

Flimby

Including Fothergill

S.19 Flood Investigation Report



Flimby Aerial View – Google Earth

Flood Event

3rd and 5th 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	Date
Working Draft for discussion with EA	Rachel Gerrard	Chris Evans	28 June 2016
Draft incorporating EA feedback	Rachel Gerrard	Chris Evans	29 July 2016
Final Draft incorporating community feedback	Chris Evans	Doug Coyle	6 th March 2017

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Executive Summary

Flimby experienced severe flooding on the evening of the 3rd December 2015 with further flooding due to heavy rain on the 5th December. As a precursor of Storm Desmond, a short period of very intense rainfall, falling on an already saturated catchment, fell across north-western Cumbria. This was prior to the prolonged rainfall across the whole of the county. The short duration intense rainstorm on the 3rd December led to a rapid and extreme response in small watercourses and surface water systems.

In response to the flood events, 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 details on the flooding that occurred in Flimby on the 3rd and 5th of December 2015, and has used a range of data collected from affected residents, site visits, surveys of the area, and data collected by observers, along with river and rainfall telemetry during the flood event.

Within Flimby, watercourses became inundated with roads becoming major flow routes for floodwater leading to the flooding of approximately 100 properties. Rainwater poured off the hillside, washing away footpaths in Flimby Great Wood, and inundating watercourses and surface water systems through Flimby before flowing out to sea. Flimby (including Fothergill) has 4 watercourses flowing through it: Flimby Gill, known locally as Barrel Arch, Penny Gill, Furnace Gill and Risehow Beck. Allerdale Borough Council lead on flood risk management activities for Risehow Beck, whilst Flimby Gill (Barrel Arch), Penny Gill and Furnace Gill fall under the remit of the Environment Agency.

Following historic flooding, some properties in Flimby raised floors and carried out resilience and resistance measures to protect themselves from flooding.

Allerdale Bough Council maintain a debris grid on Risehow Beck whilst the Environment Agency maintain debris grids on Flimby Gill (Barrel Arch) and Penny Gill.

Please note that references to left and right bank are taken looking downstream with the flow of water.

Ten actions have been recommended in this report to manage future flood risk. These will require the involvement of a number of organisations and local communities, and include a review of the risk posed by flooding in order to identify any areas that can be improved. This review will also include potential improvements to processes such as flood warnings and recovery. This review is being undertaken separately to this report.

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>

The Flood Investigation Report

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 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.

Introduction

Geographical Setting

Flimby is a small village located on the West Coast of Cumbria between Workington and Maryport with a population of approximately 2000 people, **Figure 1**. The village grew in the late 19th century due to the growth of the coal mining industry on the slopes above the village, now Flimby Great Wood. Further housing was built in the 1950's and residential growth has continued, with the largest new development at Farmers Way near Penny Gill, built approximately 2010/11.

The Whitehaven to Carlisle railway line opened 1845 and passes along an embankment on the north-west boundary of Flimby, protecting its coastal edge from the prevailing westerly winds and waves of the Irish Sea. Inland from the coast, the land rises steeply for approximately 2-3 kilometres, reaching the hill crest where the sources of the watercourses can be found.

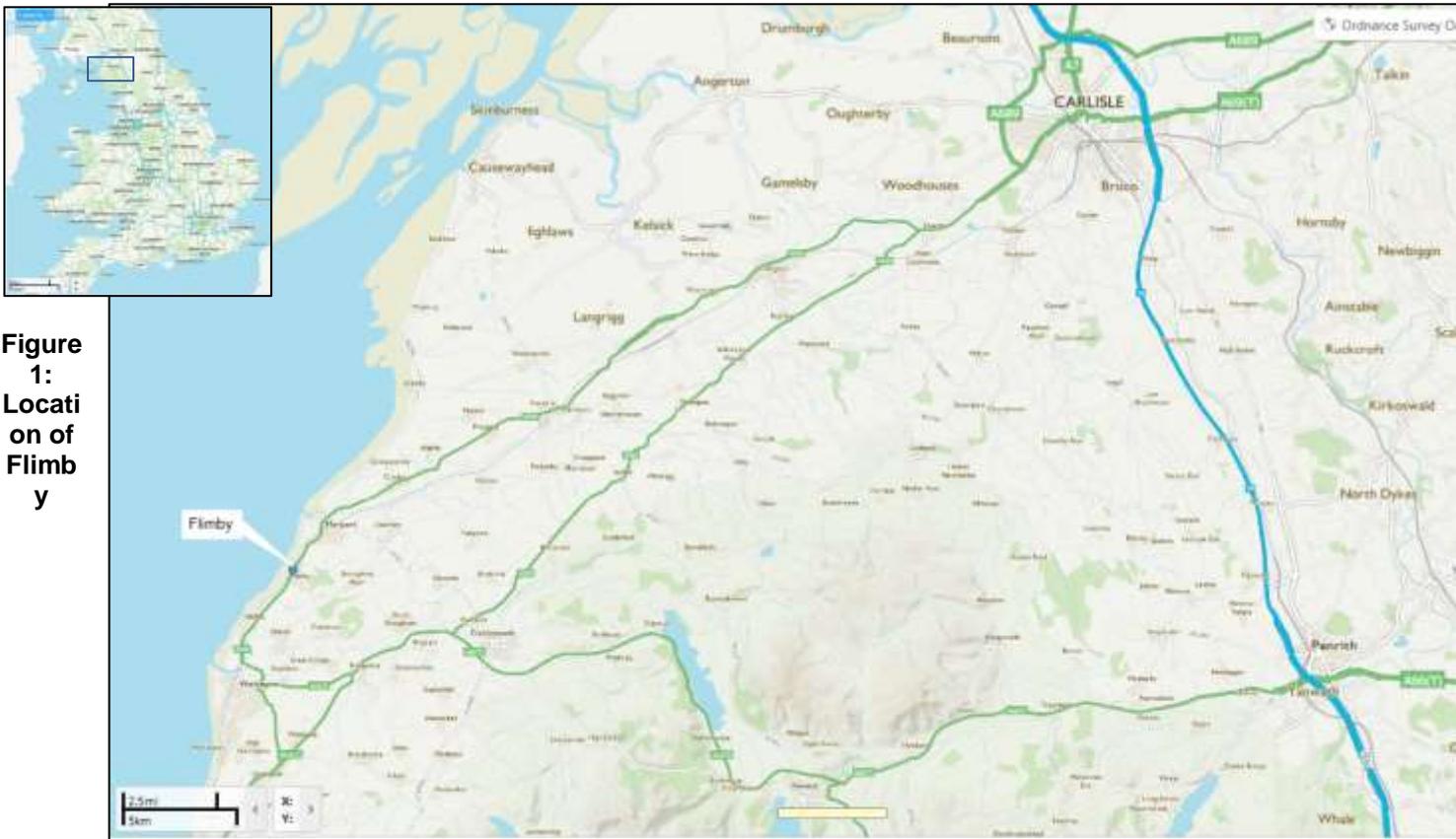


Figure 1:
Location of Flimby

Flooding History

Flimby has a long record of flooding from Penny Gill and Flimby Gill (Barrel Arch). Flimby Gill (Barrel Arch) and Penny Gill flow through culverts under the village and railway embankment before discharging out at sea. Two further watercourses pass just to the north of Flimby; Furnace Gill and Risehow Beck. Furnace Gill, Penny Gill and Flimby Gill (Barrel Arch) are all designated main rivers and fall under the powers of the Environment Agency. Risehow Beck is maintained by Allerdale Borough Council and comes under the powers of Cumbria County Council.

Flimby Gill (Barrel Arch) and Penny Gill have grids on the upstream ends of their respective culverts to prevent blockages within the downstream sections of pipe. Flimby Gill (Barrel Arch) currently has no

flooding identified on the Environment Agency flood map, **Figure 2**, but a mapping study is currently being undertaken with completion expected in early 2017. Risehow Beck has a debris screen maintained by Allerdale Borough Council.

Flimby is also vulnerable to surface water flooding, **Figure 3**. The residential area encompassing Coniston Avenue, Elm Avenue, Solway Avenue and Grange Avenue has a long record of flooding with historic works being carried out to reduce the risk of flooding from overland flow.

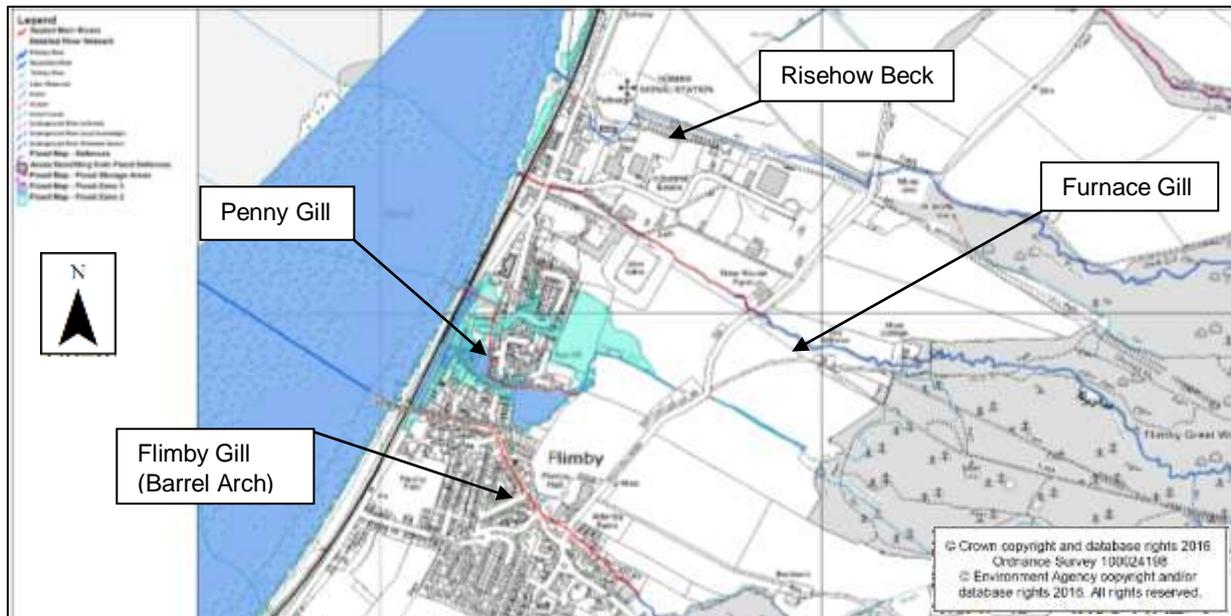


Figure 2: Environment Agency Flood Map for Flimby

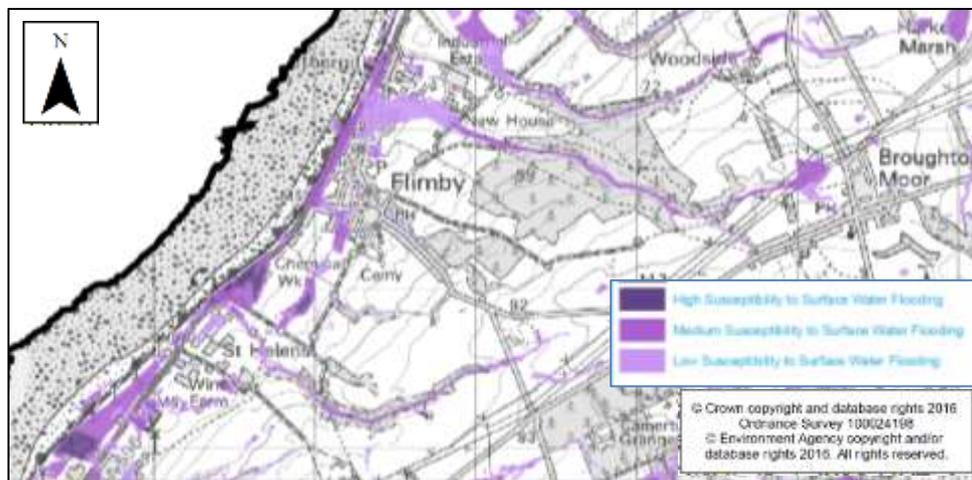


Figure 3: Extract from Allerdale Borough Council Surface Water Flood Map

Flood Event 3rd - 5th December 2015

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

Background

Flimby experienced severe flooding due to an intense rainfall event on the evening of the 3rd December 2015 with further flooding due to more prolonged heavy rain on the 5th December. Approximately 100 properties suffered internal flooding, while others experienced flooding of gardens, footpaths and

roadways. The area affected by the flooding is shown in **Figure 4**. Rainwater poured off the hillside, washing away footpaths in Flimby Great Wood, and inundating watercourses and surface water systems through the village before flowing out to sea.

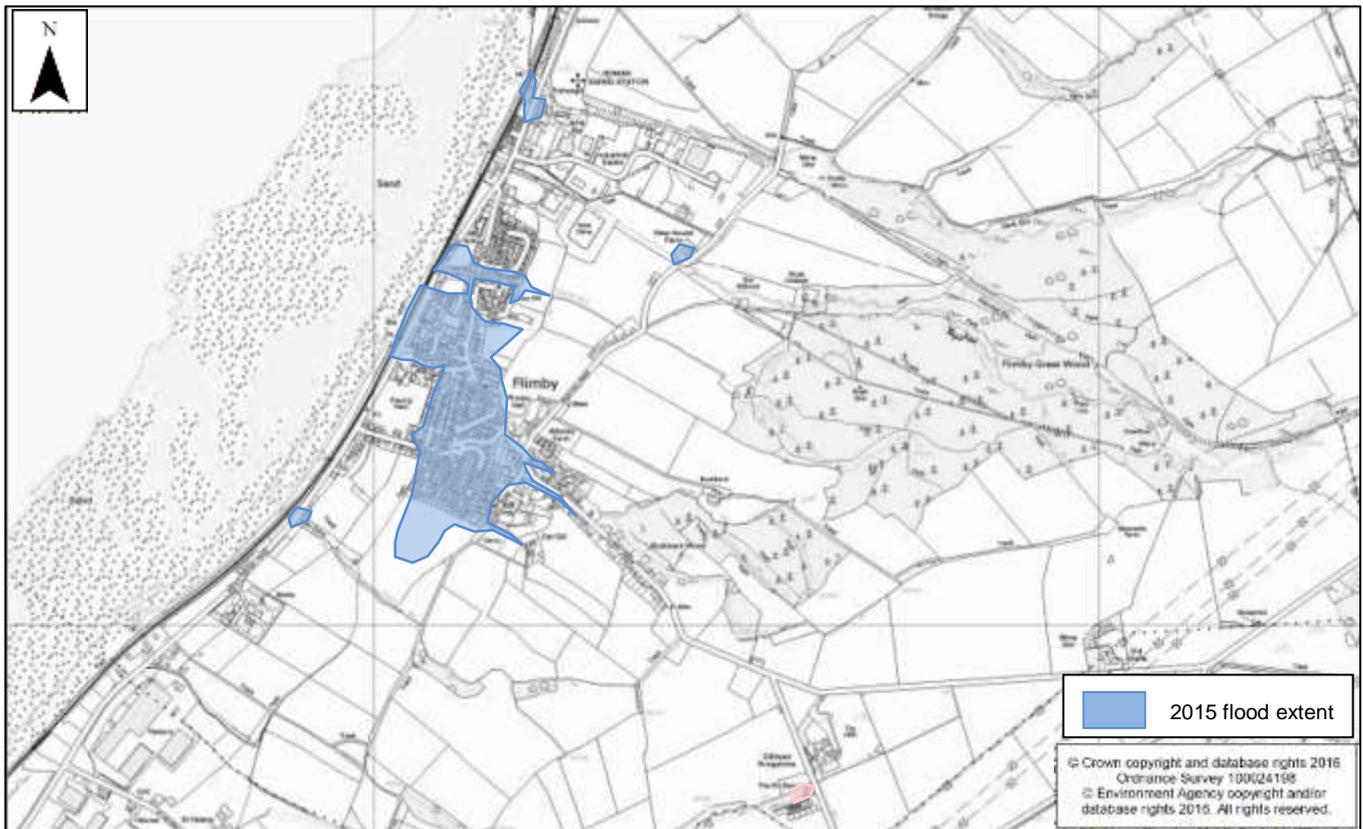


Figure 4: Extent of River (Fluvial) Flooding* in Flimby 3rd December 2015

The flood outline identifies the maximum extent of flooding. Not all properties within the extent area were flooded.

For this report, the flooded area has been divided into 6 sub-areas for investigation. These are based on flood flow routes. These sub-areas are shown in **Figure 4**:

Sub-area 1: Beckside/ Allanby Close/ Flimby Brow: Flimby Gill (Barrel Arch) and surrounding area.

Sub-area 2: Solway/ Coniston /Grange / Elm Avenues/ Church Road / West End Close: Cat Gill

Sub-area 3: Westfield View: Overland flows via roads from Flimby Gill.

Sub-area 4: Wesley Court/ Mason Terrace/ Ryehill Road / School Drive: Downstream of Penny Gill grid.

Sub-area 5: Brook Street/ Chapel Street/ Station Road: Overland flows.

Sub-area 6: Main Road Fothergill: Downstream of Risehow Beck debris grid.

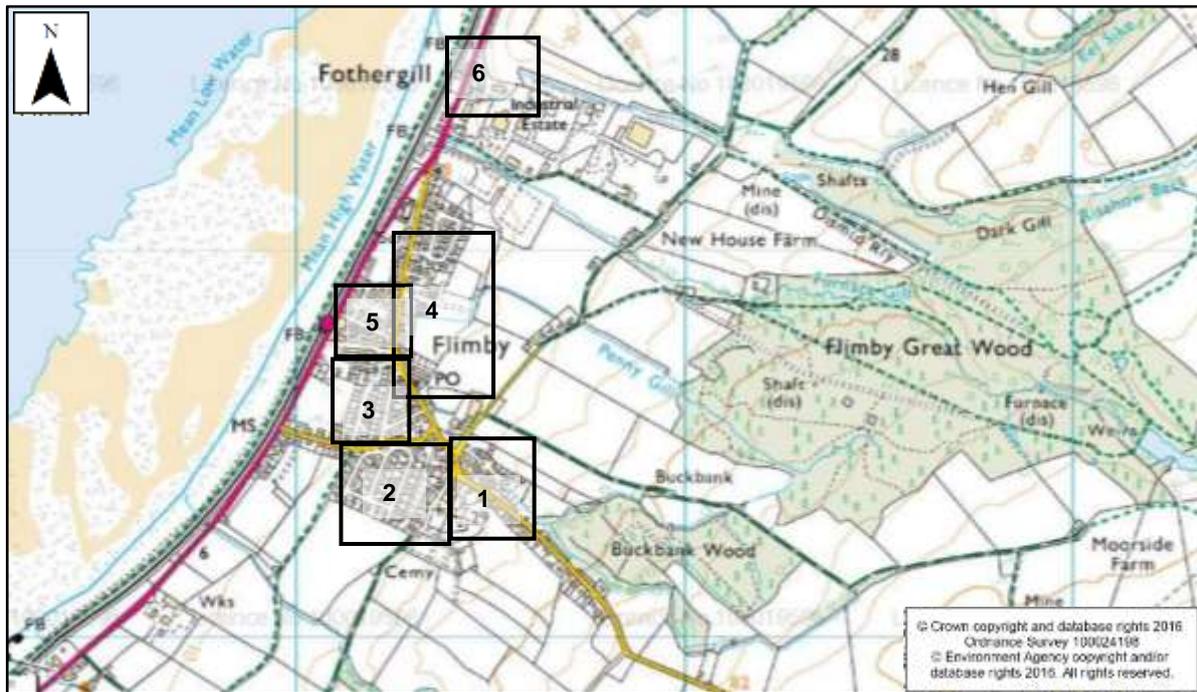
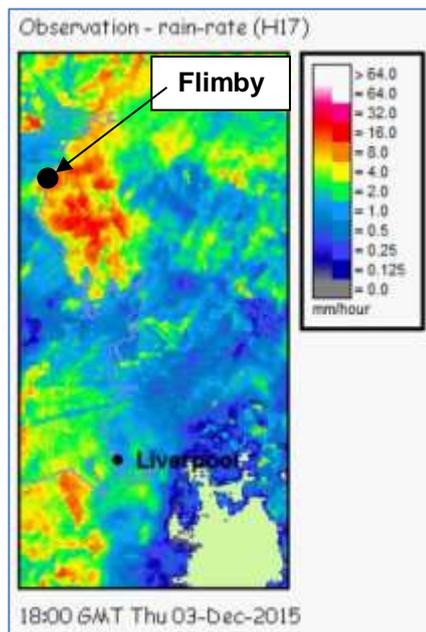


Figure 5: Identification of areas flooded

Rainfall Event

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



On the afternoon and early evening of Thursday the 3 December between Flimby and 19:30 hrs, an extreme rainfall event affected West Cumbria. The epicentre of the flooding was the west facing upslope areas near the coast, especially in the areas between Flimby and Maryport, **Figure 6**. In one 15 minute interval, 7mm of rain was recorded.

The nearest rain gauge to Flimby is at Dearham, approximately 5km to the north east. During the evening of 3 December 2015 over 30mm of rain was recorded in a 3 hour period.

Figure 1 Rainfall Intensity Radar over Cumbria 3 December 2015 18:00

The watercourses through Flimby outfall onto the beach. On the Evening of Thursday 3 December 2015 high tide was at 17:15. The tidal defences on the railway underpasses were open as the tide was not at a level to threaten the village. As the culverts containing the watercourses began to surcharge, the flood waters were seen to pass back under the railway line though the open tidal flood gates.

Existing Flood Defences

Flimby Gill (Barrel Arch) and Penny Gill have historic flooding issues and were designated Critical Ordinary Watercourses. Due to the frequency and nature of the flooding, the Environment Agency took over the associated powers for these watercourses in 2005. This enabled the Environment Agency to fund work on the watercourses. The work carried out has been culvert cleaning, culvert lining and the installation of debris grids on the upstream end of the culverts.

Penny Gill and Flimby Gill were relined and a new debris grid installed with access for Penny Gill. This work was completed in summer 2015.

In the field behind the properties in Elm Avenue there is a concrete sandbag wall with concrete box culvert following the old watercourse at a higher level. This flood relief culvert runs at the rear of properties in Coniston Avenue and Solway Avenue before crossing West Lane to run along the rear of the properties in Westfield View and St Helens Avenue. This then joins Flimby Gill (Barrel Arch) in Brook Street, **Figure 7**.

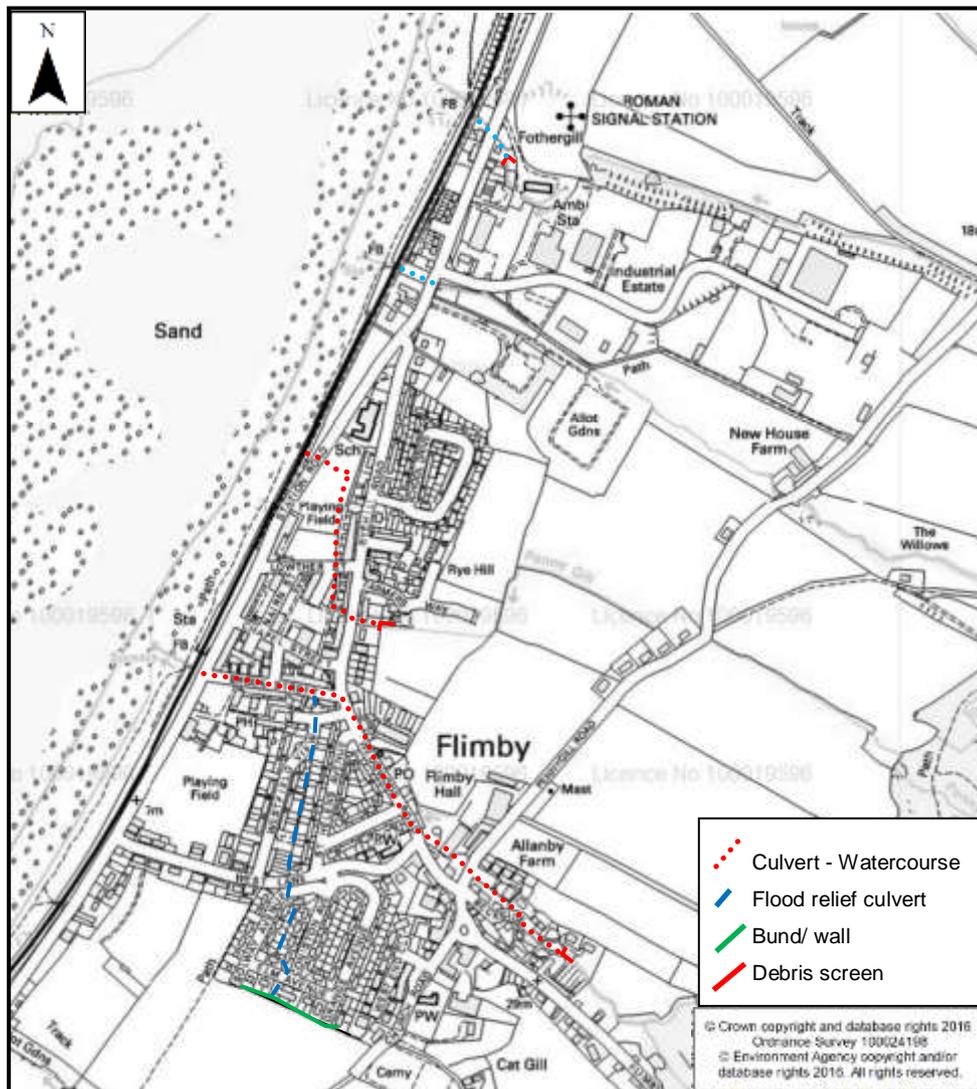


Figure 7 Flood Defences in Flimby

Investigation

This investigation was carried out by the Environment Agency through surveys of the area, and data collected from the community. This report has compiled this data to provide details of flooding from surface water, Flimby Gill (Barrel Arch), Penny Gill, Furnace Gill and Risehow Beck.

Map of Flow Routes

There were a number of flooding flow routes during the event. These are summarised in **Figure 8**. The details of these flow routes and the flooding within each of the identified areas is discussed in the 'Impacts and Likely Causes of Flooding' section, below.

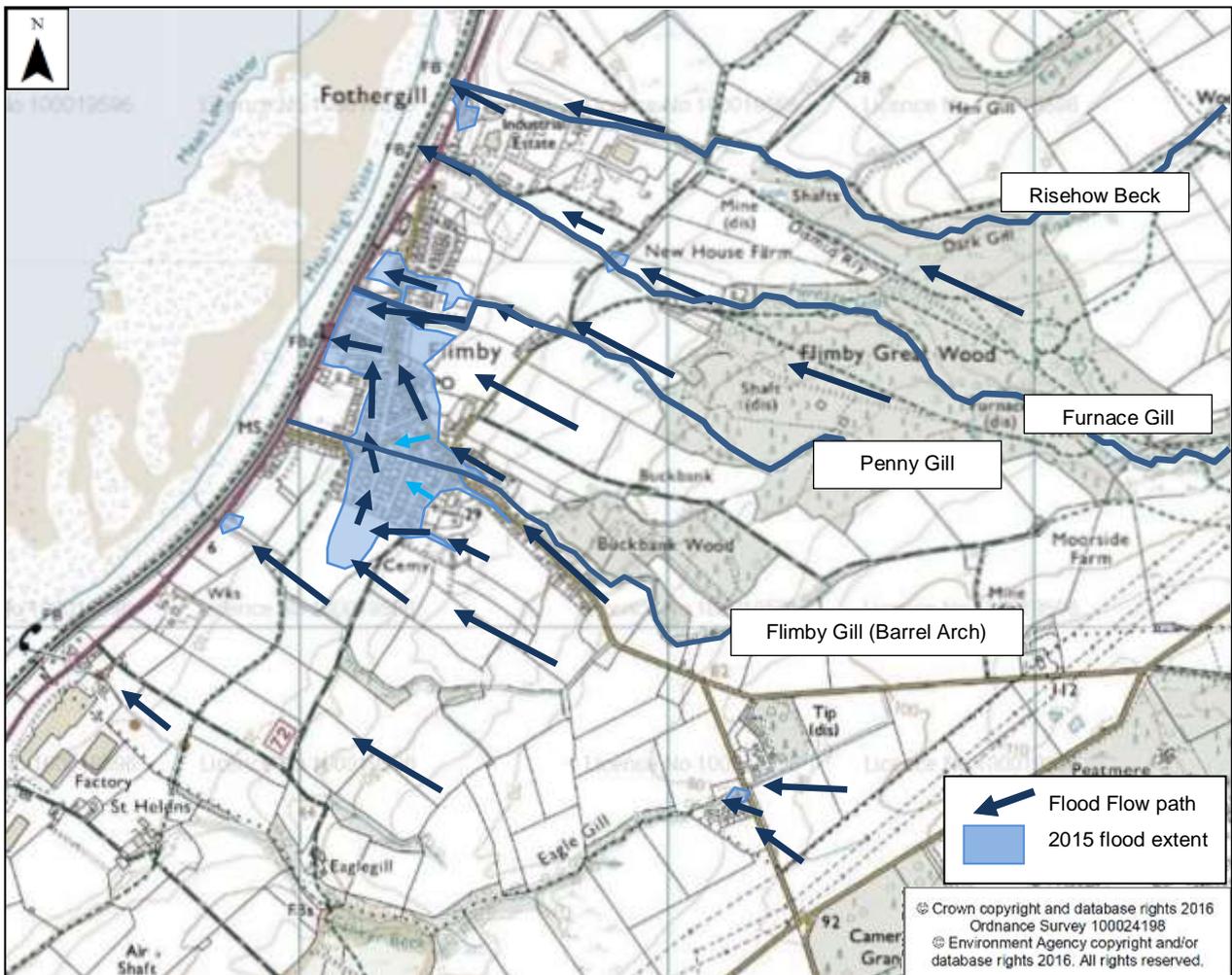


Figure 8: Summary of flood flow routes through Flimby

With ground already saturated the intensity of the rainfall event turned roads into rivers. Road drains were overwhelmed and water followed the route of least resistance to flood into homes and gardens. Water was trapped on flatter ground where it collected increasing the depth as there was no flow route out causing further flooding to property.

Impacts and Likely Causes of Flooding

Sub-area 1: Beckside / Allanby Close / Flimby Brow

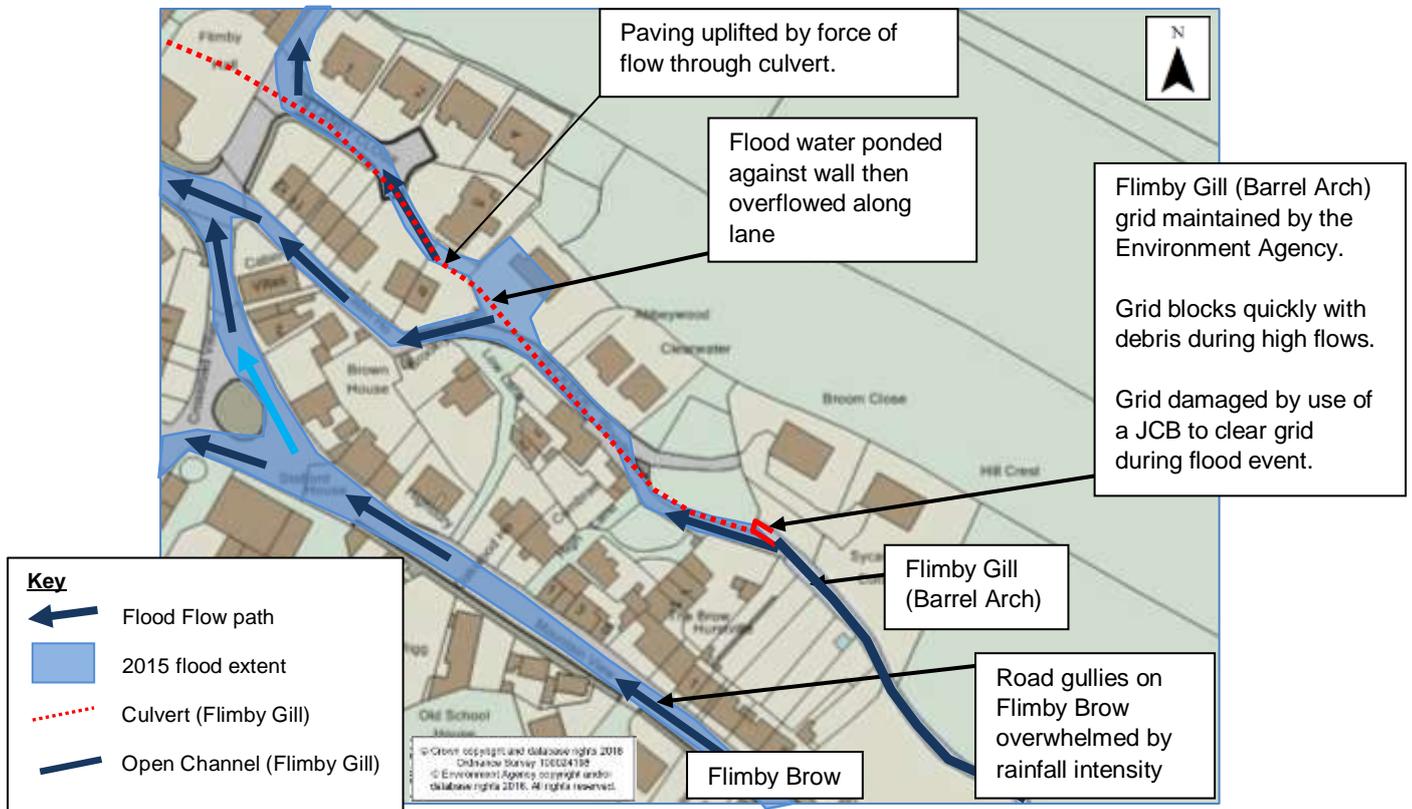


Figure 9: Flimby Gill and Flimby Brow flooding mechanisms

The Environment Agency maintains a debris grid on the culvert entrance of Flimby Gill (Barrel Arch) which was cleared of debris prior to the flood event on 3 December 2015.

During the intense rain event on the 3rd December the grid screen became blocked with wood debris washed down from the woodland, upstream of the culvert. This resulted in the flow from the gill overflowing down Beckside and ponding behind the wall to the rear of 6 Allanby Close, **Figure 10**. It then overflowed down onto Wedgewood Road past Flimby Hall. During this event the grid was damaged by a JCB being used to try and clear the debris from the grid, **Figure 11**.

The intensity of the rainfall was such that the road gullies could not cope with the volume of water. Flimby Brow became a torrent of water, flowing down Church Road and joining the flood flow from Flimby Gill on Wedgewood Road. Crossroad Villas are in a dip behind the road island which protected them from the flows.

Within this area, numerous gardens, footpaths and roads became flooded, however most properties narrowly escaped water entering with only a single record of internal flooding.

During the flood event, the Fire & Rescue Service were called by residents of Allanby Close and Beckside. The calls came between 18:30 and 19:00 on Thursday 3 December 2015 and appliance was sent from Maryport to assist.



Figure 10: 6 Allanby Close culvert blockage



Figure 11: Flimby Gill (Barrel Arch) grid 4/12/16

Further prolonged rainfall was experienced on the 5th December. During the previous event on the 3rd December, the decking above the Flimby Gill grid was removed or became detached. This enabled debris to ride over the screen into the culvert and caused a blockage, although this was not known at the time. The blockage resulted in the surcharging of a manhole and flooding on Beckside on the 5th December.

Sub-area 2: Solway/ Coniston /Grange / Elm Avenue / Church Road / West End Close

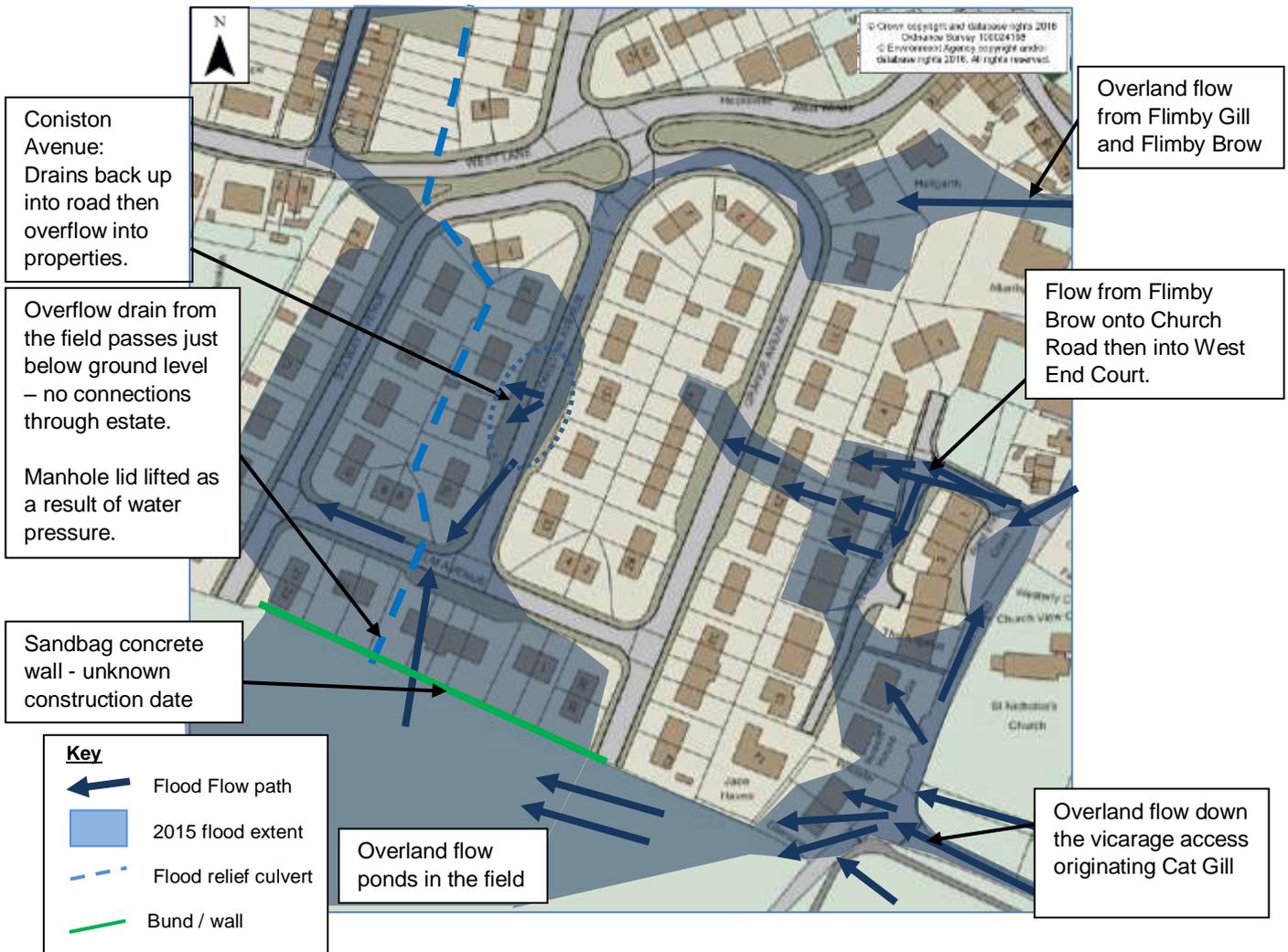


Figure 12: Elm / Coniston / Grange / Solway Avenue and Church Road / West End Close mechanisms

It is estimated that approximately 45 properties flooded within this area, **Figure 12**. Flooding on Coniston Avenue initially started about 15:30-16:00 on Thursday 3 December 2015. The initial flooding came from the road drains which are connected to the combined sewer system. The flooding peaked at approximately 18:00 but lasted until the early hours of Friday 4 December. The water peaked at a depth of approximately 400mm in Coniston Road spreading out onto Solway Ave and Elm Ave. Flood water originating from Cat Gill and Flimby Brow flowed down Church Road via West End Close onto the estate, increasing the depth of water. Some properties narrowly missed being flooded as their floor levels have been raised by the housing association. Although they were surrounded by floodwater, no ingress occurred.

The field behind the properties on Elm Avenue regularly collects water, **Figure 13**. Historically, a watercourse followed the field boundary before flowing under the rear gardens of Coniston Ave and along the rear of St Helens Avenue to join the Flimby Gill (Barrel Arch) culvert in Brook Street, **Figure 7**. A higher level concrete culvert follows this route from the field behind Elm Avenue. There is also a concrete sandbag wall which follows the field boundary, increasing the potential storage of the field. The construction date of this wall and culvert is unknown.

During the flood event, the Fire & Rescue Service were called by residents of Coniston Avenue, Solway Avenue, Elm Avenue and West End Close. The calls came between 18:00 and 21:30 on Thursday 3 December 2015.



Figure 13: Flooding in the field behind Elm Avenue



Figure 14: Flooding on Elm Avenue

Sub-area 3: Westfield View

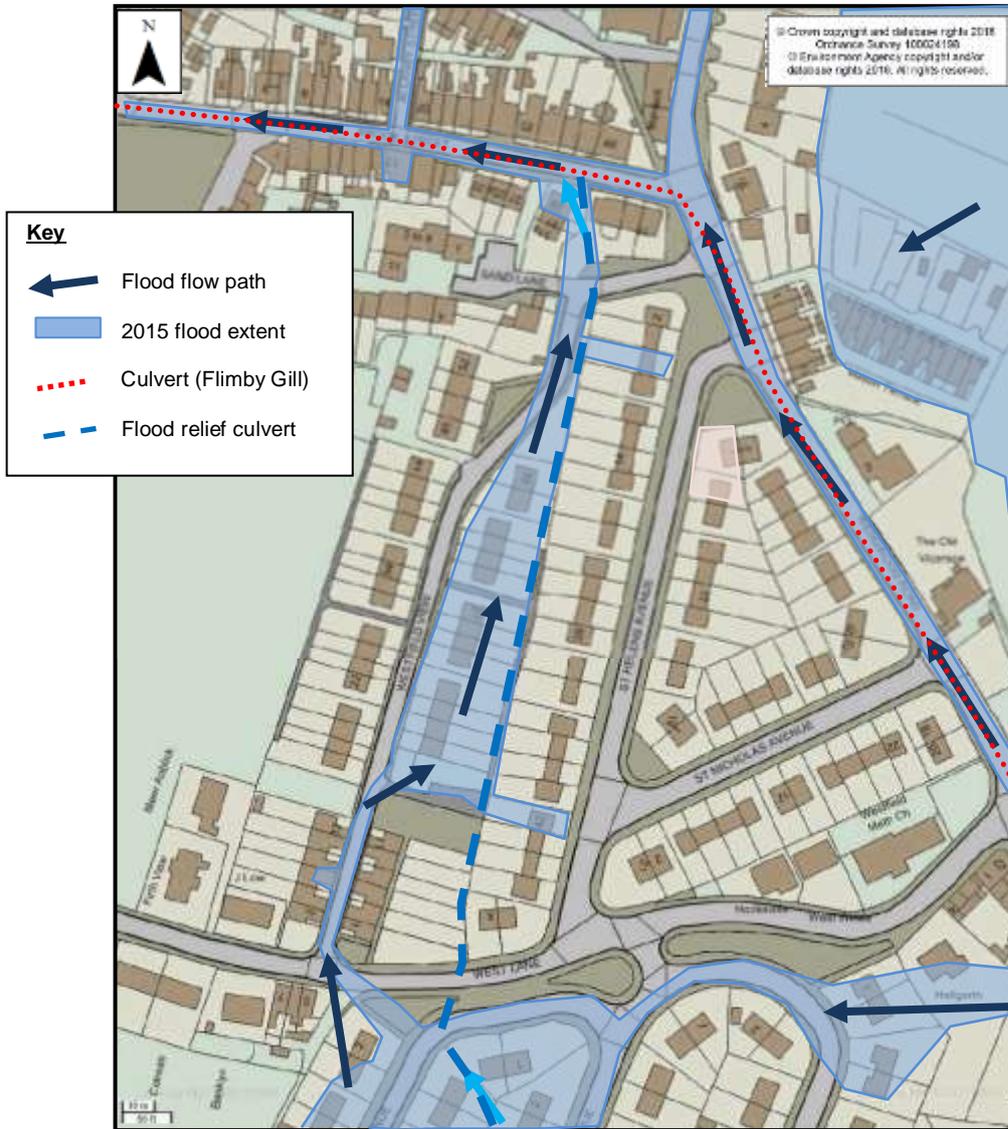


Figure 15: Westfield View Flooding Mechanisms

Westfield View flooded from overland flow via the road network. The direction of the flow was heavily influenced by the camber of the road and dropped kerbs. The water flowed through from Westfield View and Wedgewood Road onto Brook Street, **Figure 15**. Approximately 15 properties flooded in this area.

During the flood event, the Fire & Rescue Service were called by residents of Westfield View. The calls came between 18:45 and 19:40 on Thursday 3 December 2015. Appliances were sent from Silloth and Workington to assist.

Sub-area 4: Ryehill Road / Wesley Court / Mason Terrace /School Drive

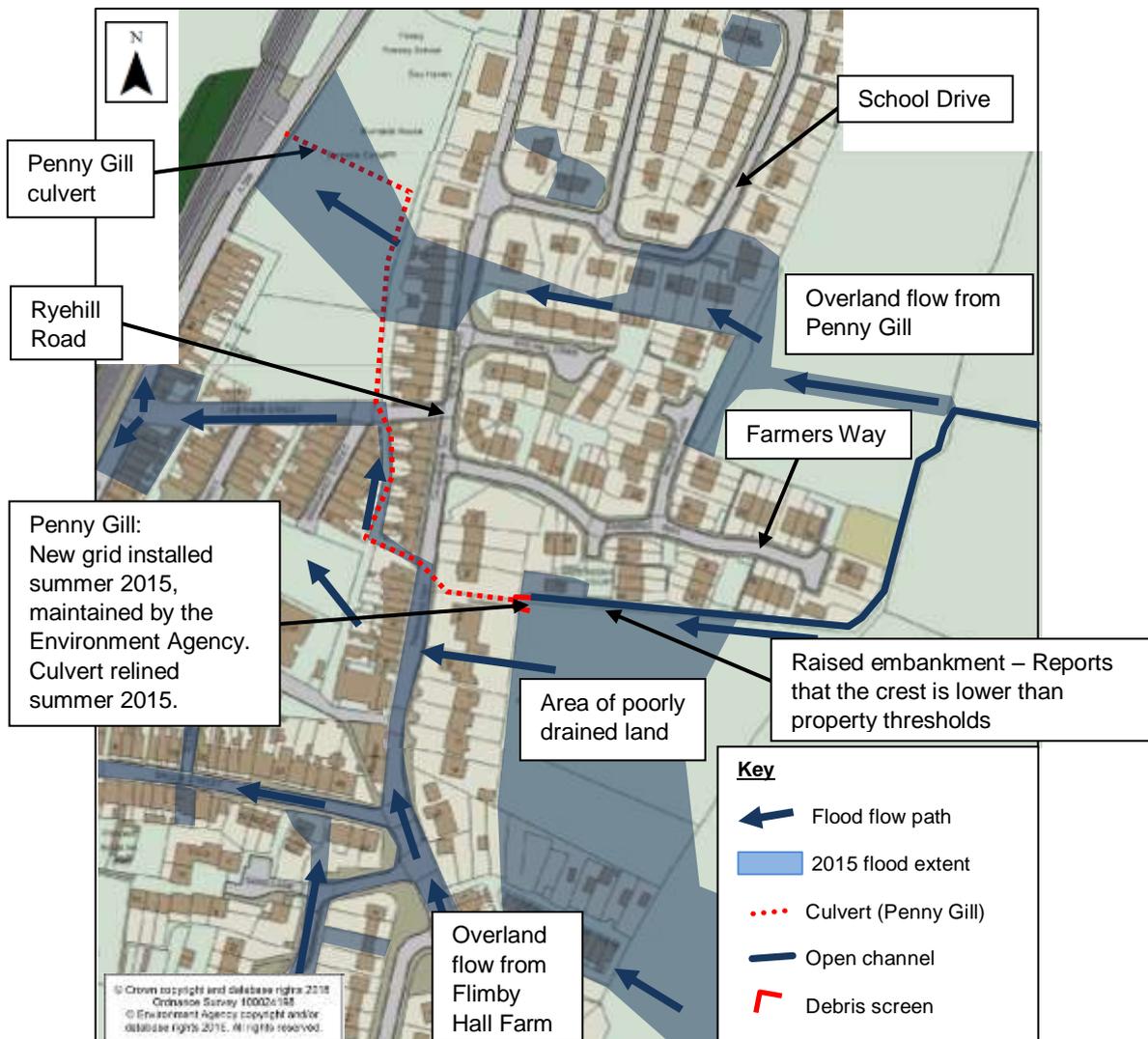


Figure 16: Penny Gill and overland flow flooding mechanisms

Penny Gill was overwhelmed by the rainfall on the afternoon and evening of the 3rd December 2015. The source of Penny Gill is located in Flimby Great Wood where it descends the steep hill and flattens out in the Farmers Way area before entering a culvert which flows under the Flimby, **Figure 16**. The culvert did not have sufficient capacity to contain the flood flows generated during the rainfall event of the 3rd December. This resulted in overland flow across Ryehill Road and down the back lane of Cooperative Terrace, flooding property.

Before Penny Gill reaches Farmers Way, flood flows spill overland to pond behind School Drive. As the direct flow route to Penny Gill grid no longer exists, the flood waters spill through the path between School Drive and Ryehill Crescent and onto Ryehill Road, **Figure 17**. Property on Ryehill Road is on the floodwater flowpath through to the playing fields. The line of the watercourse flows under the A596 and railway line and discharges into the sea.

Some flood waters from Flimby Gill (Barrel Arch) flowed overland from Allanby Close / Flimby Hall Farm to join the flood waters from Penny Gill.

Floodwaters flowed down the roads and combined with water from surcharging manholes causing flooding to properties on Station Road at the end of Lowther Street.

Approximately 40 properties are thought to have flooded in this area.

During the flood event, the Fire & Rescue Service were called to Criffel View, Station Road, School Drive Andersons Court, Farmers Way, Wesley Court and Ryehill Road between 18:00 and 21:00 on Thursday 3 December 2015. Appliances were sent from Maryport to Station Road and Ryehill Road.



Figure 17: Flooding on Ryehill Road

Sub-area 5: Brook Street/ Chapel Street/ Station Road

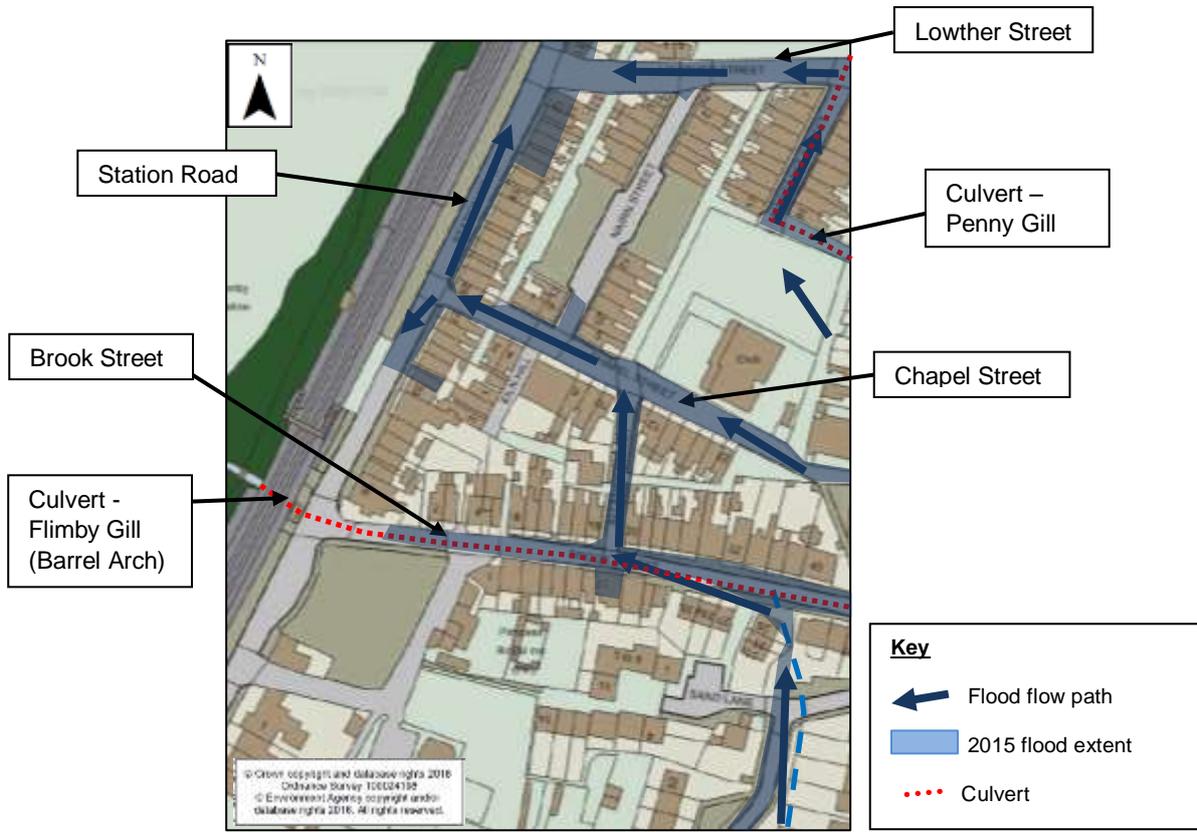


Figure 18: Overland flows from Penny Gill and Flimby Gill (Barrel Arch)

Flood waters from both Flimby Gill (Barrel Arch), Penny Gill and Cat Gill all drain to the centre of Flimby. Flooding occurs along roads, pathways and through gardens and green spaces before eventually finding a route, via drains or overland flow, out to sea, **Figure 18**. Only a small number of properties along these roads have been identified as being flooded.



Figure 19: Flooding on Station Road

Sub-area 6: Main Road Fothergill

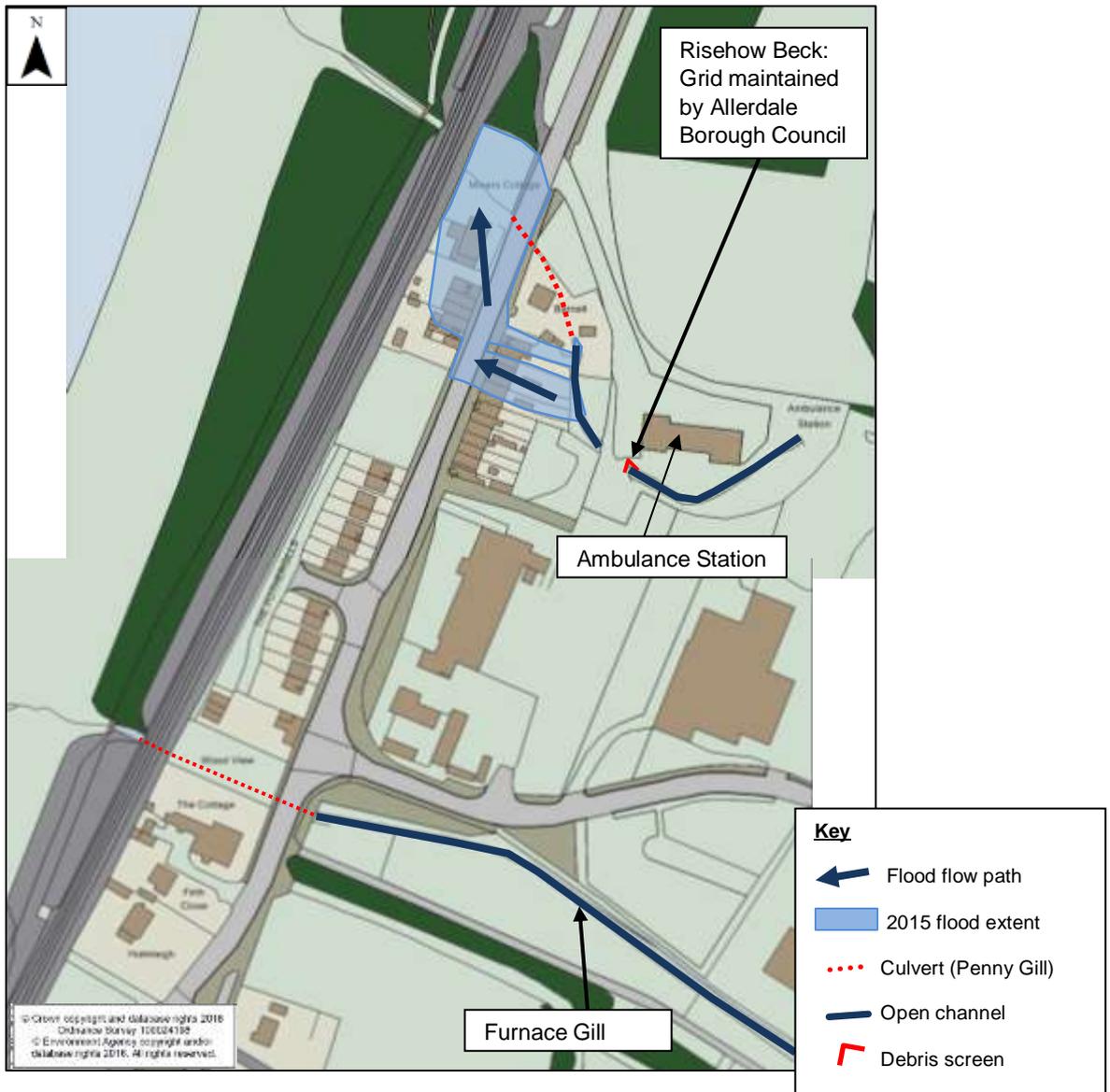


Figure 20: Risehow Beck flooding mechanisms

Risehow Beck was overwhelmed by the volume of water. The grid on Risehow Beck blocked and the watercourse flooded through properties onto Fothergill Main Road (A596), **Figure 20**. Twelve properties on Fothergill Main Road have been identified as having flooded. Vehicles passing through the floodwater caused bow waves and exacerbated the flooding in property.

During the flood event, the Fire & Rescue Service were called to Main Road between 18:50 and 20:00 on Thursday 3 December 2015. An appliance from Workington came to assist, **Figure 21**.

Risehow Beck had a new debris grid installed in 2012. During the flood event the grid suffered erosion on the left bank and behind the structure, **Figures 22 and 23**.



Figure 21 Main Road Fothergill - Risehow Beck flooding



Figure 22: Risehow Beck grid - erosion on left bank



Figure 23: Risehow Beck grid - erosion on left bank



Figure 24: Erosion behind Risehow Beck grid

Environment Agency and Highways Flood Incident Response

Flimby has a tidal Flood Alert/Warning. Presently, this area is not covered by a Fluvial Flood Alert or a Flood Warning.

The blockage at Beckside was investigated and the culvert section relined in January/February 2016. During May 2015 Cumbria County Council and the Environment Agency have carried out CCTV inspections of culverts and highways drains.

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,
 - tree and bush 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,
 - Tree and Bush Management,
 - Invasive Non Native Species Control,
 - Gravel Removal, when justified through investigation and survey.

In Flimby the Environment Agency undertake regular debris grid clearance at Penny Gill and Flimby Gill (Barrel Arch). The Environment Agency also undertake regular CCTV surveys of Penny Gill and Flimby Gill. Allerdale Borough Council maintain the grid on Risehow Beck. Furnace Gill is also maintained by the Environment Agency but there is no debris grid on this watercourse.

Recommended Actions

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

Table 1 Recommended Actions

Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
Community Resilience	Cumbria Local Resilience Forum *	Review and update plans to enable homes & business to be better prepared for flooding & reduce the impacts of flooding. For example, review of evacuation procedures / emergency response.	Complete
	Environment Agency, Cumbria County Council Highways, and Electricity North West.	Review the flood risk and resilience of infrastructure.	2016 to 2017
	Cumbria Planning Group, Allerdale Borough Council, Cumbria County Council, and Environment Agency	Review Local Development Plans and Strategic Flood Risk Assessment to reflect current understanding of flooding.	2016/17
Upstream Management	Cumbria Floods Partnership (CFP) . Legacy now with CSFP and Catchment Management Group	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. Forestry actively looking at options.	Ongoing
Maintenance	Cumbria County Council, United Utilities, and Allerdale Borough Council	Review and investigate drainage and sewage systems to better understand where improvements are required.	2016/17
	Environment Agency, United Utilities, and Cumbria County Council	Complete on-going inspections and repairs to assets that may have been damaged during the flood event.	Complete
	Allerdale Borough Council	Review maintenance programme in response to the 2015 flooding event.	2016/17
	Environment Agency	Review maintenance programme within the village in response to the flooding event of 2015. Replace remote telemetry for camera and data at EA grid.	2016/17
Strengthening Defences	Environment Agency	The Environment Agency is carrying out a series of repairs to flood defence assets that were damaged during the floods as part of the	Complete

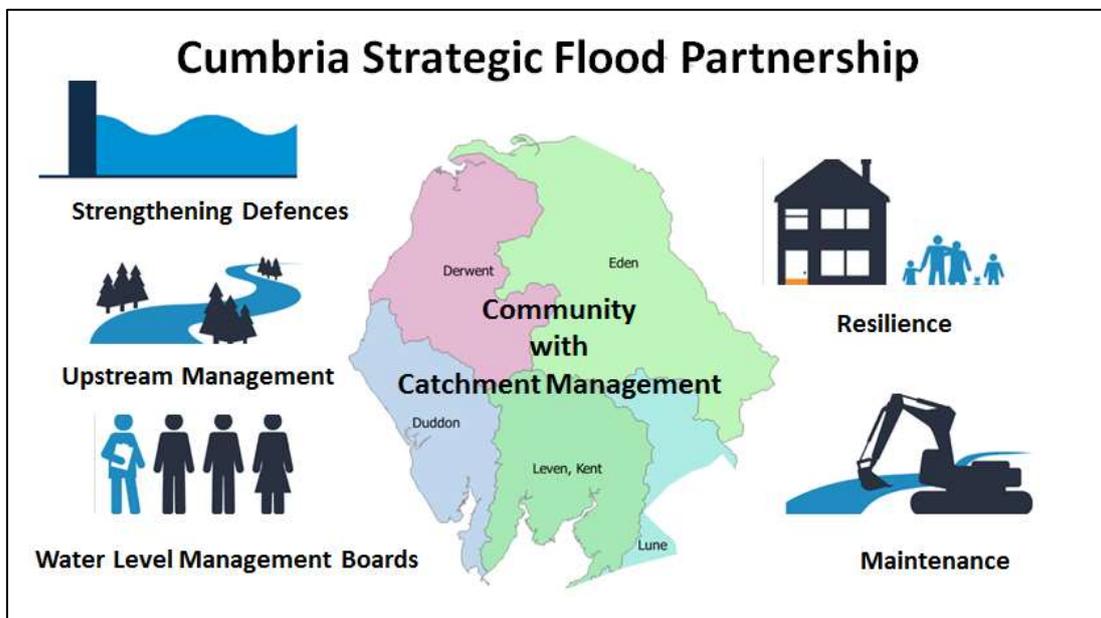
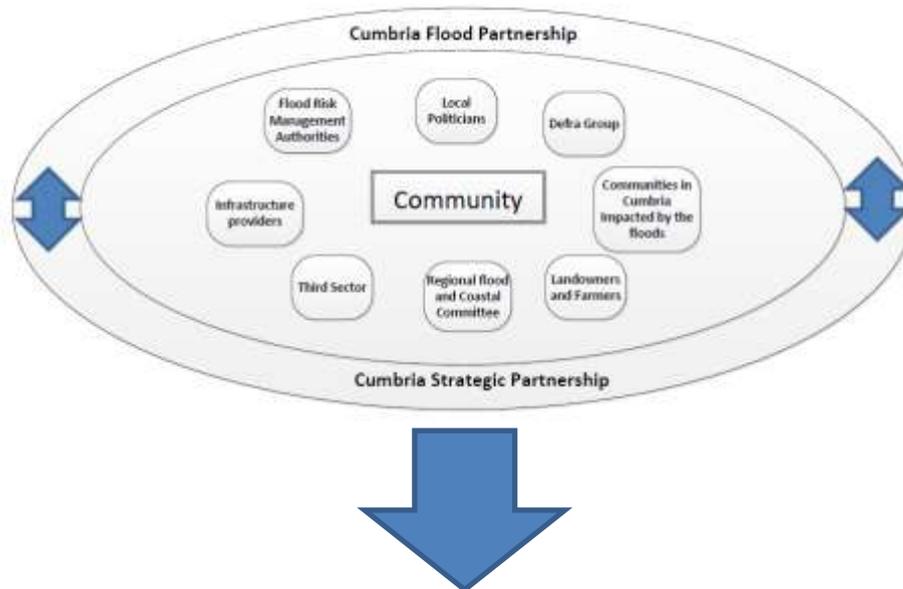
Cumbria Flood Partnership Theme	Action by	Recommended Action	Timescale
		c.£10m Asset Recovery Programme which covers Cumbria and Lancashire. This programme of repairs is scheduled to be complete before winter 2016/17.	
	Environment Agency	Funding has been secured for a flood defence scheme in Flimby subject to it being technically feasible, economically viable and environmentally sustainable. Options will involve community engagement.	May/June 2017
	Environment Agency	Investigate the option of diverting Penny Gill into an adjacent catchment.	2016/17
	Residents	Flooded properties to review effectiveness and improve flood resilience/ resistance measures to reduce impacts of future flooding.	

* 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

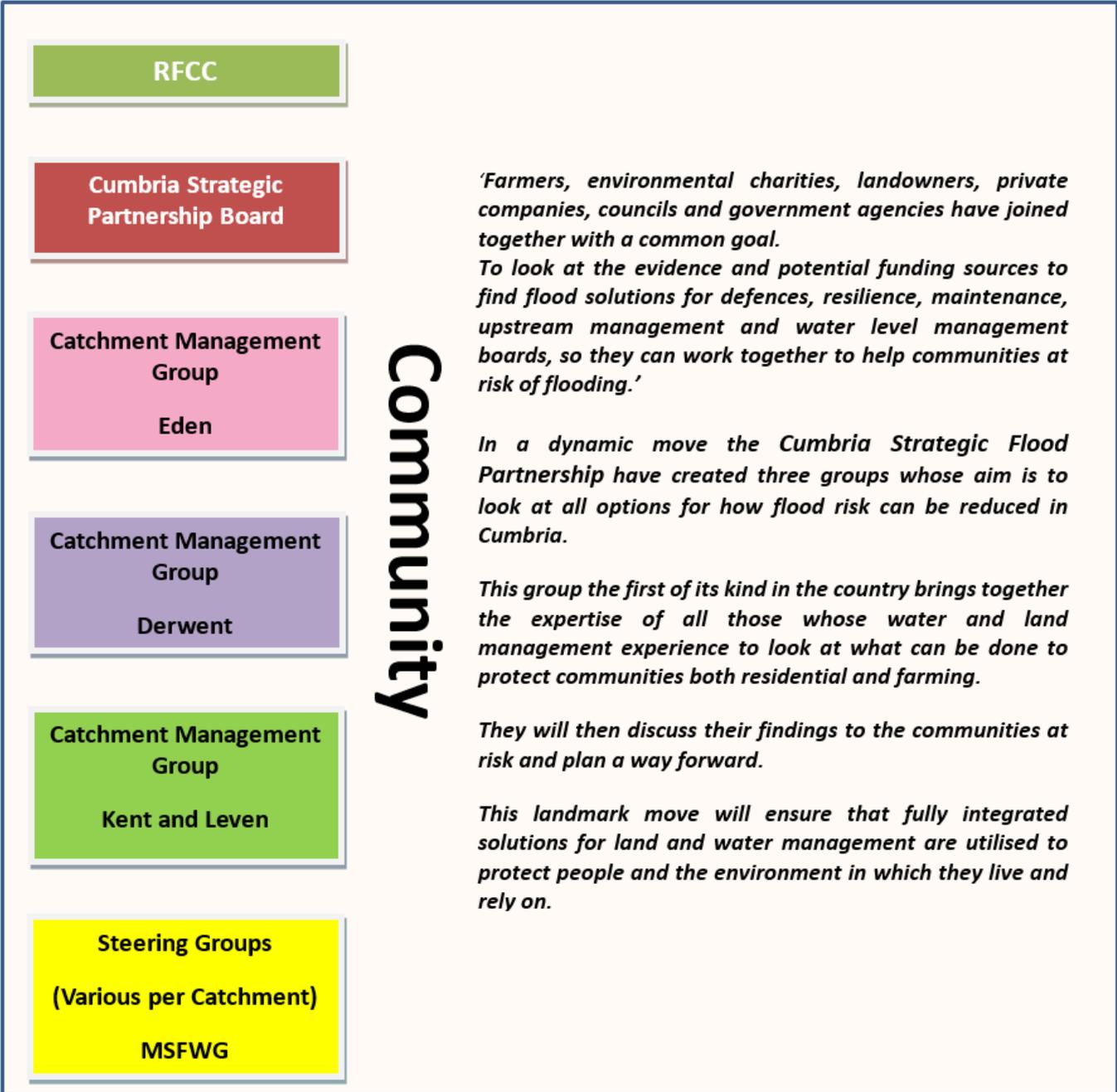
The Cumbria Floods Partnership has brought together a wide range of community representatives and stakeholders from a variety of sectors to plan and take action to reduce flood risk. The Cumbria Floods Partnership, led by the Environment Agency, is producing a 25 year flood action plan for the Cumbrian 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 helps demonstrate how the two partnerships have now come together:





Cumbria Strategic Flood Partnership



Appendices

Appendix 1: Glossary

EA	Environment Agency
CCC	Cumbria County Council
UU	United Utilities
ABC	Allerdale Borough Council
LLFA	Lead Local Flood Authority
MSfWG	Making Space for Water Group
FAG	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

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

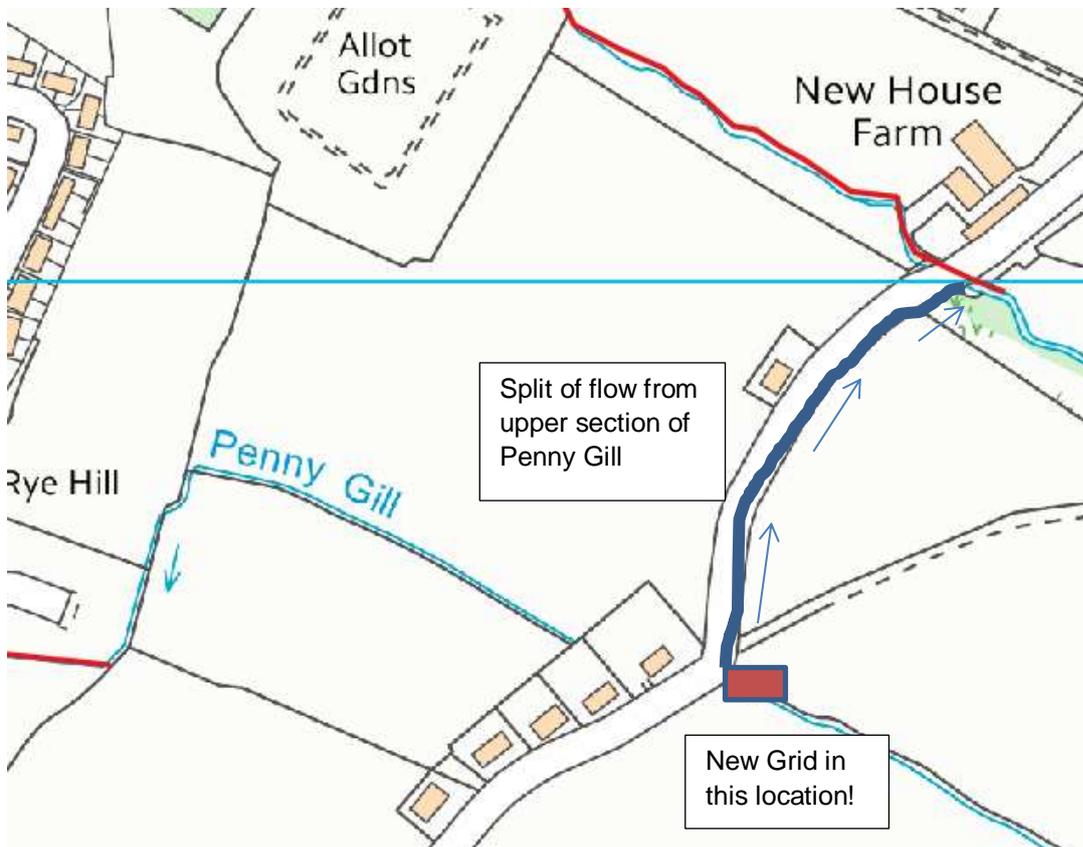
Term	Definition
Flood and Water Management Act	address flood risk by prescribing a common framework for its measurement and management. Part of the UK Government's response to Sir Michael Pitt's Report on the Summer 2007 floods, the aim of which is to clarify the legislative framework for managing surface 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.

Term	Definition
River Catchment	The areas drained by a river.
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 2: Additional information from the community

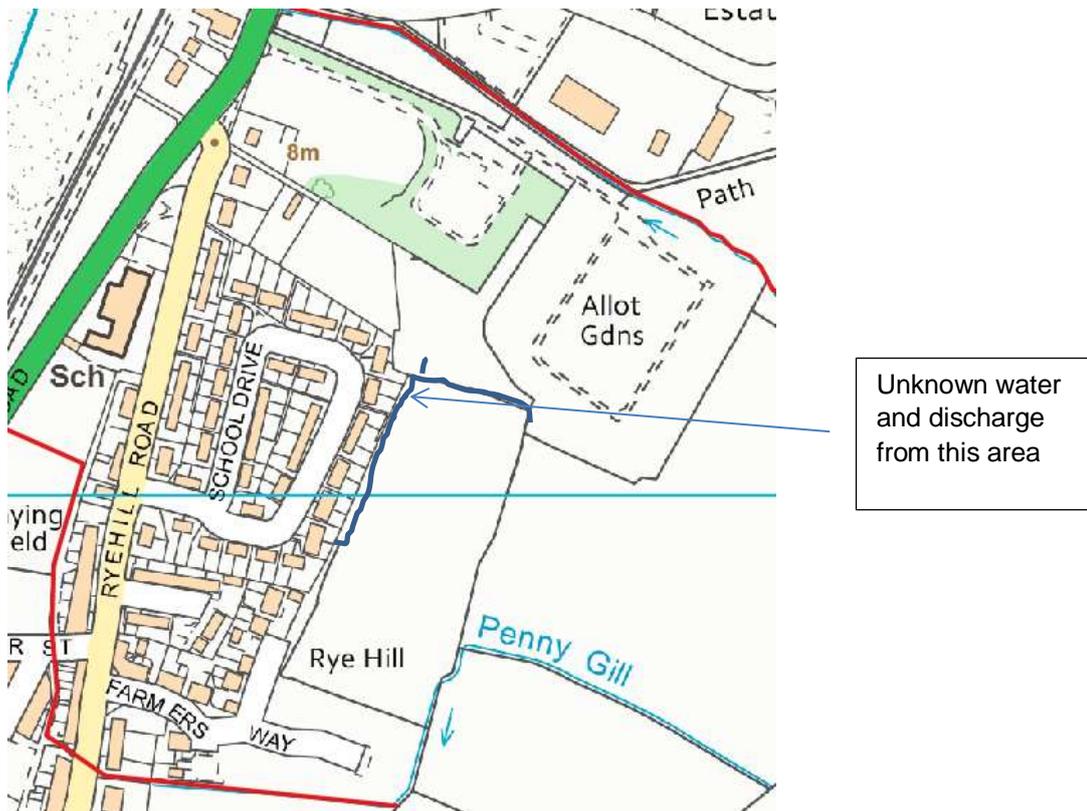
No.	Action
1	Beach outfalls not cleared – maintenance programme need to be reviewed for all 6 outfalls.
2	Furness Gill: There used to be a pond at the top of the Gill used to store cooling water for the chemical works. The pond was dammed on western side and controlled via sluice. Currently the level of water is c. 25ft lower than when the structure was in an operational condition.
3	Penny Gill: A farm on this watercourse used to have a pond before being in-filled. Potential attenuation.
4	Warnings not suitable – no telemetry
5	Incident response is not acceptable – Teams checking and responding to blockages are not suitable.
6	Lots of Debris in Barrel Arch – Maintenance needs to be reviewed and communicated Gullies are cleaned but not drain – outfall ditch blocked
7	Long and smalls – damaged trash screen
8	Deforestation upstream – debris in channel. Review of land use required.
9	Allonby Close: Pipe crushed by people building houses and replaced a section with a reduced diameter pipe therefore backing up. Investigation required.
10	Investigation of drainage in Coniston / Solway / Grange Avenue area.

Appendix 3: Ideas Discussed with Local Flood Group





Drainage investigations



Appendix 4: Flimby Community Flood Action Plan

Second Draft February 2017

Please note: this is a live plan in development and will be revised as actions are undertaken.

Summary

Issue	Objective	Actions
Raising the alarm	Ensure good incident management at future events	Invite agencies to meet with us to discuss our plan. Inform community representatives of ABC's response system.
Warning and informing	Identify a way to monitor rising water levels that the community can check and a suitable method of warning everyone in the village.	Ask EA to install reliable water level monitoring. ABC to investigate bulk texting system to raise alarm. Investigate use of siren with EA, CCC and others.
Flood sacks and containers	Purchase and install containers to store flood sacks and other useful items.	Peter will check out locations for containers. Paul Wood advised that planning permission is needed only if they are permanent. Carol has investigated cost. MTC or group to apply for funds for containers and contents.
Grab bags	Encourage residents to prepare a flood kit in a grab bag	Cumbria Community Foundation do not provide grab bags but can provide grants to flood groups.
Road Closures	Help to control traffic movement if it is causing problems	Only the Police and CCC can close roads. Cllr Keith Little suggested half barriers for minor roads within the village to slow down traffic.
Emergency Centre	Identify a local centre now that the Methodist Hall is closed	The Working Men's Club was proposed by Cllr Keith Little. He has spoken to the managers.
Constitution and grants	Establish the group with a constitution and apply for grant funding	To discuss at a future meeting.

Details on these issues are given in the following pages.

1. Aims

This plan has been prepared by residents of Flimby in response to the severe flooding in December 2015. It is hoped that by preparing this plan we can:

- Be better prepared and recover more quickly should it happen again; and
- Establish better links with the agencies involved in reducing flood risk and in managing incidents.

2. Issues and Actions

The following issues and actions were identified as a result of our experience in December 2015 and previous floods.

2.1) Raising the Alarm

In December 2015, around a hundred houses in the village flooded, yet it appears that at the time some agencies were unaware of the seriousness of the situation here and it was not declared as an 'incident'. As a result there was less support for the community during and for a few days after the flood.

This could be addressed by establishing better links between identified representatives of the community and agencies, building up trust and communication as a result of working together on this plan.

ACTION – invite agencies to meet with us to discuss our plan.

Allerdale Borough Council (ABC) has set up a system, which works out of hours, whereby anyone can ring their switchboard on 0303 123 1702 and, in the case of an emergency, will be put into contact with a senior manager, who will invoke emergency procedures.

ACTION – inform community representatives of ABC's response system.

2.2) Warning and Informing

There are specific circumstances relating to the way that Flimby flooded which mean that we can not follow the same format as some of the other flooded towns in Cumbria, where their emergency plans include co-ordinating local volunteers (whose houses are not likely to flood) to monitor river water level rises, to warn and inform those at risk of flooding and then to help with recovery afterwards. This is not practical in Flimby for three reasons:

- At present there is not a reliable way of monitoring water level rises in order to predict flooding events at Flimby;
- The flooding happened so quickly that there would be no time for door-knocking; and
- Almost every house in the village was at risk of flooding so there are no volunteers able to leave the important job of protecting their own households.

The EA Flood Warning website didn't cover the CA15 8 postcode area.

We know that the risk is highest when there is a high tide, south-westerly winds and persistent rain.

We also recognise the difficulties that could be caused by too many false alarms.

ACTION – We will work with the EA and others to identify a way to monitor water levels to give an indication of when flooding is imminent and a suitable method of warning everyone in the village.

Options to be considered include:

Reliable water level monitoring in Penny Gill and/or Flimby Gill – EA input required.
Allerdale Borough Council has a bulk texting system which could be used to alert people in the village, if they provide their numbers – Paul Wood to investigate.
Use a siren to warn the village – it is thought there is still one, but we would need the agreement of emergency services, EA and Cumbria County Council to re-instate it.

2.3) Flood Sacks and Containers

There is a stock of flood sacks at Maryport Town Hall. Anyone can ask Peter or Carol to get a small number to keep at their property.
Most people who think they will need them will keep hold of them, but we want to site containers with a stock of them – and other useful items – at two or three locations throughout the village (e.g. Ryehill Crescent, Coniston Avenue and School Drive).

Actions – Peter will check out possible locations, Carol has investigated the cost, Paul advised that they need planning permission only if they are permanent. We can now apply for funds for containers and contents.

2.4) Grab Bags

Part of an individual's flood preparation is to have a flood kit ready, with things like a torch and important documents. If residents are provided with a bag (perhaps with some contents like a wind-up torch and rubber gloves) this would encourage people to be prepared.

ACTION – We can apply for a grant to provide bags that will encourage people to prepare a flood kit and provide a list of suggested items.

2.5) Road Closures

There was an issue in the last flood when vehicles – including a fire engine – driving along the road created bow waves that made flooding in adjacent houses worse (including knocking an old couple of their feet).

Only the Police and CCC can close roads. We would like to agree with Police and Highways a system where residents can help to control traffic on local roads in the village.

Cllr Keith Little suggested that CCC provides barriers that can block one side of the road to slow traffic down.

ACTION – Follow up the offer from CCC for barriers to hold in the local containers.

2.6) Emergency Centre

Following the flood in December 2015, the Methodist Church Hall was used as a place where people could get help and advice, but at present this is not available. The Working Men's Club, SureStart building or the School were suggested as alternatives but they have restricted space and could not be open for long periods.

Allerdale Borough Council has the responsibility to identify and set up a reception centre for major emergencies, which would be Netherhall School at Maryport. As with last time, however, a more local facility could be needed – it may not even be possible to get to Maryport.

Cllr Little suggested the Working Men's Club and has spoken to its managers, who are in agreement.

ACTION – Follow up offer from the Working men's Club to act as an emergency centre.

2.7) Constitution

At the end of the meeting, it was discussed whether the group should be formally established with a constitution. It is a relatively straightforward process and would allow the group to apply for grant funding. This was thought to be a good idea.

ACTION – to discuss at the next meeting

Appendix 5: Summary of Relevant Legislation and Flood Risk Management Authorities

The Flood Regulations 1999 and the Flood and Water Management Act 2010 (the Act) have established Cumbria County Council (CCC) as the Lead Local Flood Authority (LLFA) for Cumbria. This has placed various responsibilities on the EA including section 18 of the Act which states:

The Environment Agency must report to the Minister about flood and coastal erosion risk management.

(2) In particular, the report must include information about the application of the national flood and coastal erosion risk management strategies under sections 7 and 8.

(3) The Minister may make regulations about—

- (a) the times or intervals at which a report must be made, and
- (b) the content of a report.

(4) In this section “the Minister” means—

- (a) the Secretary of State in relation to flood and coastal erosion risk management in England, and
- (b) the Welsh Ministers in relation to flood and coastal erosion risk management in Wales.

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
RIVERS					
Main river					
Ordinary watercourse					
SURFACE RUNOFF					
Surface water					
Surface water on the highway					
OTHER					
Sewer flooding					
The 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 Cumbria County Council’s work relating to flood risk.

Environment Agency has a strategic overview of all sources of flooding and coastal erosion as defined in the Act. As part of its role concerning flood investigations this requires providing evidence and advice to support other risk management authorities. The EA also collates and reviews assessments, maps and plans for local flood risk management (normally undertaken by LLFA).

Lead Local Flood Authorities (LLFAs) – Cumbria County Council are 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 risk management authority 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 risk management authorities 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.

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 responsible for a larger number of sewers than prior to the regulation.

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.

Flood risk in Cumbria is managed through the Making Space for Water process which involves the cooperation 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 MSfWGs meet approximately 4 times per year to cooperate and work together to improve the flood risk in the vulnerable areas identified in this report by completing the recommended actions. CCC as LLFA 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 partners own capital investment process

Flood Action Groups are usually formed by local residents who wish to work together to resolve flooding in their area. The FAGs are often supported by either CCC or the EA and provide a useful mechanism for residents to forward information to the MSfWG.

Appendix 6: Links to other information on Flooding

Cumbria County Council (Local Flood Risk Management):

lfm@cumbria.gov.uk, www.cumbria.gov.uk, tel: 01228 211300

Cumbria County Council (Highways):

highways@cumbria.gov.uk, www.cumbria.gov.uk, tel: 0845 609 6609

United Utilities: tel: 0845 746 2200

Allerdale Borough Council tel 01900 702702

Flood and Water Management Act 2010:

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

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>

Highways Act 1980:

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

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