Northumberland County Council

Flood Investigation Report

Investigation of the summer 2012 floods

30 December 2013

Northumberland County Council

REVISION SCHEDULE

Northumberland County Council – Flood Investigation Report
Investigation of the summer 2012 Floods

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Executive Summary

Northumberland County Council, as the Lead Local Flood Authority, has a responsibility under Section 19 of the Flood and Water Management Act 2010 to investigate flooding incidents in its area when it is deemed necessary and appropriate.

During the summer of 2012 there were numerous rainfall events that caused widespread flooding across the county. Four isolated substantial rainfall incidents occurred between June and September 2012. The rainfall event on June 28 2012 was unprecedented, with rainfall data showing a 1 in 195 year event occurring in the south-east of the county.

In total, over 200 dwellings and 40 businesses were affected by flooding in 55 separate incidents. As part of each individual Flood Investigation Report, each Risk Management Authority has been examined to see what activities it has exercised and what activities it is proposing in order to alleviate any future flooding.

As a result of the investigations, we aim to prioritise areas to seek funding through the Medium Term Plan to carry out flood alleviation works and/or to carry out further more detailed investigations.

Our main conclusion is that risk management authorities and other groups must continue to work together, sharing information and reports. In addition property owners need to be made aware of their roles and responsibilities for flooding.

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1. Introduction

According to figures from the Met Office, 2012 was the wettest year for Northern England since records began in 1910. April and June were the wettest months of 2012 and respectively the second wettest April and June since records began. Table 1 overleaf taken from the Met Office website details the wettest months in Northern England.

When analysing the data, it is easy to forget that prior to the wet weather experienced from April 2012 onwards there was a considerable dry spell. Many areas of England were officially in a drought and many water companies had imposed hosepipe bans on their customers (NB: this was not in place in Northumberland). The relatively dry months of January, February and March 2012 makes the fact that 2012 was the wettest year on record for Northern England even more astonishing.

The rainfall recorded within the summer months (June, July and August) of 2012 led it to be the third wettest summer in Northern England on record. For autumn (September, October and November) 2012, it was the sixth wettest since 1910.

The rainfall in 2012 within Northern England and Northumberland has been unprecedented in recent times. The information in Table 1 shows that this has been the wettest year for this region since records began. Amongst the rainfall events experienced, there have been some extreme, intense downpours and some long extensive rainfall events. The extensive rainfall over the months has seen the ground saturated, meaning that any additional rainfall cannot infiltrate into ground and is either stored within fields, floodplains or directly runoffs into roads, gardens and potentially dwellings and businesses.

Intense rainfall events followed by the ground conditions described above have seen numerous flooding instances across Northumberland. Flooding has occurred as a result from all sources including main river, ordinary watercourse, surface water, sewer, groundwater and highway drains including road gullies and ditches. However this is not exhaustive and there could be other sources.

rank	JAN	Year	FEB	Year	MAR	Year	APR	Year	MAY	Year	JUN	Year	JUL	Year	AUG	Year	SEP	Year	OCT	Year	NOV	Year	DEC	Year	ANNUAL	Year	SUMMER	Year	AUTUMN	Year
1	196.0	1948	160.4	2002	158.0	1981	135.2	2012	142.3	1967	188.2	2007	153.6	2009	212.9	1956	199.1	1918	176.5	1967	204.5	2009	182.6	1915	1288.1	2012	406.8	1956	479.9	2000
2	182.0	1928	139.0	1923	143.1	1947	122.8	2000	128.2	1924	167.0	2012	151.3	1988	195.7	2004	159.3	1968	171.3	1938	193.8	1951	171.7	1914	1214.0	2000	400.9	1912	442.8	1954
3	178.0	2008	133.3	1990	126.7	1979	114.3	1920	123.2	1932	139.3	1912	146.7	1940	183.9	1917	156.2	1976	169.9	2000	178.7	2000	170.4	1929	1199.8	1954	397.9	2012	431.8	1935
4	146.2	1995	132.6	1958	116.1	1913	111.7	1998	115.7	1979	135.6	1980	144.7	1930	160.7	1927	152.5	1965	167.9	1954	163.6	1946	168.7	1978	1166.1	2008	375.2	2007	409.0	1944
5	145.2	1960	132.4	1966	113.7	2006	106.5	1993	109.5	1925	133.3	1982	138.8	1920	152.6	1954	151.8	1935	161.8	1998	162.4	1944	163.1	2012	1118.1	2002	365.6	1931	377.5	1960
6	143.5	1939	131.4	1997	112.4	1919	101.5	1947	108.6	1920	131.8	1931	133.0	1939	149.7	1912	149.1	1927	151.4	1935	161.1	1954	160.0	1993	1109.4	1960	360.6	1927	372.7	2012
7	140.9	1984	129.9	1950	111.9	1912	100.3	1913	107.6	2006	128.8	1928	131.6	2007	137.8	1950	144.4	1944	147.9	1976	155.4	1929	158.0	1979	1108.4	1928	353.2	2004	372.3	1984
8	138.0	1921	125.0	1937	105.8	1951	99.8	1983	107.3	1983	125.6	1998	129.5	1922	137	1921	143.7	1950	146.9	1980	153.2	1969	157.0	1986	1098.1	1912	334.2	2008	364.1	1976
9	134.2	1988	124.6	1925	103.8	1987	99.3	2001	96.9	1986	125.3	1997	127.9	1960	135.2	1930	136.8	1946	146.6	1960	151.1	1984	153.8	1911	1096.5	1930	331.1	1930	362.2	1981
10	133.7	1930	123.1	1977	103.3	1992	98.6	1970	95.8	1969	120.9	1948	123.2	1915	133.7	1946	133.6	1981	142.3	1932	150.5	1963	151.5	1959	1093.2	1923	320.2	1954	360.2	1967
11	130.8	1990	120.2	1915	101.3	1998	96.3	1986	95.7	1976	114.9	1987	119.5	2008	131.5	1923	133.0	2012	141.1	1916	146.4	1960	147.4	1999	1085.9	1927	314.7	1928	355.1	1938
12	130.4	2004	118.3	1941	100.3	1920	90.9	1966	94.8	1993	105.1	1958	119.3	2012	130.9	1951	131.2	2000	140.2	2004	139.3	1931	144.1	1965	1079.1	1951	314.5	1946	343.5	1968
13	130.3	1943	117.9	1916	100.0	1988	90.6	2005	93.2	1958	97.3	1911	117.6	1931	130.1	1928	128.0	1957	137.1	1987	138.4	1926	142.7	1934	1068.9	1998	307.3	1980	342.8	1918
14	124.7	1999	115.7	2011	97.9	1980	90.6	1931	90.1	1954	96.7	1936	115.4	1956	129.4	1971	126.0	1984	136.3	2002	138.1	1970	140.1	1918	1066.7	1931	305.6	1958	339.0	1950
15	121.1	2007	114.9	1935	97.3	1994	84.5	1961	88.4	2003	95.9	1927	112.8	1973	128.2	1962	123.3	2008	135.1	1928	135.7	1940	139.4	2006	1060.2	2004	300.4	2009	336.7	1927
16	120.1	1994	111.8	1995	95.2	1982	84.2	2004	88.1	1951	95.1	1963	112.0	1936	127.9	2008	115.9	1974	131.8	1981	134.5	1950	138.4	1983	1048.0	1946	292.7	1948	333.0	1923
17	117.8	1961	109.3	1933	95.1	1999	83.7	1925	87.8	1938	92.7	1966	112.0	1912	127	1985	113.7	1954	130.2	1917	132.5	1939	138.0	1994	1042.6	1967	290.2	1987	330.3	1946
18	117.5	1975	108.5	1910	94.6	1916	83.6	1935	87.2	1945	89.7	1972	111.0	1932	127	1910	109.7	2010	129.6	2008	131.8	2012	135.9	1919	1042.2	1966	287.0	1922	328.8	1930
19	117.4	1936	102.4	2001	92.4	2008	82.6	1934	85.6	1943	89.3	1999	110.1	1924	125.4	1957	107.8	1993	122.1	1945	131.3	1928	132.8	1951	1042.2	1950	284.2	1910	326.4	2008
20	115.6	1986	96.0	1922	90.8	1989	80.3	1950	83.9	2007	88.7	1935	108.2	1957	125.3	1948	106.4	2001	121.0	2001	129.5	2010	130.4	2011	1042.2	1916	283.7	1957	322.6	2009
21	114.6	1974	93.4	1980	90.0	1968	80.0	1932	83.8	2002	87.9	1926	107.9	1958	119.1	1943	104.6	1943	119.6	1933	128.6	1935	126.9	1949	1042.0	1980	281.8	1985	322.4	1980
22	114.5	1956	90.8	1967	90.0	1914	79.7	1949	83.7	1923	87.7	1977	107.9	1918	118.8	1986	102.0	1924	118.6	2005	126.7	1949	124.3	1922	1024.4	1981	281.6	1988	320.2	2010
23	114.2	1978	90.0	1951	88.3	1964	79.0	1985	82.8	1955	87.2	1938	107.4	1938	116.2	1966	101.1	1936	116.8	1941	125.7	2002	121.1	1924	1023.1	1938	281.4	1966	318.5	1998
24	113.3	1919	89.8	1945	87.6	1941	78.7	1959	82.3	1942	86.8	2008	104.0	1927	116.2	1931	100.8	1962	116.7	1961	124.8	1982	120.9	1990	1021.2	1965	279.6	1938	317.2	1974
25	109.6	1998	89.1	1989	86.0	1963	77.8	1937	80.3	1916	84.0	1945	102.7	1946	115.1	2006	99.4	1994	116.2	1949	124.7	1923	120.3	2002	1020.7	1944	276.6	1917	317.2	1965
26	109.2	1913	88.7	1928	84.8	1983	77.5	2008	78.3	1972	83.2	2003	102.6	1914	114.2	1980	99.0	1952	116.0	1924	124.4	1959	117.3	1938	1020.4	2007	275.2	1950	315.3	1940
27	108.6	1920	88.6	1918	83.9	1928	77.4	1989	77.6	1997	80.8	2004	102.1	1953	113.7	1963	97.9	1925	115.3	1930	122.2	1938	116.6	1955	1018.1	1958	274.4	1953	314.3	1926
28	108.3	1993	86.2	1926	83.0	1978	76.8	1992	77.4	1937	80.8	1990	100.0	2002	111.6	2012	97.7	1999	115.2	1929	122.2	1914	114.8	1997	1014.0	1918	272.0	1939	308.0	1916
29	107.5	1915	86.1	2000	81.9	1927	76.7	1962	75.9	1968	78.5	1956	98.8	1968	111.2	1992	97.2	1983	114.8	1990	118.8	1992	113.8	1985	1010.3	1986	270.6	1998	306.9	1929
30	106.9	1938	86.1	1931	81.1	1986	75.9	1953	75.8	2011	78.3	1991	97.8	1910	109.2	1941	96.9	1967	113.2	1934	118.2	1996	113.2	2000	1005.1	2009	268.4	2002	302.3	1992
34	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	107.9	2012	----	----	----	----	----	----	----	----	----	----
42	----	----	----	----	----	----	----	----	68.3	2012	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
65	82.0	2012	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
80	----	----	43.2	2012	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
98	----	----	----	----	25.7	2012	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

Table 1 - Rainfall data for Northern England

Notes: Areal series, starting from 1910; All rainfall figures are Iin mm; Allowances have been made for topographic, coastal and urban effects where relationships are found to exist.

Seasons: Summer=June-Aug, Autumn=Sept-Nov. Values are ranked and displayed to 1 dp. Where values are equal, rankings are based in order of year descending.

Data are provisional from July 2012 and Summer 2012. Last updated 02/01/2013.

Source: http://www.metoffice.gov.uk/climate/uk/datasets/Rainfall/ranked/England_N.txt

1.1 Lead Local Flood Authority (LLFA) investigation

Northumberland County Council (NCC), as the LLFA, has a responsibility under Section 19 of the Flood and Water Management Act 2010 to investigate flooding incidents in its area when it is deemed necessary and appropriate. Section 19 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*.

In the absence of a published Flood Risk Management Strategy, NCC does not currently have a definition or a threshold of what constitutes a flood event deemed necessary to investigate. In this instance, due to the widespread flooding and the number of properties affected, it was deemed necessary and appropriate to complete an investigation into the flood incidents.

This report provides a concise review of the flood events during the summer of 2012, the areas affected and the rights and responsibilities of all risk management authorities involved. The report will outline each risk management authorities actions and whether these have been exercised.

1.2 Northumberland

Northumberland is the most northerly county within England. It is bordered by Cumbria to the west, County Durham to the south, Tyne and Wear to the south east and Scottish Borders to the north. The North Sea provides 103km of coastline to the east.

Northumberland has an area of 5,013km^2 which makes it the sixth largest in England. Despite the large size of the county, it only has a population of 316,000 (2011 Census, ONS), which makes Northumberland one of the lowest densely populated counties in England.

2. Flood incidents

There were four major rainfall events over the summer of 2012 that resulted in widespread flooding from different sources across Northumberland. These events occurred on 28 June, 7 July, 4 August and 25 September. Each event is analysed individually below.

2.1 28 June 2012

The flooding that occurred within Northumberland on 28 June 2012 also known as '*Thunder Thursday'* and the '*Toon Monsoon'* was not restricted to this county. This weather event affected the wider north east region of England.

The flooding transpired due to an exceptionally high amount of rainfall that fell over a short period of time. The rainfall over Northumberland occurred approximately between 16:00 and 19:00 mainly in the form of powerful thunderstorms that had gathered strength as they journeyed across England.

The thunderstorms were the product of two fronts that collided over the UK - warm air travelling from the Azores and cold air from the west, travelling eastwards.

Over Northumberland and the north of England these thunderstorms released a lot of precipitation in a short period of time. It was this high intensity rainfall event that led to wide spread surface water flooding across the county. The sheer intensity of the rainfall meant that water which fell on the ground could not get into drains, gulleys, ditches, watercourses and sewers quickly enough. This resulted in the pooling of water within urban and rural areas. The rainfall figures that are displayed in Table 2.1 show that in certain areas the rainfall event was extremely rare. This led to the flooding of areas that had not previously experienced flooding.

The heavy rainfall did affect some ordinary watercourses and main rivers that caused water to come out of bank. There were instances where dwellings were flooded due to these out of bank flows.

2.1.1 Rainfall data

Table 2.1 details the rainfall data across Northumberland and parts of Tyneside on 28 June 2012. The Tyneside stations that have been included are situated close to the Northumberland boundary and hence their rainfall information can be transferred to close Northumberland settlements.

The heaviest of the rainfall fell in Whitley Bay (Tyneside), with 56.4mm of rain falling in 2.5 hours. This rainfall equated to a return period of a 1 in 195 year event (0.51% annual probability of occurrence) and 113% of the average monthly rainfall falling in

just this short time. Elsewhere within Northumberland – Haltwhistle received 33.2mm of rain in 1.5 hours, corresponding to a 1 in 40 year event (2.5% annual probability of occurrence). Dewlaw (near Maften) experienced 24.2mm of rain in just 30 minutes. This corresponds to a 1 in 55 year event (1.8% annual probability of occurrence) and 48% of the average monthly rainfall falling in this very short period of time.

	Northumberland catchments								Tyneside	
28 June event (peak intensities)	**Linbriggs**	**Blyth**	**Dewlaw**	**Darras Hall**	**Chirdon**	**Knarsdale**	**Haltwhistle**	**Allenheads**	**Farne Sch**	**Whitley Bay**
mm rainfall										
30 min	16.4	14.4	24.2	18	12.2	16	19.8	18.6	21.6	19.8
1 hour	25.4	17	26.8	22.4	20	22	28.2	30	24.2	29
75 mins	27.2	21.2	26.8	22.4	21.2	27.8	30.8	30.2	29.8	33.8
1.5 hours	28.8	22.2	26.8	23.6	23.8	36.2	33.2		31.6	35.2
2 hour	31	23.4	27.2	24.8	26.2	38	35.6		32	50.4
2.5 hour	31.4				27.2	38.6	36.4		32	56.4
3 hour	31.4				27.4	39.4			32.2	58.6
return period										
30 min	18		55							
1 hour	38	8	38	17	12	12	35	32	23	45
75 mins	37	13	30	13	11	21	37	25	37	61
1.5 hours	30	12	24	12	14	44	40		38	58
2 hour	21	10	18	10	14	37	37		28	162
2.5 hour	16				12	29				195
3 hour	17				10	25				185
% of LTA June rainfall										
30 min	36%	29%	48%	34%	17%	22%	30%	30%	42%	40%
1 hour	56%	34%	54%	42%	28%	30%	42%	49%	47%	58%
75 mins	60%	42%	54%	42%	30%	37%	46%	49%	58%	68%
1.5 hours	63%	44%	54%	45%	34%	49%	50%		62%	70%
2 hour	68%	47%	54%	47%	37%	51%	53%		62%	101%
2.5 hour	69%				39%	52%	54%		62%	113%
3 hour	69%				39%	53%			63%	117%

The above table includes some data and/or results based upon the FEH methodology and data, CEH (2009) extracted from the CEH 2009 "The Flood Estimation Handbook CD-ROM 3" Centre for Ecology and Hydrology, Walingford, Oxon, UK.

Table 2.1 – Rainfall data across Northumberland on 28 June 2012 (courtesy of Environment Agency)

2.1.2 Areas affected

The floods of the 28 June were widespread and affected communities across Northumberland. The worst hit urban areas were Alnwick and Seaton Delaval, where the town centres were under several centimetres of water. Several dwellings and businesses were affected as a result of the flooding. Table 2.1 above details the heaviest rainfall falling in Whitley Bay, this would relate to the flooding experienced in Seaton Delaval which is less than 5km away. The urban areas of the south east of the county appeared to have the heaviest rainfall; however, some neighbourhoods were not severely affected.

Many communities in the west of the county were affected by this flood event, with numerous dwellings across several villages disrupted by flooding. The flooding in

these areas was mostly from excessive surface water runoff, but some instances of flooding from ordinary watercourses were reported.

Along with Alnwick, various other areas in the centre of the county were affected by flooding. Again flooding in these areas was mostly from excessive surface water runoff, but some instances of flooding from ordinary watercourses were reported.

There were some isolated reports of flooding in the North of the county. Two separate landslide incidents occurred as a result of the rainfall; one led to the closure of the east coast main railway, the other caused a road to be closed in Berwick.

Several roads across the county experienced some degree of flooding; these varied from road closures to small ponding on the surface.

Detailed reports for each affected area can be found in section 4 of this report.

2.2 7 July 2012

The rainfall on the 7 July 2012 occurred in a similar way to that of the 28 June.

Significant amounts of rainfall were caused by a weather system travelling from Southern Europe colliding with the warm, humid air that the UK had seen in the run up to the floods. However, on this occasion the thunderstorms were relatively minor.

On this occasion there were also some strong winds along with the rainfall which exacerbated the flooding. These winds caused leaves and branches to fall from trees. The leaves and branches caused some gullies and culvert entrances to be blocked, triggering water to back up and flood particular areas.

2.2.1 Rainfall data

7 July event (peak intensities)	Haltwhistle	Newbiggin
mm rainfall		
30 min	3.4	12.2
1 hour	5.2	14.2
75 mins	5.8	14.8
1.5 hours	6.2	15.2
2 hour	7.6	
2.5 hour	8.4	
3 hour	10.6	
4 hour	12.4	18.2
5 hour	13.6	
16 hour		19.2
18 hour		30.6
20 hour		34.8
return period		
30 min	<1	5
1 hour	1	4
75 mins	1	4
1.5 hours	<1	3
2 hour	1	
2.5 hour	1	
3 hour	1	
4 hour	1	2
5 hour	1	
16 hour		1
18 hour		2
20 hour		2
% of LTA July rainfall		
30 min	5%	22%
1 hour	7%	25%
75 mins	7%	27%
1.5 hours	8%	27%
2 hour	10%	
2.5 hour	11%	
3 hour	13%	
4 hour	16%	33%
5 hour	17%	
16 hour		34%
18 hour		55%
20 hour		62%

The above table includes some data and/or results based upon the FEH methodology and data, CEH (2009) extracted from the CEH 2009 "The Flood Estimation Handbook CD-ROM 3" Centre for Ecology and Hydrology, Wallingford, Oxon, UK.

Table 2.2 Rainfall data in Haltwhistle and Newbiggin on 7 July 2012 (courtesy of Environment Agency)

The floods on 7 July transpired across the county. Newbiggin had 12.2mm of rainfall falling in 30 minutes. This equates to a 1 in 5 year event (20% annual probability of occurrence) and 22% of the average monthly rainfall falling in this time.

Although the amount of rainfall was small and with a low return period, the previous flooding on 28 June made many areas vulnerable to further flooding. Therefore, although it was a low event, the circumstances made the situation worse.

2.2.2 Areas affected

Rainfall occurred across the county on the 7 July. The west of the county is where the main areas of flooding occurred. Several properties in Haltwhistle experienced flooding during this event. Isolated incidents across the centre of the county also occurred, with scattered instances of properties flooding. Several roads across the county experienced some degree of flooding; these varied from road closures to small ponding on the surface.

Detailed reports for each affected area can be found in section 4 of this report.

2.3 4 August 2012

Rainfall on the 4 August 2012 was principally isolated to the west of the county. Rainfall over a one / two hour duration caused some flooding to areas that mainly also experienced flooding during the earlier events of 2012.

2.3.1 Rainfall data

4 August event (peak intensities)	Haltwhistle
mm rainfall	
30 min	16.2
1 hour	21.8
2 hour	26.6
3 hours	28.2
6 hours	31
12 hours	31.2
return period	
30 min	11
1 hour	14
2 hour	13
3 hours	10
6 hours	6
12 hours	2
% of LTA August rainfall	
30 min	17%
1 hour	22%
2 hour	27%
3 hours	29%
6 hours	32%
12 hours	32%

The above table includes some data and/or results based upon the FEH methodology and data, CEH (2009) extracted from the CEH 2009 "The Flood Estimation Handbook CD-ROM 3" Centre for Ecology and Hydrology, Wallingford, Oxon, UK.

Table 2.3 Rainfall data in Haltwhistle on 4 August 2012 (courtesy of Environment Agency)

2.3.2 Areas affected

Similar to the 7 July rainfall event the west of the county was the main area where flooding occurred. Settlements such as Haltwhistle and Halton Lea Gate experienced flooding during this event. There were some isolated instances of flooding in other parts of the county.

Several roads across the county experienced some degree of flooding; these varied from road closures to small ponding on the surface.

Detailed reports for each affected area can be found in Section 4 of this report.

2.4 25 September 2012

The rainfall event that commenced in some areas on 24 September and continued into 25 September was a long prolonged event. On this occasion with the preceding rainfall over the past few months, land all across the county was saturated. This ensured that rain water could not infiltrate through the ground and instead directly runoff into areas that caused flooding. On this occasion main rivers such as the Wansbeck and the Coquet, rose sufficiently to cause flooding to some of the dwellings that are within its respective floodplains.

Another factor on this occasion was that as it was autumn, leaves were falling from trees. The foliage caused gullies to block which led to the flooding of roads across the county.

2.4.1 Rainfall data

25 September event (peak intensities)	Rothbury	Newbiggin	Wallington	Darras Hall	Berwick
mm rainfall					
30 min	3.8	3.2	3.8	3.2	2.4
1 hour	6.8	4.6	7.2	5.8	3.8
75 mins	8.2	5.8	8.4	6.8	4.6
1.5 hours	9.8	6.6	9.6	7.8	5.2
2 hour	12.2	8.6	11.6	9.6	6.8
4 hour	22.4	15.6	18	19.6	11.2
8 hour	32.6	24.4	30.6	32	17.6
12 hour	34.8	32.4	37.8	41.4	22.4
16 hour	37.4	35.2	42.8	45.2	24.4
20 hour	52.8	36.2	56.2	51	24.6
24 hour	54.6	41.4	61	54.4	26.2
36 hour	75	55.8	75.8	61.8	28.8
48 hour	88.2	55.8	91	74.6	29.2
return period					
30 min	1	<1	<1	<1	<1
1 hour	1	<1	1	1	<1
75 mins	1	1	1	1	<1
1.5 hours	1	1	1	1	<1
2 hour	1	1	1	1	1
4 hour	3	1	1	3	1
8 hour	4	2	3	6	1
12 hour	3	3	4	10	1
16 hour	2	3	4	9	1
20 hour	7	2	8	10	1
24 hour	5	3	8	10	1
36 hour	10	6	10	9	1
48 hour	14	4	16	14	1
% of LTA Sept rainfall					
30 min	6%	6%	6%	5%	5%
1 hour	11%	8%	11%	9%	7%
75 mins	13%	11%	13%	10%	9%
1.5 hours	15%	12%	14%	12%	10%
2 hour	19%	16%	17%	15%	13%
4 hour	35%	29%	27%	30%	21%
8 hour	52%	45%	46%	49%	33%
12 hour	55%	60%	56%	64%	42%
16 hour	59%	65%	64%	69%	46%
20 hour	83%	67%	84%	78%	47%
24 hour	86%	77%	91%	84%	50%
36 hour	118%	103%	113%	95%	55%
48 hour	140%	103%	135%	115%	55%

The above table includes some data and/or results based upon the FEH methodology and data, CEH (2009) extracted from the CEH 2009 “The Flood Estimation Handbook CD-ROM 3” Centre for Ecology and Hydrology, Wallingford, Oxon, UK.

Table 2.4 Rainfall data across Northumberland on 25 September 2012 (courtesy of Environment Agency)

The rain gauge at Rothbury showed that in 48 hours, 88.2mm of rainfall had fallen. This corresponded to a 1 in 14 year event (7.1% annual probability of occurrence) and 140% of the average monthly rainfall falling over this time.

A similar story was reflected at Wallington within the river Wansbeck catchment. This gauge saw 91mm of rain fall in 48 hours. This corresponded to a 1 in 16 year event (6.25% annual probability of occurrence) and 135% of the average monthly rainfall falling over this time.

Darras Hall, Ponteland experienced 74.6mm of rain in 48 hours. This corresponds to a 1 in 14 year event (7.1% annual probability of occurrence) and 115% of the average monthly rainfall falling over this time.

The Environment Agency has estimated through visual observations that the water levels in the river Wansbeck in Morpeth equated to approximately a 1 in 25 year return period event.

2.4.2 Areas affected

Rainfall on 25 September caused flooding all across Northumberland. The central parts of the county primarily experienced the brunt of the event. Prolonged rainfall saw water in main rivers rise and as a consequence settlements on the Wansbeck and Coquet and its tributaries were particularly affected.

Other areas such as Ponteland experienced surface water flooding during the 25 September event. Although the river Pont was high, it did not burst its banks. It was the surface water runoff that caused flooding problems in this area.

Several roads across the county experienced some degree of flooding; these varied from road closures to small ponding on the surface.

Detailed reports for each affected area can be found in Section 4 of this report.

2.5 NCC Investigation

As the flooding occurred was wide spread and affected all areas of Northumberland, in the week following the 28 June event, we asked for information on the floods via a number of different sources. As well as contacting all the parish councils in Northumberland, we placed an advert for information for members of the public who had experienced or who had witnessed flooding on the 28 June to contact us. This advert was reproduced on our external website, Facebook and Twitter accounts. As a result of these adverts we received a lot of information including pictures of the 28 June floods. Thank you to everyone who contributed to this data collection exercise.

In total more than 100 different areas within Northumberland were stated to have had been affected by flooding by some degree. When we received a report of

flooding this was recorded on a database. Some issues were resolved over the phone or via emails. For the other occasions and over the preceding months, periodic site visits by the FCERM team took place.

2.6 Data sharing with other risk management authorities

Throughout the preceding months after each flooding event we have regularly kept in touch through phone calls, emails and meetings with the Environment Agency and Northumbrian Water. We have passed on details of known flooding incidents and they have passed on similar information. This ensures that we are all aware of problem areas, the source of the problem and the Risk Management Authority responsible.

3. Roles and Responsibilities

3.1 Northumberland County Council (NCC)

Northumberland County Council is both the Lead Local Flood Authority (LLFA) and the Highway Authority (HA) within Northumberland.

As the LLFA Northumberland County Council has a responsibility to investigate flood incidents under Section 19 of the Flood and Water Management Act (2010). The nature of the investigation will depend upon the extent of the flooding and the outcome from any investigation will be used to help prioritise future bids for funding. Funding to manage flood risk is prioritised and allocated on a national basis. Therefore, we cannot promise to address all issues.

Land Drainage Consent is required from Northumberland County Council for any works that are likely to impede the flow of water within an Ordinary Watercourse. This is to ensure that the risk of flooding does not increase and that any ecological issues are addressed.

As the Highway Authority NCC has a duty to maintain the highway under Section 41 of the Highway Act (1980). This includes the management of road drainage such as gullies and highway drains.

Culverts under a Highway are most likely to be the responsibility of Northumberland County Council and blockages or any damage to these culverts should be reported to NCC.

In the event of a flooding emergency Northumberland County Council may distribute sandbags from specified locations in the vicinity of the flood zone subject to availability of resources. Sandbags are not available from Council depots. Members of the public are advised to self-help by purchasing sandbags in advance from hardware stores and builders merchants where alternative flood protection devices can also be acquired.

3.2 The Highways Agency

The Highways Agency is responsible for managing road drainage including gullies and highway drains, from the trunk road network in England, including the slip roads to and from trunk roads. Within Northumberland this includes the A1, A19 and A69.

Culverts under a trunk road are most likely to be the responsibility of the Highways Agency. Any blockages or any damage to these culverts should be reported.

3.3 Environment Agency (EA)

The Environment Agency is responsible for managing the flood risk from main rivers, estuaries and the sea.

The Environment Agency has discretionary powers to maintain Main Rivers under Section 165 of the Water Resources Act (1991).

Under Section 109 of the Water Resources Act (1991) a Flood Defence Consent is required from the Environment Agency for any works that are in, under, over or within five metres of a Main river.

The Environment Agency provides a flood warning service throughout England and Wales in areas at risk of flooding from rivers or the sea. They do this by monitoring rainfall, river levels and sea conditions 24 hours a day and then use this information to forecast the possibility of flooding.

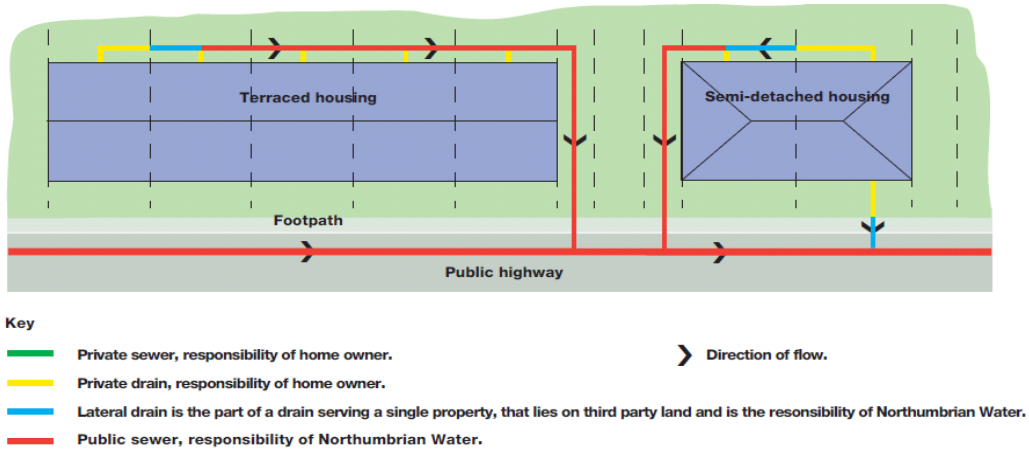
3.4 Northumbrian Water (NWL)

Under the Water Industry Act 1991, Northumbrian Water is responsible for the main sewerage system within Northumberland and their wider area which extends down to Teesside.

The majority of properties are connected to a drain; this is the responsibility of the property owner. Property owners are responsible for maintaining and resolving any problems within the drains up to the boundary of their property. If a property owner has a blocked drain, they will need to contact a plumber or drain unblocking service to unblock it for them.

The drain is connected to a sewer usually in the street or road near the property. In most cases this will be a public sewer; it belongs to NW and is their responsibility. If you are concerned that there may be a blockage in the public sewer, please call 0845 717 1100 (24 hours).

The schematic overleaf shows a typical drainage system.



3.5 Riparian owners

Riparian landowners own land adjoining a watercourse. As detailed within the Environment Agency document 'Living on the Edge', they are presumed to own the land up to the centre of the watercourse – unless it is known to be owned by someone else. Riparian landowners have certain rights and responsibilities, including the following:

- they must maintain the bed and banks of the watercourse, and also the trees and shrubs growing on the banks;
- they must clear away any debris, even if it did not originate from their land. This debris may be natural or man-made;
- they must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates;
- if they do not carry out their responsibilities, they could face legal action.

Riparian landowners must understand and act upon these responsibilities.

Riparian owners have the right to protect their property from flooding and their land from erosion. These activities may require a Land Drainage Consent from Northumberland County Council if the works are by an Ordinary Watercourse or a Flood Defence Consent from the Environment Agency if the works are by a Main River.

For more information on the responsibilities of riparian ownership please read '*Living on the Edge*' at www.environment-agency.gov.uk

Further information on protecting your property from flooding can be found via the Flood Forum Blue Pages – http://www.floodforum.org.uk/

4. Maps of affected areas

This section of the Flood Investigation Report looks in detail at specific settlements that were affected by the summer 2012 floods. It is worth noting that some areas, mainly those where just roads or where the gardens of properties were flooded have been omitted from this report. We have recorded all known flooding incidents by registering them on a GIS database.

The maps produced are based on information that we received and observed on site visits to the affected area. Therefore, there may be occasions where we have missed certain buildings and roads being flooded.

If you are aware of any irregularities within the maps of affected areas, then please contact us and we can amend them accordingly.

5. Future funding

As a result of our flood investigations we will be prioritising areas for future funding to alleviate flooding.

Funding to manage flood risk is prioritised and allocated on a national basis. Therefore, we cannot promise to address all issues. The Environment Agency has an overall responsibility for approving and paying FCERM Grant in Aid (GiA) to local authorities for flood and coastal erosion risk management schemes, strategies and projects.

As a result of all the 55 major flooding incidents across the county, we collated information on which areas were flooded, the number of properties flooded, the number of 'near misses' for properties, critical infrastructure affected by flooding, as well as other factors. These figures then enabled us to prioritise which areas we were able to bid for funding.

The last application for funding was in June 2013. The process of which funding has to go through, means that the final decision as to whether we have been successful with any funding will not be until February 2014.

6. Conclusions

2012 was an exceptional year for rainfall in Northern England. Records have shown that 2012 was the wettest year since records began in 1910.
The 28 June 2012 event was an exceptionally rare and extreme rainfall occurrence. The rainfall on this date caused widespread surface water flooding across the county. The worst hit urban areas were Alnwick and Seaton Delaval, where the town centres were under several centimetres of water. On this occasion the rainfall was very intense, so much so that it could not get away in watercourses, gulleys and sewers quickly enough. In such rainfall events it is very difficult to plan and design for these extreme occasions; especially as many of the areas that were affected have not experienced any flooding previously.

The 25 September rainfall event saw main rivers such as the Wansbeck and the Coquet, rise sufficiently to cause flooding to some of the dwellings that are within its respective floodplains. With the rainfall that had fallen over the past few months, land all across the county was saturated. This ensured that rain water could not infiltrate through the ground and instead directly runoff into areas that caused flooding.

The rainfall events in the summer of 2012 resulted in the flooding of a minimum of 187 dwellings, 37 businesses and numerous roads across the county. Exact numbers are not known. In larger settlements such as Haltwhistle, Ovingham and Seaton Delaval it was difficult to gather precise numbers. Therefore it is quite possible and feasible that over 200 dwellings and 40 businesses were affected by flooding.

As a result of these flood events we are working with other Risk Management Authorities to identify the areas at greatest risk and prioritise those where funding can be secured to alleviate future flooding.

We are very keen to ensure that all Risk Management Authorities and riparian river owners are aware of their roles and responsibilities. During the flooding events of summer 2012, we have developed a booklet which outlines these. This booklet can be downloaded via our website - http://www.northumberland.gov.uk/

With regards to our duties stipulated in the Floods and Water Management Act (2010), we have investigated each individual flooding incident where it was deemed necessary; have informed each respective Risk Management Authority; and we have published the results of this investigation via our website.

7. Disclaimer

This report has been prepared as part of Northumberland County Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide background information to support the delivery of the local Flood Risk Management Strategy and should not be used for any other purpose.

The findings of the report are based on a subjective assessment of the information available by those undertaking the investigation and therefore may not include all relevant information. As such it should not be considered as an absolute assessment of all factors that may have caused or contributed to the flood event.

The opinions, conclusions and any recommendations in this report are based on assumptions made by Northumberland County Council when preparing this report, including, but not limited to those key assumptions noted in the report, including reliance on information provided by others.

Northumberland County Council expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on circumstances encountered and information evaluated at the time of preparation and Northumberland County Council expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with those opinions, conclusions and any recommendations.

Northumberland County Council does not accept any liability for the use of this report or its contents by any third party.

Acronyms

CEH – Centre for Ecology and Hydrology
EA – Environment Agency
FCERM – Flood and Coastal Erosion Risk Management
FEH – Flood Estimation Handbook
FIR – Flood Investigation Report
FRMS – Flood Risk Management Strategy
GiA – Grant in Aid
GIS – Geographical Information System
LDC – Land Drainage Consent
LLFA – Lead Local Flood Authority
LTA – Long Term Average
MR – Main River
MTP – Medium Term Plan
NCC – Northumberland County Council
NWL – Northumbrian Water Ltd
ONS – Office for National Statistics
OW – Ordinary Watercourse
PLP – Property Level Protection
RMA – Risk Management Authority
SuDS – Sustainable Drainage Systems
SWMP – Surface Water Management Plan

Terms and Abbreviations

Culvert
A covered pipe or channel designed to prevent the obstruction of a watercourse or drainage path by an artificial construction.

Groundwater
Groundwater is all water that is below the surface of the ground and in direct contact with the subsoil or ground.

Lead local flood authority (LLFA)
In England this means—
(a) the unitary authority for the area, or
(b) if there is no unitary authority, the county council for the area.

Main rivers
Main rivers are usually larger streams and rivers, but some of them are smaller watercourses of local significance. In England Defra decides which watercourses are the main rivers, and the Welsh Government does this in Wales. Main rivers are marked on an official document called the main river map. Environment Agency local offices have copies of these maps. Main rivers can include any structure that controls or regulates the flow of water in, into or out of the channel.

Ordinary watercourse
An ordinary watercourse is every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows, but which does not form part of a main river.

Percentage LTA (long term average) rainfall
Is the percentage of rainfall expected to fall over any given one month period.

Return Period
A return period is an estimate of the likelihood of a rainfall event which is expressed in years, i.e. 1 in 20 year return period.

Risk management authority
The following risk management authorities have powers over and responsibilities for watercourse management:
• the Environment Agency;
• Lead Local Flood Authorities (LLFAs).

Surface water runoff
Surface water runoff is rainwater, including snow. It is water on the surface of the ground, whether or not it is moving, which has not entered a watercourse, drainage system.

Trash screen
A screen installed in a waterway to collect and prevent the passage of trash such as twigs, branches and litter.

Weir
A dam in a stream or river designed to raise the water level or divert its flow.

Useful links and contacts

Northumberland County Council
County Hall
Morpeth
Northumberland
NE61 2EF

Tel: 0845 600 6400
Email: ask@northumberland.gov.uk
Website: www.northumberland.gov.uk

Environment Agency
North East Area Office
Tyneside House
Skinnerburn Road
Newcastle Business Park
Newcastle-upon-Tyne
NE4 7AR

Tel: 03708 506 506
Email: enquiries@environment-agency.gov.uk
Website: www.environment-agency.gov.uk

Northumbrian Water
Boldon House
Wheatlands Way
Durham
DH1 5FA

Tel: 0845 717 1100 Floodline 0800 328 7648
Website: www.nwl.co.uk/sewer-flooding.aspx

Highways Agency
Lateral
8 City Walk
Leeds
LS11 9AT

Tel: 08459 55 65 75
Email: ha_info@highways.gsi.gov.uk
Website: www.highways.gov.uk