Staveley and Ings

Flood Investigation Report

Gowan Bridge, Staveley

Flood Event 5-6th 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.
<table>
<thead>
<tr>
<th>Version</th>
<th>Prepared by</th>
<th>Reviewed by</th>
<th>Approved by</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>Draft v1.0</td>
<td>Kevin Keating</td>
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<td>Kevin Keating</td>
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Executive Summary

The flooding experienced in Ings and Staveley on Saturday 5th December 2015 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 beyond. The flow in the River Kent through Bowston and Kendal on the 5th of December was the highest ever recorded.

In response to the 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 as the Lead Local Flood Authority, under the duties as set out in Section 19 of the Flood and Water Management Act 2010. This report provides a summary of the flooding that occurred in Staveley and Ings, 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 flood event. Whilst every effort has been made to ensure that this information is correct in understanding the full scope of the flooding that occurred, there may have been additional flooding mechanisms that were not observed within the data collected.

There are no formal flood defences that provide benefit to Staveley and Ings. There are, however, numerous man made works within or adjacent to the two main watercourses (River Kent and River Gowan) that may have influenced flooding. The flooding resulted in a significant risk to life throughout the area. An elderly man drowned having been washed into a stream feeding the Kent, upstream of Staveley. He was reportedly attempting to prevent debris entering the watercourse and causing blockage downstream in Staveley. The flooding tended to be disparate in location and the source of risk. The best current estimate is that a total of 35 properties were affected by flooding in Staveley and Ings.

The main source of flooding during the flood event was from the River Gowan and its small tributaries, with the largest single flood location being within Ings. However a further group of 4 properties on Main Street, Staveley, were affected by flooding, with the likely source being the high water levels in the Rivers Gowan and Kent, as well as groundwater. The River Kent also flooded the Kentmere Packaging business. River scour and sediment movement also caused significant problems. Two bridges suffered damage, one of which – Gowan Bridge, which provides the main access to the southern end of the village from the A591 - is still closed and is expected to remain so until 2017.

Various actions have been recommended in this report and these will require the involvement of a number of organisations and the local community. The report also highlights future work to reduce flood risk, which include:

- All RMA’s working together to ensure that there is a joint understanding of all the flooding mechanisms, and to work together to reduce the overall risk.
- Within this, review the potential to introduce new flood risk management measures, including better flood warning, upstream storage, traditional defences and further adoption of property based flood resistance and resilience.
- The Highways Authority to ensure key bridges are better able to withstand extreme flood events.

In response to the flooding, a number of community meetings have taken place, and these will continue in order to ensure that all those affected are given the opportunity to be involved in reducing the flood risk in their community. In this context, it should be acknowledged that much of the information used as the basis of the report was collected and provided by Staveley with Ings Parish Council. Their support is greatly appreciated.
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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 5th-6th 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 Report outlines recommendations and actions that various organisations and authorities can do to minimise flood risk in affected areas. Once agreed, the report can be used by communities and agencies as the basis for developing future plans to help make the area more resilient to flooding in the future.

For further information on the “Section 19” flood investigations being completed throughout Cumbria following the flooding in December 2015, including a timetable of Flood Forum events and associated documentation, please visit the County Council website at:
To provide feedback on the report please email LFRM@cumbria.gov.uk.

**Flooding History**

Staveley has a history of flooding, much of it being in common to the main historical flood events across Cumbria. The larger events on record are presented below, with river flow data mainly taken from the National River Flow Archive. The details are taken from the Kent and Leven Catchment Flood Management Plan and other Environment Agency records. Note that no river level / flow gauging data exists for the River Gowan, which is problematic given its importance in terms of local flood risk.

<table>
<thead>
<tr>
<th>Flood Event</th>
<th>Details</th>
<th>Peak Flow in River Kent at Bowston (m³/s)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 1898</td>
<td>On the 2 November 1898 flood waters reportedly flowed down Main Street with houses submerged to a depth of 1 m. This is considered to be the most significant flood on record, at least prior to the December 2015 event.</td>
<td>-</td>
</tr>
<tr>
<td>1954</td>
<td>Significant event that affected Kendal and wider area. Reportedly the worst event since 1898.</td>
<td>-</td>
</tr>
<tr>
<td>December 1985</td>
<td>Reportedly a similar scale event to 1954, with flooding thought to have occurred in Staveley but no definitive records are available.</td>
<td>86’</td>
</tr>
<tr>
<td>February 2004</td>
<td>Flooding affected the village with 1 property suffering internal flooding. This event caused significant flooding downstream in Kendal.</td>
<td>109</td>
</tr>
<tr>
<td>January 2005</td>
<td>Flooding to properties on Main Street “due to the river and surface water”.</td>
<td>122</td>
</tr>
<tr>
<td>November 2009</td>
<td>This flood event was reportedly focussed on the Kent, which affected the properties along Kendal Road and Main Street, in the vicinity of the confluence of the Gowan and Kent. 4 no. properties on Main Street flooded with ponding at the lowest point in the road and water backing up through drains reported to be the source. However, there are also reports of flooding issues related to the Gowan, particularly at Ings but no reports of internal property flooding.</td>
<td>119</td>
</tr>
<tr>
<td>June 2012</td>
<td>This event was caused by intense local rainfall. This appears to have caused direct surface water runoff-related flooding (e.g. to the school off Brow Lane) and also exceedance of the capacity of the local surface water drainage system. The main area affected was reported to be around the junction of Silver Street, School Lane and Back Lane. This is a topographically low area within the village, which backs on to the steep fell sides to the north west of the village.</td>
<td>N/A</td>
</tr>
<tr>
<td>Dec 2015</td>
<td>Detailed in this report.</td>
<td>177</td>
</tr>
</tbody>
</table>

*Table 1: Recent flood events affecting Staveley and Ings*

It should be noted that the gauge record at Bowston commenced in October 1999. Prior to this a gauge was used at Burneside. This gauge has a 5% greater catchment area size and suitable data is available.

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Data from Burneside gauge
between 1981 and 2000. The Bowston data for 2005, 2009 and 2015 events all exceed any of the recorded flow data at Burneside. The highest flow recorded at Burneside was 89 m³/s in January 1982. The last 10 to 15 years has clearly been a significantly worse period with regard to sustained high rainfall and river flow events compared with the previous decades.
Event Background

The flood incident occurred in Staveley and Ings on the 5th and 6th December 2015. This section describes the location of the flood incident and identifies the properties that were flooded.

Flooding Incident

Staveley is a village located 7km north-west of Kendal in Cumbria and is situated on the confluence of the River Kent and River Gowan. Ings is a smaller community located on the River Gowan, 2km west of Staveley. Both communities are located adjacent to the A591 between Kendal and Windermere. The two civil parishes covering the Staveley area have a population of approximately 1,150 (based on 2011 census data*).

At Staveley, the River Kent flows south and drains a mostly rural 40-41km² catchment in the south-eastern Lake District. The River Gowan is a smaller watercourse that joins the River Kent in Staveley, having flowed through the village of Ings approximately 2km upstream. The River Gowan drains a rural catchment of 15-16km². The River Kent is a designated ‘main river’, as is the River Gowan from downstream of the A591 at Ings. Also of note regarding a potential source of flood risk, there are steep fell sides immediately north-west of Staveley which drain towards the village.

The location of Staveley and Ings and associated major watercourses is shown in Figure 1.

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* https://en.wikipedia.org/wiki/Staveley,_Cumbria
Due to its position within the floodplain of the River Kent and River Gowan, parts of Staveley lie within Flood Zone 3 and are therefore at a high risk of fluvial flooding (see Figure 2). The town is also at risk from other sources of flooding, including surface water (see Figure 3).

Figure 2: Indicative risk of flooding to Staveley and Ings from rivers (fluvial)
Improved predictive flood risk mapping for the Rivers Gowan and Kent is currently being developed and is expected to be delivered in late 2016 by the Environment Agency.

On the 5th December 2015, approximately ten properties in Staveley and four in Ings were directly affected by flooding as a result of Storm Desmond. In addition, many more residents and local businesses were adversely affected by the flooding as a result of local impacts such as damaged road bridges, eroded banksides, flooding to gardens and blocked access roads. Gowan Bridge, which provides access from the A591 to the south of the village, including to the Main Street, suffered significant structural damage which led to its closure and subsequent demolition. However, the most significant local impact was that of a man dying, with his body recovered at Staveley.

The flooding experienced was from various sources and this is described in the “Investigation” section of this report.

This storm 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.

Existing Flood Defences

There are no Environment Agency maintained formal flood defences within Staveley or Ings. Staveley does, however, benefit from a "conveyance scheme" constructed in the 1970’s, designed to convey flood flows through the village on the River Gowan. The conveyance scheme consists of retaining walls, strengthened wall footings, and bed-check weirs to manage the channel gradient on the River Gowan through the village. Gravel and vegetation management on both the Gowan and Kent watercourses is completed by the Environment Agency. There are also lengths of informal flood defences, such as raised walls, along the Rivers Gowan and Kent that may have an effect on flooding and overland flow paths.

There is an embankment located on the River Kent, immediately downstream of the confluence with the River Gowan. The embankment is not a formal flood defence, however may afford agricultural land some protection. There are proposals for its removal in summer 2016, in order to reconnect the river with its natural floodplain, led by the South Cumbria Rivers Trust.

There are no formal measures in place to manage surface water run off or flooding from the local drainage system.

Property level protection and resilience measures have been taken up by some local residents.
Investigation

This section provides details of the rainfall event, the likely causes of flooding and the history of flooding in the area.

This investigation was carried out by the Environment Agency through surveys of the area and data collected from the communities affected with help from Cumbria County Council, South Lakeland District Council and Staveley with Ings Parish Council. This report has compiled this data to provide details of the flooding within Ings and Staveley.

Rainfall and Fluvial Events

December 2015 was the wettest calendar month on record with much of the northern UK receiving double the average December rainfall. This also followed a particularly wet November and as such, much of the soil within the Cumbria catchments was already saturated.

From the 4th to the 7th of December there was a period of prolonged, intense rainfall caused by Storm Desmond. Over this period, new 24 hour 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 during the November 2009 flood event, which saw widespread devastation in the towns of Keswick, Cockermouth and Workington. The record-breaking total rainfall values are presented in Table 2.

<table>
<thead>
<tr>
<th>Rainfall Period</th>
<th>Storm Desmond</th>
<th>Previous Record</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Date</td>
<td>Location</td>
</tr>
<tr>
<td>24 hour rainfall</td>
<td>December 2015</td>
<td>Honister Pass</td>
</tr>
<tr>
<td>48 hour rainfall</td>
<td>December 2015</td>
<td>Thirlmere</td>
</tr>
</tbody>
</table>

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. 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. Within Staveley, Seed Howe rain gauge recorded a total of 101.2mm of rain over 24 hours on the 5th December, with a 48 hour total of 158.7mm. Both the 24 and 48-hour recordings are the highest ever recorded at this gauge since it started recording rainfall in 1984. The location of the local catchment rain gauges is shown in Figure 4.

Five principle flow gauging stations are located within the catchment of the River Kent* (see Figure 4). All five of the stations are downstream of Staveley and the closest station on the River Kent is at Bowston, which replaced Burneside gauging station (now closed) in 1999. 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, Sprint Mill and Mint Bridge gauging stations gauge flows in the River Sprint and River Mint respectively, which both join the River Kent downstream of Staveley. Together, these stations recorded the fluvial event caused by Storm Desmond, and the recorded data is presented in Table 3, Figure 5 and Figure 6. There are currently no river flow gauges on the River Gowan.

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* Flow gauging station data obtained from Environment Agency records and the National River Flow Archive (www.nrfa.ceh.ac.uk)
At Bowston gauging station, the level of the River Kent peaked at 60.0m AOD at 18:15 on Saturday 5th December. This was the highest river level ever recorded, and exceeded the previous record level of 59.6m AOD (January 2005).

![Figure 4: Location of rain gauges and river gauging stations in the River Kent catchment](image)

<table>
<thead>
<tr>
<th>Gauging Station</th>
<th>River</th>
<th>Peak flow (m$^3$/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Dec 2015</td>
</tr>
<tr>
<td>Bowston</td>
<td>Kent</td>
<td>177</td>
</tr>
<tr>
<td>Burneside</td>
<td>Kent</td>
<td>-</td>
</tr>
<tr>
<td>Victoria Bridge</td>
<td>Kent</td>
<td>403</td>
</tr>
</tbody>
</table>

Table 3: Recorded peak river flows in the River Kent Catchment

*Source: Flow gauging station data obtained from Environment Agency records and the National Flow Archive (www.nrfa.ceh.ac.uk)
Figure 5: Recorded peak river flows in the River Kent catchment for recent flood events

Figure 6: Gauged river flows in the Kent catchment during the December 5\textsuperscript{th} and 6\textsuperscript{th} flood event
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 5th event had a 0.4% probability of occurring in any given year (0.4% Annual Exceedance Probability or AEP). However, it should be noted that this assessment is based on recorded data at a river level gauge approximately 4km downstream of Staveley, and provides only a limited guide to the severity of local rainfall and river flows in and around Staveley and Ings.

**Sources of Flooding, Flow Routes and Event Timeline**

There were several discrete flood flow routes during the event. Detailed information regarding the flow routes into these areas, the likely causes, and the recorded impacts are discussed in the ‘Flooding Incident’ and ‘Likely Causes of Flooding’ sections.

There is currently a lack of information and evidence available on the timing and sequence of flooding in Staveley. Further information is hoped to be gathered from the local community during the draft consultation process to inform our understanding of the flood event and update the timeline in Table 4 below.

<table>
<thead>
<tr>
<th>4th December 2015</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:22</td>
<td>!Flood Alert issued (Kent and Bela catchments)</td>
</tr>
<tr>
<td>19:00</td>
<td>First rainfall associated with Storm Desmond recorded at Kentmere Hallow Bank rain gauge.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5th December 2015</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30</td>
<td>Water started to enter Kentmere Packaging Ltd from the River Kent upstream of Barley Bridge and potentially from surface water runoff down Hall Lane.</td>
</tr>
<tr>
<td>15:00</td>
<td>Flooding commences in Ings. Flooding to properties on Main Street, Staveley commences.</td>
</tr>
<tr>
<td>16:00</td>
<td>Water levels reported locally to have peaked on the River Kent. Flooding to properties in the centre of the village (The Green and Silver Street).</td>
</tr>
<tr>
<td>18:15</td>
<td>River Kent peak at Bowston gauging station: 60.0m AOD/177m³/s.</td>
</tr>
</tbody>
</table>

**Table 4: Summary timeline of key events during the flooding at Staveley and Ings**
Likely Causes of Flooding: Staveley

In Staveley, the main source of flooding was from the rivers, and could broadly be split between that originating from the River Kent, River Gowan, and that from local surface water flow paths.

The River Kent burst its banks at Barley Bridge (Location 1 on Figure 7 below), near the site of Kentmere Packaging (Hall Lane), which was flooded to a depth of up to 0.5-0.8m. Flooding in the same area also affected the highway and gardens on Kent Drive.

There were several aspects to flood damage that occurred at the confluence of the Kent and Gowan (Location 2 on plan below). The recreational area near the Eagle and Child Inn flooded. Flooding in this area also extended up to the front door of the Eagle and Child Inn and its cellar was flooded. Several properties on Main Street, adjacent to the recreational area, were also affected by flooding, most likely from the combined effect of the overland flows from the rivers Gowan and Kent. Reports from home owners on Main Street also indicate that groundwater is a probable source of flooding. The highway in front of Gowan Terrace (opposite Main Street across the River Gowan), was also flooded. Gowan Bridge, spanning across the River Gowan near the Eagle and Child public house, suffered major damage, including displacement of the central pier. The damaged bridge has now been demolished, with a new structure due to be constructed in summer 2017.

A single bungalow located approximately 1km north (upstream) of Staveley, adjacent to the River Kent’s floodplain, also suffered internal flooding.

The River Gowan is reported to have burst its banks at Location 3 on Figure 7, resulting in highway flooding on Windermere Road. Residents along Windermere Road took action to protect their properties from flooding by placing makeshift flow deflection barriers at the road junctions and property boundaries along Windermere Road, which prevented flow down the road affecting more properties in this area.

River bank erosion was also reported, with particular concern at 1 Rock Cottage, where a riverside retaining wall collapsed due to undermining, also affecting a pedestrian access bridge. There was also erosion damage on the left bank of the River Gowan at Gowan Close, located opposite Rock Cottages. A riverside retaining wall collapsed as a result of undermining on the left bank of the River Gowan immediately downstream of Abbey Bridge. Significant redistribution of sediment also occurred on the Gowan, notably causing a gravel bank immediately upstream of Abbey Bridge (Location 4 on Figure 7).

Surface water flooding was a problem, with concerns regarding foul water pollution. There was also surface water / highway flooding at The Green and Silver Street (Location 5 on Figure 7), with two or three properties affected by flooding. Two properties were affected by flooding on Station Road (Location 6 on Figure 7); one at the junction with Beck Nook with floodwater entering the porch and another suffering flooding of a cellar. Surface water flooding occurred within Gowan Crescent (Location 7 on Figure 7), but this did not result in any internal flooding of property. According to a local resident, the flow route into Gowan Crescent was from the footpath connecting it with Station Road.

Culvert damage also occurred at the entrance to Caldrigg Fold, which is situated adjacent to the River Kent on Kendal Road (Location 8 on Figure 7). The culvert serves a small tributary to the River Kent which flows from the south west of the village.
Figure 7: Flooded Areas and Flow Routes at Staveley
Likely Causes of Flooding: Ings

Figure 8 below was mainly compiled using information provided by local residents during a site visit on 11th March 2016.

It should be noted that several tributaries combine at Ings to form the River Gowan. One of these tributaries, running past Ings Hall Caravan Park, appears to have been the main source of flooding. The floodplain filled to the west of Ings, perhaps due to impeded channel capacity at the culvert adjacent to the caravan park. This flood water then spilled onto the highway (Church Lane), and flood water then followed local topography and the route of least resistance along the road.

The Watermill Inn pub was reported to have flooded along this flood route (by local residents). Several other properties were close to flooding, but did not. As the flood water passed over the road bridge crossing the River Gowan (flowing north-west to south east through Ings), some flood water escaped back into the grazed area to the south. Local residents commented that the floodwater was approximately 200-300mm deep at this location and hazardous to stand in. They also commented that the floodplain to the south did not appear to be full and that better use of this land could be made during flood events.

Once the flood water had passed over the tributary (via the road crossing), it passed a short terrace of properties but, despite low thresholds, local residents met on 11th March 2016 reported that they were not flooded. This was thought to have been due to action by home-owners. The flood water then flowed towards the area of the alms houses and Meadowcroft Country Guest House. Three alms houses were affected by flooding and, according to local residents, also the Guest House (but this is not confirmed).

It is not clear whether, and how, this flood water re-connected with the River Gowan.
Figure 8: Flooded Areas and Flow Routes at Ings
Environment Agency Flood Incident Response

Pre-event Warning and Preparation

A Flood Alert for the River Kent catchment was issued on 4th December at 15:22 by the Environment Agency. A Flood Alert provides advance notice of possible flooding to low lying land and roads, and also acts as an early notification that river levels are expected to rise and that the Environment Agency are monitoring the situation closely. There are currently no Flood Warning Areas for Staveley and Ings, so during the December flood incident the Environment Agency updated the Flood Alert daily with relevant information.

Staveley and Ings do not currently have any operational assets that require operation by the Environment Agency prior to a flood event. Therefore no Environment Agency staff attended site during the flood event.

Due to the nature of the river environment in Staveley, gravel deposition occurs on both the Rivers Kent and Gowan. This can reduce channel capacity, which can have an impact on flood risk. Regular monitoring of gravel accumulation forms part of the Environment Agency’s maintenance programme in Staveley – key gravel monitoring locations are surveyed on the River Gowan upstream and downstream of Abbey Bridge, and on the River Kent upstream and downstream of Barley Bridge Weir. If gravel builds up to a level where flood risk is increased, then the Environment Agency undertakes gravel removal to maintain channel capacity and flood flow conveyance through the village.

Post-event Repairs and Maintenance

Following the flood event in December, the Environment Agency have undertaken an assessment of the gravel accumulation on the River Kent and River Gowan in Staveley. As a result of this assessment, the Environment Agency will be undertaking gravel removal on the River Gowan upstream and downstream of Abbey Bridge. This work is programmed to be completed in summer 2016.

In the period to date following the event:

- The Environment Agency has completed an inspection of the river walls along the River Gowan to assess their condition and determine the scope of repairs required. The Environment Agency has been working closely with relevant property owners and their insurance companies to make arrangements for necessary repairs.

- Cumbria County Council has commenced investigations regarding the work needed in order to reinstate Gowan Bridge. The damaged bridge has now been demolished, with a new structure due to be constructed in summer 2017.

- Discussions and planning has taken place between the Parish Council and Environment Agency regarding the installation of a gauge on the River Gowan. The Parish Council would own and maintain the gauging station.

Personnel from the Corps of Royal Engineers attended Staveley after the flood event (timing unknown) and closed both Gowan Bridge and Abbey Bridge.
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. Local activities undertaken are summarised below:

- 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 (WLMB’s). Some of these recommendations may have already been carried out or are ongoing. Some of the actions referred to in Table 6 are identified on Figure 9 and Figure 10 following this table.

<table>
<thead>
<tr>
<th>Cumbria Flood Partnership Theme</th>
<th>Action by</th>
<th>Recommended Action</th>
<th>Timescale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resilience</td>
<td>Cumbria Local Resilience Forum*</td>
<td>Review and update plans to enable homes &amp; business to be better prepared for flooding &amp; reduce the impacts of flooding. For example, review of evacuation procedures / emergency response.</td>
<td>2016</td>
</tr>
<tr>
<td>Resilience</td>
<td>Environment Agency</td>
<td>Continue to work closely with and support Staveley with Ings Parish Council to plan and prepare for future flood events, and to understand the various flooding mechanisms observed locally during the December flood event.</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Resilience</td>
<td>Environment Agency</td>
<td>Review modelling data to ensure that hydraulic models for the River Kent catchment reflect real conditions as accurately as possible and replicate the 5(^{th})-6(^{th}) 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.</td>
<td>2016</td>
</tr>
<tr>
<td>Resilience</td>
<td>Environment Agency</td>
<td>Investigate options to provide an improved flood warning service for the Staveley and Ings area. This could include the installation of new river gauges on the River Gowan, possibly managed and monitored by the community.</td>
<td>2016</td>
</tr>
<tr>
<td>Resilience</td>
<td>Residents &amp; South Lakeland District Council</td>
<td>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 £2,000 top up grant can also be applied for from the Cumbria Flood Recovery Fund.</td>
<td>Closing date for grant applications is end of December 2016</td>
</tr>
<tr>
<td>Resilience</td>
<td>South Lakeland District Council, Cumbria County Council and Environment Agency</td>
<td>Review Local Development Plans and Strategic Flood Risk Assessment to reflect current understanding of flooding.</td>
<td>2016</td>
</tr>
</tbody>
</table>

*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.
<table>
<thead>
<tr>
<th>Cumbria Flood Partnership Theme</th>
<th>Action by</th>
<th>Recommended Action</th>
<th>Timescale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upstream Management</td>
<td>Cumbria Floods Partnership (CFP)</td>
<td>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.</td>
<td>Summer 2016</td>
</tr>
<tr>
<td>Upstream Management</td>
<td>Cumbria Floods Partnership (CFP), Farmers, Landowners, Community Groups, Trusts.</td>
<td>Explore opportunities for natural flood management solutions to be used upstream of Staveley in order to ‘slow the flow’ and manage peak river levels.</td>
<td>Medium term (over next 5 years)</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Environment Agency, United Utilities and Cumbria County Council</td>
<td>Carry out inspections and repairs to assets which may have been damaged during the flood event.</td>
<td>2016</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Environment Agency</td>
<td>Review the gravel and channel maintenance programme within the catchment in response to the flooding event of 2015.</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Environment Agency</td>
<td>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></td>
<td>2017</td>
</tr>
<tr>
<td>Strengthening Defences</td>
<td>Cumbria County Council, South Lakeland District Council and United Utilities</td>
<td>Review the performance of the existing drainage and sewerage systems during the event to better understand where improvements are required.</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Strengthening Defences</td>
<td>Cumbria County Council in partnership with the Environment Agency and United Utilities</td>
<td>Conduct a detailed assessment for Staveley (including Kendal and Burneside) 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.</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Cumbria Flood Partnership Theme</td>
<td>Action by</td>
<td>Recommended Action</td>
<td>Timescale</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>Strengthening Defences</td>
<td>Environment Agency in partnership with Cumbria County Council and South Lakeland District Council</td>
<td>Develop options to improve the existing Standard of Protection in Staveley and Ings as part of a wider appraisal of flood risk management improvements in the Kent catchment (including Kendal and Burneside). Defence options to be appraised are likely to include upstream storage, improvements to flood channel conveyance, raised flood defences and natural flood management.</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Strengthening Defences</td>
<td>Cumbria County Council &amp; Environment Agency</td>
<td>Assess the impact of the road bridges and footbridges in Staveley on flood flows, and investigate options to increase their flood capacity, taking into account the potential effects on flood risk downstream.</td>
<td>2016-2017</td>
</tr>
<tr>
<td>Strengthening Defences</td>
<td>Cumbria County Council</td>
<td>Complete works to replace Gowan Bridge near the Eagle and Child public house. The replacement structure should be designed taking into account possible effects on flood risk.</td>
<td>Summer 2017</td>
</tr>
<tr>
<td>Strengthening Defences</td>
<td>Environment Agency in partnership with Cumbria County Council and Network Rail</td>
<td>Work with Network Rail to understand the interaction of the Windermere branch line with the rivers and watercourses in and around Staveley and Ings, their effect on flooding and their vulnerability during a flood.</td>
<td>2016-2017</td>
</tr>
</tbody>
</table>

Table 5: Recommended actions for consideration
Figure 9: Locations of specific actions identified in Table 5 (Staveley)

Figure 10: Locations of specific actions identified in Table 5 (Ings)
Next Steps

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, has produced a 25 year flood action plan for the Cumbrian catchments worst affected by the December 2015 flooding. The Cumbria Flood Action Plan, as well as a series of community action plans, is available online at:


The plan considers 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 were published on 30th June 2016.

The Cumbria Floods Partnership was set up by Flood Minister Rory Stewart MP following December’s floods, and includes all of Cumbria’s RMAs. They are working alongside the existing ‘Cumbria Strategic Partnership’, which was formed as part of the Flood and Water Management Act 2010 and comprises of the County’s RMAs, including the Environment Agency, Cumbria County Council, Local Authorities and United Utilities. Both partnerships are working with communities, businesses, and relevant stakeholders to understand and reduce flood risk across Cumbria.

Figure 11 helps to demonstrate how the two partnerships are working together.

![Diagram of Cumbria Flood Partnership and Cumbria Strategic Partnership](image)

Figure 11: Cumbria Flood Partnership and Cumbria Strategic Partnership

The Environment Agency is currently updating the hydraulic model for the Kent and Gowan catchments. This river model is the fundamental tool to assist with flood forecasting and to assess future flood risk management options. This study is due to be completed in 2016. The new model will then be used to inform a study examining the viability of investment in new flood risk management measures to better protect Staveley and Ings from flooding. This study will include various aspects, including consultation with relevant organisations and the local community.
# Appendices

## Appendix 1: Glossary

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEP</td>
<td>Annual Exceedance Probability</td>
</tr>
<tr>
<td>CCC</td>
<td>Cumbria County Council</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Department for Environment, Food and Rural Affairs</td>
</tr>
<tr>
<td>EA</td>
<td>Environment Agency</td>
</tr>
<tr>
<td>FLAG</td>
<td>Flood Action Group</td>
</tr>
<tr>
<td>FWD</td>
<td>Floodline Warnings Direct</td>
</tr>
<tr>
<td>LLFA</td>
<td>Lead Local Flood Authority (under the Flood and Water Management Act 2010)</td>
</tr>
<tr>
<td>MSIWG</td>
<td>Making Space for Water Group</td>
</tr>
<tr>
<td>RMA</td>
<td>Risk Management Authority (under the Flood and Water Management Act 2010)</td>
</tr>
<tr>
<td>SLDC</td>
<td>South Lakeland District Council</td>
</tr>
<tr>
<td>UU</td>
<td>United Utilities</td>
</tr>
</tbody>
</table>
Appendix 2: 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.

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

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 3: 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

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

Flood and Water Management Act 2010:

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 4: Flood Warnings and Alerts

Staveley and Ings is covered by the River Kent & Bela Flood Alert.

**Flood Alerts:**

**011WAFKB - Rivers Kent and Bela**

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, are 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.