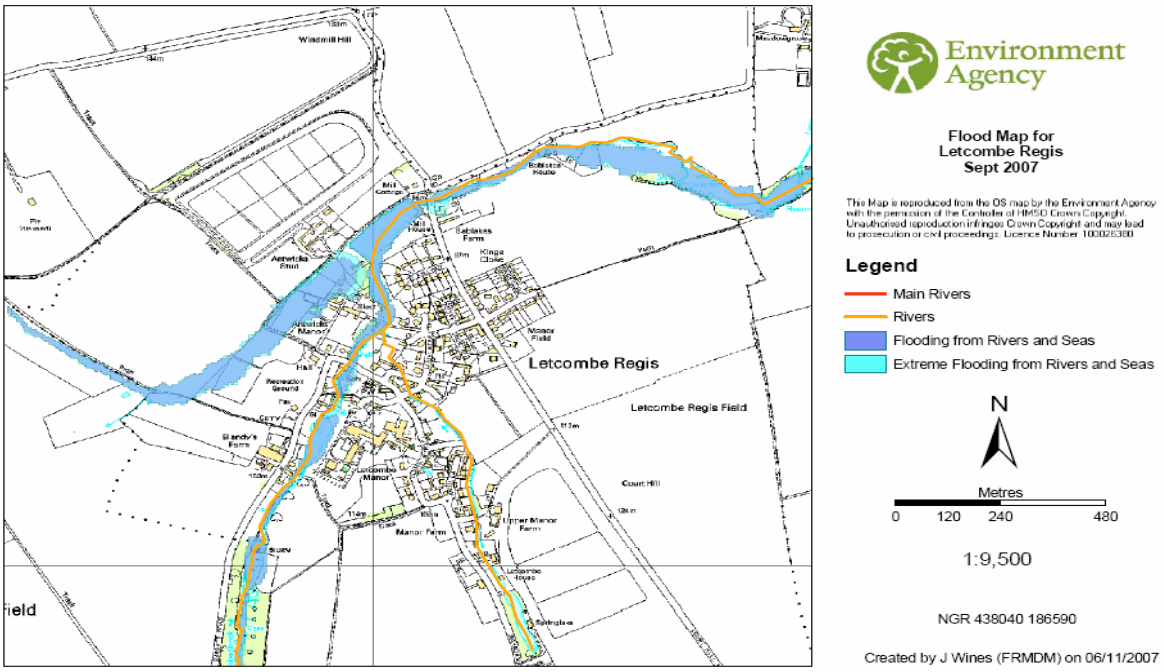


Figure 6 – Letcombe Regis Flood Zone 3 (1% annual probability of occurrence) and FZ2 (0.1% annual probability of occurrence)

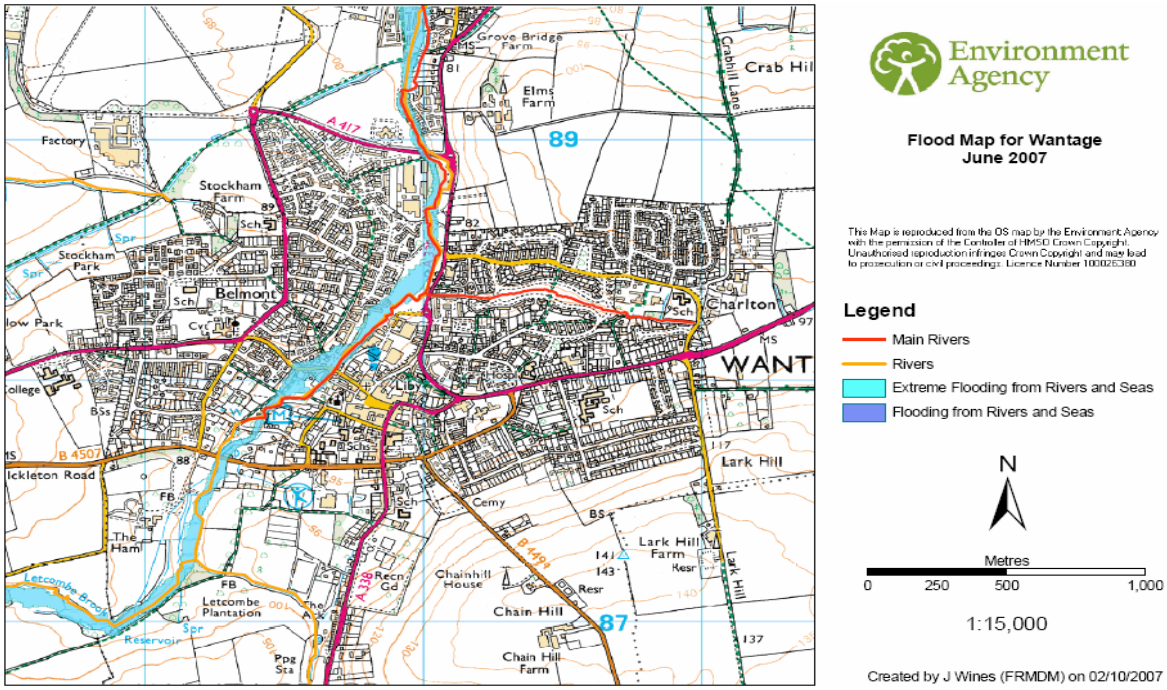


Figure 7 – Wantage –Flood Zone 3 (1% annual probability of occurrence) and FZ2 (0.1% annual probability of occurrence)

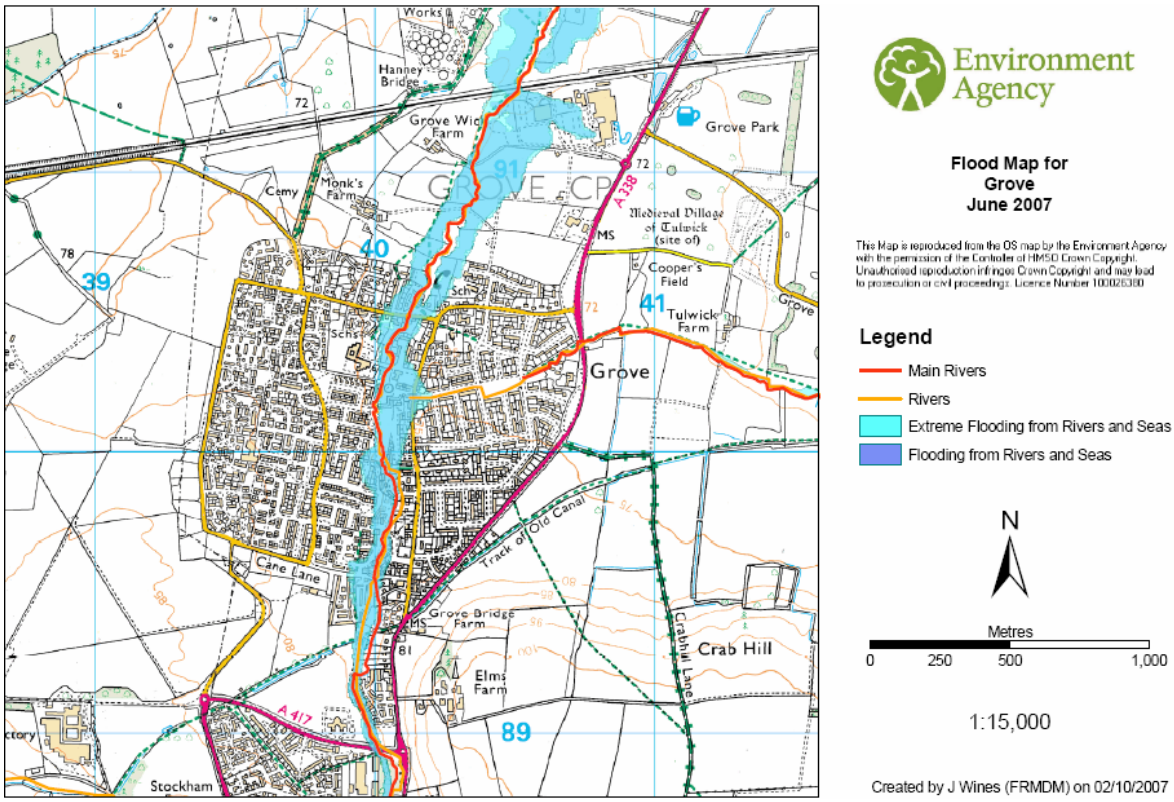


Figure 8 – Grove –Flood Zone 3 (1% annual probability of occurrence) and FZ2 (0.1% annual probability of occurrence)

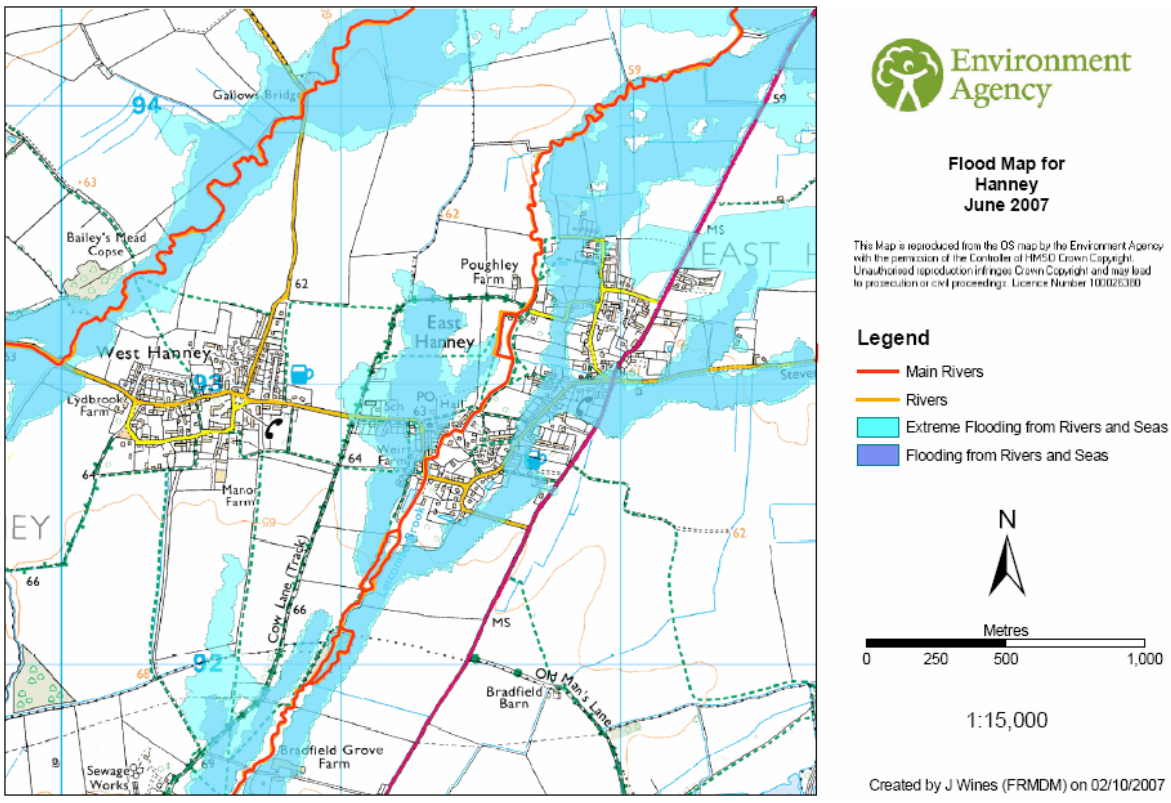


Figure 9 – East Hanney –Flood Zone 3 (1% annual probability of occurrence) and FZ2 (0.1% annual probability of occurrence)

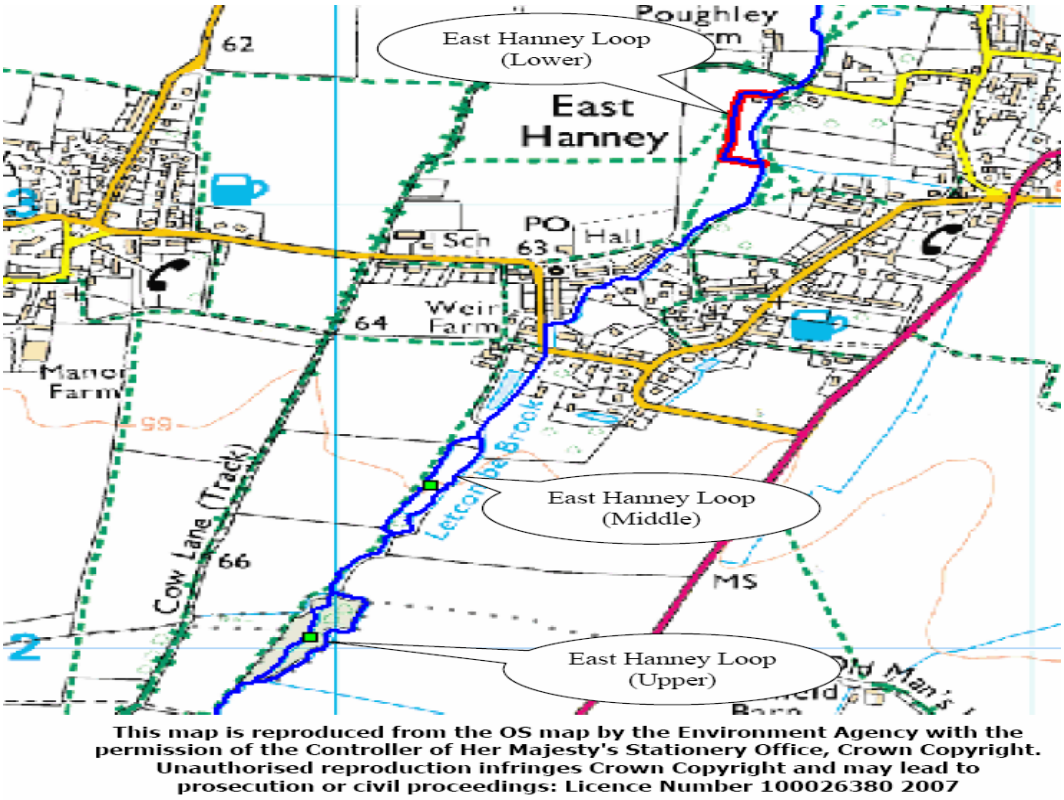


Figure 10 – Environment Agency maintenance location for the 3 East Hanney Loops

Glossary of terms

Cost benefit analysis
In order to receive funding for a flood defence scheme an analysis must be made of the costs and benefits. The costs include the design, construction and maintenance over a 100 year period. This is compared against the benefits – i.e. the reduction in damage caused by flooding of properties in financial terms. The higher the ratio of cost to benefit the more likely the scheme is to gain funding due to the national prioritisation of flood risk capital funding.

Critical ordinary watercourse
These are ordinary watercourses which have been identified by DEFRA as being strategically important and are to be enmained.

Culvert
A closed conduit for the conveyance of water, e.g. a pipe underneath a road.

Enmained
Procedure in which the Environment Agency assumes powers to legally chance the classification of an Ordinary Watercourse to a Main River in order to maintain exercise its Permissive powers for maintenance, flood warning and flood alleviation works.

Flood plain
A flood plain is an area of land over which river or sea water flows or is stored in times of flood. A flood plain can extend beyond the land immediately adjacent to a watercourse. (Living on the edge)

Flood zone
Flood Zones are the Environment Agency's nationally agreed geographical layers of information that define the extend of flood risk. They are split into Flood Zone 1, 2 and 3.
Flood Zone 2 is flooding from rivers without defences at a 1% (1 in 100) chance of happening each year. It is the natural flood plain area that could be affected in the event of flooding from rivers.
Flood Zone 3 is the outline of a flood extent in an extreme flood with a 0.1% (1 in 1000) chance of happening each year.

Flood storage area
A flood storage area is a part of the flood plain that allows flood waters to be temporarily stored. The purpose of such an area is generally to retard larger floods from reaching a main watercourse for a designed flood return period.

Fluvial flooding
Flooding where the source is river water.

Land drainage scheme
Post World War II the emphasis in river engineering was on increasing the farming capacity of the UK. This was achieved through land drainage schemes that increased the quality of farmland by maximising the drainage of water.

Main rivers
Main rivers are defined under the Water Recourses Act 1991, they are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown as such on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of the main river. The Environment Agency's powers to carry out flood defence works apply to main rivers only. Main rivers are designated by the Department for Environment, Food and Rural Affairs in England (DEFRA) and by the Welsh Assembly Government.

National flood and coastal defence database (NFCDD)
The National Flood and Coastal Defence Database is a central store for Flood Risk Management related data. It aims to allow rapid access to national data, stored and maintained in a consistent manner.

Ordinary watercourse
An ordinary watercourse as defined under the Land Drainage Act 1991 is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than public sewer) and passage through which water flows which does not form part of a main river. On ordinary watercourses, the local authority and, where relevant, Internal Drainage Boards (IDB) have similar permissive powers as the Environment Agency has on main rivers. (Living on the edge)

Pluvial flooding
Flooding where the source is surface water.

Priority score
The national scoring system that is used by the Environment Agency and DEFRA to prioritise the capital funding of flood defence schemes.

Professional partners
Professional partners are organisations we work with. Specifically, the emergency services, local authorities, health bodies, utilities, transport bodies and other Government agencies.

Public surface water sewers
The sewerage undertaker is responsible for maintaining surface water sewers that are vested in them. Surface water sewers are likely to go directly into a watercourse.

Roadside ditches and highway drainage
The County Council as Highway Authority is responsible for draining those highways, which are county roads, and has responsibility for certain bridges and culverts, under the Highways Act 1980. In general terms, it is usual for the roadside ditches to be the responsibility of the adjoining landowner; exceptions to this rule are where the ditch was constructed to drain the highway or where it falls within the land owned by the highway authority.

Riparian owner
The owner of the river in terms of property. The usual situation is for the landowner of each bank to own up to the centreline of the river. There are responsibilities and rights associated with owning the river – principally that of maintenance of the watercourse and associated structures.

Sewer
Includes all sewers and drains which are used for the drainage of buildings and yards appurtenant to buildings, excluding a drain used for the drainage of a single building or of buildings within a single curtilage.

Trash screen
A grill or grate that is installed on a culvert or other limited opening on a river to collect debris and prevent blockages.

List of abbreviations

AOD	Above Ordinance Datum
BSI	British Standards Institute
CFMP	Catchment Flood Management Plan
COW	Critical Ordinary Watercourse
DEFRA	Department for Environment, Food & Rural Affairs in England
FSA	Flood Storage Area
GMT	Greenwich Mean Time
NFCDD	National Flood and Coastal Defence Database
LTA	Long Term Average
PPS25	Planning Policy Statement 25
RICS	Royal Institute for Chartered Surveyors
SMD	Soil Moisture Deficit

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