

# Burneside

## Flood Investigation Report



Surface water flooding at Hall Park on the 5<sup>th</sup> December 2015

## Flood Event 5-6<sup>th</sup> December 2015

This flood investigation report has been produced by the Environment Agency as a key Risk Management Authority under Section 19 of the Flood and Water Management Act 2010, in partnership with Cumbria County Council as Lead Local Flood Authority.

Version	Prepared by	Reviewed by	Approved by	Date
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Draft v2.0	David Webborn	Jonathan Coates, EA Elizabeth Kelly, EA	Kathryn Tanner, EA	6 <sup>th</sup> July 2016
Final v3.0	Jonathan Coates, EA	Catherine Evans, EA	Kathryn Tanner, EA	November 2016

# Executive Summary

The flooding experienced in Burneside on the 5<sup>th</sup> and 6<sup>th</sup> of December 2015 was the largest on record, and was the result of the effects of Storm Desmond. This storm caused a period of prolonged, intense rainfall across Northern England. This rainfall fell on catchments that were already saturated and resulted in high river levels and flooding throughout Cumbria and further afield. Flows in the River Kent and the River Sprint on the 5<sup>th</sup> of December were the highest ever recorded, and the various flooding mechanisms that occurred caused widespread flooding throughout the village.

In response to the Storm Desmond flood event, this *Flood Investigation Report* has been completed by the Environment Agency as a key Risk Management Authority (RMA) working in partnership with Cumbria County Council (CCC) as the Lead Local Flood Authority (LLFA), under the duties set out in Section 19 of the Flood and Water Management Act 2010. This report provides a summary of the flooding that occurred in Burneside on the 5<sup>th</sup> and 6<sup>th</sup> of December, and to do so it has used a range of data collected from affected residents, professional partners, site visits, surveys, and general observations, along with river and rainfall telemetry data recorded during the event.

Approximately 80 properties were directly affected by flooding, with the majority of these located in the centre of the village. The principal source of this flooding was the River Kent, where the recorded water level broke the previous record and resulted in the river bursting its banks and overwhelming existing flood defences. Some flood defences were overtopped, while others were outflanked, and Ford Bridge suffered structural damage. Fluvial flooding also occurred from other, smaller watercourses in the Burneside area, with parts of the village also suffering from surface water flooding.

This report provides details of the flooding that occurred in Burneside from the River Kent, River Sprint, and other smaller watercourses. It also identifies areas affected by flooding from surface water and drainage systems.

In total, 21 actions have been recommended in this report, which will require the involvement of a number of organisations, as well as from local communities. One of the main actions is for the Environment Agency to undertake a review of the existing modelling data, to ensure that the flooding mechanisms that occurred in Burneside are fully understood. This important information will be used to inform Environment Agency investment plans for new flood defences and an improved flood warning service in Burneside.

A draft version of the Burneside Flood Investigation Report was published online in July for public consultation. Following the draft publication, a public meeting chaired by Cumbria County Council was held in Burneside on the 12<sup>th</sup> July, where the Environment Agency formally presented the report to the local community. Other Risk Management Authorities were also present at the meeting to answer any questions raised during a question and answer session following presentation of the report. Through the public meeting and local consultation with the community, including with the local Flood Action Group, a range of feedback has been provided on the report. The Environment Agency have reviewed this feedback and, where appropriate, updated the Final version of the report to reflect the required amendments.

Please note that references to left and right bank in this report are for the observer looking downstream with the flow of water.

Any additional information that can be provided to the Environment Agency and Cumbria County Council to help develop our understanding of the flooding is welcomed. A lot of information has already been provided, much of which has been used to inform this report. Any additional information should be provided to;

<http://www.cumbria.gov.uk/planning-environment/flooding/floodriskassessment.asp>

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# Introduction

Under Section 19 of the Flood and Water Management Act (2010) Cumbria County Council, as Lead Local Flood Authority (LLFA), has a statutory duty to produce Flood Investigation Reports for areas affected by flooding. Section 19 of the Flood and Water Management Act states:

- (1) *On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate:*
  - (a) *which risk management authorities have relevant flood risk management functions, and*
  - (b) *whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*
- (2) *Where an authority carries out an investigation under subsection (1) it must —*
  - (a) *publish the results of its investigation, and*
  - (b) *notify any relevant risk management authorities.*

This section of the Act leaves the determination of the extent of flood investigation to the LLFA. It is not practical or realistic for Cumbria County Council to carry out a detailed investigation into every flood incident that occurs in the County, but every incident, together with basic details will be recorded by the LLFA.

Only those with 5 or more properties/businesses involved will have investigations published.

An investigation will be carried out, and a report prepared and published by the LLFA when the flooding impacts meet the following criteria:

- Where there is ambiguity surrounding the source or responsibility of flood incident,
- Internal flooding of one property that has been experienced on more than one occasion,
- Internal flooding of five properties has been experienced during one single flood incident and
- There is a risk to life as a result of flooding.

As a flood Risk Management Authority (RMA), the Environment Agency have partnered with Cumbria County Council (CCC) to produce the 53 flood investigation reports across Cumbria.

## Scope of this Report

This Flood Investigation Report **is**:

- An investigation on the what, when, why, and how the flooding took place resulting from the 5<sup>th</sup>-6<sup>th</sup> December 2015 flooding event and
- A means of identifying potential recommendations for actions to minimise the risk or impact of future flooding.

This Flood Investigation Report **does not**:

- Interpret observations and measurements resulting from this flooding event. Interpretation will be undertaken as part of the subsequent reports,
- Provide a complete description of what happens next.

The Flood Investigation Reports outline recommendations and actions that various organisations and authorities can do to minimise flood risk in affected areas. Once agreed, the reports can be used by communities and agencies as the basis for developing future plans to help make areas more resilient to flooding in the future.

For further information on the S19 process, including a timetable of Flood Forum events and associated documentation, please visit the County Council website at:

<http://www.cumbria.gov.uk/floods2015/floodforums.asp>

To provide feedback on the report please email [LFRM@cumbria.gov.uk](mailto:LFRM@cumbria.gov.uk).

## Flooding History

Burneside is located on the confluence of two major rivers that both drain upland rural catchments, and is therefore highly prone to flooding.

The earliest recorded flooding in Burneside dates back as far as the 17<sup>th</sup> century. Prior to the December 2015 flood event, the highest recorded flood event in Burneside was in November 1898. In December 1954, flooding nearly reached the same level as in 1898. Further flood events of a lower magnitude were also experienced in 1979, 1982, 1985, 1995 and 1999.

In February 2004, flooding affected the Bridge Street and Carlingdale areas, flooding approximately 11 properties. Very heavy rainfall on the 6<sup>th</sup> and 7<sup>th</sup> January 2005 resulted in flooding impacts in various locations in Burneside. The River Kent affected several properties in the Carling Steps area, and also overtopped upstream of Ford Bridge. This may, in part, have been due to a tree being lodged against the bridge. Nine properties were flooded upstream of the bridge, some as a result of the River Kent overtopping, and some from groundwater and surface water seeping through floors. Downstream of Ford Bridge, properties at Junction Cottages were affected by the River Kent overtopping.

A further flood event occurred in November 2009, affecting much of Cumbria, including flooding impacts in Burneside. Properties at Bridge Street and Junction Cottages were flooded from the River Kent, whilst properties at Carling Steps were flooded from a minor watercourse, which flows through the area from the rear of the properties.

The 2015 event caused by Storm Desmond was of significantly greater magnitude than past events, and the gauged flows in the River Kent and River Sprint were the highest on record. Table 1 shows the recorded maximum flows in the two rivers during past flooding events, and the numbers of properties affected (where available).

Flooding Event	Number of Properties Flooded	Peak Flow in River Kent @ Bowston	Peak Flow in River Sprint @ Sprint Mill
February 2004	8	109.0	71.9
January 2005	19	122.5	80.5
November 2009	25	118.9	71.7
December 2015	80	177.0	94.8

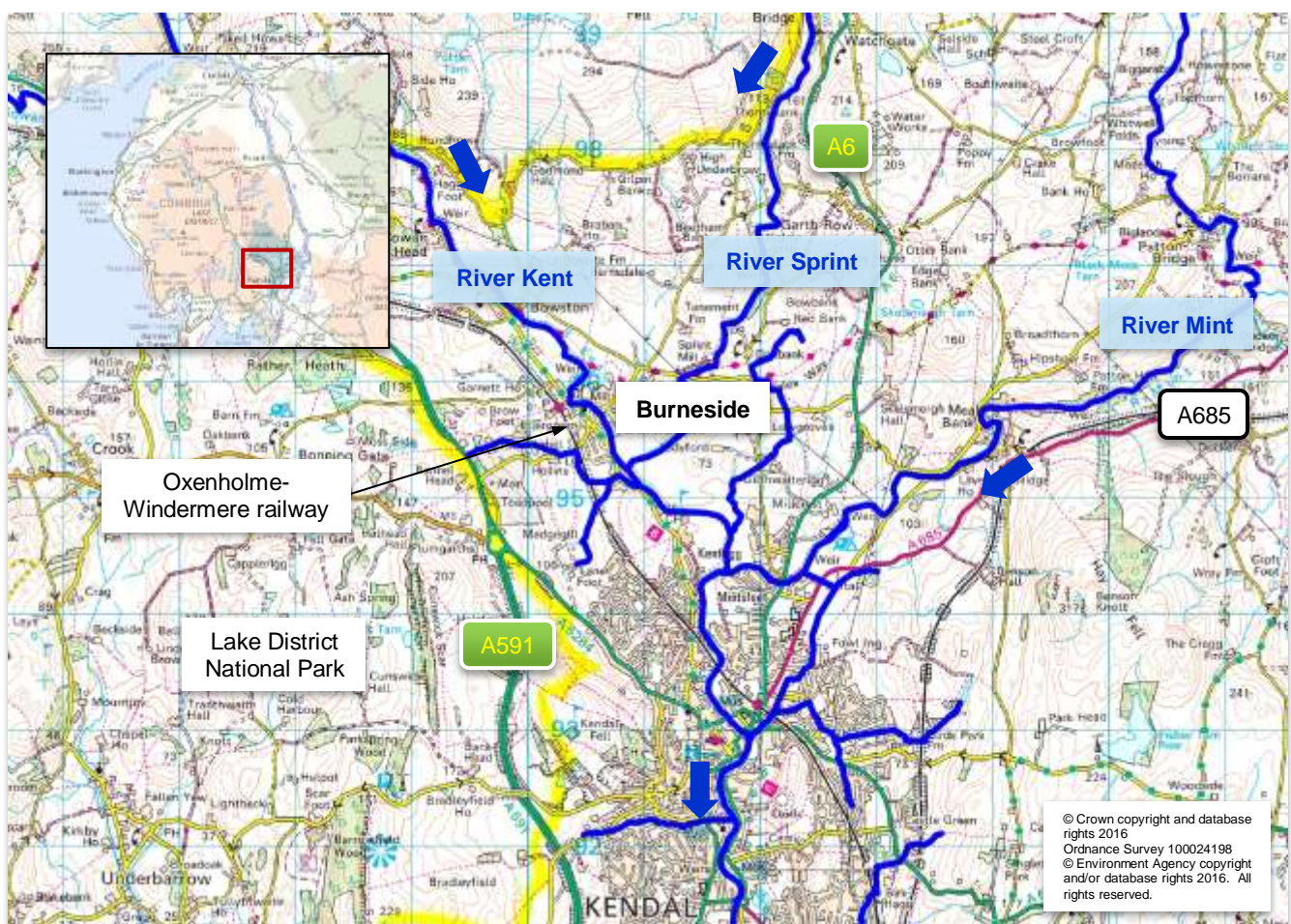
**Table 1: Recent flood events affecting Burneside**

# Event Background

This section describes the location of the flood incident and identifies the areas of the village that were flooded.

## Flooding Incident

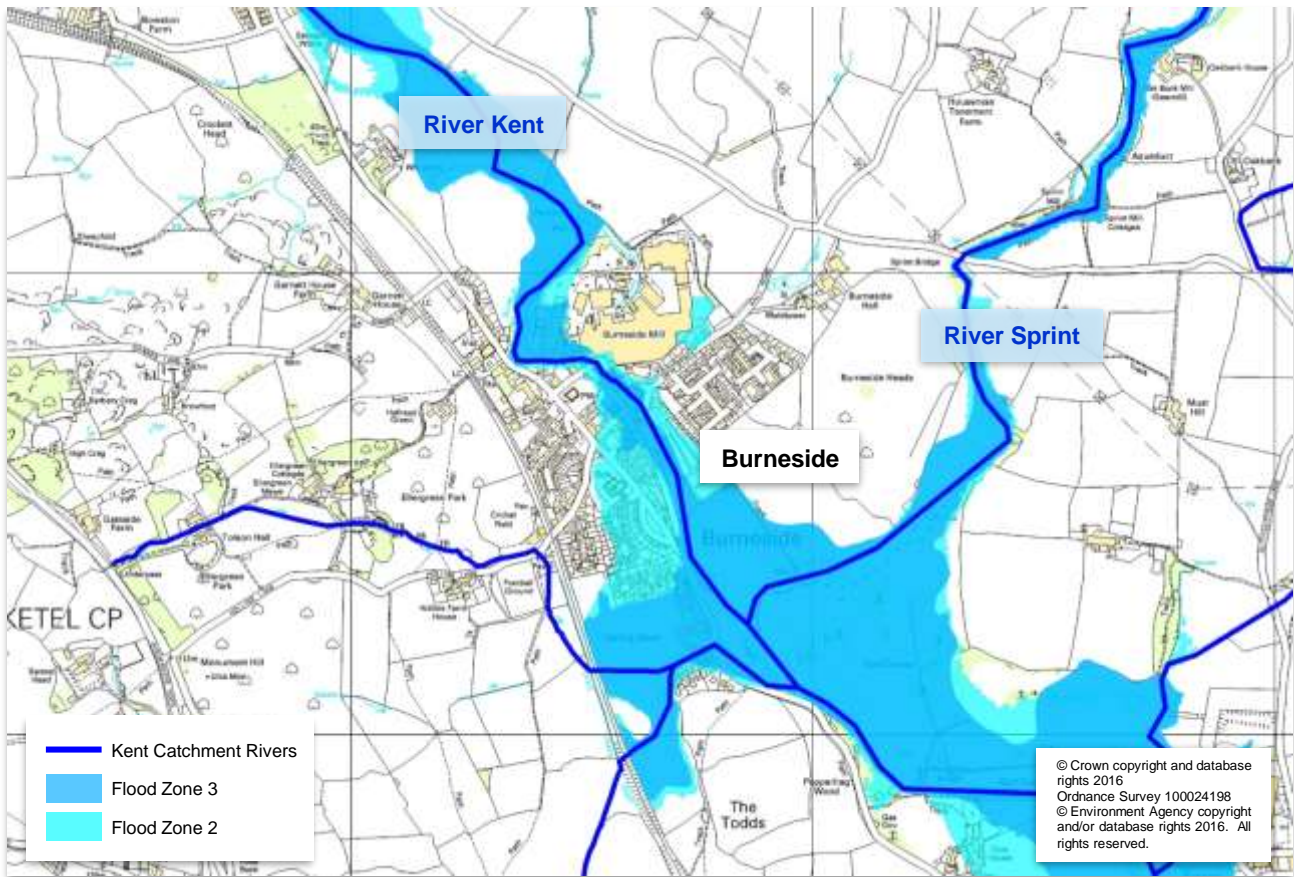
The village of Burneside is located in south-east Cumbria and is partly situated in the floodplains of the Rivers Kent and Sprint. Upstream of the former Burneside gauging station, the River Kent drains a mostly rural 74km<sup>2</sup> catchment that includes part of the south-eastern Lake District National Park. The village itself is situated immediately upstream of the River Kent's confluence with the River Sprint, which drains a 36km<sup>2</sup> catchment due north of the village. The location of Burneside and its major rivers are shown in Figure 1.



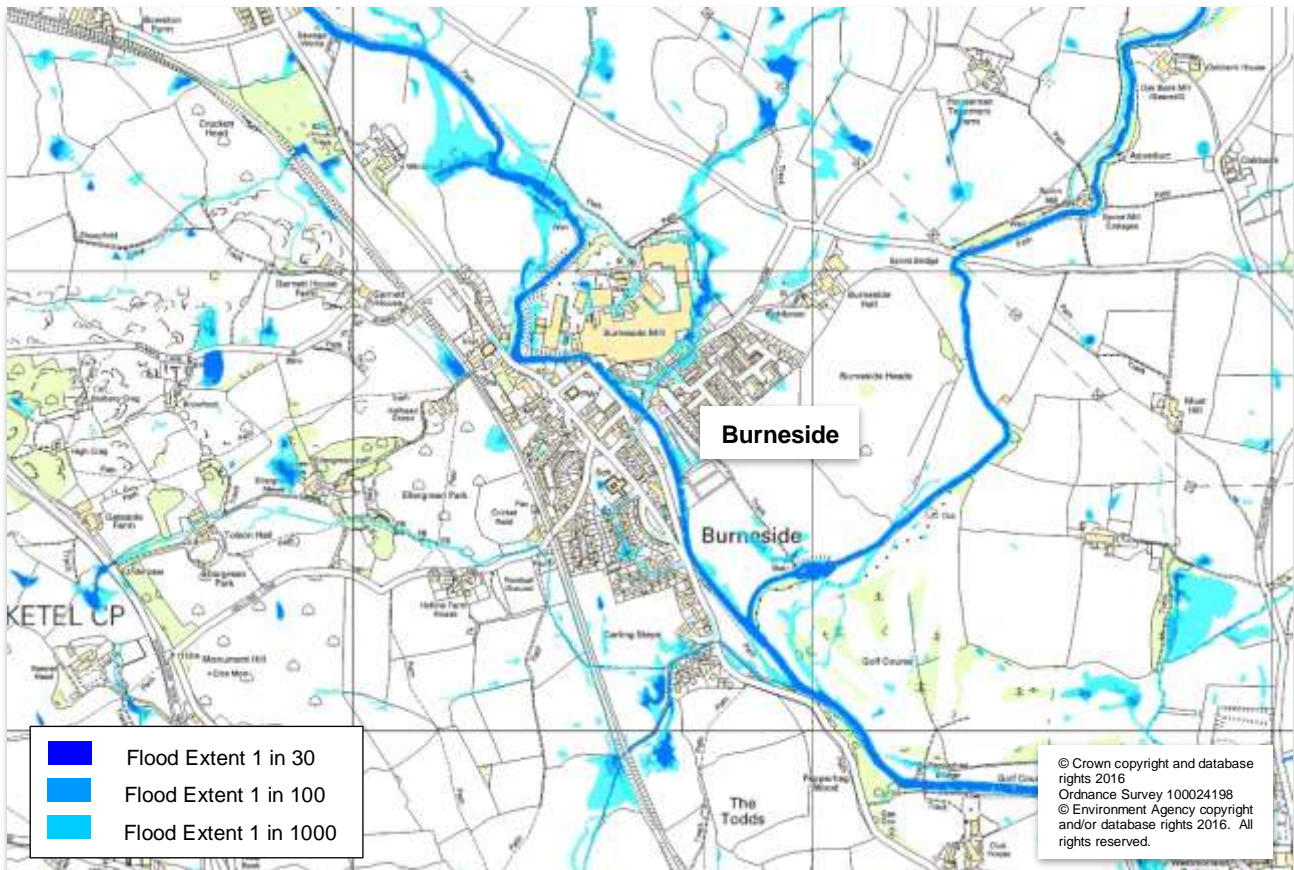
**Figure 1: Location of Burneside and its major rivers**

Burneside is located approximately 3km north-west of Kendal and has a population of around 2,000. Principal road access to the village is provided from the A591, and it is also served by the Oxenholme-Windermere railway line. The village is home to the James Cropper paper mill, which forms a significant part of the village's local economy.

Due to its position within the floodplains of the Rivers Kent and Sprint, parts of Burneside lie within Flood Zone 3 (1% Annual Exceedance Probability or AEP) and are therefore at risk of fluvial flooding (see Figure 2). Parts of the village also lie within Flood Zone 2 (0.1% Annual Exceedance Probability or AEP). The village is also at risk from other sources of flooding, including surface water (see Figure 3).



**Figure 2: Indicative risk of flooding to Burneside from rivers (fluvial)**



**Figure 3: Areas in Burneside at risk of surface water flooding**



On the 5<sup>th</sup> and 6<sup>th</sup> December 2015, approximately 80 properties in Burneside were affected by flooding as a result of Storm Desmond, which caused record breaking rainfall over Cumbria and other parts of north-west England. The storm led to widespread river and surface water flooding across Cumbria, with significant flood events occurring on the Eden, Derwent and Kent catchments.

In Burneside, the main source of the flooding was from the River Kent as flood water overtopped the banks of the river. Initially, overtopping of the left bank resulted in flooding to commercial property within the James Cropper paper mill complex. The river banks and flood defences were also overtopped in the centre of the village downstream of the mill. This overtopping caused flooding to residential properties on both sides of the river on Bridge Street, as well as affecting properties on New Street and New Road.

Flooding from the River Kent also affected the southern end of Burneside, with properties on Bournville, Carling Steps and Carlingdale affected. Properties in this area were also directly affected by flooding from an ordinary watercourse that flows through Carling Steps and Carlingdale and is culverted under Burneside Road, as well as by flooding from surface water run-off from the south-west.

Surface water run-off caused further isolated flooding in other parts of the village, including the area around Burneside rail station and at the top of Hall Park.

Flooding originating in the Mill Flats field to the north east of the James Cropper paper mill also affected the eastern area of the complex, with floodwater from this area flowing through the complex and down New Street towards Bridge Street, affecting properties in these locations.

Figure 4 indicates the extent of the flooding that occurred in Burneside from all sources following Storm Desmond. Further details on the above flooding mechanisms are contained in the *Sources of Flooding, Flood Flow Routes and Event Timeline* section from page 16.

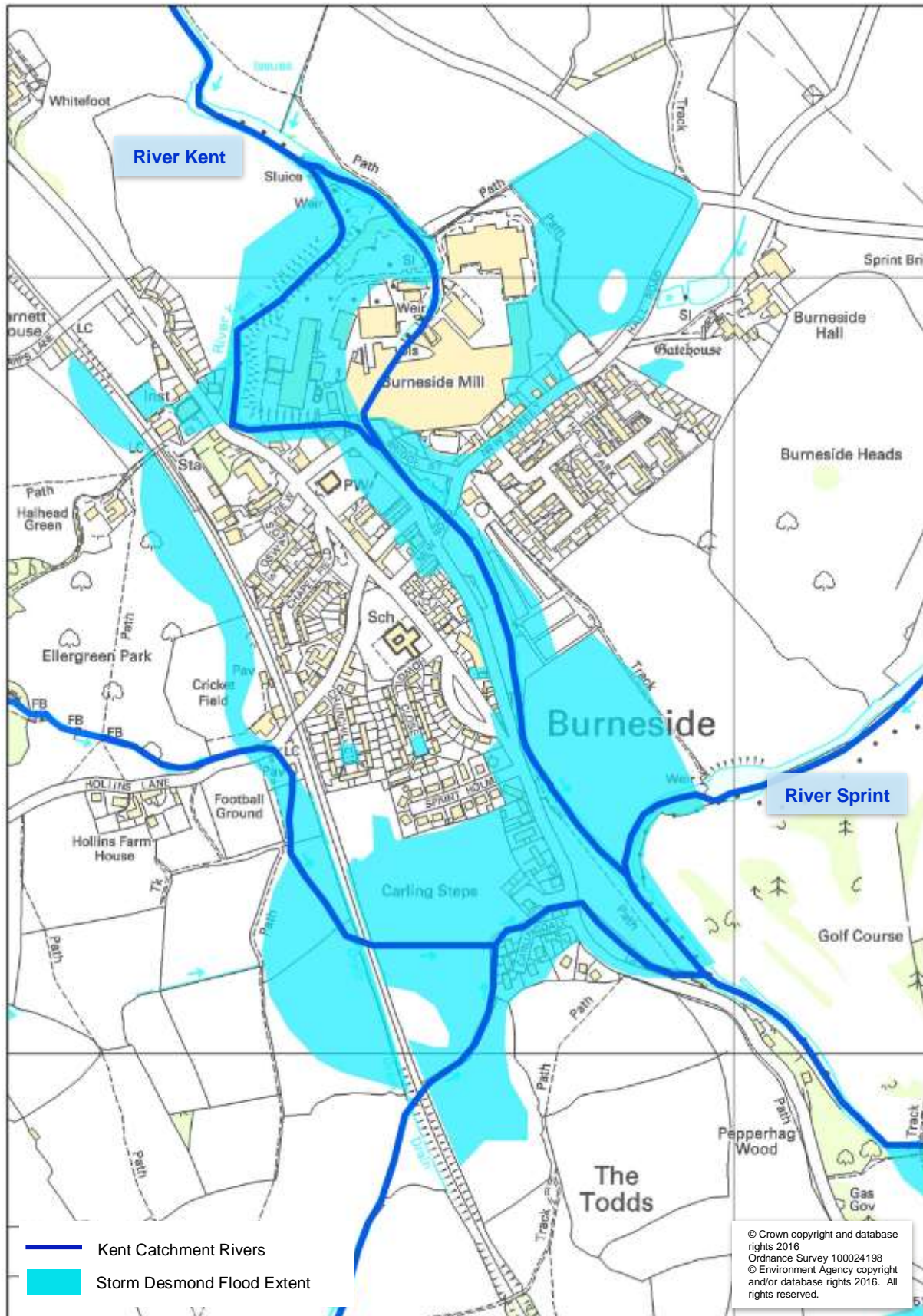


Figure 4: Extent of flooding in Burneside on 5-6<sup>th</sup> December 2015

## Existing Flood Defences

There are a small number of formal raised flood defences within Burneside. A defence wall on the left river bank runs along Bridge Street between the James Cropper Paper Mill and Ford Bridge. There is also a defence wall that runs around a terrace of properties on Steeles Row. These walls incorporate flap valves, which allow water gathered on the 'dry' side of the defence wall to drain once river levels fall.

A map of existing flood defences and other flood risk management assets serving the village is shown in Figure 5.

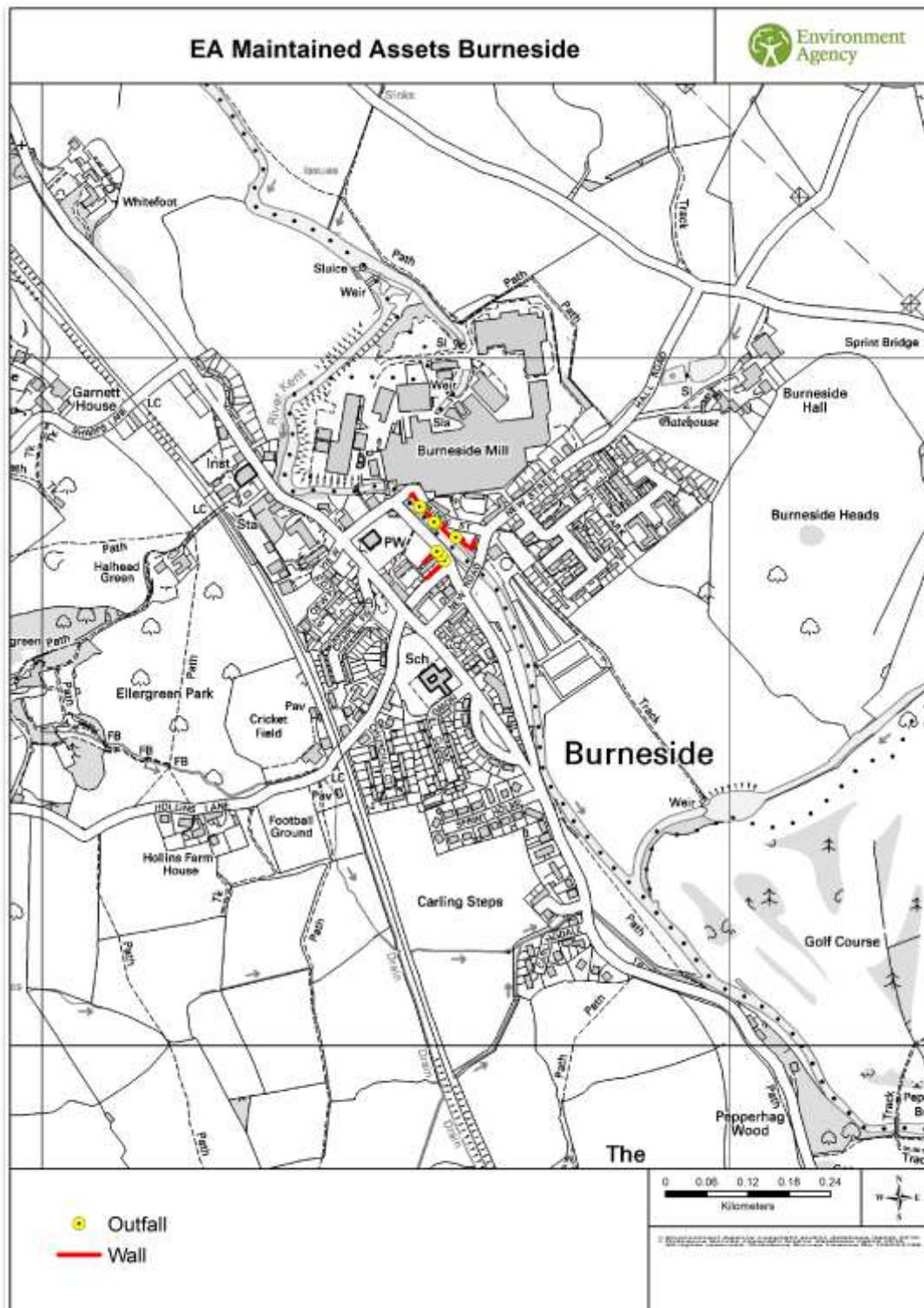


Figure 5: Existing flood defences in Burneside

# Investigation

This section describes the rainfall and fluvial events that occurred on the River Kent and River Sprint catchments, the likely causes of flooding and the Environment Agency response in Burneside. It also provides a timeline of the events that occurred over 5<sup>th</sup>-6<sup>th</sup> December 2015.

This investigation was carried out by the Environment Agency using data collected from surveys of the area, and from the communities affected, with help from Cumbria County Council. This report has compiled this data to provide a detailed record of the flooding in Burneside.

## Rainfall and Fluvial Events

December 2015 was the wettest calendar month on record, with much of northern England receiving double the average rainfall for that time of year. This also followed a particularly wet November, which resulted in catchments that were already heavily saturated prior to the rainfall event associated with Storm Desmond.

From the 4<sup>th</sup> to the 7<sup>th</sup> of December 2015, Storm Desmond resulted in a period of prolonged rainfall across Cumbria, which was particularly intense over 5<sup>th</sup>-6<sup>th</sup> December and caused widespread flooding across the county. Over this period, new 24 and 48 hour rainfall records were set for the UK. Both of these were within Cumbria and broke the previous records, also within Cumbria, set in the November 2009 flood event, which saw widespread devastation in the towns of Cockermouth and Workington. The record-breaking total rainfall values are presented in Table 2.

Rainfall Period	Storm Desmond			Previous Record		
	Date	Location	Total rainfall (mm)	Date	Location	Total rainfall (mm)
24 hour rainfall	December 2015	Honister Pass	341.4	November 2009	Seathwaite	316.4
48 hour rainfall	December 2015	Thirlmere	405.0	November 2009	Seathwaite	395.6

**Table 2: UK Rainfall Records**

Within the Kent catchment, Kentmere Hallow Bank rain gauge recorded a total of 225.8mm of rain between 19:00 on 04/12/2015 and 07:45 on 06/12/2015. In the River Sprint catchment, Longsleddale Swinklebank rain gauge recorded a 24 hour rainfall total of 168.6mm on 05/12/2015, with a 48 hour rainfall total of 240.8mm. This is the rainfall associated with Storm Desmond, and this followed a series of smaller rainfall events in the preceding days, which contributed to the already saturated ground conditions in the catchment. Table 3 summarises the rainfall data recorded in the River Kent and River Sprint catchments during Storm Desmond, and illustrates that the data recorded during Storm Desmond far exceeds the previous record gaugings. The locations of the rain gauges are shown in Figure 6.

Location	Rainfall Period	Storm Desmond		Previous Record	
		Date	Total rainfall (mm)	Date	Total rainfall (mm)
Kentmere Hallow Bank	24 hour rainfall	December 2015	183.4	November 2009	137.6
	48 hour rainfall	December 2015	225.8	November 2009	160.4
Longsleddale Swinklebank	24 hour rainfall	December 2015	168.6	January 1999	102.8
	48 hour rainfall	December 2015	240.8	November 2009	157.2

**Table 3: Rainfall data associated with Storm Desmond in the River Kent and River Sprint catchments**

Five principal flow gauging stations are located within the catchment of the River Kent<sup>1</sup> (see Figure 6). One of the stations is located upstream of Burneside on the River Kent at Bowston, which replaced Burneside gauging station (now closed) in 1999. Sprint Mill gauging station gauges flow on the River Sprint and is located approximately 1km north-east of the village. Further downstream on the River Kent, Victoria Bridge gauging station is located in the centre of Kendal, while Sedgwick gauging station is located approximately 6km downstream of Kendal town centre. In addition to these, Mint Bridge gauging station gauges flows in the River Mint, which joins the River Kent downstream of Burneside in north Kendal. Together, these stations recorded the fluvial event caused by Storm Desmond, and the recorded data is presented in Table 4, Figure 7 and Figure 8.

At Bowston gauging station, the level of the River Kent peaked at 60.0m AOD at 18:15 on Saturday 5<sup>th</sup> December. This was the highest river level ever recorded, and exceeded the previous record level of 59.6m AOD (January 2005).

<sup>1</sup> Flow gauging station data obtained from Environment Agency records and the National River Flow Archive ([www.nrfa.ceh.ac.uk](http://www.nrfa.ceh.ac.uk))

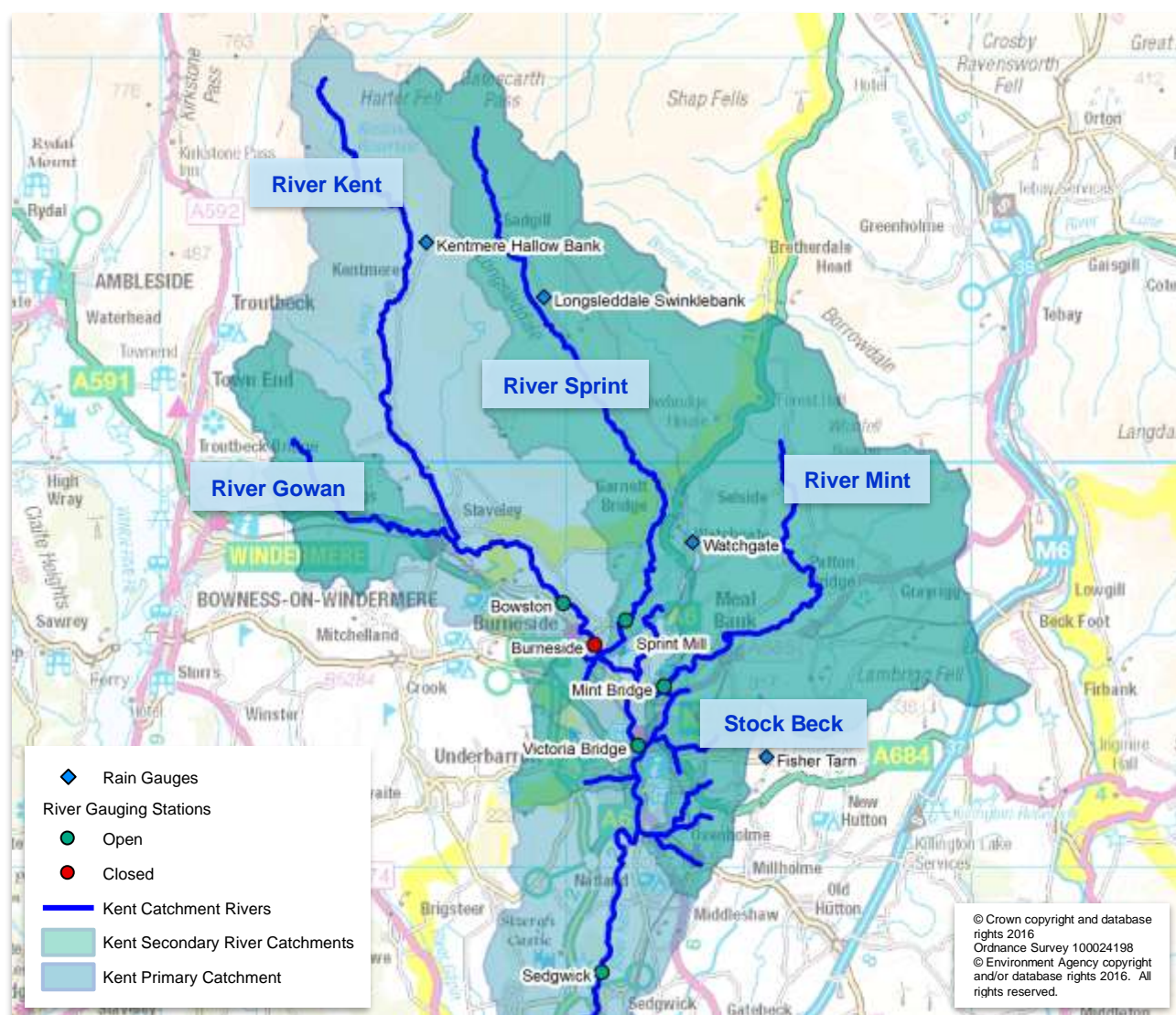


Figure 6: Location of rain gauges and river gauging stations in the River Kent catchment

Gauging Station	River	Peak flow (m <sup>3</sup> /s)	
		Dec 2015	Jan 2005
Bowston	Kent	177.0	122.5
Sprint Mill	Sprint	94.8	80.5
Mint Bridge	Mint	170.0	115.4
Victoria Bridge	Kent	403.0	286.5
Sedgwick	Kent	526.8	347.0

Table 4: Recorded peak river flows in the River Kent Catchment

Source: Flow gauging station data obtained from Environment Agency records and the National River Flow Archive ([www.nrfa.ceh.ac.uk](http://www.nrfa.ceh.ac.uk))

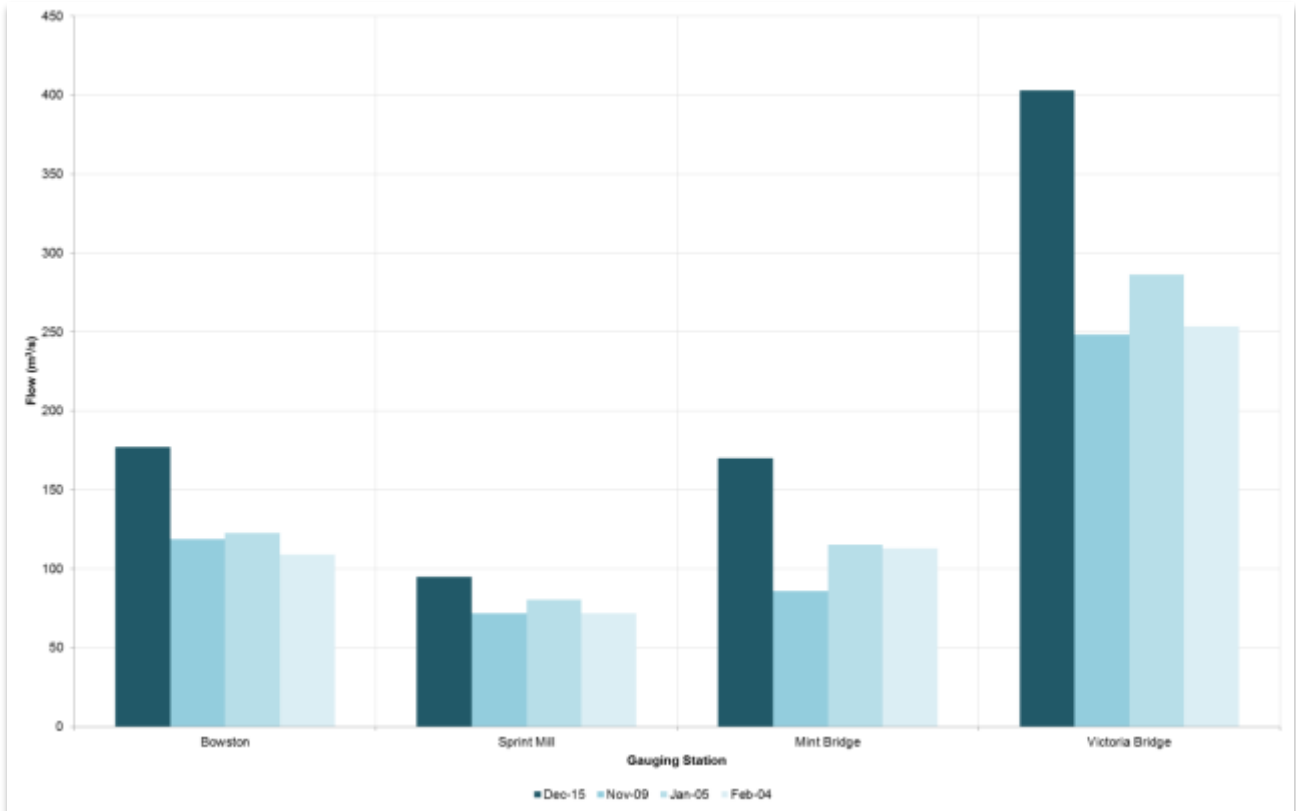


Figure 7: Recorded peak river flows in the River Kent catchment for recent flood events

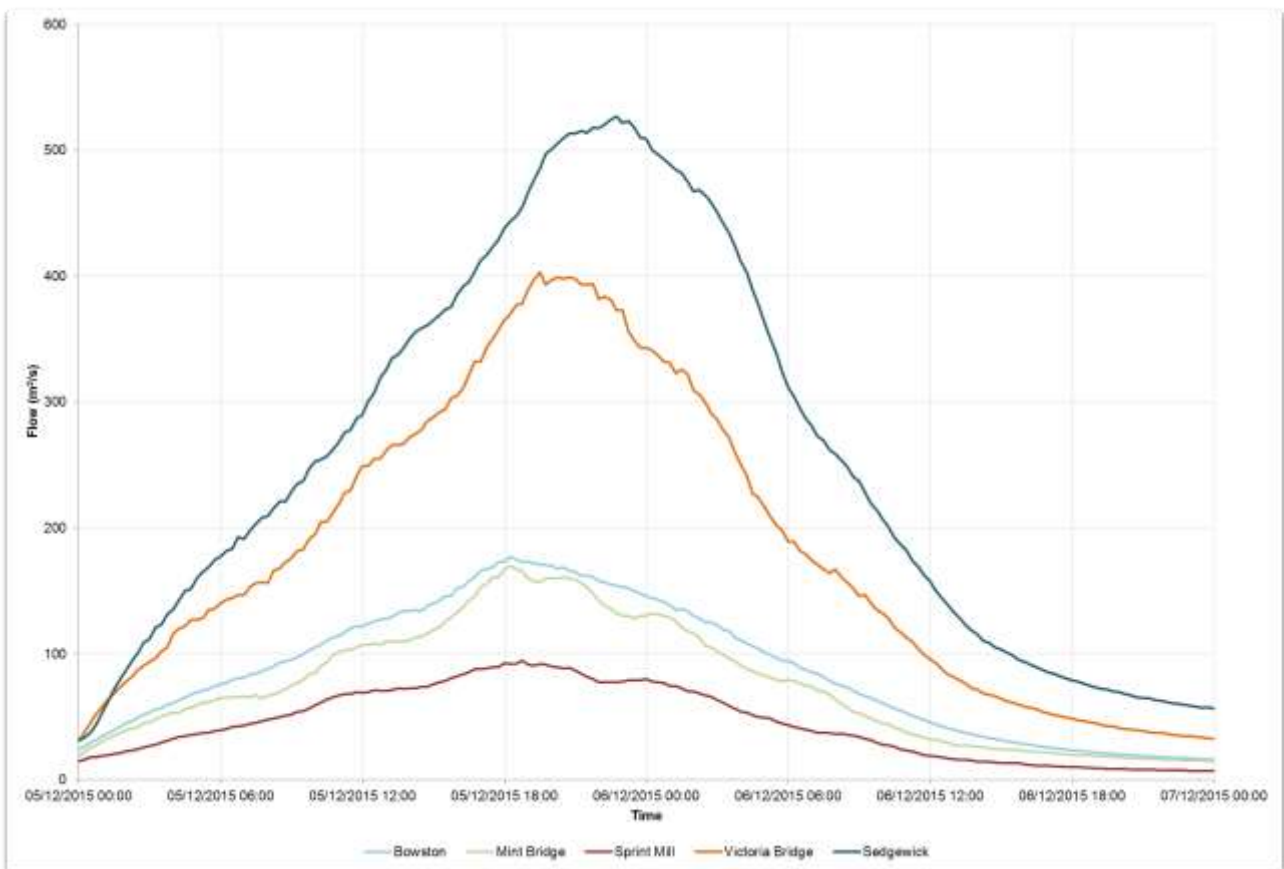


Figure 8: Gauged river flows at various locations in the Kent catchment on the 5<sup>th</sup>-6<sup>th</sup> December 2015

The recorded peak flow at Bowston gauging station is greater than any flow previously recorded at this location on the River Kent, and initial analysis of this data suggests that the December 5<sup>th</sup> event had a 0.4% probability of occurring in any given year (0.4% Annual Exceedance Probability or AEP). The magnitude of the flood event was greater than the size of event that the existing flood defences within Burneside were designed to defend against. Therefore, river levels would be expected to be higher than the flood defence level, and overtopping of the defences would be expected to occur.



## Sources of Flooding, Flood Flow Routes and Event Timeline

The overland flows that caused the flooding in Burneside on the 5<sup>th</sup> and 6<sup>th</sup> December 2015 were complex, and derived from multiple sources. From the data and evidence obtained both during and after the flood event, it is clear that river, surface water, drainage system, and groundwater sources all contributed to the flooding in the village. Generally speaking, the principal source of flooding in Burneside may be attributed to the River Kent and (to a lesser extent) the River Sprint. However, the evidence suggests that surface water flooding, and flooding from drainage systems, played a role and these are all discussed in the Likely Causes of Flooding section of this report. An overview of the principal flood flow routes through Burneside is presented in Figure 9.

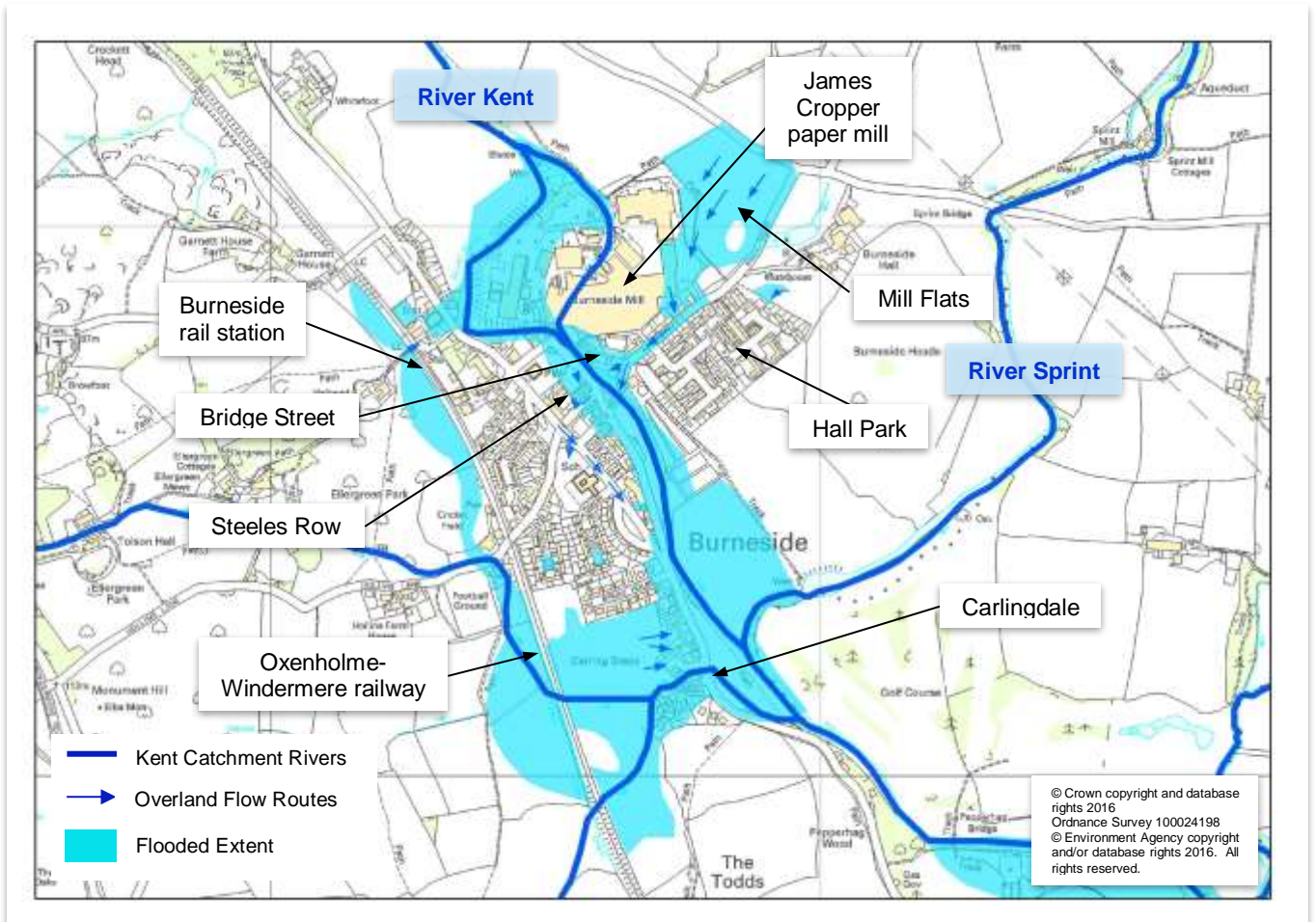






Figure 9: Principal overland flow routes through Burneside

Table 5 provides a summary timeline of the key events as the flooding affected Burneside.

4 <sup>th</sup> December 2015	Event
15:22	 <b>Flood Alert issued (Kent and Bela catchments)</b>
19:00	First rainfall associated with Storm Desmond recorded at Kentmere Hallow Bank rain gauge.
5 <sup>th</sup> December 2015	Event
05:31	 <b>Flood Warning issued (011FWFNC18A: River Kent at Burneside, Steeles Row and Carling Steps).</b>
09:53	 <b>Flood Warning issued (011FWFNC18B: River Kent at Burneside, Bournville, Bridge St, Carling Dale, Ivy Crescent, New Road and St).</b>
13:58	Surface water run-off from Burneside Heads channelled towards Hall Park, with flooding to rear garden of 110 Hall Park.
15:00	Flooding on the main road through Burneside at the access to Burneside rail station reported to be 0.5m deep.
15:55	 <b>Severe Flood Warnings issued for Burneside.</b>
18:15	River Kent peak at Bowston gauging station: 60.0m AOD/177m <sup>3</sup> /s.
18:45	River Sprint peak at Sprint Mill gauging station: 59.4m AOD/94m <sup>3</sup> /s.

**Table 5: Summary timeline of key events during the Burneside flooding**

## Likely Causes of Flooding

### Fluvial Flooding

On 5<sup>th</sup> December 2015 the principal source of fluvial flooding in Burneside was the River Kent. As it enters the village, the river flows through a bifurcation structure (splitting the river channel), which provides a feed to the James Cropper paper mill. Immediately downstream of this structure, the River Kent overtopped its banks, flooding part of the paper mill site and affecting buildings within the mill complex. Figure 10 shows the bifurcation structure during the flood event, whilst Figure 11 shows Burneside Bridge adjacent to the James Cropper paper mill complex.



**Figure 10: The bifurcation structure on the River Kent upstream of the James Cropper paper mill at 13:55 on 5<sup>th</sup> December**

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**Figure 11: Burneside Bridge at 14:27 on 5<sup>th</sup> December**

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Significant overtopping of the river banks on both sides of the River Kent occurred in the centre of Burneside. In particular, properties on Bridge Street were affected as floodwater overtopped doorway flood barriers, causing internal flooding (see Figures 12 and 13).



**Figure 12: Bridge Street, Burneside at 14:20 on 5<sup>th</sup> December**

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**Figure 13: Affected property on Bridge Street, Burneside**

On the right bank of the river, properties at the east end of Steeles Row closest to the river were initially prevented from flooding by the existing flood defence walls. Reports from residents indicate that prior to the flood defence walls overtopping, initial flooding occurred from a combination of groundwater, flooding through utility pipes and sewer flooding. As the River Kent continued to rise and flow further up Steeles Row to the west, the flood defences were outflanked, before eventually being overtopped, resulting in further internal flooding.



**Figure 14: Steeles Row, Burneside, showing existing flood defence wall around properties**

The fluvial flooding in the Bridge Street and Steeles Row area appears to have been exacerbated by Ford Bridge, which restricted flows in the river channel and caused the river to back up (see Figure 15). The bridge itself suffered structural damage, and was closed to Heavy Goods Vehicle (HGV) traffic, with all other traffic restricted to single lane operation following the event.



**Figure 15: Ford Bridge, Burneside, at 14:20 on 5<sup>th</sup> December. Note the capacity of the bridge has already been exceeded four hours ahead of the flood peak at Bowston gauging station**

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Downstream of Ford Bridge, further flooding from the River Kent affected properties at Junction Cottages. Here, property-level doorway flood barriers were once again overwhelmed by the record-breaking water levels in the River Kent. In the Carling Steps area, properties on Bournville and Carlingdale, which are situated immediately adjacent to the confluence of the River Kent and the River Sprint, suffered fluvial flooding with boundary walls damaged by the flow of water. Some residents in Carlingdale reported that flood water initially entered the properties through the floors.

Fluvial flooding in Burneside also occurred from smaller watercourses that feed the River Kent from the surrounding upland areas. In particular, an ordinary watercourse draining a 4km<sup>2</sup> area to the west of Burneside contributed to significant flooding in the Carling Steps area at the southern end of the village. This watercourse drains a predominantly rural catchment and comprises two main tributaries. The two tributaries meet downstream of the Oxenholme-Windermere railway line before entering culvert to the rear of properties on Carlingdale. The culvert carries the watercourse beneath the main road into Burneside, before flowing through open channel downstream of the road and joining the River Kent.

During the event, flows in this watercourse were unable to drain freely to the River Kent due to the high water levels. This, combined with the low capacity of the channel upstream of Carling Steps, resulted in out-of-bank flows that flooded properties on Carlingdale and Carling Steps, which was exacerbated further by surface water. After the event, the Environment Agency had to pump ponding water in the adjacent field back into the ordinary watercourse after it was prevented from draining naturally by a small earth embankment.

On the north east side of the village, run-off from a field known locally as Mill Flats to the north east of the James Cropper paper mill site was ultimately channelled down New Street towards the River Kent and the Bridge Street area.

Two long-term local residents, who formerly worked at the James Cropper paper mill, believe two culverted watercourses that flow through this field will have contributed a significant volume of the flow observed in this area. One of these watercourses is known locally as the Barnsdale Runner, and originates from Barnsdale to the north east of Burneside. The watercourse is culverted from the north east of the Mill Flats field, and is believed to flow in culvert along the alignment of the northern field boundary wall before discharging into the mill race within the James Cropper paper mill site. The other referenced watercourse possibly contributing flows in this area is culverted from the outlet of the pond at Burneside Hall, and follows a course flowing in a south-westerly direction under Hall Road and to the rear of properties on New Street. The outlet of the culvert at its confluence with the River Kent is visible on the left bank of the River Kent immediately upstream of Ford Bridge, and is visible in Figure 20.

During the flood event, local residents observed flow from the Mill Flats field flowing in a south-westerly direction into the eastern extent of the James Cropper paper mill complex, as illustrated in Figure 16, which reportedly flooded the loading bay area and despatch warehouse. Due to the nature of the local topography, flow continued through the complex towards the rear of the three properties located at the top of New Street. The residents of these properties reportedly took action to protect their properties, which prevented internal flooding, however the properties were surrounded by water. Water flowed between these properties onto New Street, before flowing down the hill towards Bridge Street, as illustrated in Figures 17, 18 and 19. Residents of the properties along New Street reportedly placed makeshift barriers in their entrance gates along the road, which prevented their properties from flooding and channelled the water down the road.



**Figure 16: Looking north across Mill Flats, located to the north east of the James Cropper paper mill complex. The arrows indicate the reported direction of flow across the field**





**Figure 17: Flow route from the James Cropper paper mill complex between properties at the top of New Street, at 14:13 on 5<sup>th</sup> December**

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**Figure 18: Flow route down New Street at 14:15 on 5<sup>th</sup> December**

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**Figure 19: Flow down New Street towards Bridge Street and Ford Bridge, at 14:15 on 5<sup>th</sup> December**

© Gary Moore

The flow route down New Street described and illustrated above resulted in water being trapped on the 'dry' side of a flood defence wall. Whilst this wall incorporates flap valves to allow water to drain out (see Figure 20), these were surcharged by the River Kent and so prevented the car park area from draining freely. The impact of this was that properties in this area were initially flooded from water trapped behind the flood defence wall. Later in the flood event, as the River Kent continued to rise, the flood defence wall was overtopped, further exacerbating the flooding in this area.



**Figure 20: Properties on Bridge Street and New Street flooded initially as a result of water being trapped on the 'dry' side of the flood defence wall**

### Surface Water Flooding

Surface water run-off generated from the rainfall associated with Storm Desmond, and exacerbated by the saturated ground conditions, was a significant cause of flooding in Burneside.

In the north-west part of the village, run-off from the hillside to the west of the Oxenholme-Windermere railway became impounded against the railway line itself, before being channelled beneath the railway and down Station Yard. A long-term local resident reported that a stream which runs through the fields to the west of the railway line could possibly be culverted under the railway towards the northern end of the platform. The resident believed that a lot of the water that caused the flooding on the main road in the area around the Bryce Institute came from the flooded fields to the west of the railway line, flowing through the football field and bowling green areas. This water then flowed in an easterly direction across the main road through Burneside, before flowing into the River Kent opposite the Bryce Institute. This flooding mechanism affected properties in this area, with a reported depth of flooding on the main road of approximately 0.5m.

Surface water run-off from Burneside Heads flooded part of the rear garden of 110 Hall Park, where the owner had to dig a drainage trench around the boundary of the property to drain standing water into the surface water drainage systems serving Hall Park. Figure 21 shows the extent of the surface water flooding at 110 Hall Park.



**Figure 21: Surface water flooding at 110 Hall Park**

© Michael Hardy

Flooding from surface water also occurred in the vicinity of the village primary school, which is situated on the corner of the junction between the main road through Burneside, New Road and Hollins Lane. Overland flows were channelled down the main road and entered the school site, flooding the playing field to an estimated depth of 75mm.

Further to the south, surface water run-off also contributed to the flooding at Carling Steps. At the start of the event, overland flows from the grassland to the west were impounded against the property boundaries and were also prevented from returning to the watercourse by a low level embankment. When combined with overland flows from the adjacent ordinary watercourse, flooding to the rear gardens then started to occur, before ultimately reaching the properties themselves, which were also affected by flooding from the River Kent.

Other isolated incidents of surface water flooding occurred on Churchill Court and Howgill Close in the southern part of the village, although no flooding to properties occurred at these locations.

### **Flooding from Drainage Systems**

Whilst the principal sources of flooding in Burneside were the rivers and surface water run-off, there were also reports of flooding from drainage systems. In particular, manholes on the public sewer systems in the centre of the village were seen to surcharge as the below ground system was overwhelmed. The main system within the village is a combined water system that is pumped at a number of locations. Flooding from this source will likely have contained polluted water, but the extents of any contamination are not known at this stage.

It is also possible that flooding could have occurred from any highway (surface water) drainage systems that discharge directly to the River Kent. In this situation, flows within the systems are likely to have been prevented from discharging to the river due to the high water levels.

# Environment Agency Flood Incident Response

## Pre-event Warning and Preparation

A Flood Alert for the River Kent catchment was issued on the 4<sup>th</sup> of December at 15:22. Following this, Flood Warnings were issued to the flood warning areas within Burneside between 05:31 and 09:33 on the 5<sup>th</sup> December. Severe Flood Warnings were issued at 15:55 on the same day. The details of the flood warning areas and the timings of these warnings are shown in Appendix 3.

There is some evidence that not all residents within flood warning areas received the relevant communications. In particular, one residence on Carlingdale, which usually receives flood warnings, reportedly did not receive any during this event.

Immediately prior to the flood event, the Environment Agency inspected watercourses and operational structures such as debris screens to ensure that there were no blockages which may have caused an increase in flood risk.

## Post-event Repairs and Maintenance

Following the flood event, the Environment Agency has removed blockages and obstructions (such as large fallen trees) from the Rivers Kent and Sprint in and around Burneside. This work improves channel conveyance and reduces the risk of any further blockages occurring downstream. Standing water to the rear of Carling Steps was also pumped back into the ordinary watercourse draining the area.

The Environment Agency has undertaken repairs to the flood defence wall which provides protection to properties on Steeles Row. No other Environment Agency flood defence assets were damaged as a result of the flood event.

Environment Agency engineers undertake annual visual inspections of the River Kent through Burneside, and of the gravel trap on the River Sprint just upstream of Burneside, to monitor gravel deposition. If gravel builds up to a level where flood risk is increased, or when the gravel trap requires clearing, then the Environment Agency will undertake gravel removal to maintain channel capacity and improve conveyance.

## On-going Maintenance Activities

The Environment Agency maintains flood risk management structures and sections of river channel where maintenance actively reduces the risk of flooding to people and property. Activities we undertake are summarised below:

- We conduct yearly visual inspections of flood defence embankments and walls, and deliver a variety of maintenance tasks which include, as necessary:
  - Grass cutting,
  - Vegetation management,
  - Invasive species control,
  - Vermin control and
  - Expansion joint repairs.
- We deliver targeted maintenance on River Channels where the activity is beneficial to the reduction in flood risk. This could include:
  - Weed Control,
  - Grass Control,
  - Vegetation Management,
  - Invasive Non Native Species Control,
  - Gravel Removal, when justified through investigation and survey.

# Recommended Actions

The following table details recommended actions for various organisations and members of the public to consider using the Cumbria Floods Partnership's 5 Themes: Resilience, Upstream Management, Strengthening Defences, Maintenance and Water Level Management Boards (WLMBs). Some of these recommendations may have already been carried out or are ongoing.

Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
Resilience	Cumbria Local Resilience Forum*	Review and update plans to enable homes and business to be better prepared for flooding and reduce the impacts of flooding. For example, review of evacuation procedures / emergency response.	2016 -2017
	Environment Agency and Residents	Ensure all properties at risk are registered to receive flood warnings and that all details are up-to-date.	2016-2017
	Residents and South Lakeland District Council	Implement flood resilience measures within flooded properties to reduce the impacts of future flooding. South Lakeland District Council is administering the Flood Recovery and Resilience Grants of up to £5000 per property to help people better protect their homes. A further £2000 top up grant can also be applied for from the Cumbria Flood Recovery Fund.	Closing date for grant applications is end of March 2017
	South Lakeland District Council, Cumbria County Council and Environment Agency	Review Local Development Plans and Strategic Flood Risk Assessment to reflect current understanding of flooding.	2016-2017
	South Lakeland District Council, Cumbria County Council and Environment Agency	Review and monitor the discharge of planning conditions relating to flood risk for recent and ongoing developments in Burneside to ensure that flood risk has not been increased to surrounding areas as a result of new development.	2016-2017
	Cumbria County Council, United Utilities, Environment Agency and Electricity North West.	Review the resilience of critical transport, utility and power supply infrastructure in relation to flood risk.	2016-2017

Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
Resilience	Environment Agency	Review modelling data to ensure that hydraulic models for the River Kent catchment reflect real conditions as accurately as possible and replicate the 5 <sup>th</sup> -6 <sup>th</sup> December 2015 flood event to ensure the flooding mechanisms identified are reflected in the modelling output. Update the models where required and use this information to make any improvements to the flood forecasting and warning service.	2016-2017
	Environment Agency	Review and update the Flood Warning Areas for Burneside as required, ensuring they reflect all known fluvial flooding mechanisms in the Burneside river system as far as possible.	2016-2017
	Environment Agency	Using the updated hydraulic model for the River Kent catchment, investigate whether the flood damage re-instatement work undertaken by Carus Green Golf Club on the left bank of the River Sprint, immediately upstream of the confluence with the River Kent, has any impact on flood risk to the surrounding area, and specifically to properties in the Carling Steps area.	Assessment to be undertaken in February 2017
Upstream Management	Cumbria Floods Partnership (CFP)	The CFP action plan will consider natural flood management options to reduce flood risk across the catchment. This may also include land use changes and/or flood storage.	Action Plan published Summer 2016
	CFP, Farmers, Landowners, Community Groups, Trusts.	Explore opportunities for natural flood management solutions to be used upstream of Burneside in order to 'slow the flow' and manage peak river levels.	Medium term (over next 5 years)
Maintenance	Environment Agency, United Utilities and Cumbria County Council	Carry out inspections and repairs to assets which may have been damaged during the flood event.	2016 (Completed by EA)
	Environment Agency	Review the gravel and channel maintenance programme within the catchment in response to the flooding event of 2015.	2016-2017
	Environment Agency	A new Environment Agency system is being developed to make it easier for communities to understand what maintenance work is being carried out in their area. Improvements will show exactly when, where and what maintenance is being planned each year. Make sure that communities understand how they can access information on planned maintenance at: <a href="https://www.gov.uk/government/publications/river-andcoastal-maintenance-programme">https://www.gov.uk/government/publications/river-andcoastal-maintenance-programme</a>	2017



Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
Strengthening Defences	Cumbria County Council & Environment Agency	Assess the impact of the road bridges and footbridges in Burneside on flood flows and investigate options to increase their flood capacity, taking into account the potential effects on flood risk downstream.	2016-2017
	Environment Agency & Cumbria County Council	As part of the appraisal of options to improve the existing Standard of Protection in Burneside, investigate improvements required in the Bridge Street and New Street areas to manage the floodwater flowing to the area down New Street.	2016-2017
	Cumbria County Council in partnership with the Environment Agency and United Utilities	Conduct a detailed assessment for Burneside (including Staveley and Kendal) under the Surface Water Management Plan process and identify solutions to mitigate surface water flood risk in high risk areas that will integrate with fluvial flood risk mitigation options as part of a joined up approach.	2016-2017
	Cumbria County Council, South Lakeland District Council and United Utilities	Review the performance of the existing drainage and sewerage systems during the event to better understand where improvements are required.	2016-2017
	Environment Agency in partnership with Cumbria County Council and South Lakeland District Council	Develop options to improve the existing Standard of Protection in Burneside as part of a wider appraisal of flood risk management improvements in the Kent catchment (including Staveley, Ings, and Kendal). Defence options to be appraised are likely to include upstream storage, improvements to channel conveyance, raised flood defences and natural flood management.	2016-2017
	Environment Agency in partnership with Cumbria County Council and Network Rail	Work with Network Rail to understand the interaction of the Windermere branch line with the rivers and watercourses in and around Burneside, its effect on flooding and its vulnerability during a flood.	2016-2017
	Environment Agency	Review the need and practicalities of deploying temporary defences in certain locations in Burneside as an interim or longer term measure to help reduce flood risk.	2016-2017

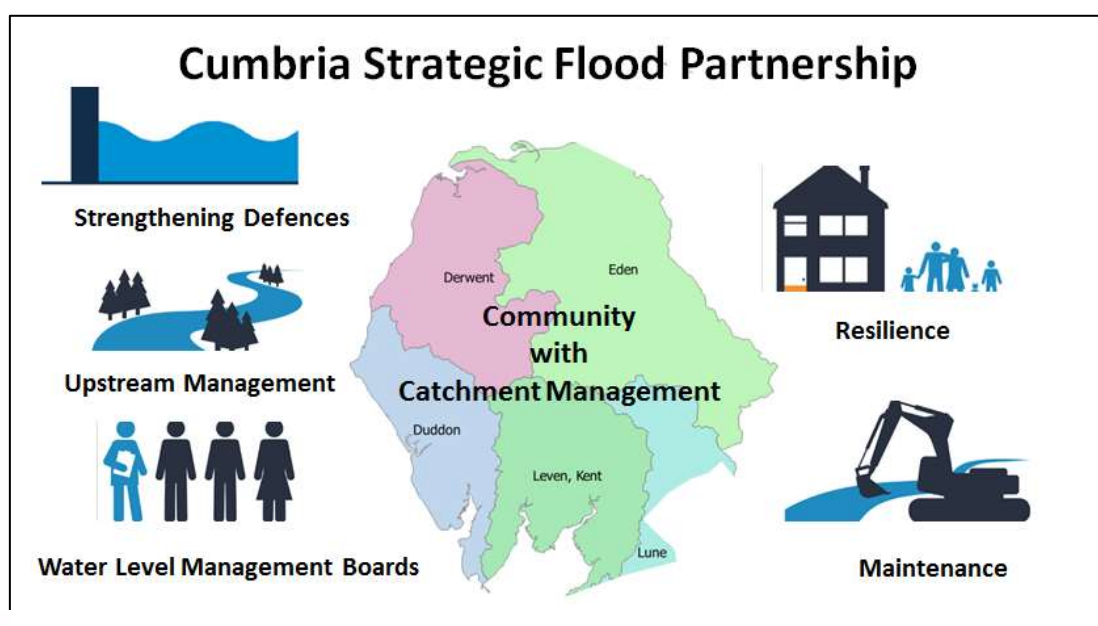
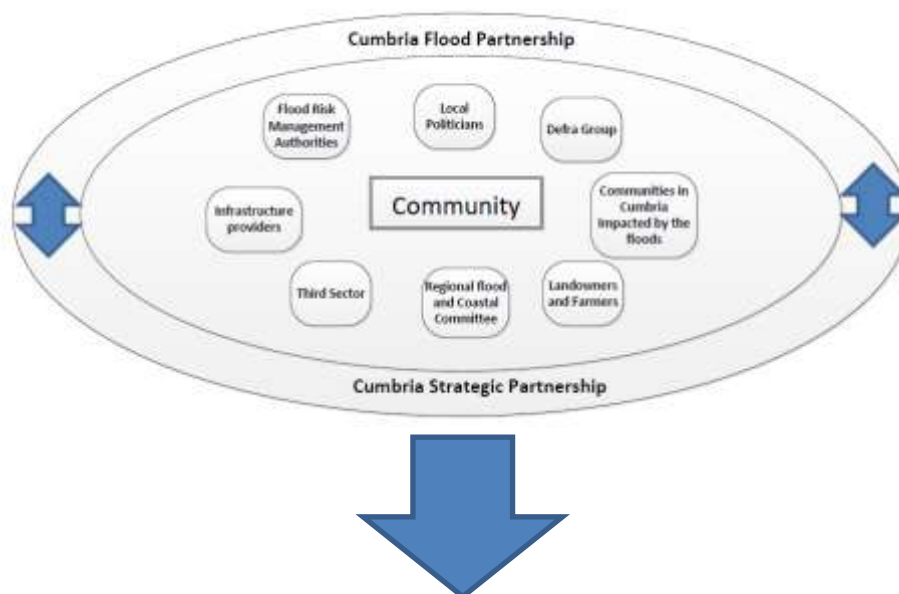
**Table 6: Recommended actions for consideration**

\*The Cumbria Local Resilience Forum includes emergency services, local authorities, Cumbria County Council, Environment Agency, Maritime Coastguard Agency and health agencies along with voluntary and private agencies. Under the Civil Contingencies Act (2004) every part of the United Kingdom is required to establish a resilience forum.

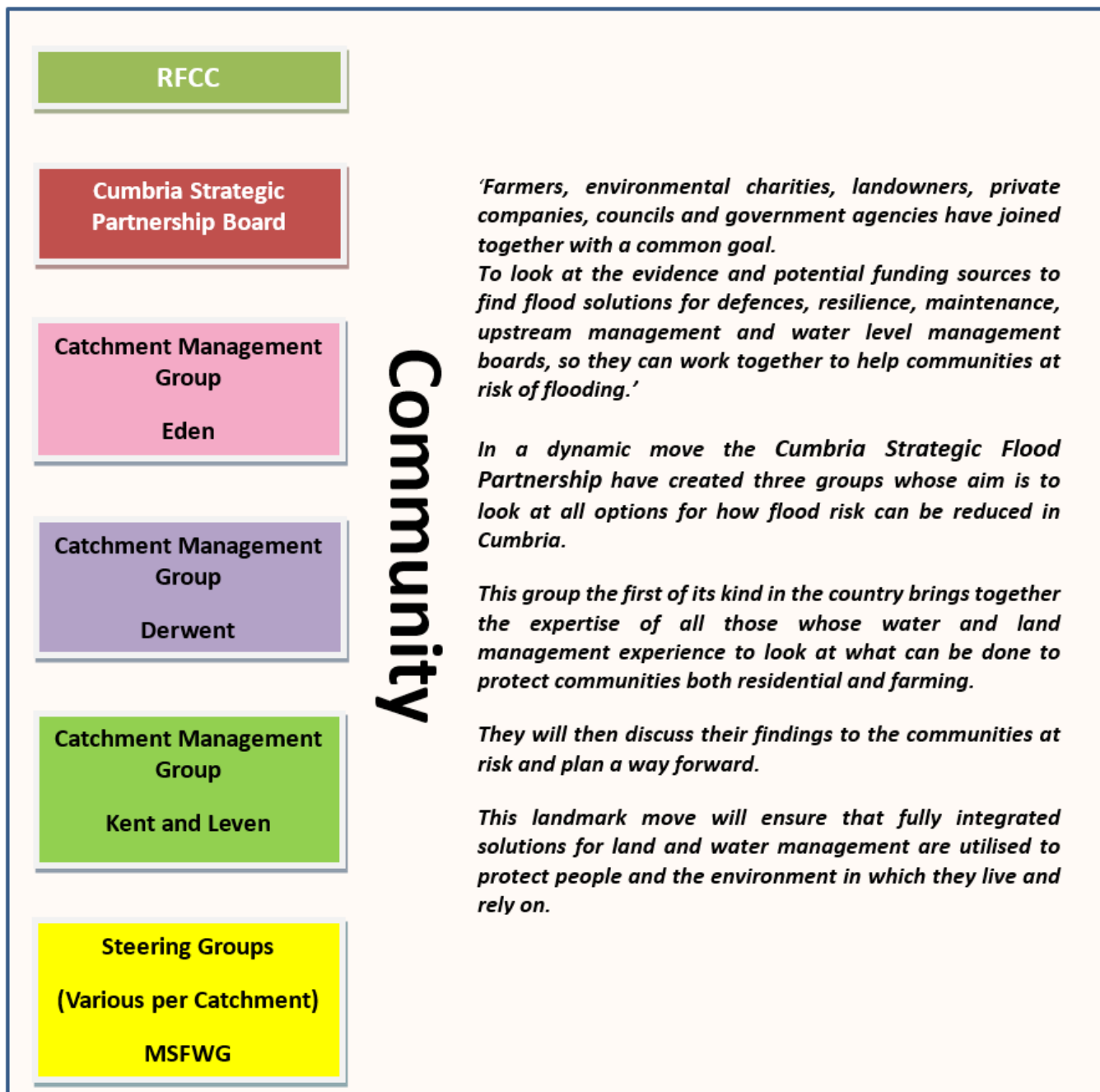
# Next Steps – Community & Catchment Action Plan

The Cumbria Floods Partnership has brought together a wide range of community representatives and stakeholders from a variety of sectors to plan and take action to reduce flood risk. The Cumbria Floods Partnership, led by the Environment Agency, is producing a 25 year flood action plan for the Cumbrian catchments worst affected by the December 2015 flooding, including Carlisle. The plan will consider options to reduce flood risk across the whole length of a river catchment including upstream land management, strengthening flood defences, reviewing maintenance of banks and channels, considering water level management boards and increasing property resilience. The Cumbria Floods Partnership structure below details how these 5 themes are being delivered in the Flood Action plans which will be completed in July.

The diagrams below help demonstrate how the two partnerships have now come together:



## Cumbria Strategic Flood Partnership



The Environment Agency is currently updating the hydraulic model for the Kent Catchment, which is used to assist with flood forecasting and will help to assess future flood risk management options for the catchment as a whole. This study is due to be completed in early 2017 and will be used as part of the review of the current Flood Warning Areas for Burneside.

The data from this event is also being used to carry out a review of the existing flood defence assets in Burneside. Following this, the Environment Agency will work with the relevant parties to carry out the recommended actions and to manage the risk of future flooding. Part of this will include an assessment of options to improve the existing standard of protection from flooding in Burneside.

# Appendices

## Appendix 1: Acronyms and Glossary

Acronym	Definition
EA	Environment Agency
CCC	Cumbria County Council
SLDC	South Lakeland District Council
LLFA	Lead Local Flood Authority
FLAG	Flood Action Group
LFRMT	Local Flood Risk Management Team
FWMA	Flood and Water Management Act 2010
LDA	Land Drainage Act 1991
WRA	Water Resources Act 1991
UU	United Utilities

Term	Definition
Aquifer	A source of groundwater comprising water-bearing rock, sand or gravel capable of yielding significant quantities of water.
Attenuation	In the context of this report - the storing of water to reduce peak discharge of water.
Catchment Flood Management Plan	A high-level planning strategy through which the EA works with their key decision makers within a river catchment to identify and agree policies to secure the long-term sustainable management of flood risk.
Culvert	A channel or pipe that carries water below the level of the ground.
De Facto Flood Defence	A feature or structure that may provide an informal flood defence benefit but is not otherwise designed or maintained by the Environment Agency
Flood Defence	Infrastructure used to protect an area against floods as floodwalls and embankments; they are designed to a specific standard of protection (design standard).
Floodplain	Area adjacent to river, coast or estuary that is naturally susceptible to flooding.
Flood Resilience	Measures that minimise water ingress and promotes fast drying and easy cleaning, to prevent any permanent damage.
Flood Risk	The level of flood risk is the product of the frequency or likelihood of the flood events and their consequences (such as loss, damage, harm, distress and disruption)
Flood Risk Regulations	Transposition of the EU Floods Directive into UK law. The EU Floods Directive is a piece of European Community (EC) legislation to specifically address flood risk by prescribing a common framework for its measurement and management.

<b>Term</b>	<b>Definition</b>
Flood and Water Management Act	Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface water flood risk in England.
Flood Storage	A temporary area that stores excess runoff or river flow often ponds or reservoirs.
Flood Zone	Flood Zones are defined in the NPPF Technical Guidance based on the probability of river and sea flooding, ignoring the presence of existing defences.
Flood Zone 1	Low probability of fluvial flooding. Probability of fluvial flooding is < 0.1%
Flood Zone 2	Medium probability of fluvial flooding. Probability of fluvial flooding is 0.1 – 1%. Probability of tidal flooding is 0.1 – 0.5 %
Flood Zone 3a	High probability of fluvial flooding. Probability of fluvial flooding is 1% (1 in 100 years) or greater. Probability of tidal flooding is 0.5%(1 in 200 years)
Flood Zone 3b	Functional floodplain. High probability of fluvial flooding. Probability of fluvial flooding is >5%
Fluvial	Relating to the actions, processes and behaviour of a water course (river or stream)
Fluvial flooding	Flooding by a river or a watercourse.
Freeboard	Height of flood defence crest level (or building level) above designed water level
Functional Floodplain	Land where water has to flow or be stored in times of flood.
Groundwater	Water that is in the ground, this is usually referring to water in the saturated zone below the water table.
Inundation	Flooding.
Lead Local Flood Authority	As defined by the FWMA, in relation to an area in England, this means the unitary authority or where there is no unitary authority, the county council for the area, in this case Cumbria County Council.
Main River	Watercourse defined on a 'Main River Map' designated by DEFRA. The EA has permissive powers to carry out flood defence works, maintenance and operational activities for Main Rivers only.
Mitigation measure	An element of development design which may be used to manage flood risk or avoid an increase in flood risk elsewhere.
Overland Flow	Flooding caused when intense rainfall exceeds the capacity of the drainage systems or when, during prolonged periods of wet weather, the soil is so saturated such that it cannot accept any more water.
Residual Flood Risk	The remaining flood risk after risk reduction measures have been taken into account.
Return Period	The average time period between rainfall or flood events with the same intensity and effect.
River Catchment	The areas drained by a river.

<b>Term</b>	<b>Definition</b>
Sewer flooding	Flooding caused by a blockage or overflowing in a sewer or urban drainage system.
Sustainability	To preserve /maintain a state or process for future generations
Sustainable drainage system	Methods of management practices and control structures that are designed to drain surface water in a more sustainable manner than some conventional techniques.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations meeting their own needs.
Sustainable Flood Risk Management	Sustainable Flood Risk Management promotes a catchment wide approach to flooding that uses natural processes and systems (such as floodplains and wetlands) to slow down and store water.
Topographic survey	A survey of ground levels.
Tributary	A body of water, flowing into a larger body of water, such as a smaller stream joining a larger stream.
Watercourse	All rivers, streams, drainage ditches (i.e. ditches with outfalls and capacity to convey flow), drains, cuts, culverts and dykes that carry water.
Wrack Marks	An accumulation of debris usually marking the high water line.
1 in 100 year event	Event that on average will occur once every 100 years. Also expressed as an event, which has a 1% probability of occurring in any one year.
1 in 100 year design standard	Flood defence that is designed for an event, which has an annual probability of 1%. In events more severe than this the defence would be expected to fail or to allow flooding.

## Appendix 1: Summary of Relevant Legislation and Flood Risk Management Authorities

The table below summarises the relevant Risk Management Authority and details the various local source of flooding that they will take a lead on.

Flood Source	Environment Agency	Lead Local Flood Authority	District Council	Water Company	Highway Authority
<b>Rivers</b>					
Main river					
Ordinary watercourse					
<b>Surface Runoff</b>					
Surface water					
Surface water on the highway					
<b>Other</b>					
Sewer flooding					
Sea					
Groundwater					
Reservoirs					

The following information provides a summary of each Risk Management Authority's roles and responsibilities in relation to flood reporting and investigation.

**Government:** DEFRA develop national policies to form the basis of the Environment Agency's and the LLFA's work relating to flood risk.

**Environment Agency:** Strategic overview of all sources of flooding and coastal erosion as defined in the Flood and Water Management Act (2010). As part of its role concerning flood investigations, this requires providing evidence and advice to support other RMAs. The Environment Agency also collates and reviews assessments, maps and plans for local flood risk management (normally undertaken by LLFA).

**Lead Local Flood Authorities:** Cumbria County Council is the LLFA for Cumbria. Part of their role requires them to investigate significant local flooding incidents and publish the results of such investigations. LLFAs have a duty to determine which RMA has relevant powers to investigate flood incidents to help understand how they happened, and whether those authorities have, or intend to, exercise their powers. LLFAs work in partnership with communities and flood RMAs to maximise knowledge of flood risk to all involved. This function is carried out at CCC by the Local Flood Risk Management Team.

**District and Borough Councils:** These organisations perform a significant amount of work relating to flood risk management, including providing advice to communities and gathering information on flooding. These organisations are classed as RMA's.

**Water and Sewerage Companies:** Manage the risk of flooding to water supply and sewerage facilities and the risk to others from the failure of their infrastructure. They make sure their systems have the appropriate level of resilience to flooding and where frequent and severe flooding occurs they are required to address this through their capital investment plans. It should also be noted that following the Transfer of Private Sewers Regulations 2011, water and sewerage companies are now responsible for a larger number of sewerage than prior to the regulation. These organisations are classed as RMAs.

**Highway Authorities:** Highway authorities have the lead responsibility for providing and managing highway drainage and certain roadside ditches that they have created under the Highways Act 1980. The owners of land adjoining a highway also have a common-law duty to maintain ditches to prevent them causing a nuisance to road users. These organisations are classed as RMAs.

Flood risk in Cumbria is managed through the Making Space for Water (MSfW) process, which involves the co-operation and regular meeting of the Environment Agency, United Utilities, District/Borough Councils and CCC's Highway and LFRM Teams to develop processes and schemes to minimise flood risk. The MSfW Groups will meet approximately 4 times per year to co-ordinate operations and work together to mitigate flood risk in the vulnerable areas identified in this report by completing the recommended actions. As LLFA, CCC has a responsibility to oversee the delivery of these actions.

Where minor works or 'quick win' schemes can be identified, these will be prioritised and, subject to available funding and resources, will be carried out as soon as possible. Any major works requiring capital investment will be considered through the Environment Agency's Medium Term Plan process or a partner's own capital investment process.

Flood Action Groups are usually formed by local residents who wish to work together to help reduce flood risk in their area. The FAGs are often supported by either CCC or the Environment Agency and provide a useful mechanism for residents to forward information to the MSfW Group.



## Appendix 2: Links to Other Information on Flooding

### Sign up for Flood Warnings

<https://www.gov.uk/sign-up-for-flood-warnings>

### Environment Agency – Prepare your property for flooding; a guide for householders and small businesses to prepare for floods

<https://www.gov.uk/government/publications/prepare-your-property-for-flooding>

### Environment Agency – What to do before, during and after a flood: Practical advice on what to do to protect you and your property

<https://www.gov.uk/government/publications/flooding-what-to-do-before-during-and-after-a-flood>

### Environment Agency – Living on the Edge: A guide to the rights and responsibilities of riverside occupiers

<https://www.gov.uk/government/publications/riverside-ownership-rights-and-responsibilities>

### Flood and Water Management Act 2010:

<http://www.legislation.gov.uk/ukpga/2010/29/contents>

### Water Resources Act 1991:

<http://www.legislation.gov.uk/all?title=water%20resources%20act>

### Land Drainage Act:

<http://www.legislation.gov.uk/all?title=land%20drainage%20act>

## Appendix 3: Flood Warnings and Alerts

Burneside is covered by a Flood Alert, and certain areas are served by two Flood Warnings as shown in the table below, which summarises the times of the Flood Warnings issued during this flood event:

Flood Warning	Flood Warning Issued	Severe Flood Warning Issued	Properties	Contacts	% Success *
011FWFNC18A	05/12/15 05:31	05/12/15 15:55	18	155	74
011FWFNC18B	05/12/15 09:53	05/12/15 16:55	37	157	72

The following pages show additional details on the flood alerts and warnings issued during this event.

### Flood Alerts

#### 011WAFLE: Kent and Bela Catchments

Alert issued on Friday 04/12/2015 at 15:22

Alert removed on Thursday 10/12/2015 at 16:18

**Customers in Flood Alert area registered on FWD: 227**

**Contacts (landline, mobile, email etc.) in Flood Alert area registered on FWD: 609**

**Successful contacts: 531**

**Unsuccessful contacts: 78**

#### Alert Message:

A Flood Alert has been issued by the Environment Agency for the Rivers Kent and Bela. Flooding is possible for Rivers Kent and Bela. Low lying land and roads will be affected first. Be prepared to protect yourself, family, pets and property.

Heavy and persistent rainfall, along with strong South-Westerly winds, is forecast to continue this evening through until Sunday 06/12/2015. With the ground already saturated the river levels are expected to rise further and we may see some significant impacts. The forecast is likely to result in Flood Warnings being issued on Saturday. We advise that you keep an eye on the situation by listening to weather forecasts, checking our web pages or calling Floodline. We are continuing to monitor the situation and have workers on site operating defences and clearing blockages where required.

\* Contact Successful if at least one attempt to contact a fully-registered recipient registered to the property returned a status of "Acknowledged", "Successfully Received", "Successfully Sent" or "Unacknowledged"

## Flood Warning Target Areas

### **011FWFNC18A: River Kent at Burneside, Steeles Row and Carling Steps**

Flood Warning issued on Saturday 05/12/2015 at 05:31  
Severe Flood Warning issued on Saturday 05/12/2015 at 15:55  
Severe Flood Warning removed on Sunday 06/12/2015 at 12:25

**Date/Time Warning Level Reached: 05/12/2015 06:30**  
**Time customers had to take action: 00:58:52**  
**Customers in Flood Warning area registered on FWD: 49**  
**Contacts (landline, mobile, email etc.) in Flood Warning area registered on FWD: 155**  
**Successful contacts: 114**  
**Unsuccessful contacts: 41**

#### **Warning Message:**

A Flood Warning has been issued by the Environment Agency for the River Kent at Burneside, Steeles Row and Carling Steps.

Flooding is expected for Commercial and residential properties adjacent to the River Kent at Burneside, Steeles Row and Carling Steps. Immediate action required.

Heavy and persistent rainfall is expected throughout Saturday. River levels will continue to rise and further Flood Warnings are likely. Please check for updates throughout the weekend. Operational Teams have closed flood defences and are checking watercourses for blockages.

The river level recording station used for this flood warning is Victoria Bridge

### **011FWFNC18B: River Kent at Burneside, Bournville, Bridge St, Carling Dale, Ivy Crescent, New Road and St**

Flood Warning issued on Saturday 05/12/2015 at 09:53  
Severe Flood Warning issued on Saturday 05/12/2015 at 16:00  
Severe Flood Warning removed on Sunday 06/12/2015 at 12:21

**Date/Time Warning Level Reached: 05/12/2015 09:45**  
**Time customers had to take action: -00:08:00**  
**Customers in Flood Warning area registered on FWD: 59**  
**Contacts (landline, mobile, email etc.) in Flood Warning area registered on FWD: 157**  
**Successful contacts: 113**  
**Unsuccessful contacts: 44**

#### **Warning Message:**

A Flood Warning has been issued by the Environment Agency for the River Kent at Burneside, Bournville, Bridge St, Carling Dale, Ivy Crescent, New Road and St.

Flooding is expected for Commercial and residential properties adjacent to the River Kent at Burneside, Bournville, Bridge Street, Carling Dale, Ivy Crescent, New Road and Street. Immediate action required.

Heavy and persistent rainfall is expected throughout Saturday and in to Sunday. River and lake levels will continue to rise. Please check for updates throughout the weekend.

The river level recording station used for this flood warning is Victoria Bridge