

# Flood Investigation Report

Devon Floods 21<sup>st</sup> – 25<sup>th</sup> November 2012

Final Report



Front cover images, left: Cullompton resident; right: DCC (River Exe)

This flood investigation report has been produced by Devon County Council as a Lead Local Flood Authority under Section 19 of the Flood and Water Management Act 2010

## Revision Schedule

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## 1. Introduction

The Flood Risk Regulations 1999 and the Flood and Water Management Act 2010 (the Act) have established unitary and upper tier local authorities as the Lead Local Flood Authority (LLFA) for their area. This has placed a number of responsibilities on the LLFA in relation to flood risk management and in particular Section 19 of the Act which states:

### **Flood and Water Management Act 2010: Section 19 – Local Authorities: investigations**

- 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.

*Flood and Water Management Act (2010), S.19, c.29, London: HMSO*

A 'Risk Management Authority' (RMA) means:

- (a) the Environment Agency,
- (b) a lead local flood authority,
- (c) a district council for an area for which there is no unitary authority,
- (d) an internal drainage board,
- (e) a water company, and
- (f) a highway authority.

When considering if it is necessary or appropriate to investigate a flood event Devon County Council (DCC) will review the severity of the incident, the number of properties affected and the frequency of such an occurrence. The Local Flood Risk Management Strategy, currently being prepared by DCC, will clearly set out the criteria to be used when considering a Flood Investigation Report.

Previously DCC have carried out a Section 19 flood investigation when a threshold of 5 or more properties suffering internal flooding, at any one location, has been reached. The flood event experienced over the week from 21<sup>st</sup> – 25<sup>th</sup> November 2012 caused widespread flooding across the County to a number of urban and rural areas, some of which are sparsely populated. To ensure the full extent of the flooding is appreciated and recorded it has been decided that this report will include all locations, brought to our attention, which experienced any internal property flooding and also other areas of particular concern.

In partnership with the other RMAs in Devon this report has been produced to comply with legislation and to determine the main causes of the flooding. It should be noted that in order to progress with their flood risk management function DCC has opted to develop this report further by considering the various actions that should be considered by the relevant RMA. DCC as the LLFA

will continue to monitor the list of actions with all of the RMAs and will assist in the delivery where practical to do so.

Each affected area or group of smaller areas investigated within this report will have a number of recommended actions to be taken forward by the relevant RMAs or in some cases, by the land owner or local community action group. There are various levels of action that can be taken depending on the severity of the situation and the practical solutions available to reduce the risk of further flooding. The recommended actions will generally fall into one of the following categories:

**Delivery of Quick win schemes:** a solution that can be implemented quickly by the EA or Local Authority at relatively low cost; some of these have already been completed as this report has been progressed.

**Further investigation/research:** Further investigations such as catchment studies and hydrological/hydraulic assessments to understand the flow rates and directional paths and evaluate the extent of flooding. This would provide evidence for future capital investment.

**Development of Future schemes:** Where immediate action is not financially viable or a solution not readily available then a larger scale flood alleviation scheme may be required. In such cases national funding would need to be secured together with additional contributions from others, such as local levy, local authorities and other third parties.

**Land owner action:** Members of the public who own land adjacent to watercourses have riparian responsibilities and therefore have a duty to maintain their section of watercourse to ensure there is no impediment of flow. Other works to protect their property may also need to be funded by themselves to ensure delivery within their timescales.

**Community action:** In some cases it may be prudent for community groups to join forces and deliver their own local schemes. In some cases this may generate further contributions from local levy or the LLFA.

Given the extremely widespread nature of the flood event, it has not been possible to produce very specific and detailed actions for all of the affected localities. This investigation report will provide a starting point, with suggested actions being further refined in the light of further studies and where possible, through further dialog with the affected communities. All of the feedback received at the flood drop in events, held for some of the affected communities, may not be individually listed in this report or shown as specific actions but it should be noted that all of these are being taken into consideration as the actions and solutions are prioritised.

#### **Recommended Actions:**

The purpose of this report is to act as a tool for all of the relevant RMAs to understand and appreciate the extent of flooding in their area and to consider and prioritise those actions relevant to their authority. Due to the extent of flooding, not only from the events covered in this report, the level of recommended actions far exceeds the budgets and resources available to enable them to be delivered immediately. Although we take all flooding issues seriously it should therefore be appreciated that some actions may not be progressed within the timescales expected by some residents or communities. Every effort will be made to progress the actions if and when suitable funding is obtained.

The recommended actions highlighted in this report will be used by the LLFA to monitor progress achieved by the RMAs.

## 2. Risk Management Authority Responsibilities

### 2.1. Recording Flood Incidents

LLFAs must now record flood incidents as part of their new duties. Table 2.1 shows the national guidance given as part of the Preliminary Flood Risk Assessment Spreadsheet submission to the Environment Agency (EA), which outlines information to be collected by LLFAs.

**Table 2.1** Information the LLFA must now record.

<b>'LLFAs should record the following information from December 2011' Devon County Council (DCC) will record this on the DCC flood incident database:</b>	
<b>Start Date</b>	
<b>Days duration</b>	
<b>Probability</b>	
<b>Main source</b>	Surface runoff; Groundwater; Ordinary watercourses; Artificial infrastructure; Main rivers; The sea; No data
<b>Main mechanism</b>	Natural exceedance; Defence exceedance; Failure; Blockage or restriction; or No data
<b>Main characteristics</b>	Natural flood; Flash flood; Deep flood; Snow melt flood; No data
<b>Significant consequences</b>	To human health (residential properties) To economy (non residential properties) To the environment (designated sites flooded)

### 2.2. Key Responsibilities

RMA's in Devon all have their own roles and responsibilities. The following Table 2.2 summarises the relevant flood risk management functions for each of the RMA's and the different sources of flood risk that the DCC investigation procedure follows.

**Table 2.2** Relevant flood Risk Management Authorities that will take the lead in managing the risk from various local sources of flooding.

<b>Flood Source</b>	<b>Environment Agency</b>	<b>Lead Local Flood Authority</b>	<b>District Council</b>	<b>Water company</b>	<b>Highway Authority</b>
<b>RIVERS:</b>					
<b>Main river *</b>	✓				
<b>Ordinary watercourse *</b>		✓	✓		
<b>SURFACE RUNOFF:</b>					
<b>Surface water</b>		✓			
<b>Surface water originating on the highway</b>					✓
<b>OTHER:</b>					
<b>Sewer flooding</b>				✓	
<b>The sea</b>	✓				
<b>Groundwater</b>		✓			
<b>Reservoirs</b>	✓				

\* A Main River is a river that has been designated as such by the EA. These tend to be the larger arterial watercourses that are considered to pose a significant flood risk. Ordinary watercourses include all rivers and streams not designated as a Main River and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages, through which water flows.

The general RMA responsibilities in relation to flood risk and surface water management are outlined below:

**The Environment Agency** is responsible for managing the risk from the sea, Main Rivers and reservoirs and has a strategic overview role for all flood risk management, making it a key local partner for DCC, especially when managing the risk from combined sources and in the event of a large flood incident. The EA also provides a flood warning service throughout England and Wales in areas at risk of flooding from rivers or the sea.

**Devon County Council as the Lead Local Flood Authority** is responsible for overseeing the flood risk from Ordinary Watercourses, groundwater and surface water runoff. They are also responsible for consenting to works on Ordinary Watercourses and enforcing the removal of any unlawful structure or obstruction within the watercourse. And, as previously stated they must ensure that a flooding investigation is carried out by the relevant authority and publish a report. DCC must also prepare a Local Flood Risk Management Strategy and maintain a register of flood risk assets.

**Local District Councils** are classified as land drainage authorities with discretionary powers under the Land Drainage Act, such as the implementation and maintenance of flood defences on ordinary watercourses. They also have powers under the Public Health Act to ensure the removal of any blockage within an Ordinary watercourse that is considered a nuisance. As a planning authority they are responsible for the preparation of development plans and making decisions based on planning policy.

**Devon County Council as the Highway Authority** maintain the highway drainage system to reduce the amount of standing water on the highway. This is achieved by limiting the water on the roads and ensuring that they are kept clear of rainwater; including the maintenance of highway gullies and culverts.

**The Highways Agency** is responsible for managing, maintaining and improving the Motorway and trunk roads across England and any associated drainage and flood risk.

**Land/Property Owners** that have a watercourse in or adjacent to their land have riparian responsibilities on that watercourse. This means the landowner must:

- Let water flow through their land without any obstruction, pollution or diversion which affects the rights of others.
- Accept flood flows through their land, even if these are caused by inadequate capacity downstream.
- Keep the banks clear of anything that could cause an obstruction and increase flood risk, either on their land or downstream if it is washed away.
- Maintain the bed and banks of the watercourse and the trees and shrubs growing on the banks and should also clear any litter or debris from the channel and banks, even if it did not come from their land.
- Keep any structures, such as culverts, trash screens and debris grills, weirs and mill gates, clear of debris.

**The LLFA must also take an overseeing role to ensure that all flood risk is being managed appropriately.**

**In small localised groundwater and surface water flooding incidents which do not reach the threshold level to trigger a flood investigation by the LLFA under Section 19, the Local Authorities will work in partnership to consider the appropriate action.**

**All RMAs have a duty to co-operate and to share information in relation to their flood risk management functions.**

## 3. Flood Incident Extent and Impact

### 3.1. Summary

During the days of 20<sup>th</sup> to 25<sup>th</sup> November 2012, many areas across Devon experienced intense rainfall (discussed in section 3.2) resulting in the flooding of over 450 residential and commercial properties across Devon, mainly focused in the Mid and South of the County. However, it is believed that many more properties may have been flooded but have not been brought to our attention or determined by our investigations. Table 3.1 lists the towns and villages affected together with the reported number of properties flooded and the status of flood warnings that were issued by the EA for the Main Rivers within that area. Figure 3.1 shows the geographical extent of flooding within the Devon County area. Each of the reported flood locations have been identified on the Devon map, also showing how these have been grouped together to form the chapters of this report. Some of the more significantly affected communities have been reported in separate chapters rather than grouped together with other locations in the same District, as these required a more in depth explanation. It should be noted that chapters have been reported in District Council alphabetical order and not in any order of priority.

**Table 3.1.** Summary of properties flooded, based on approximate numbers collected in this investigation, with flood warnings issued on rivers in the area.

Location	Number of properties flooded	Flood Warning Issued	Location	Number of properties flooded	Flood Warning Issued
<b>East Devon</b>					
Axminster	1	Warning	Nether Exe	2	Alert
Budleigh Salterton	4	Warning	Newton Poppleford	2	Warning
Clyst St Mary	5	Warning	Otterton	3	Warning
Colaton Raleigh	12	Alert	Ottery St Mary	1	Warning
Colyton	1	Warning	Rudway Barton	1	Not Available
Dalwood	1	Alert	Seaton	1	Warning
East Budleigh	5	Warning	Sheldon	1	Alert
Exmouth	12	Alert	Sidmouth and Bowd	2	Warning
Exton	2	Alert	Smallridge	1	Alert
<b>Feniton</b>	<b>15</b>	<b>Not Available</b>	Stoke Cannon	2	Warning
Fluxton	2	Alert	Talaton	2	Alert
Harpford	5	Warning	Tipton St John	7	Warning
Hawkchurch	1	Not Available	Uplyme	6	Alert
Honiton	1	Warning	Westwood	6	Alert
Killerton	2	Warning	Whimble	2	Alert
Lypstone	11	Alert	Woodbury Salterton	0	Alert
Membury	1	Alert			
<b>Exeter</b>					
Exeter	16	Warning			
<b>Mid Devon</b>					
Ashill	1	Not Available	Hookway	1	Not Available
Bampton	3	Warning	Kentisbeare	3	Alert
Bradninch	0	Not Available	Morchard Bishop	3	Not Available
<b>Cullompton</b>	<b>47</b>	<b>Warning</b>	Shillingford	1	Alert
Crediton	4	Warning	Swandhams Farm	1	Not Available
Culmstock	3	Warning	Thorverton	0	Warning
Halberton	1	Not available	Tiverton	6	Warning
Hele	3	Alert	Uffculme	1	Warning
Hemyock	3	Warning			

### Flood Incident Extent and Impact

<b>North Devon</b>					
Cheldon	1	Not Available	Westleigh	1	Not Available
<b>South Hams</b>					
Ashprington	1	Not Available	Modbury	6	Alert
Aveton Gifford	0	Warning	Noss Mayo	4	Alert
Avonwick	4	Warning	South Barton	3	Not Available
Bittaford	1	Alert	South Milton	2	Not Available
Frogmore	5	Alert	Thornham and Lower Keaton (Ermington)	4	Thornham - Alert Keaton - Warning
Goverton and Ledstone	3	Goveton - Alert Ledstone - not available	Totnes	3	Warning
Harberton	1	Alert	Ugborough	4	Alert
Harbertonford	1	Warning	Wrangaton	2	Not Available
Kernborough	1	Not Available	Yealmbridge	3	Warning
Lee Mill	1	Warning	Yealmton	4	Warning
Longcombe	1	Not Available			
<b>Teignbridge</b>					
Abbotskerswell	1	Alert	<b>Kennford</b>	<b>40</b>	<b>Alert</b>
Ashburton	5	Not Available	Kenton	2	Alert
Bickington	1	Warning	Kingskerswell	4	Alert
<b>Bovey Tracey</b>	<b>12</b>	<b>Warning</b>	Kingsteignton	9	Warning
Bridford	1	Alert	Liverton	1	Not Available
<b>Buckfastleigh</b>	<b>32</b>	<b>Warning</b>	Newton Abbot	3	Warning
Chudleigh	4	Warning	Poundsgate	2	Not Available
Combeinteignhead	11	Alert	(Higher) Rocombe Barton	3	Not Available
Dawlish	9	Alert	Shaldon and Ringmore	6	Alert
Dawlish Warren	1	Not Available (coastal only)	Starcross	3	Alert
Forder Green	1	Not Available	Stokeinteignhead	12	Alert
Haytor Vale	1	Not Available	Tedburn St Mary	1	Not Available
Ideford	1	Alert	Teigngrace	1	Warning
Ilsington	1	Not Available	Teignmouth	5	Alert
Kenn	4	Alert			
<b>Torrige</b>					
Great Torrington	2	Warning	Weare Giffard	0	Warning
Littleford, Nr Bradworthy	1	Not issued			
<b>West Devon</b>					
Buckland Monochorum	5	Alert	Lydford	1	Alert
Hatherleigh	0	Warning	Milton Combe	4	Alert
Lewdown	1	Not Available	Throwleigh	1	Not Available
Lifton	1	Not issued			
<b>Total properties flooded:</b>			<b>466</b>		

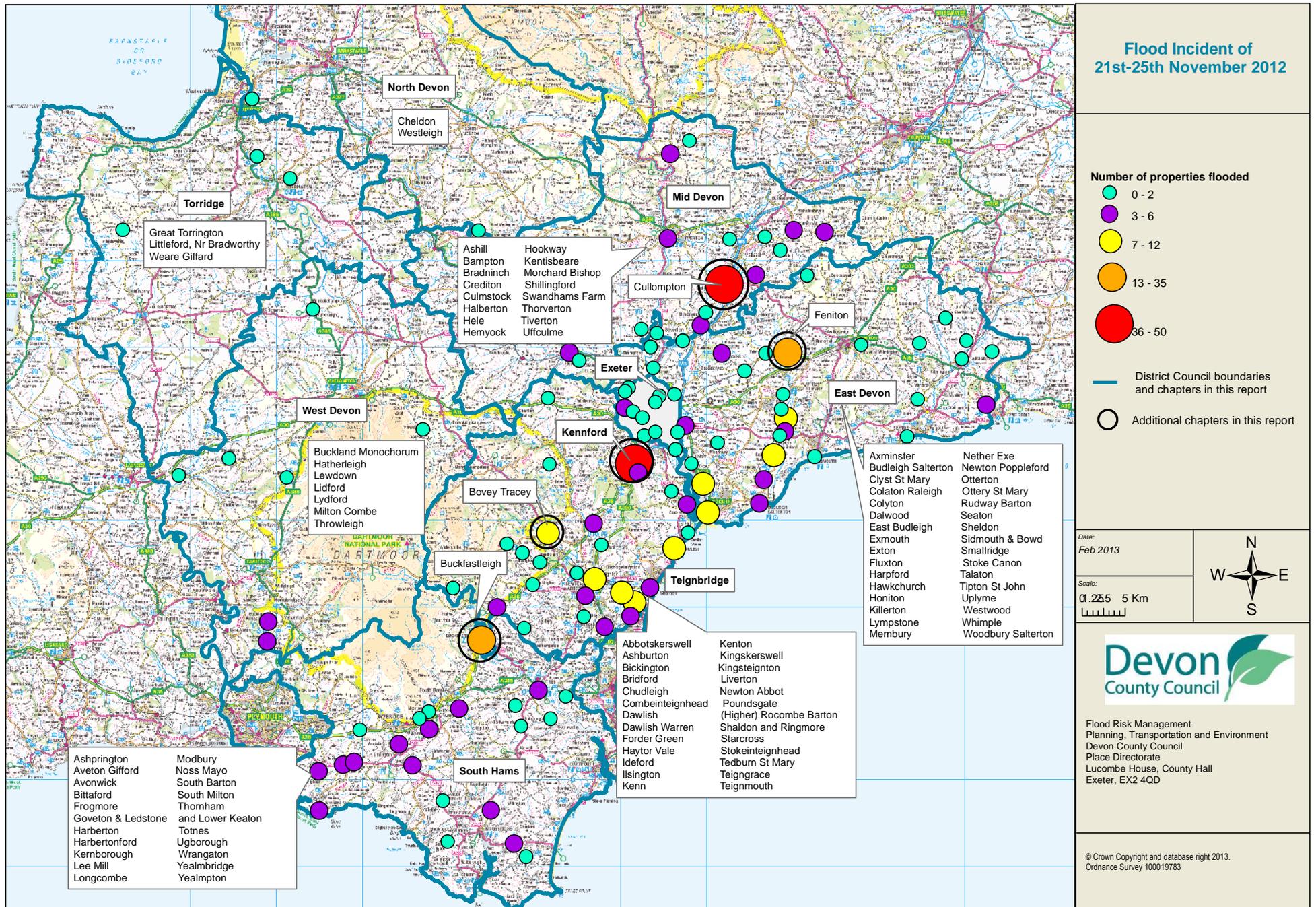


Figure 3.1. The extent of flooding across Devon over 21<sup>st</sup> – 25<sup>th</sup> November and how these have been grouped together as chapters in this report.

## 3.2. Rain and River Flow Gauge Records

The South West Region suffered a long duration winter fluvial flood event beginning 19<sup>th</sup> November 2012. The event was unusual as a region wide flood and comparisons have thus been drawn with the last event of this pattern in the autumn of 2000.

Throughout November rainfall totals exceeded twice the average in many locations and nearly three times in a few locations.

In the six days leading up to the event up to 250mm of rainfall was recorded with up to 85mm of that in the last 24 hour period. In 2000 we had up to 270mm in 10 days and 90mm in 30 hours, so very similar in rainfall terms. Figure 3.2 shows the rainfall radar image during the storm. In many places, the highway drainage systems were overwhelmed. This is unsurprising as they are not designed to cope with such extreme flood conditions that were experienced during this event.

Many of our rivers saw the highest levels in their record periods. Table 3.2 lists the levels recorded.

The contributing rainfall frontal bands leading up to the event could be considered to have started on 19<sup>th</sup> November and leading up to the majority of river level peaks of the flood event there were 3 distinct frontal rainfall bands separated by no more than a 24 hour gap on each occasion. Most of the rain was region wide and long duration on each occasion lasted between 14 and 60 hours.

The frontal rain was generally moderate intensity with some notable embedded convection at times but notable by its persistence especially in the 24 hour duration frontal rain on 24/25<sup>th</sup> November.

Whitebarrow on Dartmoor received the greatest rainfall over the 6 day and the 1 day periods (and over the month). From 09:00 on 19<sup>th</sup> November until 09:00 on 25<sup>th</sup> November we recorded 255mm at this location.

Catchments were very wet during the month and became largely saturated by 20<sup>th</sup> November after the first frontal rain had gone through. It is concluded that the antecedent conditions were an important driver of this event and resulted in a saturated catchment state across the region in the lead up. Catchment wetness was unusually high in 2012 due to the high and near continuous rainfall since the Spring.

EA Flood Warning gauges have been interrogated for peak levels and these are shown in Table 3.2. The Flood Warning gauge statistics are a very useful measure of the severity and scale of the event. It is also notable that some of these rank scores will have been affected by other extreme events during 2012.

At a number of these locations the EA are embarking on studies to further understand the resulting flows associated with the levels (Stage, mCD) shown in the table. This requires more detailed study and can also help understand the relative frequency of the event at various locations in order for the RMAs to make various informed decisions on flood risk management.

The EA and DCC is currently compiling a list of locations where more detailed study will benefit the understanding of flood risk and flooding mechanisms.

### Flood Incident Extent and Impact

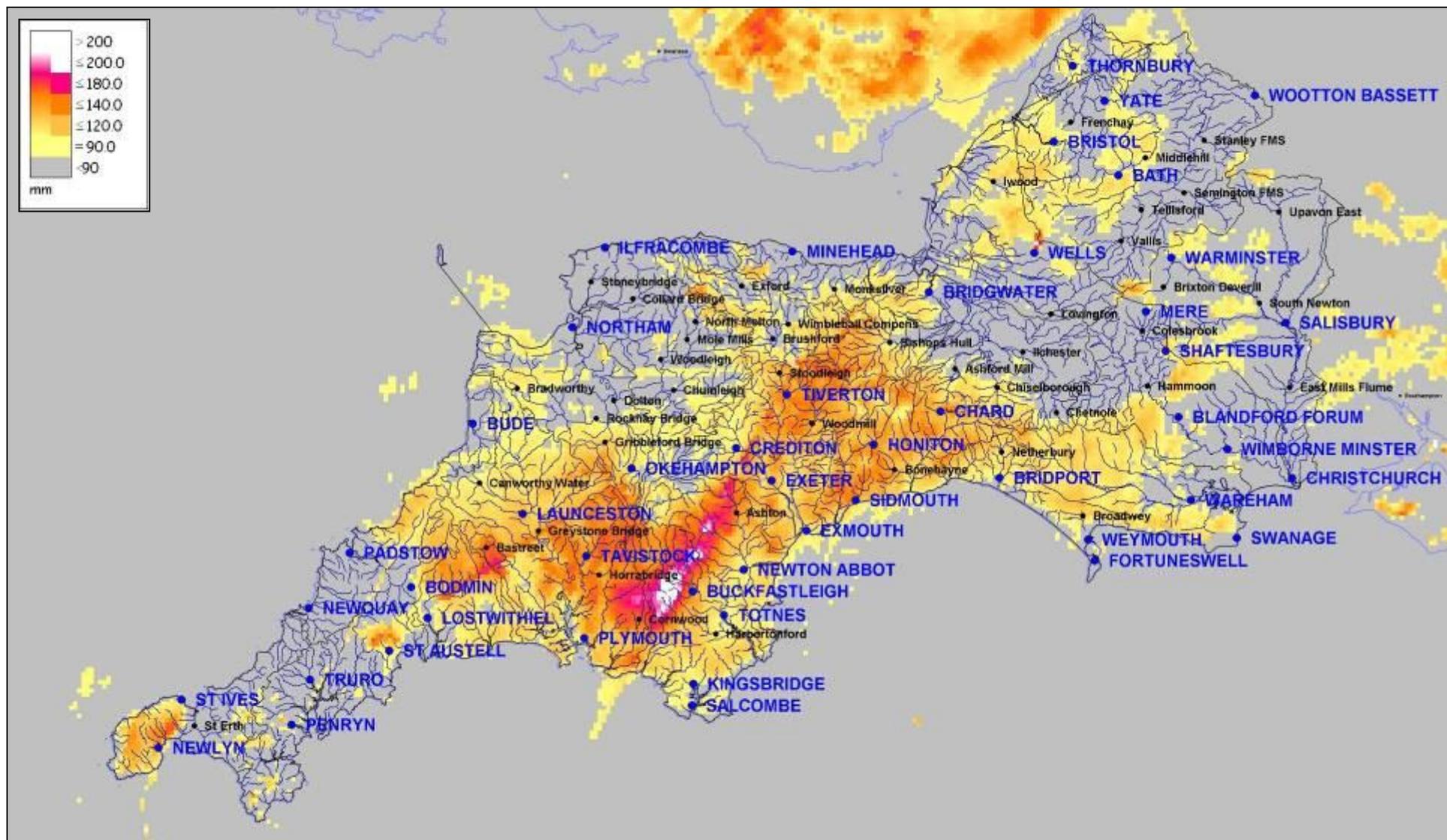


Figure 3.2. Radar image showing the UKPP total rainfall accumulations per 1km (mm) from 04:00 GMT 19-Nov-12 to 04:00 GMT 25-Nov-12.

Flood Incident Extent and Impact

**Table 3.2.** Environment Agency flow gauge records for November 2012 flood peaks where mCD is the water level to Chart Datum and events are ranked by how this event compares with previous events at the same location.

River	Gauge	Event Date	Time	Stage (mCD)	Start of record	Rank in record
Coly	Bonehayne	24/11/2012	23:45	1.958	20/11/1995	2
Umbourne Brook	Wilimington	24/11/2012	23:45	1.867	21/02/1995	3
Yarty	Court Place Farm	21/11/2012	9:40	1.69	03/11/1995	3
Axe	Winsham	25/11/2012	01:00	3.297	21/02/1995	5
	Forde abbey				13/05/2010	
	Chard Junction	25/11/2012	01:30	3.309	08/11/1995	5
	Weycroft	25/11/2012	02:30	3.292	01/12/1995	2
	Whitford	25/11/2012	02:15	2.482	06/11/1964	3
Otter	Upottery	24/11/2012	23:30	2.007	30/08/1995	5
	Fenny Bridges	25/11/2012	00:30	2.635	01/09/1974	4
	Dotton	21/11/2012	13:45	2.533	01/10/1962	5
Clyst	Ashclyst	21/11/2012	10:30	2.631	03/02/1995	>12
	Clyst Honiton	21/11/2012	13:00	2.831	02/06/2003	1
Lowman	Craze Lowman	25/11/2012	00:30	1.945	23/11/1995	2
Sid	Sidbury	25/11/2012	00:00	2.413	01/01/1998	2
Batherm	Bampton	25/11/2012	00:30	1.807	08/11/1995	2
	Bampton Bridge	25/11/2012	01:30	2.028	17/12/2008	1
Avon	Lodiswell	25/11/2012	01:30	2.691	01/03/1971	2
	Didworthy	24/11/2012	22:30	2.038	08/11/1995	3
Erme	Harford	24/11/2012	22:45	1.812	28/09/1995	>12
	Ermington	24/11/2012	22:45	2.68	01/01/1974	3
Harbourne	Rolster Bridge	25/11/2012	00:15	2.006	20/02/1995	2
	Harbertonford	25/11/2012	02:30	1.478	11/12/1995	3
Taw	Umberleigh	25/11/2012	09:00	3.978	01/10/1958	9
	Chulmleigh	25/11/2012	02:15	2.619	21/11/1995	1
Culm	Woodmill	21/11/2012	13:15	3.725	30/01/1962	1
	Culmstock	21/11/2012	10:15	2.173	20/02/1995	1
	Rewe	21/11/2012	17:00	1.71	20/02/1995	1
Exe	Stoodleigh	25/11/2012	03:15	3.534	01/04/1960	13
	Tiverton	25/11/2012	00:15	3.185	07/12/1995	3
	Thorverton	25/11/2012	07:00	2.785	01/05/1956	12
Creedy	Upton Hellions	21/11/2012	00:45	2.725	19/10/1995	2
	Yeoford	25/11/2012	00:45	2.688	19/12/1995	4
	Cowley	25/11/2012	08:00	3.658	24/03/1964	7
Exe	Exwick	25/11/2012	10:00	2.678	14/05/1996	5
	Trews Weir	25/11/2012	10:15	4.587	06/10/1997	2
Lemon	Bickington	24/11/2012	22:30	2.17	16/02/1995	1
Lew	Gribbleford Bridge	24/11/2012	23:45	2.422	22/02/1988	6
Torridge	Dolton	25/11/2012	03:30	3.965	16/11/1995	1
	Torrington	25/11/2012	08:00	4.523	01/08/1960	9
Teign	Clifford Bridge	25/11/2012	02:30	2.829	10/01/1995	3
Hooke	Hooke	25/11/2012	00:45:00	0.559	01/11/1992	5
Yealm	Puslinch	25/11/12	01:44	2.140	01/03/1966	2

### 3.3. Data and Information Collation

Following the events during late November 2012, DCC, the EA and relevant District Councils have worked in partnership to gather as much information as possible to build up a picture of the incident extent, eventually resulting in the image shown in Figure 3.1. Due to the large nature of the event covering such a large area of Devon and the recurrent flooding that continued throughout November and December, this proved to be a very slow and lengthy process which involved working closely with the relevant RMAs. In addition to receiving information from District Council officers on the ground, the media (including social media) played a large part in initially determining the areas affected. Information on flooded highways and drainage problems were received through the DCC Highway Operations Control Centre, which liaises with the police and receives calls from the public. In the days following the event, EA flood reconnaissance teams were out on the ground collecting information on the flood extent, damages caused and numbers of properties flooded. However, it should be noted that this report is only based on the information brought to the attention of DCC through its professional partners, the media and the public and where further investigation by the authorities have identified additional flooded properties . Therefore, it cannot be guaranteed to contain an exact or exhaustive list of affected communities in the November 2012 event.

## 4. Flooding Impact on Transport and Infrastructure

### 4.1. Highway Infrastructure

The storm event over the period of 21<sup>st</sup> to 24<sup>th</sup> November had a considerable effect on the highway network. The extent of the problem was so severe that at one point during the evening of the 24<sup>th</sup> November it is believed that every "A" road in the south of the County was obstructed with flood water.

The A376 from Exmouth to Exeter was closed due to deep flooding at Exton, Ebford, Lypstone and Clyst St George; The A3052 Newton Poppleford at Goosemoor, 4 Elms and at Blue Ball was impassable due to flooding and land slips; The A377 was flooded and closed to a depth of over 0.5m at Hookway, Smallbrook, Bishops Tawton and Tesco's Roundabout in Crediton; The A379 was flooded and impassable at Kenton and Dawlish; The A361 North Devon Link Road (Bolham to Heathcoat way) was closed; The A382 Moretonhampstead was closed with 3ft deep flood water; The A3072 at Bow was closed, flooded either side of the village and a very large tree down and at Bickleigh closed due to flooding; The A396 was closed at Stoke Canon and Bickleigh; The A375 was flooded and closed and at Sidbury; The A358 at Weycroft was closed; The A380 was closed at Splatford split; There were stability concerns on the A399 at Newton Wood, near Brayford (road open but under traffic lights); The A373 from Honiton to Cullompton flooded in various locations; The A3121 Modbury was closed and the A383 at Hele Park was also closed due to flooding.

The Highways Agency also experienced problems with the A38 closed at Deepway, and Splatford Split flooding. The M5 Junction 25 to Junction 26 in Somerset was closed due to flooding. The A30 at Honiton was closed and the A35 was closed due to a land slip near Hunters Lodge.

The effect of the storm has resulted in approximately £3.7m damage to the highway network, including the loss of a Grade II listed bridge on the river Culm, near Bradninch, and more than 30 land slips requiring embankment support to be constructed. In addition, £1.3m was spent on clearing up the debris left by the storms. Work is still being identified, particularly with respect to blocked and damaged drainage schemes and the repair work will continue through 2013. There is long term concern about the damaging effect of this storm, the previous and subsequent storms have had on the condition of the highway network. Before the November storm the backlog in highway maintenance was estimated at £687m. It is anticipated that this will have risen by far more than £50m when the results of the next survey are completed in the autumn of 2013.

The system of storms that passed over Devon in November compounded by the previous wet weather had left land saturated. Highway drainage is complex and is primarily there to drain water falling on the highway rather than running onto it from adjacent land. The latter is traditionally channelled via land drainage systems under the roads, not over and onto carriageways. With the saturated ground conditions, the land drains and ditches upstream of highways became full, with the majority of the resulting water flowing onto the highways, accompanied in many places with considerable volumes of debris. This consequently overwhelmed and blocked the drainage systems on the highways leaving roads effectively running as rivers. A condition they were never designed for.

### 4.2. Network Rail

The railway network was significantly affected by the November floods;

#### **Cowley Bridge Junction:**

Cowley bridge junction is located approximately 1 mile north of Exeter St David's Station. Approximately ¼ mile north east of the junction is Stafford's Bridge where the River Exe meanders beneath the Exeter to Bristol main line. The bridge is at a low level compared to high flows of the

Exe and high river levels cause speed restriction and closures reasonably often. In order to prevent (or minimise) damage to the structure the river is allowed to weir over its outer bank and discharge into an area bounded by the railway embankment and the A396. This flow of water is channelled to Cowley Bridge Junction where it passes through 2 culverts and rejoins the main River Exe.

In certain rainfall events (currently thought to be around a 1 in 10 year event, 10% probability of occurrence in any given year) the volume of water that weirs into the channel is unable to pass through the culverts sufficiently quickly and backs up. The backing up is exacerbated by coincidental high levels in the main Exe channel where the culverts exit. When the trapped water reaches sufficient level its only means of escape is up and over the railway infrastructure at the junction.

During November and December 2012 the mechanism described above occurred and flood water inundated the railway infrastructure. The track ballast was locally washed out removing support for the rails and sleepers. Water continued down the tracks toward Exeter, flooding a relay room and fourteen trackside cabinets causing significant damage to signaling equipment.

Following the flood event of 21<sup>st</sup> November Network Rail worked to replace damaged signaling and telecoms equipment and replaced approximately two miles of cables. The track was restored by importing new ballast, stabilising the formation and realigning and consolidating the track enabling the route to be reopened three days later. The signaling, however, took another two weeks. Four days after the line was reopened in November, Cowley Bridge flooded again. The track was once more washed out and the signalling systems damaged again. On the 22<sup>nd</sup> December the flood waters rose again and the track was once again washed out, the signalling was less severely affected as specialist coffer dams were deployed to protect much of the signalling equipment.

### **Stoke Canon and Hele and Bradninch:**

At the time of the flooding of Cowley Bridge Junction, two other locations on the Exeter to Bristol main line were affected by flood water. Hele and Bradninch level crossing is a regular flood event. The railway at Stoke canon is less often flooded but was on this occasion. Had the railway not been closed at Cowley Bridge Junction it is very likely that water levels at these locations would have ceased or severely disrupted railway operations. Network Rail is investigating possible flood mitigation and improved resilience in these locations with appropriate agencies and industry experts.

### **Other incidents:**

The sea cliffs at Teignmouth suffered a landslip on the 27<sup>th</sup> November 2013. In excess of 5000 tonnes of material has been recovered to date from this slip. The slip is attributed to the extreme rainfall and changes in local surface and groundwater flows. The landslip caused the closure of the line for 2 days and services are still disrupted with a complete rectification still months away.

In December the Barnstaple branch suffered twenty two separate track washouts and the foundations of bridge structures were compromised by the high river flows and scour; the line was closed until early January 2013.

Other train delays attributed to the extreme weather in November and December occurred at Whiteball Tunnel near Tiverton, Blackboy Tunnel in Exeter, and Laira in Plymouth.

Network Rail has begun to work in collaboration with the Environment Agency and industry experts to investigate improved resilience of the railway infrastructure to flood events. This is in conjunction with the Environment Agency and local authority combined scheme to improve the flood defence of the city of Exeter. An immediate programme of lifting the signalling equipment above flood levels has begun and will be completed shortly; this will reduce the time from a flood event to restoration of normal train services.

### 4.3. Grand Western Canal

The Devon County Council owned Grand Western Canal suffered a serious breach on 21<sup>st</sup> November 2012 at the Swing embankment which rises nearly 60 feet from surrounding fields at Halberton. The breach was a result of erosion resulting from over-topping of the embankment, rather than an inherent failure of the embankment. This followed unprecedented rainfall of 38mm during the early hours (as recorded at a nearby weather station), coupled with the ingress of water into the canal from adjoining land.

On the morning of 21<sup>st</sup> November the level in the canal basin was found to have increased an unprecedented 25cm over the previous twenty-four hours. Immediate steps were taken to fully open the main sluice at Fossend which was carried out by 8:45 am. Calls were also being received from the landowners at Shuteslade Farm in Halberton concerning flooding due to overtopping. Having cleared the culverts at Lowdwells, the Canal Manager then collected and delivered sandbags to Shuteslade Farm, where the landowners were already taking steps to minimise flooding of property.

Shortly after 11:00 am it became apparent that water over topping the canal was eroding the face of the Northern embankment at which point the Canal Manager requested the assistance of the Bridge Maintenance Team. With the assistance of local residents the canal staff inserted stop boards at Rock Bridge to begin the damming off of the Halberton section of the canal. They then went to Greenway Bridge to install the further stop boards. The Bridge Team arrived on site at approximately 12:30 pm and set about sealing and reinforcing the boards at Rock Bridge. The Canal Team were still endeavouring to seal the stop boards at Greenway Bridge when at about 2:40 pm the full breach occurred.

A lagoon was formed to the North of the embankment (see Figure 4.1) and for several days the emergency services pumped water away whilst there was a risk of flooding to the neighbouring village. The parish council emergency plan was put into operation.

Further rainfall on 22<sup>nd</sup> and 24<sup>th</sup> November, coupled with pumping from the lagoon and runoff from surrounding land caused levels in both sections of the canal to again increase to high levels. Levels in the Tiverton section were brought under control with the use of pumps.

The EA has since carried out two fish rescue events with an estimated 70% of the stocks rescued. The EA has also sourced young fish to be introduced to the canal in the spring and autumn of 2013.

The Canal is now dammed at Greenway Bridge and Rock Bridge. This half mile section at Halberton is closed, as is the towpath between Swing Bridge and Rock Bridge. The rest of the canal remains open, with a towpath diversion in place between Swing Bridge and Battens Bridge. From an operational viewpoint there are currently two separate canals, one of 4 miles in length from Tiverton to Halberton and the other of 6.5 miles from Rock Bridge to Lowdwells near the county boundary.

A more detailed report of the breach, with recommendations, is being prepared by the County Council and will be available shortly.



**Figure 4.1.** Fire Service pumping water from the lagoon formed by the canal breach.

## 5. East Devon

### 5.1. Flood Incident Extent and Impact

The extent of flooding in East Devon was spread across the majority of the District and many small towns and villages were affected, with over 100 properties flooded in total. Colaton Raleigh, Exmouth, East Budleigh, Tipton St John and Westwood were the worst affected areas with several properties flooded in each. A common theme in lots of the affected areas was the overwhelming of small watercourses and drainage systems. Feniton was one of the worst affected communities in East Devon with 15 properties flooded and has been looked at separately in more detail in Chapter 6.

### 5.2. Historic Flooding

Towns and villages across the District of East Devon have suffered from many flood events, particularly in the catchments of the River Otter, Axe, Sid and along the Exe Estuary. In October through to December 2000, many of these communities were affected from a combination of fluvial and surface water flooding and in October 2008 Ottery St Mary and surrounding villages were flooded from severe storms. Many of the villages included in this chapter were also affected in the floods of July 2012 and were featured in the corresponding flood investigation report, Axminster in particular was hit badly, where 67 properties were flooded on 7<sup>th</sup> July 2012.

### 5.3. Evidence Collected

#### 5.3.1. Axminster

1 property was reported to have flooded from the Purze Brook.

#### 5.3.2. Budleigh Salterton

In Budleigh Salterton, the Cricket club was reported to have flooded up to the roof (as in July 2012), in addition to the flooding of 2 properties in Granary Lane and a garage in Mimosa Court.

It was reported at the East Budleigh flood drop in session held on 15<sup>th</sup> January that there was a lower level of water in the river than on the cricket field side and therefore is it possible to put in extra flap valves from the cricket club side to the river. Other suggestions included raising the bend on the West side of the stream.

Water was also reported to be coming up through the road drainage in Granary Lane. These drain into the stream through a flap valve but they need to be checked and maintained.

Outside of Budleigh Salterton near Dalditch Farm on the corner of Dalditch Lane, a property was reported to have flooded due to water backing up at a culvert under a bridge at Knowle. Devon Highways have previously dredged this to increase capacity to a certain extent. However, there are high voltage electric cables running underneath the river bed and so the work that can be done is very limited until more information is known about the exact depth and location of these.

1 property at Knowle Village was affected by surface water coming off the highway. However, it is not clear if the property suffered internal flooding. At Little Knowle on West Hill Lane, several gardens were flooded but no internal flooding was reported.

In total 4 properties were flooded (including the Cricket Club building). Budleigh Salterton was affected in the July 2012 floods to a greater extent than in November. A number of actions were recommended that are being progressed, including investigating the issues and defence levels at Granary Lane.

### 5.3.3. Clyst St Mary

In Clyst St Mary, 5 properties were reported to have flooded.

### 5.3.4. Colaton Raleigh

12 properties were flooded in the village of Colaton Raleigh when the ordinary watercourse that flows through the village from West to East and towards the Main River Otter came out of bank affecting roads and properties throughout the village. Figure 5.1 shows the extent of flooding.

The watercourse runs under a highway bridge on Exmouth Road, the capacity of which was insufficient to take the high flows, causing it to overflow through the railings into the road and back up against the parapet wall on the bridge on the opposite side of the road. At the bridge wall, water caused erosion damage where it forced its way through and mesh fencing further downstream was prevented water from re-entering the watercourse. These factors contributed to the flooding of Exmouth Road, with internal flooding at 2 commercial properties. where flood water came up through the floor in the local shop and the Blue Ball Dairy had 12 inches of water inside.

Water then continued to flow from Exmouth Road and down Church road where further properties were flooded. All 3 Quashbrook Cottages were flooded internally and 2 properties, Baileys Cottages are level with the road and were both flooded. Further along Church Road, 3 properties were flooded: Place Court had 2 foot of water; Hayes had water into the front hall; and Hill View had water through the vents and under the floor. Highway drains take water into a culvert here but were unable to during the event due to the watercourse being at full capacity.

Further downstream by the church, 1 property, Brooklyn also flooded and Railway Cottage to the eastern side of the village had 2-3 feet of water from the watercourse.

A culvert downstream at Otter Farm is reported to be of insufficient size (2 small 12 inch pipes), which resulted in water being unable to escape into the floodplain, causing water to back up through the village. These conditions are said by residents to have occurred with increasing frequency in recent years.

### 5.3.5. Colyton

In Colyton 1 property in Coly Vale was reported to have flooded. In addition to this, a blocked culvert at the Ridgeway Lane/Clay Lane crossroad was causing water to flow down Ridgeway Lane, affecting a property at Burnard's Field Road.

### 5.3.6. Dalwood

In Dalwood, 1 property, a pub was reported to have flooded. Further properties were protected from flooding due to the use of sandbags.

### 5.3.7. East Budleigh

Following the flooding in East Budleigh on 24<sup>th</sup> November 2012, Environment Agency Reconnaissance Teams visited the village. Evidence was found of the East Budleigh Brook overtopping in Lower Budleigh and surface water coming down Middle Street and Brookfield Road. Water also came down from Budleigh Hill and joined the East Budleigh Brook flows, contributing to the flooding of 2 properties next to the river. In total, 5 properties were flooded in East Budleigh, including a village pub. Figure 5.2 shows the extent of the flooding.

A flood drop in event was held in East Budleigh on 15<sup>th</sup> January 2013 for the village and surrounding areas. Issues reported for East Budleigh included concerns over the existing Environment Agency flood defence scheme. Surface water was reported to be flowing through the gate to the channel and as a result, causing debris to build up. Residents had to work hard to keep this clear in order to stop the water backing up and flooding properties. The question was raised several times of ownership of the key to this gate and how best to manage this so that the gate could potentially be opened by residents during a flood event. There was also concern that the scheme was not performing as it should and the flows of water in the village were not getting in to the brook.

Drains were also a common concern with the local residents and those in critical locations in the village were reported to have been blocked at the time of the flood. This includes highway drains and gullies and a land drain at Wynards Farm, the ownership of which still needs to be clarified. However, further investigations are necessary to establish whether it was due to the shear volume of runoff unable to get into the overloaded systems.

Many of the local residents were keen to be involved in the East Budleigh Community/Emergency Flood Plan, keen to improve the preparedness of the village and ensure sandbags and equipment is available. The matter of the key to the flood defence scheme gate would also be considered as part of an emergency plan. This is something that will be developed by the EA and the local community.

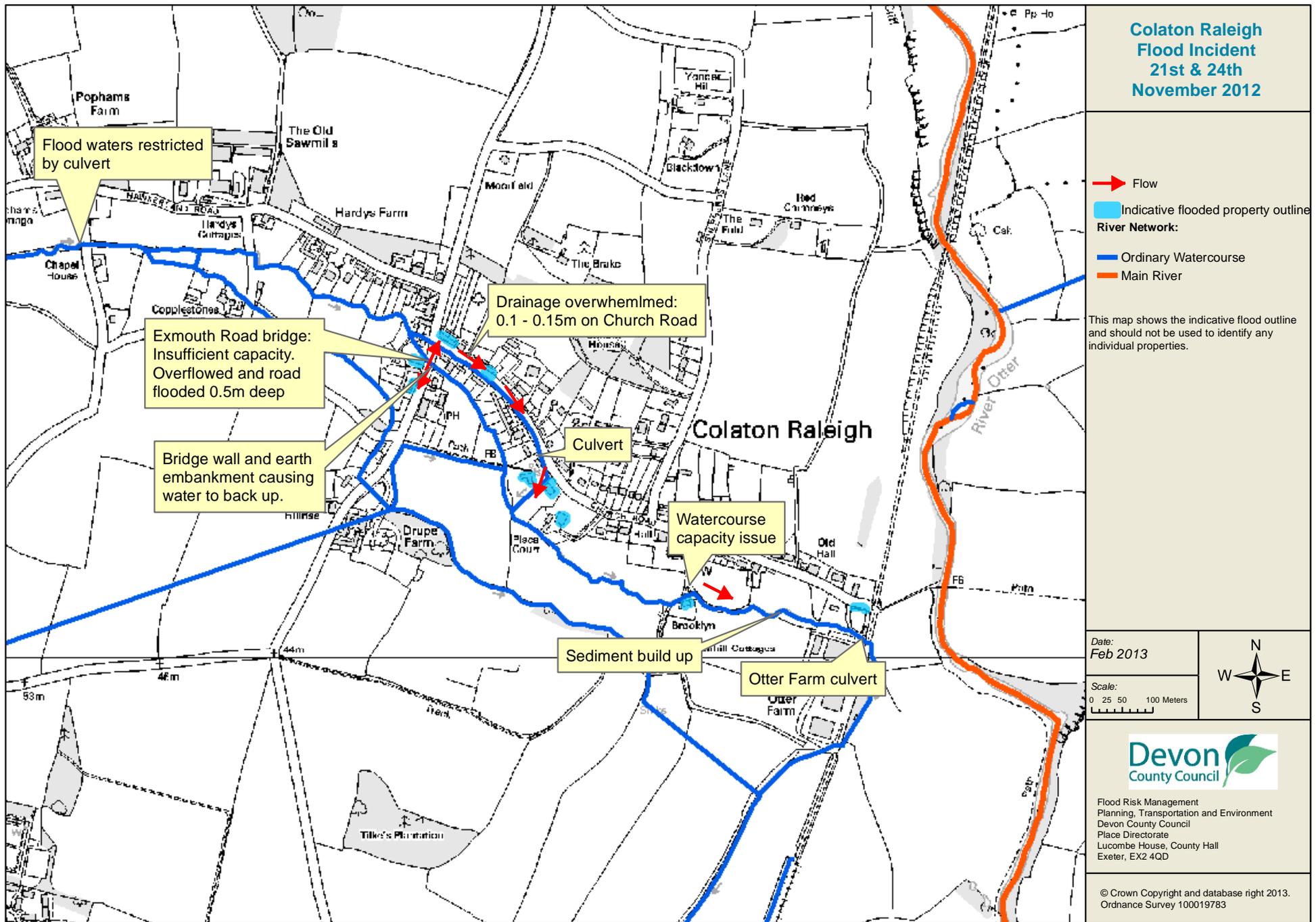


Figure 5.1. November flood extent and impact in Colaton Raleigh

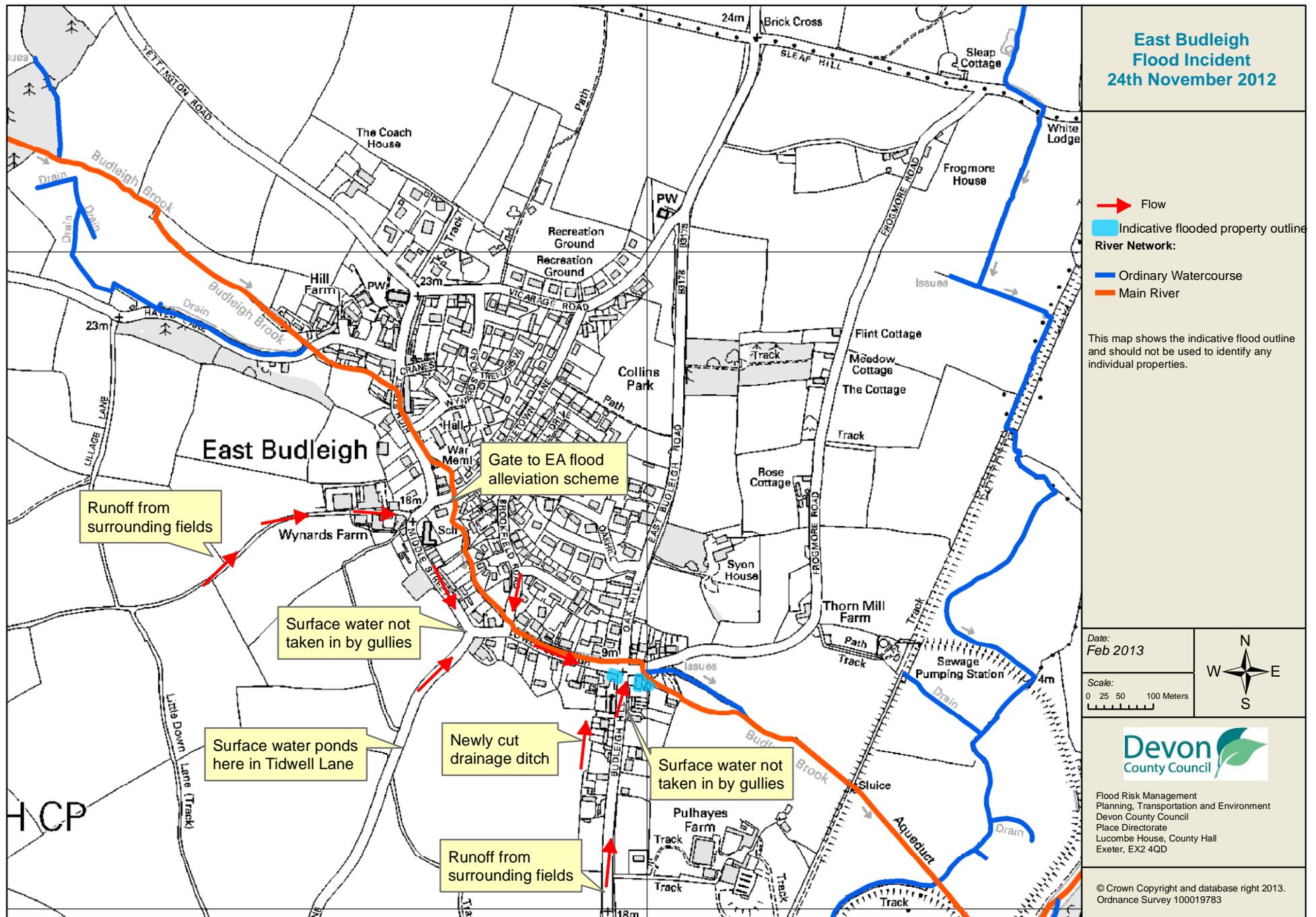


Figure 5.2. November flood extent and impact in East Budleigh

### **5.3.8. Exmouth**

In Exmouth, many roads were flooded with surface water and 12 properties were flooded in New Street. Many houses here had used sandbags but water still entered some. The flooding was a result of heavy rain and high tide resulting in surface water backing up, unable to discharge into the Estuary. Imperial Road was impassable on foot, with problems near Victoria Road in particular. St Johns Road was also reported as flooded.

### **5.3.9. Exton**

In Exton, 2 properties were flooded. Significant ponding occurred on Barton Close and Fire Services were deployed to pump away the flood water.

### **5.3.10. Fluxton**

In Fluxton, 2 properties were flooded. The watercourse to the West of the village was out of bank before it reached the main road, where the water level was nearly 1m deep. In addition to the stream bursting its banks it was reported that blocked highway drains may also have contributed to the flooding.

### **5.3.11. Harpford**

On 24<sup>th</sup> November 5 properties were flooded in Harpford. The Ordinary Watercourse which flows from the East of the village came out of channel on Higher Way and badly flooded 2 properties to a depth of 1m. Flows continued down the main road towards the bottom of the village, where it meets the River Otter. 2 properties in Lower Way were then flooded, in addition to 1 property flooded from the River Otter at the South of the Village near to Newton Poppleford Bridge.

### **5.3.12. Hawkchurch**

Just outside of Hawkchurch at Langmore Farm, 1 property suffered internal flooding due to flows exceeding the capacity of a culvert and surface water consequently running down a private lane.

### **5.3.13. Honiton**

Just outside of Honiton, opposite Springfield Farm, 1 property was flooded due to a ditch being blocked. This resulted in water running across the road into the property.

### **5.3.14. Killerton**

At the Killerton estate, 2 properties were reported to have flooded.

### **5.3.15. Lympstone**

In Lympstone, 11 properties were flooded on Longmeadow Road where an ordinary watercourse flowing from Exmouth Road came out of bank and flooding 10 properties. The water then re-joined the Main River Wotton Brook. Just on the outskirts of Lympstone, a blocked culvert was reported on Wotton Lane, said to be causing flooding to 1 property. Figure 5.3 shows the extent of flooding in the centre of Lympstone.

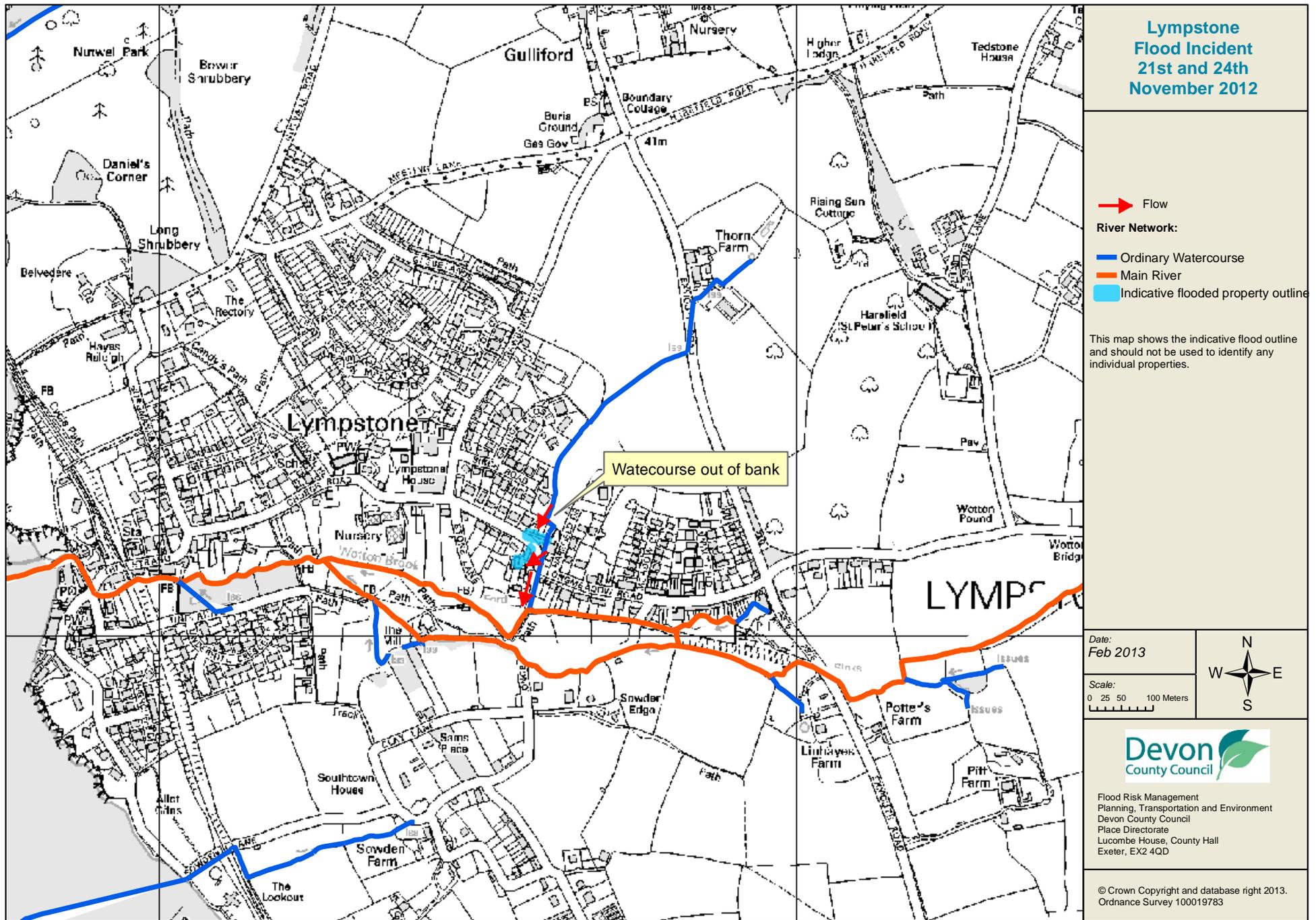


Figure 5.3. November flood extent and impact in Lymington

### **5.3.16. Membury**

1 property was reported to have flooded from surface water in Membury.

### **5.3.17. Nether Exe**

In Nether Exe, situated by the River Exe and other minor watercourses, the main road was flooded and 2 properties suffered internal flooding. It was reported that the water remained for several days as it was unable to drain away towards the river.

### **5.3.18. Newton Poppleford**

In Newton Poppleford, 2 properties were flooded from Back Brook and 1 from the River Otter.

### **5.3.19. Otterton**

3 properties were flooded in the village of Otterton. Due to the restrictions caused by the low bridges, flood waters spilled out into Ottery Street, flowing down the main road flooding 1 property. Other properties both immediately upstream and downstream just escaped flooding.

Surface water from Bell Street joined the flows from Ottery Street and ran into Fore Street. Water spilled out of the main flood channel flooding the road and flooded 1 property. Once again, many properties just escaped internal flooding. The area "The Green" was completely under water but fortunately property floor levels were raised and so no internal flooding occurred. 1 additional property was flooded from both the River Otter and the Otterton Brook.

Residents from Otterton also attended the East Budleigh flood drop in event on 15<sup>th</sup> January. Concerns raised included the availability of sandbags and questions about an emergency plan for the village. The restriction of flow under the bridges was also a concern.

It was also reported that fast flowing water was moving through the village on 21<sup>st</sup> and 24<sup>th</sup> of November and there is now silt and mud on the roads which needs to be cleared.

### **5.3.20. Ottery St Mary**

In Ottery St Mary, 1 property, a residential unit was flooded from the local stream.

### **5.3.21. Rudway Barton, Thorverton**

At Rudway Barton, near Thorverton but just over the border in the East Devon District area, 1 property was flooded. This was reported to be caused by plants and boulders that were blocking a nearby ditch. The boulder was reported to be quite large, requiring machinery to move it.

### **5.3.22. Seaton**

In Seaton, 1 property was flooded in Old Beer road from an ordinary watercourse.

### **5.3.23. Sheldon**

In Sheldon, near Honiton, blocked gullies were reported to causing flooding to 1 property. 6 inches of water was reported to have been flooding into the property and all along the road.

### **5.3.24. Sidmouth and Bowd**

Many roads were reported to have flooded in Sidmouth, including Manor Road, Seafeld Road and Station Road. It has been reported by residents that in the heavy rain experienced, these roads carry a lot of water. The water from these roads then follows the natural course down Coburg Road, with some continuing down Corburg Road and some ending up in Magnolia Cottage's parking area. The soakaway here cannot cope with the additional flows from the road and consequently fills up. In this incident, flooding was avoided by the resident holding a board up to keep the water on the road. It is believed that the drains were blocked in this area and that by raising the kerbstone that this situation could be avoided in future. Other suggestions for improvement in the area include the digging of a culvert at the top of the driveway along the

existing drainage run to replace a 5 inch pipe. Drains were also to be silted up in Manor Road, so the clearing of these may help improve the situation.

1 property in Yardlands flooded and blocked drains were reported on the highway outside the property. 1 property was also flooded in Woolbrook Road. Water was reported to be coming from the field opposite, with the drainage systems unable to cope with the amount of water coming down the road.

In Bulverton Park, 3 feet of water was on the B3176 adjacent to the road and a further 4-6 inches in the road, Bulverton Park. Residents have reported an issue with a culvert here and have sandbags to protect themselves in case of any further flooding. No properties were reported to have flooded.

In Bowd, just outside of Sidmouth, properties were reported to have flooded in Bowd Court.

In total, 2 properties are known to have flooded in Sidmouth and Bowd.

#### **5.3.25. Smallridge**

In Smallridge, just outside of Axminster, a highway culvert was reported to have collapsed, causing water to flood into 1 property. The water was also said to be going into the septic tank, causing a risk of sewage contamination. DCC Highways are aware of the situation.

#### **5.3.26. Stoke Canon**

In November 2012, Stoke Canon was affected by flooding from the River Culm. 2 properties were reported to have flooded.

#### **5.3.27. Talaton**

In Talaton, 2 properties were reported by the Parish Council to have flooded, Numbers 2 and 3 The Moor.

#### **5.3.28. Tipton St John**

EA reconnaissance records show that the areas flooded in Tipton St John on 24<sup>th</sup> November were along the main road through the village that crosses the River Otter, where the Garage and Pub were both flooded on the South side of the road. On the North side of the road, the Post Office was flooded from the rear and 4 residential properties were flooded from the road. 7 properties in total were flooded from the overtopping of the scheme on the Main River. Figure 5.4 shows the extent of the flooding.

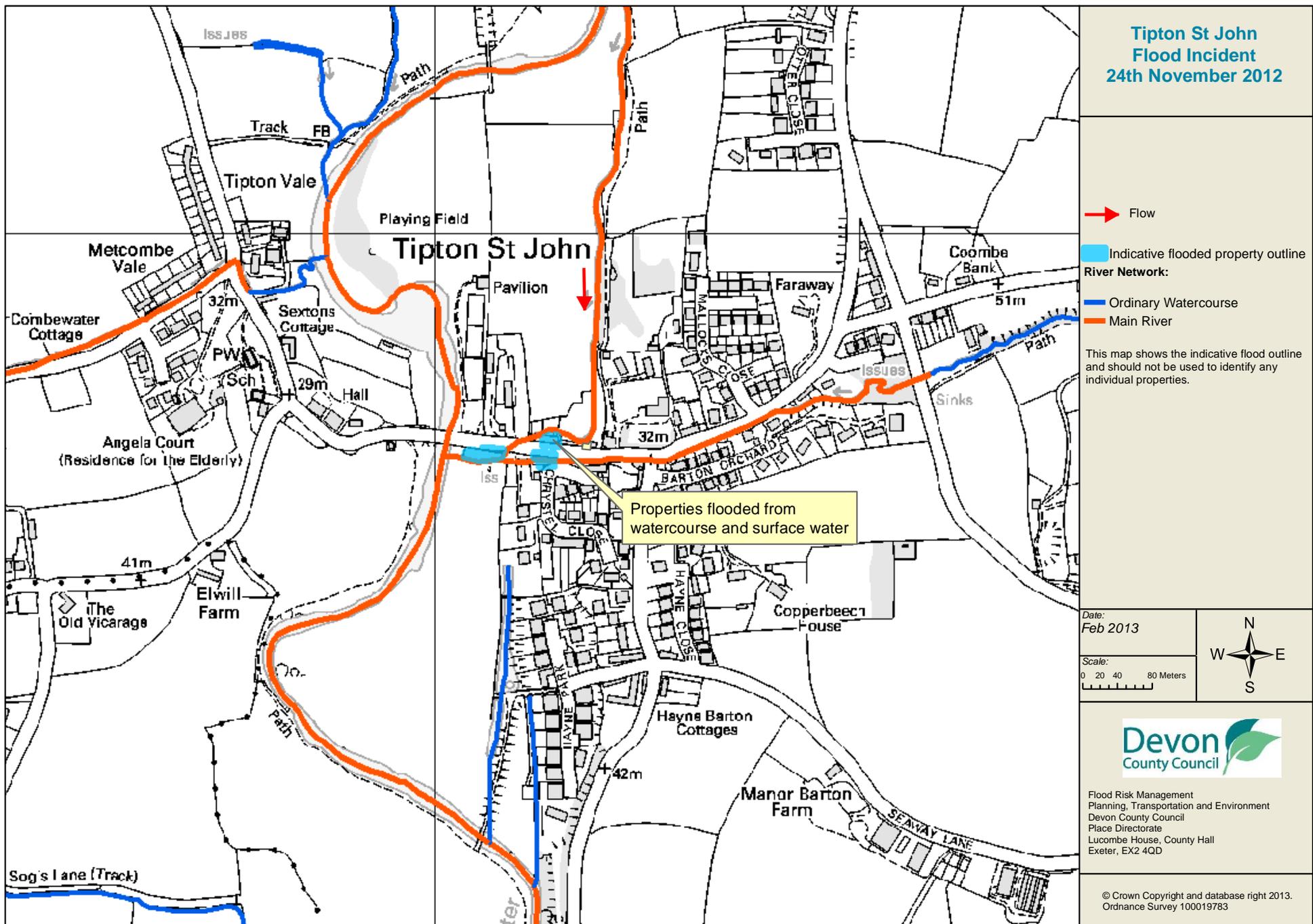


Figure 5.4. November flood extent and impact in Tipton St John

### **5.3.29. Uplyme**

Information on the November flooding in Uplyme has been provided by Uplyme Parish Council:

Heavy rain on 18<sup>th</sup> Nov caused heavy flooding in Cooks Mead, which had to be closed, due to sheer volume of water and the culvert being exceeding capacity. The cricket pitch and tennis court were flooded for a while and the (tennis court and children's playground covered in silt) but this was not from the breach of the wall by the South culvert. The Venlake culvert was brim full in places but did not exceed capacity.

Further heavy rain on 24<sup>th</sup> November caused the Venlake culvert to overtop and run across the road. Debris upstream and downstream was then removed by the residents. It should be noted that the ditches adjacent to the village hall were cleaned by DCC Highways on 21<sup>st</sup> November prior to the event.

In total 4 houses were flooded in Cooks Mead and Church Street, in addition to the 2 cricket pavilions.

Several meetings have been held by the Parish Council resulting in many actions to be taken forward by local residents to clean areas and remove debris, in addition to ensuring sandbags and other appropriate equipment is available.

At the Lyme Road South culvert to the River Lim, residents believe there is a blockage here and a build-up of silt. The bridge over the River Lim was reported to have been under water in the recent floods.

Properties on the South side of Cooks Mead have been using sandbags to prevent further flooding. The water flows across the road here due to a highway culvert exceeding capacity.

Debris is said to build up on private land at the entrance to a DCC highway culvert off Pound Lane. A large debris grill here would prevent this. This pipe then enters an open ditch on the opposite side of the road belonging to EDDC, from where it is still flowing across the road as a result of the culvert being blocked further downstream at Cook Mead.

### **5.3.30. Westwood**

In Westwood, Broad Clyst, at least 6 properties were flooded in the November event. This included a local shop, in addition to 5 residential properties and a further 3 that were saved by the use of sandbags. Other properties were flooded from inside the houses as water levels forced their way in. 2 properties at Feebers (National Trust) are partially addressing this with repairs. Pratts Farm was flooded as the drainage systems were overwhelmed and water came under the kitchen at the back of the house and flooded rooms at a lower level.

The main problem was said to be a concrete block wall between Pratts Farm and Woodground allowing the stream (that runs alongside the road) to flood the road, causing damage to highway and flooding to Eastons. DCC have put a few sandbags in the gap here. However, this has not been effective. It is thought that by rebuilding this wall, the risk of flooding to 6 properties could potentially be removed.

### **5.3.31. Whimble**

On both 21<sup>st</sup> and 24<sup>th</sup> November in Whimble, the River, The Cranny Brook burst its banks near to Slewton Crescent and further downstream at The Green. 2 properties were reported to have flooded internally, with outbuildings affected in two others.

### **5.3.32. Woodbury Salterton**

It was reported in Woodbury Salterton that no properties were flooded but that many escaped serious flooding with the flood waters only a few inches from properties. The brook that runs alongside Village Road was said to be overgrown with debris filling the channel and the drainage in Village road blocked. Therefore water came off the nearby fields and flowed into Village Road. The water from Honey Lane had nowhere to go as Grindle Brook was backing up. In this flooded

section of Honey Lane, in the dip by Greendale, have caused caused damage to cars and disrupted bus transport to the village.

Residents have expressed an interest in working with the authorities to make the village a safer place. This is something that could be incorporated into a community flood plan.

## 5.4. Recommended Actions

The heavy rain that fell across the East Devon region in already saturated catchments has resulted in the overwhelming of many watercourses and highway drainage systems. In some cases, blocked drainage has been thought to be a cause of the flooding, or simply inefficient drainage systems with drains and gullies. The actions that DCC recommend to be taken forward are listed in Table 5.1.

**Table 5.1.** Recommended actions for the District of East Devon.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	To ensure efficient operation of highway drains and culverts.	Review and carry out maintenance in problem areas
EDDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
EDDC	Review sandbag policy.	Review sandbag policy.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Budleigh Salterton:</b>		
EA	Investigate options to reduce the risk of flooding from the River Otter opposite the Cricket Ground	Partnership working
LLFA	Ensure efficient operation of culvert /bridge at Dalditch Farm	Investigate further work to improve the condition and capacity of the watercourse at Dalditch Farm culvert/bridge
<b>Clyst St Mary:</b>		
EA / DCC Highways / SWW / EDDC	To better understand the current flooding situation	LLFA to coordinate further investigations in line with other priorities.

<b>Colaton Raleigh:</b>		
LLFA / EDDC	Ensure efficient operation of culverts throughout the village.	Carry out a survey of the watercourse and a hydraulic assessment of culverts and bridges.
LLFA / DCC Highways	Ensure efficient operation of bridge/culvert at Exmouth Road.	Consider options to allow for larger flows at Exmouth Road and Otter Farm.
DCC Highways	Ensure efficient operation of highway drainage systems.	Works to improve the flood flows off the highway. Works completed by DCC Bridges.
EDDC / LLFA / Riparian land owners	Ensure efficient operation and maintenance of watercourses.	Ensure watercourse is free of debris and educate land owners of their riparian responsibilities.
<b>East Budleigh:</b>		
Local Community / EA	Improve community flood resilience.	EA Flood Resilience Team to work with community to develop a community flood action plan.
EA	To ensure the efficient operation of the East Budleigh flood defence scheme.	Use information collated at Drop In sessions to support minor scheme alteration.
<b>Harpford:</b>		
EDDC / LLFA	Consider improvement works for Ordinary Watercourse that runs through village	Consider a hydraulic assessment of watercourse and identify any restrictions of flow.
<b>Hawkchurch:</b>		
LLFA	Ensure efficient operation of highway culvert	Investigate capacity of culvert and consider options to increase culvert size.
<b>Honiton:</b>		
EDDC / LLFA	Ensure riparian responsibilities are adhered to.	Liaise with land owners to ensure watercourses are kept clear of debris and vegetation.
<b>Newton Poppleford:</b>		
EA	Ensure efficiency of watercourses River Otter and Back Brook	Investigate any restrictions of flow in the watercourse.
<b>Otterton:</b>		
Local Community / EA	Improve community flood resilience	Consider developing a community flood action plan.
<b>Tipton St John:</b>		
EA	To ensure assets are operating efficiently	Inspect Main River defences and review maintenance regime

East Devon

<b>Uplyme:</b>		
LLFA / DCC Highways	Ensure flood risk issues are considered in on-going work.	Continue working with Local Parish Council to take flood prevention measures forward.
EDDC	Continue with investigations to reduce flood risk.	Consider commissioning area survey.
<b>Westwood:</b>		
DCC Highways / EDDC / LLFA	To reduce risk of flooding to highway and property in the area.	Re-build section of wall by the highway.
<b>Whimble:</b>		
EA	To improve flood defences.	Continue promoting flood alleviation scheme.
<b>Woodbury Salterton:</b>		
Local Community / EA	Improve community flood resilience	Consider developing a community flood action plan.
Riparian owners / EDDC	Ensure efficient operation of watercourse	Ensure watercourse is free from vegetation and debris.

## 6. Feniton

### 6.1. Flood Incident Extent and Impact

Feniton is a village and civil parish in East Devon the English county of Devon. It lies approximately 4 miles (6.4 km) West of Honiton, 3 miles (4.8 km) North of Ottery St Mary, and 2 miles (3.2 km) east of Talaton. The parish of Feniton also incorporates the hamlets of Colesworthy, Higher Cheriton and Curscombe, and covers an area of 644 hectares (1591 acres).

Vine Water issues approximately 3km North of Old Feniton Village at Penscombe wood and runs East of Old Feniton Village before draining into the River Otter at Fenny Bridges.

Old Feniton Village area is drained by a culvert system that runs South Eastwards from the lowest point in the centre of the village on Curscombe Lane to Vine Water The culvert is some 300m long. The catchment draining to the culvert covers an area of some 17 hectares generally to the North of the village. Some 500m of Curscombe Lane is in the catchment together with a significant area of roofs and paved surfaces, all of which produce rapid runoff during rainfall. The undeveloped part of the catchment is steep and will respond by producing runoff quickly to rainfall.

There is a smaller catchment covering the Western part of the village; the runoff from this area drains down the road to Fenny Bridges.

New Feniton is also drained by a ditch and culvert system which takes water away from the village towards the A30.

On Saturday 24th November several areas within Feniton were affected by flooding. The areas worst affected were Salisbury Avenue and Wells Avenue and further down towards Metcombe Cottage. In total 15 Properties were internally flooded and many others had depths of up to 600mm in their gardens. Figure 6.1 shows the extent and impact of the flooding in Feniton.

12 properties in total were flooded in the area of Salisbury Avenue, Salisbury Close, York Crescent and Wells Avenue. This was caused by surface water running down York Crescent to the West and along Salisbury Avenue from East to West towards the low point in the road. Other low lying properties in the area narrowly avoided being flooded.

A further 2 properties were flooded just South of the Sewage Pumping Station. These properties flooded on both the 22<sup>nd</sup> November and 24<sup>th</sup> November as well as numerous times previously. Here the water ran off the surrounding hills and the existing drainage system was unable to cope with the volume. Also water backed up from the pumping station, along the ditch and overwhelmed the double culvert.

South West Water have investigated a DG5 (Sewer flooding register) property around the Burlands adjacent to Ottery Road. During the flooding sewerage started rising up through the toilets. A resolution of the issue is being sought.

A property was also affected in Old Feniton as the drainage system again was unable to cope with the surface water runoff.

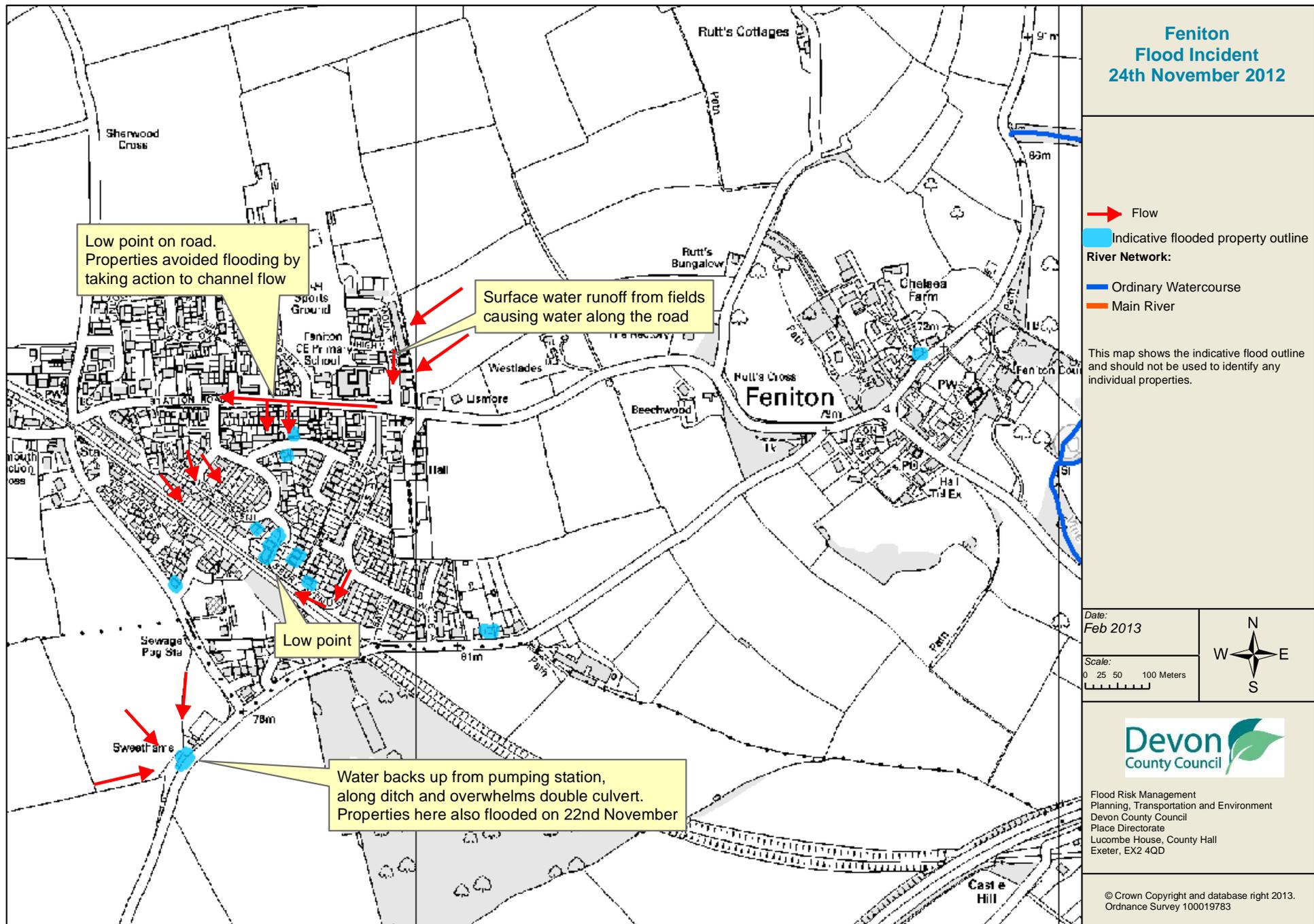


Figure 6.1. November flood extent and impact in Feniton

## 6.2. Historic Flooding

Feniton has regularly suffered from surface water flooding issues, where a number of properties in the village and roads in the area have been affected repeatedly as a result of runoff from surrounding fields running through the village, with insufficient drainage to cope with the large flows. In the October 2008 flood event approximately 21 properties were flooded in New Feniton and 8 in the old village.

## 6.3. Evidence Collected

### 6.3.1. Environment Agency Flood Reconnaissance

Information compiled by the EA Flood Reconnaissance Teams has been used to assess the impacts of the events on 24th November. The site was visited on 26th November.

### 6.3.2. Local Knowledge and Flood Drop In Session

Following a drop in event in Feniton on 3<sup>rd</sup> December 2012, many concerns from the local residents were noted:

Many reports were made of inadequate drainage in the village. In particular problems were experienced at Curscombe Lane, Chelsea Farm, Cherwell House and Wells Avenue. Water unable to drain on Feniton Road near to the A30 bridge was reported to overflow into Gosford Road and Pattersons Cross. A culvert behind Mount View and at Metcombe Cottage were also reported to have inadequate capacity to cope with the flood waters. Insufficient pipes were also reported in the Old Feniton village.

Concerns were raised with the water in York Crescent, which was reported to have come from Feniton Gardens and Wells Avenue. A Culvert in the corner of 39 York Crescent was reported to be in poor condition and residents were concerned of the condition deteriorating and increasing the problem.

Water was reported to flood Station Road and go down into the homes, naturally flowing down Salisbury Avenue and Close. It then cannot go any further because due to the railway line embankment causing it to back up. A blocked culvert was reported under the railway.

It was also reported that water was coming over the bank by 22 and 23 Feniton Gardens. The footpath slopes back towards the school here and because Feniton Garden residents now have flood defences, the water was coming along the foot path in between houses 34 – 36.

Many residents reported concerns over the sewerage problems in the village, such as at Salisbury Close, where sewerage pipes were backing up into houses and sewerage coming up through drains and manholes.

A common theme from the residents of Feniton was concerns over any new developments in the area and that this will increase the surface water problems. In addition to this, many are concerned with the resulting insurance premiums and falling house prices associated with the regular flooding of the village.

An additional safety issue was reported regarding the street lights turning off at midnight on 24<sup>th</sup> November. This caused problems as residents could not see the flow or level of flood water.

The recent flood event has highlighted issues of sandbag availability. It was suggested that a co-ordinator or warden role is needed to take control in flood event.

### 6.3.3. Development and Planning

A common theme from the residents of Feniton was concerns over any new developments in the area and that this will increase the surface water problems. It is essential that early discussions are had with developers to ensure a robust Sustainable Drainage System (SuDS) is provided.

There are currently concerns over the Wainhomes development on land East of Feniton. Proposals include either 120 homes or 59 homes on the site.

### 6.3.4. Feniton Proposed Flood Defence Scheme

The total cost of the new flood defence scheme is £1.6m, £500,000 coming from East Devon District Council (EDDC) with the remainder of the funding being sought from DCC, the EA and DEFRA (Department for Environment, Food and Rural Affairs). Figure 6.2 shows a recent plan of the proposed works at Feniton down to, and past Metcombe Cottage. In simple terms EDDC are planning to install a 1050mm diameter pipe on a new line under the railway to connect into the system just above Metcombe Cottage. A new ditch will be formed to bypass Metcombe Cottage and work will have to be carried out downstream to reduce any further risk of flooding at Patteson Cross and the properties all the way down to the Otter. EDDC is working closely with a developer to consider a flood channel and lagoon to control the water travelling down to Patteson Cross.

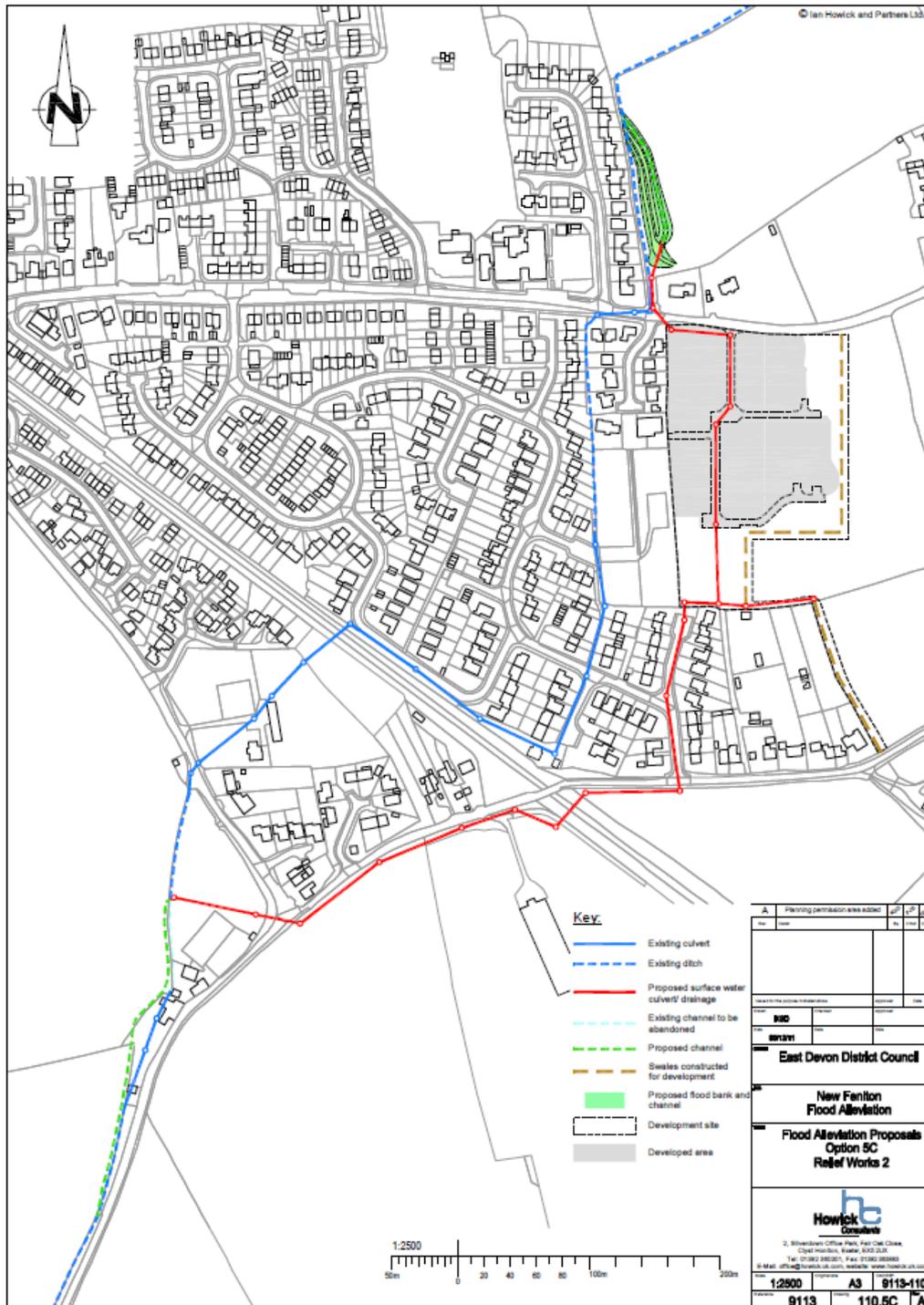


Figure 6.2. Proposed flood alleviation scheme for Feniton.

### **6.3.5. Highways Information**

At Salisbury Close, outfall pipes from the whole drainage system which pass beneath the railway are unable to cope with the large quantities of water which collect there, causing the whole system to back up.

In Station Road, underground storage capacity has been installed to cope with short periods of heavy rainfall. However, this was likely to have been filled to capacity by the time of the heaviest rain. A blocked drain beneath Station Road East of the village, which has since been cleared, may have directed some additional surface water in this direction. However, the system which water should otherwise have entered was itself overflowing where it enters a pipe in Coventry Close.

### **6.3.6. South West Water Information**

The foul water system was overwhelmed by surface water flow which led to flooding of the sewer network adjacent to the Sidmouth Junction SPS Ottery Road. This in turn led to the contaminated waste water flowing onto adjacent farm land and passing to a ditch which passes down to Sweethams and Metcombe Cottage.

SWW are commencing surveying the transferred sewer assets located principally North of the railway embankment (Salisbury Av, Wells Av et al). The estate is believed to contain many lengths of pitch fibre pipe which we are surveying for defects etc.

When the estate floods North of the railway embankment (caused by high quantities of land drainage flows escaping from an culvert that exceeded capacity around Station Road/Louvigny Close) SWW infrastructure in the vicinity becomes overwhelmed. This obviously does not have sufficient capacity to deal with such high levels of flow. The issue is exacerbated as the surface water gets 'stuck' against the railway embankment. The embankment does have a culvert(s) passing through it but this appears to be damaged (collapsed) or at least under capacity. It is believed the culvert belongs to Network Rail as Riparian owner.

Both pumping station wet wells have been cleared of any debris that was deposited during the event.

## **6.4. Likely Cause of Flood Incident**

The heavy rain that fell across the East Devon region in already saturated catchments has resulted in the overwhelming of many watercourses and highway drainage systems. In some cases, blocked drainage has been thought to be a cause of the flooding, or simply inefficient drainage systems with drains and gullies

## **6.5. Recommended Actions**

The actions that DCC recommend to be taken forward are listed in Table 6.1.

**Table 6.1.** Recommended actions for Feniton.

Action By	Recommended Action	How
SWW	Investigate sewer capacity and ensure efficient operation of public combined and surface water sewers.	Undertake a survey of sewer assets and continue maintenance regime and consider storm separation where appropriate.
DCC Highways	Ensure efficient operation of highway culverts and drainage	Investigate reports of blocked drains and continue routine maintenance.
EDDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
EDDC / EA / LLFA	Progress major Capital Flood Defence Scheme for Feniton	Continue to work in partnership to obtain funding, prepare detailed design and deliver scheme.
EA / Local communities	Increase community resilience.	Develop community emergency/flood action plan.

## 7. Exeter

### 7.1. Flood Incident Extent and Impact

The impact of flooding across Exeter was seen at various isolated locations along the River Exe and some of its tributaries, in addition to surface water problems in other areas on higher ground. The most significant areas affected were several properties in Exwick from surface runoff, properties flooded in Countess Wear and properties in Topsham, close to the Estuarial waters of the River Exe. In total 16 properties were flooded, including 7 commercial properties. Figure 7.1 shows the extent of flooding across Exeter.

### 7.2. Historic Flooding

The Exeter area has previously flooded with properties affected by the Main River Exe and various other ordinary watercourses that run through the city. The most significant and memorable flood event was in 1960 when the River Exe burst its banks, flooding approximately 1,000 properties in the city, in particular affecting the St Thomas and Alphington areas. Surface water flooding has also been an additional problem affecting properties throughout Exeter more recently in the 1980's onwards. Highway records also show many instances of blocked surface water drainage and flooding of roads and property in recent years.

### 7.3. Evidence Collected

#### 7.3.1. Highways Information

Several incidents of blocked drainage and subsequent road and property flooding in Exeter were reported to DCC Highways throughout the November event.

At Westminster Road in Redhills, blocked gullies were reported to be causing rainwater to flood the pavement and flood the properties backing onto the pavement. As a result, the rear gardens flooded. Residents were concerned about the retaining walls holding up with the vast amount of water cascading down from the path above. The number of gardens affected is unknown.

At Harrington Lane, Pinhoe, 1 property was reported to have flooded due to blocked drainage. This was said to have been close on previous occasions but the first time to have flooded the house.

The Cowley Bridge Inn pub was reported to have flooded badly on the morning of 21<sup>st</sup> November. On 22<sup>nd</sup> November, 1 – 2 inches was said to be covering the pub floor. A blocked storm drain on the road opposite the pub was thought to be contributing to the problem.

Ferry Road in Topsham was reported to have flooded on 25<sup>th</sup> November, with various drainage problems reported along the length of the road, from Ashford Road to Holman Way. Here, when combined with high tide, the recreation field floods which extends into the highway and the road gullies surcharge rather than remove water, due to the drainage outfalls being in the river. 1 pub was flooded here and other properties on Ferry Road were required to take action to prevent flooding, such as sandbagging along their property frontages.

#### 7.3.2. Local Knowledge and Flood Drop In Session

Following a drop in event in Exeter on 18th December 2012, many concerns from the local residents were noted:

Concerns included queries on the proposed River Exe flood defence scheme and how properties will be protected in the interim before the scheme is completed.

The maintenance of drains in the areas of Ferry Road in Topsham and Norwich Road in Exwick were raised, in addition to a report of the culvert in Lincoln Road that required improved

maintenance to keep the inlet screen clear of debris, which was undertaken in 2008 by SWW following a previous flood incident at this location.

In Mill Road, Countess Wear, the question of the efficiency of the a non-return valve was raised, that is fitted into a wall opposite Number 28. SWW issue?, in addition to concerns about maintenance required on the watercourse adjacent to Mill Lane, Countess Wear.

The Mill on the Exe is situated by the river as the Exwick flood relief channel joins the main river. The pub was flooded on 21<sup>st</sup> November and it was said that it did so before any warning was received. Therefore there was no time to put up defences.

The Royal Deaf Academy on Topsham Road was flooded in the basement from surface water. This resulted in the power supply being cut out.

1 property, a combined commercial and residential unit was reported to have flooded from Exwick Leat. Due to the close proximity & level of the property in question to the river, it is likely that the cause of this was due to the high level in the adjacent River Exe backing up into the tributaries, consequently severely restricting their outflow. It should be noted that this property has been identified for Individual Property Protection as part of the proposed River Exeter Flood Risk Defence Scheme.

### **7.3.3. Beacon Heath**

The Children's Centre in Beacon Heath suffered flooding on 21<sup>st</sup> and 24<sup>th</sup> November. On both occasions surface water ponded in the car park. The entrance foyer was saturated and water went under the inner door into the main office.

It was reported that the surface water comes down Chancellors Way and down a path behind properties on Chancellors Way. The Centre is lower than the Road, Beacon Lane and so the surface runoff pools in the car park.

### **7.3.4. Beacon Avenue**

The heavy rainfall in the November flood event repeated a recurring land drainage problem affecting 5 properties at Beacon Avenue. This has caused the rear gardens to flood and threaten the properties. This has affected sheds, patios and planting as the ground has remained waterlogged for long periods and exacerbated by rainfall events which cause the water level to rise towards the existing properties. The tenants are then forced to lift their inspection covers to their drains to prevent the water from threatening their houses.

There is a lack of clarity of the responsibility of the drain and land ownership issues. Recently, Exeter City Council (ECC) have unblocked the existing land drain which is located at the foot of the former railway siding embankment and discharges to the public combined sewer which serves this row of houses. The CCTV survey for this land drain revealed that it is in very poor condition and not likely to stay operational for very long without either collapsing or blockage. ECC recommend that this is replaced with a larger pipe contained within a French drain with a new outfall across the Southern end of the Council allotments to the culverted watercourse in Beacon Lane.

There are also complications with a recent development on the land immediately North above the affected properties. This concerns a possible leaking underground attenuation tank, designed for a 1 in 30 year rainfall event and is currently being investigated by ECC. This requires investigation in order to clarify land ownership and an inspection of the attenuation tank for water tightness and structural suitability. ECC are currently trying to resolve the land ownership issues to try to determine any responsibilities or liabilities and investigating the possible threat from the underground attenuation tank.

### **7.3.5. Norwich Road, Exwick**

Late on Saturday 24<sup>th</sup> November, 5 properties on Norwich Road suffered flooding, where the cause was believed to be a blocked inlet into a public surface water sewer, which consequently surcharged, causing the escaping flow to be mobilised overland into the rear gardens of the affected properties. These houses are arranged across the valley floor so that they impound the natural runoff or floodwater and hence suffered flooding to depths of up to 1.2metres deep against

the buildings, which inundated gardens, garages, "half" basement storage areas, but it is believed not within residences themselves. The floodwater did pass under their suspended floors via their airbricks from back to front. However, at least one property was evacuated by its owners.

SWW attended the blockage but were unable to relieve the situation, but did highlight the sensitivity of the flood risk and future need for more proactive maintenance at his location. Further investigation in the New Year revealed that the existing 675mm diameter sewer was substantially blocked some 70metres downstream from the inlet. A similar event occurred in 2008, after which SWW accepted the future maintenance liability of keeping the inlet to their sewer suitably clear, which initially seemed to be the main cause of the problem, but in this instance was not the case. SWW are now looking to change the status of this sewer to a culverted watercourse thereby passing the maintenance of it back to the many riparian ownerships along its length until it reaches the River Exe. ECC are challenging this move.

### **7.3.6. Marsh Barton Industrial Estate**

On Saturday 24<sup>th</sup> November at the Marsh Barton Industrial Estate on Matford Park Road, Westerly BMW and Truscotts Peugeot garages and showrooms were both severely flooded. 28 vehicles suffered water ingress in addition to the workshops and showrooms flooded at Truscotts and the valeting bays at Westerly. In the past the land opposite from the Westerly garage would have been flooded. However, on this occasion it did not. It is thought that the raising of the land here may have indirectly lead to water build behind and the highway drainage unable to cope. The garages are situated below the road level and this location has continued to flood several times since the November storms, in fact in 2012 the area has been reported to have flooded 9 times, with the most significant being in November. This recurring flooding has resulted in huge costs and insurance claims of circa £250k.

A major development is underway in the locality, where the Garage owners believe that this is contributing to the flooding problem. A section 106 agreement requires the developer to include a new culvert in Bad Homburg Way. However, this is not required until more than 50,000 sq ft of floor space in the development is occupied. Negotiations are currently underway with developer to bring the construction of a culvert forward. Following a further planning application by the developer to adjust and further extend the development plateau, an opportunity has arisen to re-negotiate the location and timing of this proposed relief culvert and will be reviewed and conditioned accordingly. ECC planners are aware of the Flood Risk at this location.

A South West Water flow pipe discharges into the stream (tributary to the Matford Brook) and the ditches alongside the Park & Ride car park. It is believed that these pipes require non return flap valves and an urgent need to address where the water should flow.

Following further investigations and the undertaking of temporary works to stem the high level of base flows entering the watercourse from the Matford Brook immediately upstream of Matford Bridge, the immediate risk of the repeated flooding incidents to the garage premises and the Council Park & Ride Facility have been significantly reduced. Part of the problem was found to be from a substantial blockage to the inlet of the road culvert under Bad Homburg Way which was removed by ECC. Other successful interim measures have been taken to stem the high base flows entering the watercourse from the Matford Brook by partially blocking a "take off" pipe (circa 600mm diameter) and reinstating slot boards on the sluice on the downstream side of the Bridge structure under Dawlish Road. Teignbridge and Exeter City Council have agreed to such measures with a view to agreeing a permanent solution when the relief culvert is installed by the developer and subject to formal consents from DCC as LLFA.

It should be noted that one rainfall event did apparently exceed the capacity of the main Matford Brook culvert under Bad Homburg Way which caused flows to back up and overtop the adjacent Highway (Dawlish Road) and re-enter the watercourse that flows towards the garage premises, which the interim measures would not prevent a repeat of.

### **7.3.7. Mill Road, Countess Wear**

Close to the River Exe on Mill Road in Countess Wear, at least 10 properties were affected from flood waters. 2 properties flooded despite having individual property protection measures in place.

A third such property narrowly escaped internal flooding after its external defences were finally inundated after apparently being effective for some time.

### **7.3.8. Exeter Flood Defence Scheme**

The proposed Exeter flood defence scheme has now been granted the additional funding required to allow the project to go ahead and is programmed to be complete during 2017. This scheme will substantially reduce the risk of flooding from the River Exe between Cowley Bridge Road and Bridge Road at Countess Wear and increase the current protection to some 4000 properties and 1000 business premises within the City.

### **7.3.9. Current Studies**

Exeter is included in the current surface water management studies underway by DCC, working in partnership with other local RMAs such as ECC, the EA and SWW. The Surface Water Management Plan Phase 2 concentrates on Exeter and the identified 'wetspots' that require further investigation and surface water modelling work in order to identify possible solutions to reduce the flood risk to vulnerable properties. The wetspot catchments include the areas North East of the city and River Exe, such as Pennsylvania, Stoke Hill, the university, Heavitree, Whipton, Wonford and Pinhoe. It should also be noted that the Norwich Road area will be one of ECCs desk top studies to be completed as part of the Exeter SWMP. The Exeter SWMP phase 2 report is due to be published by June 2013.

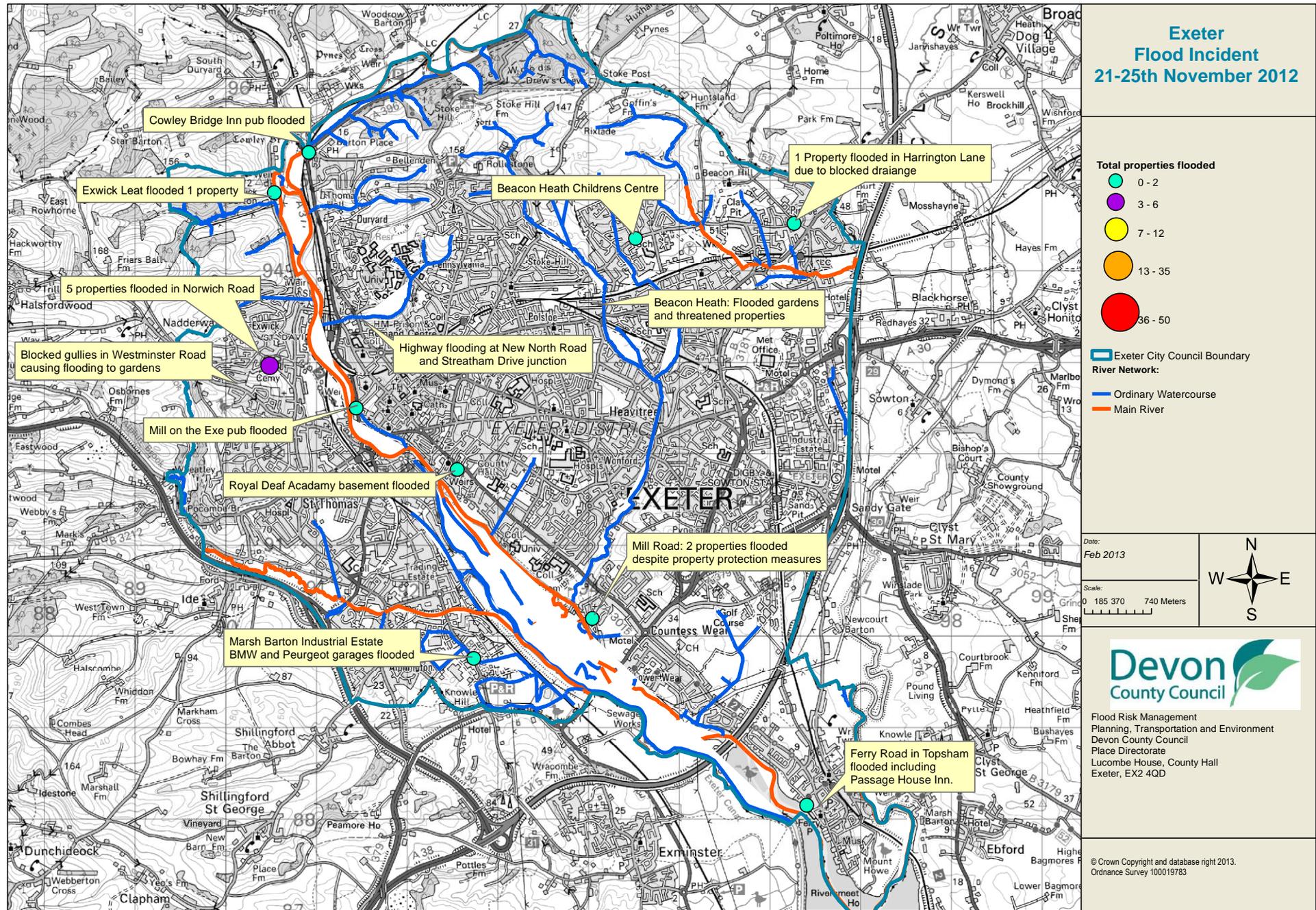


Figure 7.1. November flood extent and impact in Exeter

## 7.4. Recommended Actions

The cause of flooding in Exeter is very specific to each location as the affected areas were isolated across the City. In many areas, it was a case of insufficient drainage and there are possible solutions by improving the drainage systems to take higher flows or simply to ensure that drains are not blocked. Other flooded locations were a result of the high flows in the River Exe. The recommended actions that can be taken forward are listed in the recommended actions for Exeter, Table 7.1.

**Table 7.1.** Recommended actions for the Exeter area.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	To ensure efficient operation of highway drains and culverts.	Review and carry out maintenance in problem areas
ECC / EA / LLFA /	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
ECC	Review sandbag policy.	Review sandbag policy.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Beacon Avenue:</b>		
ECC	Determine ownership of drain and ensure efficient operation of drainage system.	Investigate and clarify land ownership. Carry our inspection of attenuation tank for water tightness and structural suitability. Consider options for improving capacity of drainage system.
<b>Beacon Heath:</b>		
Property owners	Consider flood risk to own properties.	To install property level protection where necessary.
ECC	Ensure efficient operation of watercourse	Investigate operation of watercourse upstream near Chancellors Way for any restriction of flow and liaise with riparian landowners.

<b>Norwich Road:</b>		
ECC / SWW	To ensure efficient operation of drainage systems	ECC to work in partnership with SWW to carry maintenance work on sewer inlet and determine suitable future maintenance arrangements, i.e. ECC to potentially work as a sub-contractor.
<b>Marsh Barton:</b>		
ECC / TDC / LLFA	To ensure the efficient operation of drainage systems in the area	Continue to develop actions to alleviate the risk and to find a permanent solution.
SWW	To ensure assets in area are operating efficiently	Work in partnership with local authorities and carry out routine maintenance and improvements in the area
<b>Mill Road:</b>		
EA / ECC	To review flooding situation	Encourage property protection improvement.

## 8. Mid Devon

### 8.1. Flood Incident Extent and Impact

The November flood event affected many small towns and villages across the District. The most significant of these was in Cullompton, with up to 50 properties affected. However, this has been addressed separately in Chapter 8. In many cases, the flooding has affected single properties. Larger impacts have been in locations such as Tiverton and Fordton. Over 30 properties were flooded in total in Mid Devon, excluding Cullompton.

### 8.2. Historic Flooding

Many of the Mid Devon communities covered in this chapter have a history of previous flooding. In the 1960 floods, the whole village and industrial estate at Fordton was flooded from the River Creedy, affecting approximately 37 properties and 14 properties in Culmstock. Culmstock has also seen more severe flooding since, with 20 properties affected in 1968 from the River Culm and further, more minor events in 1983 and 1992.

In 1969, 40 properties were affected from heavy rain in Bampton. In October 2000, Bampton also had over 18 properties affected and 20 again in Dec 2000. In the 2008 October storm 10 properties were flooded from prolonged heavy rainfall in Kentisbeare.

### 8.3. Evidence Collected

#### 8.3.1. Ashill

In Ashill, 1 property was internally flooded in Ashill Moor. The drainage was said to not be blocked, but unable to cope with the large volume of water.

Blocked drains in the village were causing water to flow down the road and flood the courtyard near the Church. However, there were no other flooded property reports.

#### 8.3.2. Bampton

In Bampton, 3 basements were reported to have been flooded from an ordinary watercourse. The EA flood defence scheme here performed well and protected properties.

#### 8.3.3. Bradninch

In Bradninch, surface water runoff from the fields came down the roads, Fore Street, Hen Street and Cullompton Hill in particular. 1 property on Parsonage Street, off of Cullompton Hill was hit by flows from the roads and fields behind. Internal flooding was avoided through the residents own prevention measures, including repositioning the front door and building a retaining wall. However, the driveway and surrounding gravel was still washed away and water was close to the front step.

A culvert in Parsonage Road was said to be insufficient to take the large flows in addition to drains being blocked. In one case, some plastic tape had been left over the drain following highway maintenance.

#### 8.3.4. Crediton

High levels were recorded on the River Yeo. EA reconnaissance found that just outside of Crediton, 1 commercial property was flooded at Downes Mill. At Fordton most houses at risk were sandbagged and there was significant ponding in the field which some residents believed was most likely to have been caused by flow over the flood plain. The flood defence scheme was well within design flows.

In Fordton, 6 properties were reported to have been affected by flood water. However, no properties were actually flooded internally due to the use of sandbags. Flood water was reported on the road at Fordton Terrace and Fordton Plain, especially in front of the Garage. It was reported that the drains here were blocked with leaves and debris and that there is an ongoing problem with standing water.

It was reported that the leat at the back of the properties was dealing with the amount of water but the highway runoff could not get to the leat. A local farmer helped the residents with a vacuum tanker and some steel rods. It was said that the highway drainage was blocked, but even if this was clear it would not have been able to deal with the amount of water.

At Creedy Bridge, 2 properties were flooded due to a combination of the River Creedy and surface water runoff. A solution to the issues in this area are already being considered by DCC Flood Risk Management and Highways and MDDC, as well as the residents and landowner.

Just outside, to the West of Crediton, 1 property was also flooded.

### **8.3.5. Culmstock**

EA reconnaissance carried out in Culmstock on 21<sup>st</sup> November showed that the flood defence wall contained flood waters but the freeboard was as little as 50mm. There were no signs of leakage or damage. Surface water was ponded in the road to a depth of up to 100mm and traffic was passing with care. Several properties North of the bridge had suffered internal flooding in the order of up to 150mm.

Throughout the flood event from 21<sup>st</sup> – 24<sup>th</sup> November, at least 4 properties were affected but are not known to have flooded internally. 2 residential properties and a Public House was flooded internally to a depth of approximately 100mm. At the Cullompton flood drop in event held on 6<sup>th</sup> December 2012, residents of Culmstock were concerned about a highway ditch and blocked culvert adjacent to the road by these properties, in addition to a SWW 12 inch pipe narrowing to 6 inches as it passes through these properties. Sewerage was in the flood water here and it is believed by residents that the sewer systems cannot cope with the number of properties that the system serves.

Properties to the North of the pub were affected by highway and field runoff. This would be more frequent without efforts of local residents to keep drainage running. There is a potential solution here for collecting runoff more efficiently and creating new discharge but this will require investigation with DCC Highways and landowners.

### **8.3.6. Hemyock**

In Hemyock, 3 properties were flooded in the Cornhill and Fore Street area.

### **8.3.7. Halberton**

In Lower Town, Halberton, 1 property was reported to have flooded. This was due to excess surface runoff from a nearby farm, a DCC smallholding, in addition to restricted flows in a culvert in a garden of a private property, which has a smaller capacity than the highway culvert that feeds it.

### **8.3.8. Hele**

In Hele, 3 Properties were reported to have flooded from the River Culm and the backing up of drains, including 1 property on Streathculm Road. It was reported that debris in the stream was exacerbating the problem, in addition to blocked highway drainage. Station Road was also affected and was closed due to flooding.

### **8.3.9. Hookway**

There were reports of flooding in Hookway, with 1 property reported to have flooded internally.

### **8.3.10. Kentisbeare**

At least 3 properties were flooded on Fore Street and others threatened by flood waters close to the ordinary watercourse, in addition to land that was flooded by the church further downstream.

1 property on Fore Street suffered flood damage (despite having flood boards up). The flat-arch bridge on Fore Street has been reported to be silted up and collecting debris, which has resulted in nearly no flow under one of the arches.

On the outskirts of Kentisbeare, 2 properties were affected. 1 property at Goodiford Farm was flooded from surface runoff coming down the roads and the small watercourse, causing damage to the garden but no internal flooding suffered. At Goodiford Mill Farm, water was coming off the highway and onto the property. Surface water drains above and below river crossing by the property were reported to be blocked.

### **8.3.11. Morchard Bishop**

3 properties are reported to have flooded in Morchard Bishop and is said to be due to the effect of development. MDDC are currently investigating this.

### **8.3.12. Shillingford**

In Shillingford, 1 property was flooded. The fire service was unable to pump out the water here as the surrounding roads were also flooded.

### **8.3.13. Swandhams Farm**

On 21<sup>st</sup> November at Swandhams Farm between Sampford Peverell and Halberton, 1 property was flooded from surface runoff from the surrounding land. Problems with the highway drainage were reported here, with the capacity being exceeded by the large flows.

The road between the Railway Station entrance (Tiverton Parkway) and up to the roundabout was reported to be flooded with water covering the whole road.

### **8.3.14. Thorverton**

Thorverton has suffered from flash flooding in the November event. However, no properties were reported to have internally flooded on this occasion. Highway records show that surface water flooding occurred on the junction of Broadlands and Bullens Close. However, there are various reasons for the floods that have been suggested, including local farming practices, new development and changes and restrictions in the stream. Solutions to these problems include suggestions such raising the village bridge, taking away stone blocks and clearing out the watercourse and the possible construction of a dam with a sluice gate or outlet pipe.

### **8.3.15. Tiverton**

6 properties are reported to have flooded in Tiverton. The overtopping of the Ordinary Watercourse that originates from Bingwell Wood affected properties in Lime Tree Mead and Atherton Way, in addition to the Police Station. Drain covers popped and sandbags were used in front of the houses. A damaged and blocked culvert and grill are reported here. At least 1 property was reported to have flooded at Arnold Crescent due to a blocked grid.

Water was reported to be nearly deep enough to enter the airbricks of Exe View House. Water was said to be pouring down Long Drag Hill into North Devon Cottage Road. It is thought that this was due to blocked drains in the highway.

Highway flooding was recorded throughout Tiverton, including Leat Street and in particular in areas near to the rivers, such as just off of King Street, Andrews Street/Tumbling Field Lane, the Howden Road area and Chapel Street and Belmont Road.

### 8.3.16. Uffculme

In Uffculme, highway flooding was reported on Denners Way. A basement to 1 property was flooded on Denners Way/Bridge Street. There were also flooding issues at Yondercott Farm, which is ongoing and currently being investigated by DCC Highways and MDDC.

## 8.4. Recommended Actions

The flooding across the Mid Devon District in November was caused by various small watercourses exceeding their capacity, combined with highway drainage being overwhelmed and in some cases blocked. Each cause is very specific to the location and these are addressed in the recommended actions in Table 8.1.

**Table 8.1.** Recommended actions for the Mid Devon area.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	To ensure efficient operation of highway drains and culverts.	Review and carry out maintenance in problem areas
MDDC / EA / LLFA / SWW	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Bampton:</b>		
MDDC	Ensure efficient operation of watercourse	Liaise with riparian owners and ensure watercourse is free from any blockages
<b>Crediton:</b>		
LLFA / DCC Highways / MDDC / Residents	Continue to work to find solution to flooding problems at Creedy Bridge	Partnership working
<b>Culmstock:</b>		
SWW	To ensure efficient operation of sewerage systems	Investigate and ensure that systems in area are sufficient for the number of properties it serves.
LLFA / DCC	To ensure efficient operation of	Investigate possible solutions in

Mid Devon

Highways / SWW / Local residents	highway drainage and culverts	partnership with local residents
<b>Halberton:</b>		
MDDC	Ensure flood risk is reduced and any land drainage problems identified	Investigate and reduce flooding issues in the area at Lower Town
<b>Hele:</b>		
MDDC	Ensure efficient operation of watercourses	Ensure riparian land owners are aware of responsibilities and watercourses are kept clear of any blockages
<b>Hemyock:</b>		
MDDC / LLFA	Consider improvements to reduce flood risk.	Progress design of flood alleviation scheme.
<b>Kentisbeare:</b>		
DCC Highways	To ensure efficient operation of road drainage and flow under the highway bridge is not impeded.	To inspect as necessary and remove any blockages to drainage / bridges.
LLFA / MDDC	Continue with investigations in Fore street area	Partnership working and liaising with local residents
<b>Tiverton:</b>		
MDDC /LLFA / DCC Highways	Consider flood defences in Lime Tree Mead area	Investigate possible solutions and carry out maintenance and improvements on culvert and grill
MDDC	Ensure efficient operation of ordinary watercourses	Improve grill on culvert at Arnold Crescent
EA	Ensure timely flood warnings issued	Review flood warning criteria and trigger levels.

## 9. Cullompton

### 9.1. Flood Incident Extent and Impact

Cullompton is a town situated 16 miles North East of Exeter on the River Culm. Smaller watercourses flow into the Culm from the east (River Ken) and from the West (Spratford Stream, Crow Green Stream, Cole Brook and St Georges Well Stream). The M5 motorway passes to the east of the town and the river Culm flows beneath it just upstream of the sewage works in the South of the town.

The flood event in November was due to further heavy rain falling onto already saturated ground and also saw the highest recorded river levels in the Culm since 1962 (see Table 3.2). Two flood events occurred in November the first and larger of the two peaked at around midday on Wednesday 21<sup>st</sup> November 2012. The second flood event occurred on Saturday 24<sup>th</sup> November but this did not affect as many properties as the Wednesday flood event. The following account is for the Wednesday 21<sup>st</sup> flood event. Figure 9.1 shows the extent of the flooding.

The main areas affected by the flood event on the Wednesday were: Alexandria Industrial Estate, Rivermead, Pound Square, Duke Street and Meadow Lane.

At approximately 12:30pm Alexandria Industrial Estate started to flood as the River Culm overtopped a localised stretch of the earth embankment. Within half an hour it was fully inundated with up to 1m of water. Once inundated waters began to weir back over the defence into the river and people needed to be evacuated by Devon & Somerset Fire and Rescue Service by boat. Up to 20 units were flooded.

The M5 services flooded, possibly due to the presence of an old culvert that passes beneath the adjacent Exeter to Bristol railway line.

At Rivermead flood waters from the River Culm and Spratford Stream inundated 14 houses and 3 bungalows during the event. It was reported that water was backing up through drains and flooding properties before the rivers rose to their peak. Evacuation of properties was carried out by the emergency services.

Approximately 10 properties were also affected at Pound Square and Waterloo Cottages due to flows overtopping channels and exceedance of the capacity of road culverts beneath Exeter Road. Evidence suggests the road culvert at Exeter Road was half full of silt which was a contributing factor to waters flowing over into Exeter Road.

There is also evidence that suggests that South West Waters sewage works, which is situated to the South of Cullompton, flooded.

Many roads were also affected by the floods. The B3181 was flooded to a depth of approximately 300mm from the River Culm by Baulk Bridge during the peak of the 21st November event. Flood waters from the Spratford Stream also affected the B3181 by Five Bridges on that event.

Waters from the Crow Green Stream flowed over Exeter Road, Cullompton on the morning of the 21<sup>st</sup> November causing flooding along Brook Road, Pound Square and Meadow Lane. It is also possible this occurred on the evening of the 24<sup>th</sup> November.

Waters from a tributary of the Cole Brook flooded out of bank at the road bridge on Colebrooke Lane and through the residential estate to the Exeter Road roundabout at Knightswood and Heyridge Meadow. There are reports that netting on the bridge, presumably for stock control, blinded with material which exacerbated the problem. It was also reported that sewage occurred in the surface water at Knightswood.

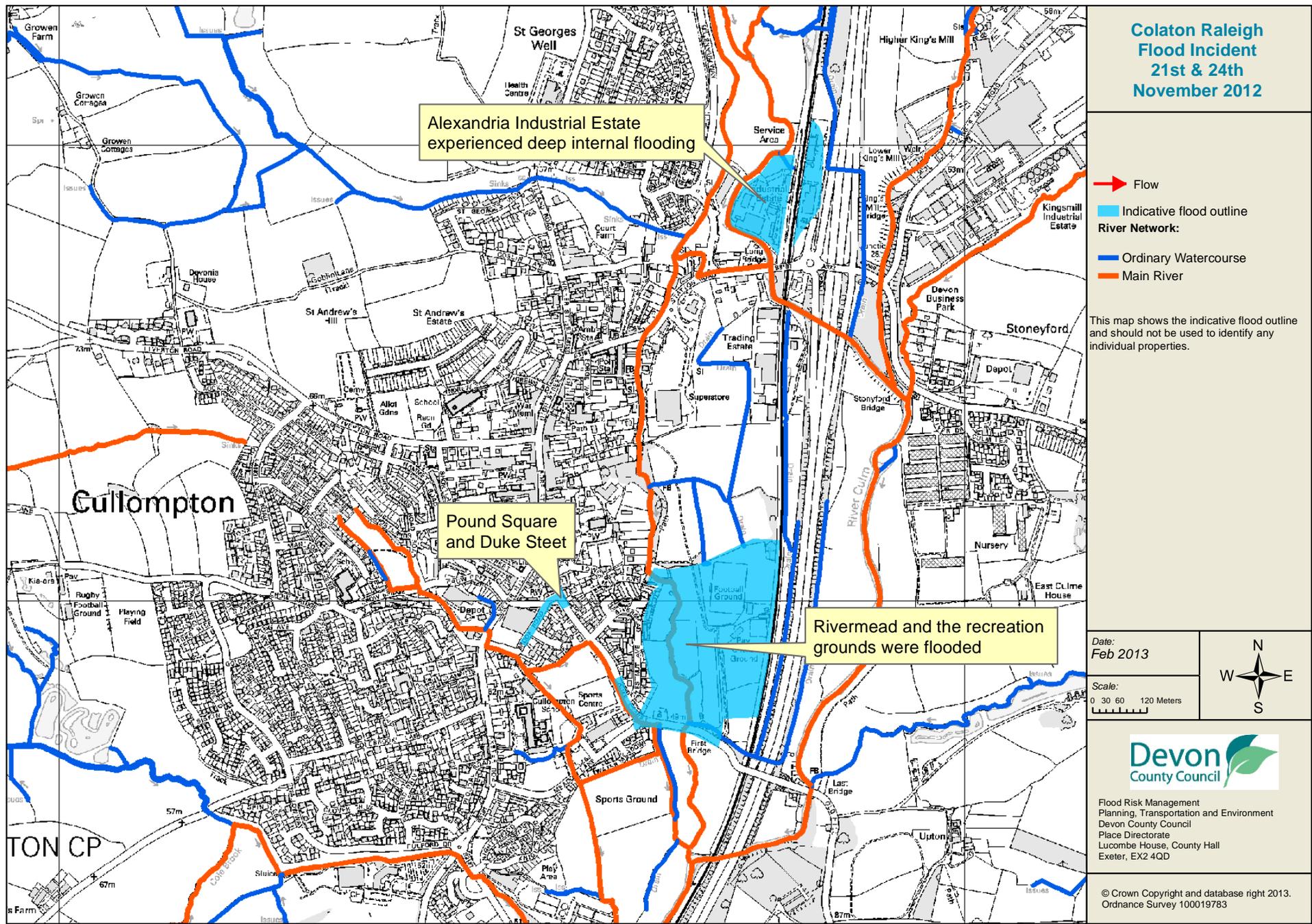


Figure 9.1. November flood extent and impact in Cullompton

## 9.2. Historic Flooding

Due to the presence of numerous watercourses and the large areas of floodplain, Cullompton has experienced flooding in the past. The list below is an example of some of the past flood events and is not a comprehensive history of flooding.

29/10/2008	Land flooded, no properties believed to have been affected
15/10/2002	At least 1 property flooded
07/12/2000	At least 1 property flooded
30/10/2000	Road and railway flooded, property numbers unknown
01/01/1999	Several houses flooded in Kingswood estate
07/08/1997	Estimated 30 properties affected by flooding
24/05/1989	Approximately 10 properties flooded
17/11/1980	North farm estate flooded. Estimated that 40 properties flooded

## 9.3. Evidence Collected

### 9.3.1. Environment Agency Flood Reconnaissance

Information compiled by the EA Flood Reconnaissance Teams has been used to assess the impacts of the events on 21st and 24th November, from photos, wrack marks of water levels and observation of flooded locations and the invaluable contribution of accounts provided from the residents of Cullompton. The site was visited on 21st and 23rd November and 3rd December and subsequent visits were conducted to collect further information, assess the condition of flood defences and river channels and survey flood levels.

### 9.3.2. Local Knowledge and Flood Drop In Session

Information from a 'drop in' flood session in Cullompton on 6th December and from discussions with local residents has highlighted that the main public concerns are the lack of maintenance for leats, ditches and culverts. There is also a strong feeling in the town that highways culverts are not up to capacity and do not get cleared frequently enough.

### 9.3.3. Development and Planning

Waters from the St Georges Well Stream appeared to have flowed through the green open space corridor on the Persimmon Homes development (Court Farm Phase 2). The flood corridor performed as it was designed to do.

Flood waters from the Crow Green Stream inundated the floodplain at the new, as yet unfinished, Knowle Lane development upstream of Langlands Road. None of the new houses were flooded due to them being situated outside the floodplain of the watercourse. Surface water runoff from the development would have been contained within the underground attenuation tanks, and lagoons.

The recent (2006) improvements to the B3181 road culvert by the old Toad Hall, and access bridge to the development, appeared to have contained flood waters from the Cole Brook on the morning of the 21st November. These measures helped prevent widespread flooding of Knightswood from the Cole Brook, as occurred in August 1997.

## 9.4. Likely Cause of Flood Incident

The evidence collected for this flood event highlighted many causes for the flooding experienced in Cullompton in November 2012. Flood defences were overtopped by high river flows and some culverts and drainage systems in the town were not large enough to convey the volume of water created by the flood. None of these systems failed in their design to reduce flood risk however it was apparent that this flood event was larger than the design capacity of some of these structures. There is also evidence that suggests that a lack of maintenance of highway culverts and fly tipping/vandalism, contributed towards flooding, in particular on the Crow Green Stream. A lack of routine maintenance of road gullies, and minor ditches/watercourses, was almost certainly a contributing factor towards instances of localised surface water flooding.

## 9.5. Recommended Actions

In order to reduce the risk of flooding in Cullompton in the future, it is recommended that several actions are taken. These are listed in Table 9.1.

**Table 9.1.** Recommended actions for Cullompton.

Action By	Recommended Action	How
EA / Local communities	Increase community resilience.	Develop community emergency/flood action plans.
EA	Consideration of flood management options.	Develop 2D river model for the Culm and tributaries. Working in partnership with Devon County Council
EA	Removal of debris within scheme.	Complete
EA	Screen and embankment improvement	EA to investigate current situation and available options
LLFA / DCC Highways	To ensure efficient operation of highway drainage	To assess condition of watercourses and drainage systems in problem areas such as Exeter Road, Pound Square, Duke Street and Rivermead. Carry out routine maintenance and clear any blockages.
EA / MDDC	Public awareness of fly tipping	PR to local community.
MDDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
MDDC / LLFA	Review of flood risk from local sources.	Consider catchment study / assessment of risk.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
Property owners / EA / LLFA	Consider flood risk to own properties.	To install property level protection where necessary.

## 10. North Devon

### 10.1. Flood Incident Extent and Impact

In the November flood incident, North Devon saw very little impact to its communities. Only 2 properties have been recorded as suffering internal flooding, in isolated areas due to the heavy rainfall and surface water flows.

### 10.2. Historic Flooding

The history of flooding in the recently affected areas of North Devon is quite minor with no large numbers of properties affected. Cheldon has seen various instances of flooding on the highway at Cheldon Bridge and 1 property was reported to have flooded from the highway in 2009. In Westleigh, there have been various reports of blocked surface water drainage in recent years but no significant flooding recorded.

### 10.3. Evidence Collected

#### 10.3.1. Cheldon

1 property in Cheldon was flooded due to land drainage or potentially groundwater issues causing water to seep down the hill and against the property causing internal flooding.

#### 10.3.2. Westleigh

1 property was flooded due to the blocking up a large storm drain. It was reported that a concrete channel that runs from the drain was breaking up, causing water to leak into the hallway of the property.

### 10.4. Recommended Actions

The likely cause of incidents here are very localised issues, such as surface water or highway drainage problems that can be addressed by the appropriate authority or land owner. The actions that DCC recommend to be taken forward are listed in Table 10.1.

**Table 10.1.** Recommended actions for the North Devon area.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	To ensure efficient operation of highway drains and culverts.	Review and carry out maintenance in problem areas
NDDC / EA / LLFA / SWW	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Cheldon:</b>		
LLFA / NDDC / Land owner	Ensure efficient / appropriate drainage of land	Ensure land owners are aware of available options

## 11. South Hams

### 11.1. Flood Incident Extent and Impact

Many communities were hit by the November flood event in the South Hams area with over 40 properties suffering internal flooding. The areas of Avonwick, Ugborough and Yealmpton/Yealmbridge were the worst affected areas, although many single properties were flooded across the District from various local sources.

### 11.2. Historic Flooding

The South Hams towns and villages detailed in this chapter have various flooding histories, with many recently affected in July 2012 and reported in the Summer Floods Investigation Report, such as Harbertonford which had extensive flooding in 1999 and 12 properties flooded in July 2012. Modbury has had regular flooding problems in and around the town, in addition to 27 properties flooded in July 2012 and further flooding since. 20 properties were also affected in Yealmpton and Yealmbridge during the July 2012 flood event.

### 11.3. Evidence Collected

#### 11.3.1. Ashprington

At Lower Frogmore in Ashprington, 1 property was flooded from groundwater. The fire service pumped the water out but the water then re-emerged. In addition to this, 2 properties on the outskirts of the village are regularly affected by surface water runoff from adjacent farmland, where the highway drainage is overwhelmed.

#### 11.3.2. Aveton Gifford

Aveton Gifford was flooded on 21<sup>st</sup> and 24<sup>th</sup> November. The watercourse through the village flowed out of bank and got very close to the Village Store and Hall. There was no internal flooding here but water was said to have been 1 inch from the Hall.

The outdoor area of the school was also flooded '2 bricks deep' from surface runoff, but there was no internal flooding. A culvert under a road to the East of the school grounds was blocked and flood water from the adjacent field was flowing into the school grounds. This pipe had to be broken in order to let the flows back in downstream from the blockage.

Following on from the summer flooding DCC has commissioned a study in Aveton Gifford with a particular focus on the culvert near Homefield. This study will consider any impact on downstream properties if increased flows were conveyed downstream. The study will investigate these issues and consider suitable improvements that can be made.

#### 11.3.3. Avonwick

Following a drop in event held on 17<sup>th</sup> December 2012, concerns from the local residents were noted, in particular, queries were raised in Avonwick over the trigger level for the warning system. Highway records show that a surface water drain was blocked causing water to flow down the driveway of Avon Villa. Highway gullies have since been cleaned and jetted. Water was also reported in the road alongside the watercourse (which was overwhelmed) along 'Cobbled Way' and also on the road by the Church. Reports show that 4 properties were flooded.

#### **11.3.4. Bittaford**

In Bittaford, 1 conservatory was reported to have flooded. Flooding was reported on the road where the Lud Brook goes under the Railway and highway, in addition to water along the road to the West of this point.

#### **11.3.5. Frogmore**

Following a drop on 17<sup>th</sup> December 2012, many concerns from the local residents in Frogmore were noted. Residents were concerned about a group of properties flooded as a result of a local farmers field to the North of the village being ploughed, causing surface water to runoff into houses. It was reported that initially, properties higher up the village were affected, with some houses being flooded at the base of the ploughed field. The runoff then broke through further to the East through a narrow field and through a pub, affecting the kitchen, restaurant and bar. The field was reported to have been in pasture for the last 17 years. In total, 8 properties affected, with 5 flooded internally.

SHDC have visited the site in question on previous occasions where it is believed that surface water combined with high levels of silt and stone overtopped the field boundary hedge and entered the gardens and buildings. A property on the South side of the main road has also been affected when highway gullies have been overwhelmed and caused the outfall pipe through the garden to surcharge. SHDC have now commissioned a study in order to find a solution.

#### **11.3.6. Goveton and Ledstone**

Both of these communities lie in the bottom of steep valleys surrounded by a considerable area of arable land. Following heavy rain there were a number of properties and vehicles affected by the overwhelming of bridges and culverts causing water to flow across the highway where gullies were overwhelmed. 3 properties were flooded in Goveton but none are believed to have internally flooded at Ledstone. Residents however are keen to help themselves and would welcome guidance and support from the authorities.

#### **11.3.7. Harberton**

Following a drop in event on 17<sup>th</sup> December 2012, concerns from the local residents in Harberton were noted. Drains were overwhelmed near to Ford Farmhouse, where it was said that water coming in the village was mainly draining from the A381. At least 1 property is known to have flooded in Harberton, where a shallow road bridge was unable to cope with the large flows. The possibility of de-silting the stream bed together with providing a supplementary culvert through private land is currently under consideration.

#### **11.3.8. Harbertonford**

Following a drop in event on 17<sup>th</sup> December 2012, many concerns from the local residents in Harbertonford were noted. Concerns were raised about the widening work in the village that has impacted property due to increased flow. It was reported that lower parts of the river are maintained and that this resulted in a larger flow from the village to Crowdy Mill. The operation of Palmers Dam was also questioned, where it is thought that when it is open, the flow is too great, in danger of flooding Crowdy Mill. It was thought that the community would benefit from being educated to better understand the dam's use. 1 property was flooded in Harbertonford

#### **11.3.9. Kernborough**

In Kernborough 1 property was flooded, where highway drainage was overwhelmed by the quantity of water. This property was reported at the flood drop in event held in Totnes to have suffered from both surface water and groundwater flooding.

#### **11.3.10. Lee Mill**

On the 21<sup>st</sup> November, 1 property was reported to have flooded at Lee Mill due to blocked drains in the New Park Road, Lee Mill Bridge area, causing internal damage to the property.

### **11.3.11. Longcombe**

In Longcombe, 1 property was reported to have flooded. Sandbags were placed outside but were unable to stop the water getting into the property. Surface water runoff from nearby fields was said to have overwhelmed the drainage system.

### **11.3.12. Modbury**

The town of Modbury has suffered from recurrent flooding and was featured in the DCC Summer Flood Investigation Report<sup>1</sup>. This resulted in a series of actions which are still being progressed, including a survey of the culvert at the Exeter Inn Pub, designing a new grill for the culvert in Burns Lane and carrying out a catchment study to understand the hydraulic processes in the area in order to focus improvement works. This study is due for completion in April 2013.

A meeting is also to be held with brewery officials to discuss their forthcoming consultant's report and proposals for the culvert running below the Exeter Inn.

Modbury suffered further flooding on 21<sup>st</sup> and 24<sup>th</sup> November, when 6 properties were flooded, including 1 residential property. The Exeter Inn pub area was flooded again, in addition to commercial properties on Galpin Street and at the bottom of the valley at Swanbridge Mill. These properties were also flooded badly in July and have been again since the November incident.

Surface water was running down Brownstone Street and it was reported that a local farmer had blocked a field entrance towards Marys Cross that exacerbated the situation.

### **11.3.13. Noss Mayo**

In Noss Mayo 4 properties flooded in total, 3 residential and 1 business. DCC highways have been made aware of the issues and are currently investigating.

### **11.3.14. South Barton**

In South Barton on 21<sup>st</sup> November, 3 properties were reported to have flooded due to blocked gullies.

### **11.3.15. South Milton**

In South Milton, on 25<sup>th</sup> November 2 properties are known to have flooded and the main road through the village was reported to be impassable.

### **11.3.16. Thornham and Lower Keaton (Ermington)**

In Lower Keaton, 1 property was reported to have flooded, with the water flowing down the lane from Penquit. 3 properties were reported to have flooded from the River Erme.

Just South in Thornham, 1 property was nearly flooded on 24<sup>th</sup> November for the second time since July 2012. It was reported that the nearby leat was blocked upstream contributing to the problem. The owner is looking into developing a scheme to prevent further flooding.

### **11.3.17. Totnes**

In Totnes, 3 properties were flooded at various locations in the town. Following a drop in event on 17<sup>th</sup> December 2012, many concerns from the local residents were noted:

2 properties on Plymouth Road were flooded on 21<sup>st</sup> November (in addition to flooding previously on 6<sup>th</sup> October 2012). The water was reported to have been coming down Jackmans Lane (a green lane) and exiting onto Plymouth Road. On both occasions, flood waters have brought with them a considerable amount of debris and silt, which is believed to have been deposited on Jackmans Lane. This caused the road to be closed and covered the drains, in addition to causing damage to property.

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<sup>1</sup> DCC Devon Summer Floods 7<sup>th</sup> – 8<sup>th</sup> July 2012 Flood Investigation Report November 2012  
<http://www.devon.gov.uk/devon-summer-floods-2012-joint-report.pdf>

The fields either side of Jackmans Lane provide a large catchment that drains into the lane, causing washed down silt and debris to block the gullies in Plymouth Road. Once these are blocked, the principal route for the water and debris to take is across Plymouth Road.

DCC Highways and Public Rights of Way have been involved in the surface water runoff and drainage issues at this location and in order to try and resolve the problem, action is being taken by DCC and a local resident. There is little that can be done to stop or redirect the water in the lower section of the green lane so numerous concrete bars are to be placed across here at strategic points to minimise debris and reduce the speed of the water prior to it reaching Plymouth Road.

The highway drainage is to be upgraded at the bottom of Jackmans lane. Currently 3 gullies and a 6 inch pipe take the water under Plymouth Road with an outlet onto the road leading to Whitely Bridge. It is planned to increase the piped system to 12 inches and remove the gullies. These will then be replaced with a catchment pit to catch any debris washed down in a holding chamber, still allowing the water to access the piped system and drain away. The property owner is also taking their own precautions to protect their property from flooding.

1 property on the outskirts of Totnes was reported to have internally flooded and that the drain opposite the property was not taking any water away.

In Smithfields, Totnes there were concerns with water flowing overland from farmland above from a stream which has not been maintained. The surface water runoff crosses the highway, which has insufficient gullies, and flows through private gardens giving concerns for building flooding. Several residents have carried out individual property protection in this area.

Longstanding drainage problems were also reported at Fallowfields.

### **11.3.18. Ugborough**

4 properties were flooded in Ugborough on 24<sup>th</sup> November, in addition to suffering in the July 2012 flood incident. Flooding was also experienced on 21<sup>st</sup> November but to a lesser extent. Several watercourses flow into the village and surface runoff from surrounding fields played a large part in the flooding problems experienced.

On Lutterbourn Street, 4 properties were flooded. The contributing factors are reported to be that the pipes where 2 streams pass under Lutterburn Street were totally blocked, causing water to come through the holes in the wall and down the embankment in Undertown. 2 other streams to the West which join the above to form one stream just before a private lane burst the bank and brought gravel, soil and vegetation down the lane which then covered and blocked drains. Water was cascading off the field up the lane towards Whitehouse farm, bringing shale and vegetation down the hill. Because the drains up this hill were already full of silt the debris and water continued down the road to meet water from the streams and from the private lane.

Concerns were raised by Ugborough residents with pipes under the road that cannot cope with the large storm flows and a grill in the watercourse that gets blocked up with debris. This issue is currently being investigated between a local resident, DCC and SHDC. Concerns were also raised regarding a large pile of gravel, rock and foliage that was left after the flood waters subsided which had to be shovelled up with a JCB in to the field behind Lutterburn Street. Debris was cleared out of several pipes that the watercourses flow through by residents after the July flooding, however, it is believed that a certain amount of debris may still be in these and require cleaning.

Residents have tried various methods of reducing the risk to property by building walls with sandbags to stop the stream coming through where it had previously in July, in addition to clearing pipes of debris as much as possible without appropriate equipment.

### **11.3.19. Wrangaton**

Flooding was reported on 21<sup>st</sup> November at 2 properties where drainage gullies were reported to be blocked.

### 11.3.20. Yealmpton and Yealmbridge

Throughout the November flood event, 4 properties were flooded in Yealmpton and 3 in Yealmbridge. Some of which were flooded on 2 occasions.

On 21<sup>st</sup> November 1 property in Yealmpton was flooded from surface water runoff coming over a hedge bank situated at the lower end of Bowden Hill. The neighbouring properties garage was also flooded. An ordinary watercourse runs through a culvert under Bowden Hill which could not cope with the flow of water, either due to a blockage or being of insufficient size. The sewage works in Yealmpton were also flooded, due to a build up of water behind Boldventure.

In Yealmbridge, 1 property was also flooded from surface water backing up from drains. It is likely however that these were unable to drain due to the high river levels.

On 24<sup>th</sup> November the properties at Stray Park were prevented from flooding due to the use of sandbags. 2 properties were flooded in Yealmpton on this occasion, in addition to the sewage works again. It is believed that these properties were flooded due to water being unable to enter the river and building up behind the flood bank.

In Yealmbridge 1 property was flooded for the second time in 1 week on 24<sup>th</sup> November, in addition to 2 more. It was thought that rising groundwater contributed the flooding here. 1 property on the road to Sunridge Nursery was also flooded by the adjacent brook.

In Yealmpton it is thought that the culverted stream that runs adjacent to Byeways was very full and had flooded the road at Higher Torr. When the stream reached the culvert under Ford Road it was reported to have been overwhelmed, resulting in a torrent of water down Ford Road towards Boldventure, in addition to water coming down Ford Road from Newton Ferrer's direction.

### 11.4. Recommended Actions

The likely cause of flooding across the South Hams is from a variety of localised issues, from local watercourses being overwhelmed and surface water and highway drainage unable to cope with the large flows. In some cases, groundwater flooding has added to the problems experienced. The recommended actions in Table 11.1 will focus on solutions to be considered for individual areas.

**Table 11.1.** Recommended actions for the South Hams area.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
SHDC / EA / LLFA / SWW	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.

South Hams

DCC Highways	To ensure efficient operation of highway drainage.	To inspect as necessary and remove any blockages to drainage. With particular attention to Harberton, Kernborough, Lee Mill, Longcombe, Noss Mayo, South Barton, Totnes (Fallowfields) and Wrangaton.
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**In addition to the general actions the following should be considered at specific locations:**

**Ashprington:**

LLFA / SHDC	Advise home owners with regards to groundwater issues	Provide advice
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**Aveton Gifford:**

LLFA / Land owner	To ensure efficient operation of culvert near school	Determine ownership, remove any blockages and repair any damage.
LLFA	Continue to assess culvert capacity and effect on downstream properties near "Homefield".	Continue with on-going study.

**Avonwick:**

EA	Investigate community preparedness	Review current warning systems and community engagement
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**Frogmore:**

SHDC	Investigate possibilities of reducing flood risk issues in the area.	Continue with commissioned study of the area.
EA	Improve land management practices	Advise local landowners about improved land management practices.

**Goveton and Ledstone:**

EA / SHDC / LLFA	Community engagement.	Provide guidance to residents and consider the need for a community flood action plan.
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**Harberton:**

SHDC	Ensure efficient operation of watercourse.	Consider the possibility of de-silting the stream bed together with providing a supplementary culvert through private land.
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**Harbertonford:**

EA	Inform the local community about the operation of Palmers Dam.	Hold a public meeting/event to inform the community about the scheme.
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**Totnes:**

LLFA / SHDC	Improve condition of watercourse at "Smithfields"	Survey watercourse and advise riparian owner (s) of their
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South Hams

		responsibilities.
DCC Highways	Improve drainage on Plymouth Road.	Continue with proposed works.
<b>Thornham:</b>		
LLFA / SHDC	Ensure efficient operation of culverts and watercourses.	Survey leat and advise riparian owner (s) of their responsibilities.
<b>Ugborough:</b>		
SHDC / LLFA	Ensure efficient operation of culverts and watercourses.	Inspect condition and design of culvert grill.
<b>Yealmpton / Yealmbridge:</b>		
SHDC / LLFA	Ensure efficient operation of culverts and watercourses.	Culvert grill to be designed and installed at Creamery Close / Ford Road and bolt down manhole covers.
South West Water	Ensure flood resilience of infrastructure.	Look at the flood resilience of the sewage treatment works and how it operates during times of flood.
EA	Improve understanding of flood risk.	Develop a 2D river model of the Yealm.

## 12. Teignbridge

### 12.1. Flood Incident Extent and Impact

The November storms and flooding hit many areas across the Teignbridge District. Over 90 properties were flooded in Teignbridge, in addition to the most heavily hit areas of Bovey Tracey, Buckfastleigh and Kennford, which have all been addressed in more detail in separate chapters of this report.

### 12.2. Historic Flooding

The communities affected in the November flooding have a range of flooding histories. The most significant of these include 700 properties flooded in Newton Abbot in 1979 from fluvial and tidal sources and 50 properties in Stokeinteignhead in 1957 from surface water and minor watercourses. Combeinteignhead and Stokeinteignhead both flooded with approximately 15 properties affected in each in 1993. Ashburton has an extensive flooding history with 20 properties being flooded due to heavy rain in 2005 and many other instances with flooded property recorded.

### 12.3. Evidence Collected

#### 12.3.1. Abbotskerswell

In Abbotskerswell, 1 property, situated at the bottom of a hill was reported to have flooded internally from surface runoff from the highway and adjacent land.

#### 12.3.2. Ashburton

In Ashburton on Saturday 24<sup>th</sup> November, 5 properties were flooded, including 2 commercial properties. In Headborough Road, 3 properties were reported to have had 2 feet deep flood waters. This was from surface runoff and not the River Ashburn (Main River).

Gardens flooded in Long Park, Jordans Meadow, Hares Lane and St Lawrence Lane (where surface water and debris was also in the road). Sandbags were used by the shops in the Kingsbridge Lane area, but there were no signs of flooding.

2 Commercial properties between Church Path and Chuley Road were flooded where the nearby watercourse, the River Ashburn came out of bank. Gardens were also flooded downstream of this section at Stone Park Crescent and evidence of surface water ponding was found further downstream near the Dartmoor Motel.

#### 12.3.3. Bickington

In Bickington, 1 property was reported to have flooded up to 20mm internally from an ordinary watercourse. There were reports of flooding on the road at Bow Bridge and blocked surface water drainage at Lemonford Lane.

#### 12.3.4. Bridford

In Bridford, 1 property was flooded internally. Bridford Barton showed evidence of being flooded. This is likely to have been from the ordinary watercourse that runs near the house.

#### 12.3.5. Chudleigh

3 residential properties in Chudleigh were reported to have flooded basements in Parkway Road. The capacity of the bridge adjacent to the residential properties was not able to convey large volumes of water generated by the event.

In Chudleigh Knighton nearby, 1 property flooded which has suffered repeated flooding due to a

combination of surface water runoff and highway water.

### **12.3.6. Combeinteignhead**

11 properties were flooded in Combeinteignhead, affecting properties on both 21<sup>st</sup> and 24<sup>th</sup> November, with more properties affected by flooded gardens and garages. Figure 12.1 shows the extent of the flooding.

The properties were flooded internally on both occasions when the nearby ordinary watercourse burst its banks. Some required the fire brigade to pump out the water. It is thought that the debris grill on the culvert inlet could have been cleared to help reduce the flooding but it was evident during the flooding that the culvert beneath the Church entrance was surcharged and the flow of the watercourse had exceeded its capacity, causing the water to overflow. This resulted in the water overtopping onto the road, which was reported to be exacerbated by further surface water flowing down the highway from the Thorn Villas direction.

The culvert, mentioned above, which is located in the rear gardens of the cottages backing onto All Saints Church was of great concern and many feel that the culvert needs to be upsized and cleared of silt more often. This is an irregular culvert that has been formed by the historical slabbing-over of the open watercourse by the riparian property owners to extend their rear gardens. A survey carried out 'without-prejudice' by Teignbridge District Council in 2002 identified its poor condition and a number of obstructions that were removed at that time. It also revealed the poor methods that were used to cover the watercourse and the failings of some of these works. The culvert remains the responsibility of the riparian owners and, as with all watercourses, any maintenance needs to be carried out by them. DCC and TDC, in partnership, have agreed to fund and arrange an updated survey of this culvert and present the results to the riparian owners for their consideration. A further concern was the condition of the upstream debris grill; so this has now been replaced by TDC. This will continue to be cleared for the foreseeable future by TDC as part of their proactive weekly grill clearance regime. The brook here was also reported to be regularly cluttered up with debris, so it is important that the landowners are reminded of their riparian responsibilities and also of good practices for storing items adjacent to a watercourse.

A number of highway issues were raised, such as gullies and drains that need clearing and improved maintenance required. There were also reports of a camber in the road which is thought to be adding to the flooding problem at this location and requires further investigation.

Following a drop in event in Combeinteignhead on 5th December 2012, many concerns from the local residents were noted. Several of these include concerns on insurance premiums as a result of this flooding and also the problems this may cause with the selling of houses in the area. There were also concerns that the road should have been closed, as vehicles were driving through causing further flooding to nearby properties. In addition to this, sandbag distribution, availability and quality were of concern.

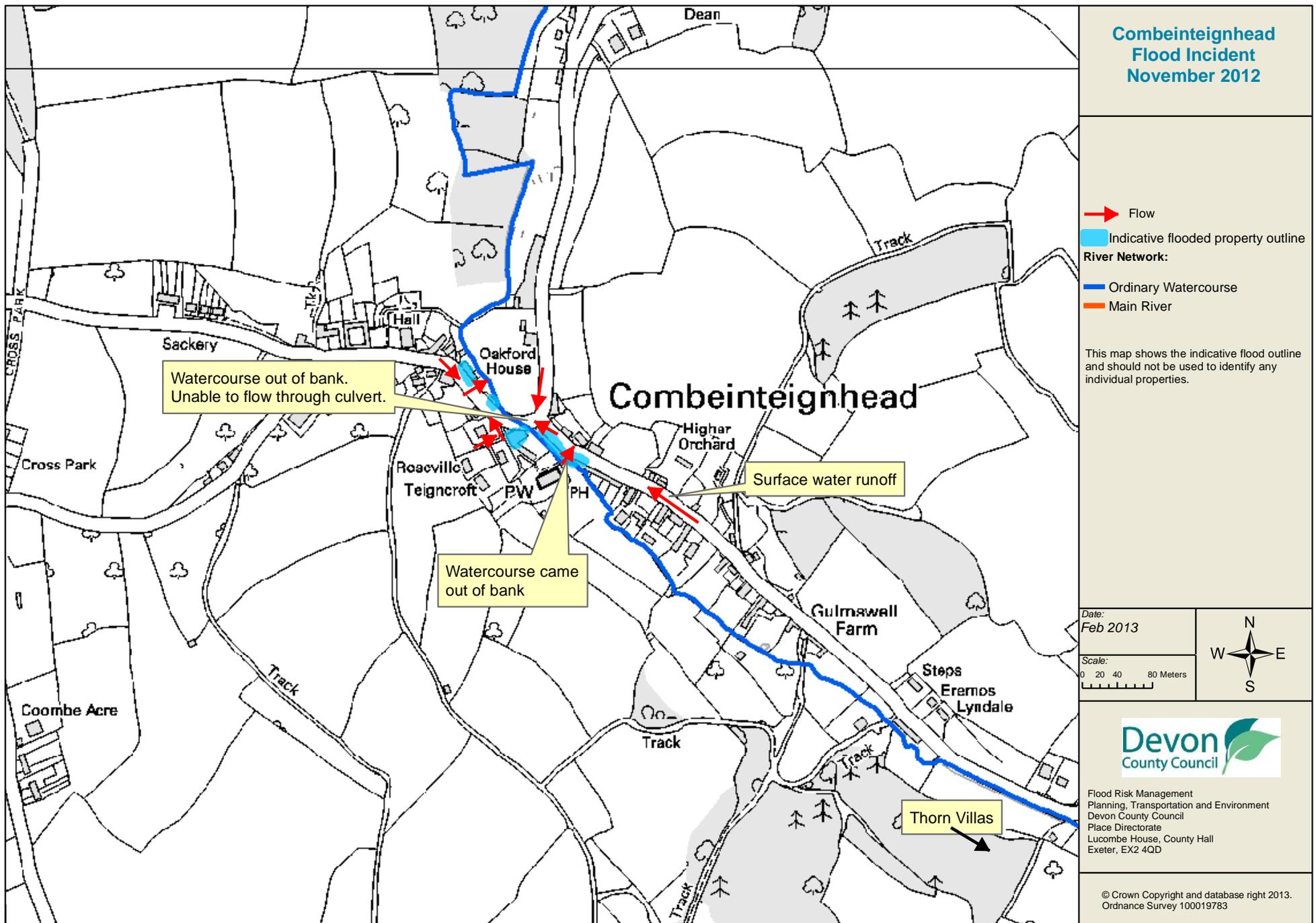


Figure 12.1. November flood extent and impact in Combeinteignhead

### **12.3.7. Dawlish**

In Dawlish 9 properties were flooded, including 5 residential and 3 commercial properties on Brookdale Terrace when Dawlish Water burst its banks.

Local residents who attended a Flood drop in session on 26<sup>th</sup> February highlighted problems that occurred on the evening of the flooding: Surface water was reported to be coming down Teignmouth Hill; and the pedestrian crossing railings along Station Road became blocked up with debris causing water to back up in the watercourse. It was suggested that the crossing could perhaps be changed or moved to a different location along the road to prevent this from happening again. It was also suggested that a wall surrounding 'Tucks Plot' was also causing water to back up.

It was reported by several residents that the watercourse is silted up with debris, restricting the flow of water. The EA and Local Authorities are currently investigating the causes of sediment build up in Dawlish Water, where sediment runoff from further inland and the weirs in the watercourse have caused sediment to settle. Annual expensive dredging would only deal with this symptom in the short-term and not tackle the root cause of the problem. Unfortunately, areas in the lower reaches of the Brook are in a designated flood zone and only expensive flood defences, which may include major redesigns of the Lawn and town centre, could be considered. However, problems with the watercourse could be tackled at source (upstream), using an engineering solution developed in partnership with the EA and Dawlish Town Council. If sediment transfer from the catchment into the lower reaches of Dawlish Water can be identified and managed, this will reduce deposit rates and will have a positive effect on the town, the Brook and the beach.

The EA have now completed a survey and noted actual and potential inputs further away from the river such as road gullies and landslips alongside the highway. In the meantime, Council engineers will complete a detailed survey of the lower section of Dawlish Water, from the viaduct to Barton Hill, to establish the hydraulic characteristics of this critical section. A further survey of the upper section, from Barton Hill to Church Street, will also be undertaken and this information will help assess the flows and performance of the weirs and sluices in the river.

### **12.3.8. Dawlish Warren**

In Dawlish Warren, 1 property on Secmaton Lane was flooded. The driveway flooded and damaged the car. Water was not coming in through the door, but came in under the floor. It was reported that this flooding was most likely due to a sewage system problem.

### **12.3.9. Forder Green**

At Forder Green, outside of Ashburton, 1 property was flooded internally from surface runoff from the surrounding fields and highways on both 21<sup>st</sup> and 24<sup>th</sup> November. It is thought that the culvert under the road is inadequate to take the large flows of water generated by the storm events and the installation of a debris grill on the inlet would prevent the culvert from becoming blocked.

### **12.3.10. Haytor Vale**

At Haytor Vale, a Hotel reported to have suffered surface water flooding entering via the airbricks causing extensive flooding to store rooms. This property is known to have suffered flooding before.

### **12.3.11. Ideford**

In Ideford, 1 property flooded where a road drain overtopped causing water to flood down the side of the road and into the property. This was due to the highway drainage system being overwhelmed by the large quantity of surface water runoff from adjacent fields.

### **12.3.12. Ilsington**

In Ilsington, 1 property was reported to have internally flooded.

### **12.3.13. Kenn and Kenton**

6 properties were flooded in the areas of Kenn and Kenton. In Kenn, 3 residential properties and 1 commercial.

In Kenton, 2 properties were reported to have flooded, including 1 on the Powderham Estate. There was also flooding on the Mamhead Road to Starcros. Water was flowing from fields opposite a property and the road drains could not cope. It was thought that the field opposite requires pumping out to solve the problem and the road drainage reviewed, with the property having flooded on 3 separate occasions in the November flood event.

### **12.3.14. Kingskerswell**

In Kingskerswell 4 properties were reported to have flooded in the Brookedor area, which is situated by the Main River, known as The Aller Brook. Residents reported that water had come out of the channel via an un-flapped pipe at the entrance to the unmade road North of Brookedor Gardens. The pipe is approximately 200m wide and just in front of a sleeping policeman across the entrance to this unmade road and, due to the levels in the Brook and no flap, let water out of the Brook into this area. There was evidence that water may have come out of bank downstream of this entrance too. It also escaped out of the right hand bank, filling a nearby field, which is a lower level to the surrounding homes and the road and appeared to have provided an element of storage.

Upstream of this location, water came out of bank and flooded some gardens of Orchard Terrace and made its way through the garage of one. This property also suffered some flooding to the kitchen, which is in the end nearest to the watercourse.

There were reports that the wall on this road was damaged as a result of flood water filling the road. The water has also damaged the low wall between the road and the watercourse.

### **12.3.15. Kingsteignton**

In Kingsteignton there was repeat flooding of residential properties. 9 properties were reported as flooded, including 2 properties in Whitears Way, 1 property in Longford Lane, 1 in Rydon Road and 5 properties in Newton Road. The risk of flooding to the school was averted by the manual intervention of the upstream flood alleviation scheme.

On Newton Road several properties suffered internal flooding. This was due to the volume of rainfall, and the road gullies being completely blocked. The road flooded, which then flooded onto the footpath, before starting to run towards the properties. Although the police attended and placed a road closed sign, traffic bypassed this and drove through the water. This caused a wave which contributed to the flooding. The properties were flooded through the front doors, and this seemed to seep in and under the doors. DCC Highways attended the next day to hand dig the gullies. This was promptly followed by a vactor to suck out the gully pots. Several residents have said that they are never cleared or not cleared as much as they used to be.

### **12.3.16. Liverton**

It has been reported that 1 property flooded in Liverton from an ordinary watercourse.

### **12.3.17. Newton Abbot**

3 properties were reported to have flooded in Newton Abbot, including 2 in the Broadlands area. Flooding on the road was reported off Shaldon Road near to the Penn Inn roundabout, Keyberry Park, The Avenue, Courtenay Street and Pomeroy Road.

### **12.3.18. Poundsgate**

2 properties are known to have flooded in Poundsgate. It was reported that the garden and cellar of 1 property were flooded as a result of blocked ditches and drains through Poundsgate. Highway records show that flooding on the road was recorded on the main road through the village.

### **12.3.19. Higher Rocombe Barton**

3 properties were reported to have flooded internally in Higher Rocombe. Surface water was also recorded on the road through the village.

### **12.3.20. Shaldon and Ringmore**

In Shaldon, 3 properties were reported to have flooded. 1 property on Orchard Close was reported as flooded due to a blocked road gully on the corner of Higher Ringmore Road. Ringmore Farm was flooded on 21<sup>st</sup> November and sandbags were used to prevent any reoccurrence. 1 property on Laurel Lane was also reported to have flooded, where several reports of surface water on the road were made. The highway culvert that runs under Laurel Lane has since been cleaned but it is believed that this cannot cope with the large flows that it picks up from the surrounding catchment.

In Ringmore, 3 properties were reported to have flooded from surface water. 1 property on The Strand was flooded on 21<sup>st</sup> November and on 24<sup>th</sup> November, where the watercourse converges. 1 property at Longmeadow, Combe road was also flooded. The camp site here was affected due to excessive damage to the access road. Surface water is discharged into a drain in Long Lane which discharges into Pegwell Lane and then into the camp site. Drains have been installed by the owners at the top of the driveway by the owners to reduce the flood water but the surface of the driveway has had to be replaced numerous times. Further ditch clearance by the riparian owners is essential for the systems to work more effectively.

### **12.3.21. Starcross**

In Starcross 3 properties were reported as flooded. There was also flooding of gardens in Brickyard Lane. Parker's Road was also flooded and threatened properties. Sandbags were used in both Brickyard Lane and Parker's Road to protect property.

### **12.3.22. Stokeinteignhead**

12 properties were flooded in Stokeinteignhead. 4 properties were flooded on Stoke Road down to Stoke Cross. The Village Hall car park was flooded and the drainage system here was reported to be surcharging. Surface water was flowing down Stoke Road alongside the watercourse. Some properties along the junction of Deane Road and Stoke Cross avoided flooding due to the use of sandbags. Further downstream 7 properties by Ivytree Hill were also flooded. 1 garage was also reported to have flooded here. Figure 12.2 shows the extent of the flooding and flow paths of the water in the village.

Following a drop in event in Combeinteignhead on 5th December 2012, many concerns from the local residents of Stokeinteignhead were noted. Several of these include concerns on insurance premiums as a result of this flooding and also the problems this may cause with the selling of houses in the area. Several residents were keen to produce a community flood action plan. It was also felt that more information about flooding is required as there is only one exit from the village.

### **12.3.23. Tedburn St Mary**

1 property was reported to have flooded internally in Tedburn St Mary.

### **12.3.24. Teigngrace**

In Teigngrace, 1 property was reported to have internally flooded. Highway records show that surface water was reported on the road in the Hayn Lodge area.

### **12.3.25. Teignmouth**

In Teignmouth, 5 basement flats were reported to have flooded on Bitten Park Road at the junction with Reed Vale. Surface water flooding was recorded along the length of Bitten Park Road.



## 12.4. Recommended Actions

The communities affected in Teignbridge were from various localised sources which will be addressed in the following recommended actions in Table 12.1.

**Table 12.1.** Recommended actions for Teignbridge.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	Ensure efficient operation of highway culverts and drainage.	Investigate reports of blocked drains. In Particular at Bickington (Lemonford Lane), Combeinteignhead, Ideford (Olchard Farm), Kingsteignton (Newton Road), Shaldon and Ringmore (Higher Ringmore Road) and Palace Mill, Chudleigh.
TDDC / EA / LLFA / SWW	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Chudleigh:</b>		
TDC / EA / LLFA	To ensure efficient operation of watercourse.	Carry out site inspection of affected area to ensure watercourses are not restricted. COMPLETED.
<b>Combeinteignhead:</b>		
DCC Highways	Ensure efficient operation of highway drainage.	Investigate reports of camber in road near to flooded cottages next to Church to possibly reduce flood risk to property.
TDC	Ensure efficient operation of culvert and watercourse.	CCTV survey to be carried out of culvert at entrance to the Church Improve debris grill on culvert. COMPLETED Advise riparian land owners of responsibilities.

Teignbridge

<b>Dawlish:</b>		
TDC / EA / LLFA	Reduce flood risk in the lower area of Dawlish Water.	Carry out hydraulic model of Dawlish Water and consider possible improvements.
<b>Dawlish Warren:</b>		
SWW	To ensure efficient operation of sewer systems in the area.	Investigate problems that occurred to flood property to find solution.
<b>Forder Green:</b>		
DCC Highways / Landowner	Ensure efficient operation of highway culverts and drainage.	Look into operation of culvert and the installation of a debris grill.
<b>Kenn:</b>		
EA	Improve understanding of flood defences.	Investigate hydrology of the catchment.
EA	Monitor River Kenn.	Review options for monitoring flows.
<b>Kingskerswell:</b>		
EA	Investigate methods of minimising flood water out of bank.	Investigate and consider installation of flap valve on the pipe into the watercourse.
<b>Shaldon and Ringmore:</b>		
Local residents / landowners	Carry out riparian landowner duties.	Ensure watercourse is free of vegetation, debris and any obstructions.
EA / LLFA / TDC	To improve surface water drainage systems in the Ringmore area.	To liaise with EA and carry out further drainage works.
LLFA / DCC Highways / TDDC	To ensure efficient operation of the culvert at Laurel Lane.	Consider works in this location to improve operation of culvert.

## 13. Bovey Tracey

### 13.1. Flood Extent and Impact

Bovey Tracey is a small town situated on the eastern edge of Dartmoor National Park about 10 miles South West of Exeter. The River Bovey has quite a large catchment area of approximately 90 km<sup>2</sup>. The catchment of the River Bovey consists of steep sided valleys that react quickly to rainfall.

Catchments were very wet throughout November and became largely saturated by 20th November. 250mm of rainfall was recorded in the six days leading up to the 24<sup>th</sup> November, with up to 85mm recorded throughout the 24<sup>th</sup> November. The gauge at Bovey Parke recorded 2.34mCD at 23:15 on 24 November 2012. This is the highest level in its history (it's been recording since September 2004).

Flood water came from the River Bovey and overtopped the scheme and the walls on the roadside opposite the Riverside Hotel. The pub and the arts centre flooded as large volumes of water came around the bridge and over the adjacent wall. The bridge seemed to have been overwhelmed however there were significant obstacles on both the up and downstream side of the bridge that would have potentially increased flood levels by backing up the water. Flooding also occurred from water backing up through the courtyard of the arts centre as this drains directly to the river. The stream running behind the car park also flooded but the flood water did not reach the properties of The Waterside.

Two properties on Station Road flooded internally to depths of up to 100mm. Some businesses on this road had workshops flooded as the watercourse flows beneath them.

Surface water flooding on the roads in the town centre was quite severe with the roundabout being underwater and flows coming down Station Road, Monks Way, Marlborough Terrace and Manaton Road. This then met the fluvial flooding by the fire station and led to water of 40cm deep on the bypass causing the lower end of the bypass, especially near the old railway station, to be impassable to smaller cars. At 23:00 there was for a time no road access down Le Molay Litry Way nor out along the B3344 to Chudleigh Knighton where the road was closed and limited access along the A382 (bypass). The Moretonhampstead Road to the West of Mary Street was nearly impassable due to severe surface water flooding coming down the Furzeleigh Lane and past the hospital. There is a culvert that runs under gardens off the Moretonhampstead Road under houses in Staddons View that was overwhelmed by the amount of water.

A property near the roundabout at the West of Station Road flooded from surface water but no other properties were reported to have flooded from this source. The surface water quickly found its way into small watercourses and added to their volume. The watercourse flowing from Monks Way to Station Road came out of bank at the rear of Albert Terrace and flooded a property there. This channel was also responsible for flooding 3 other houses.

A total of 8 residential properties and 4 commercial premises were affected by internal flooding. Figure 12.1 shows the extent of the flooding in Bovey Tracey.

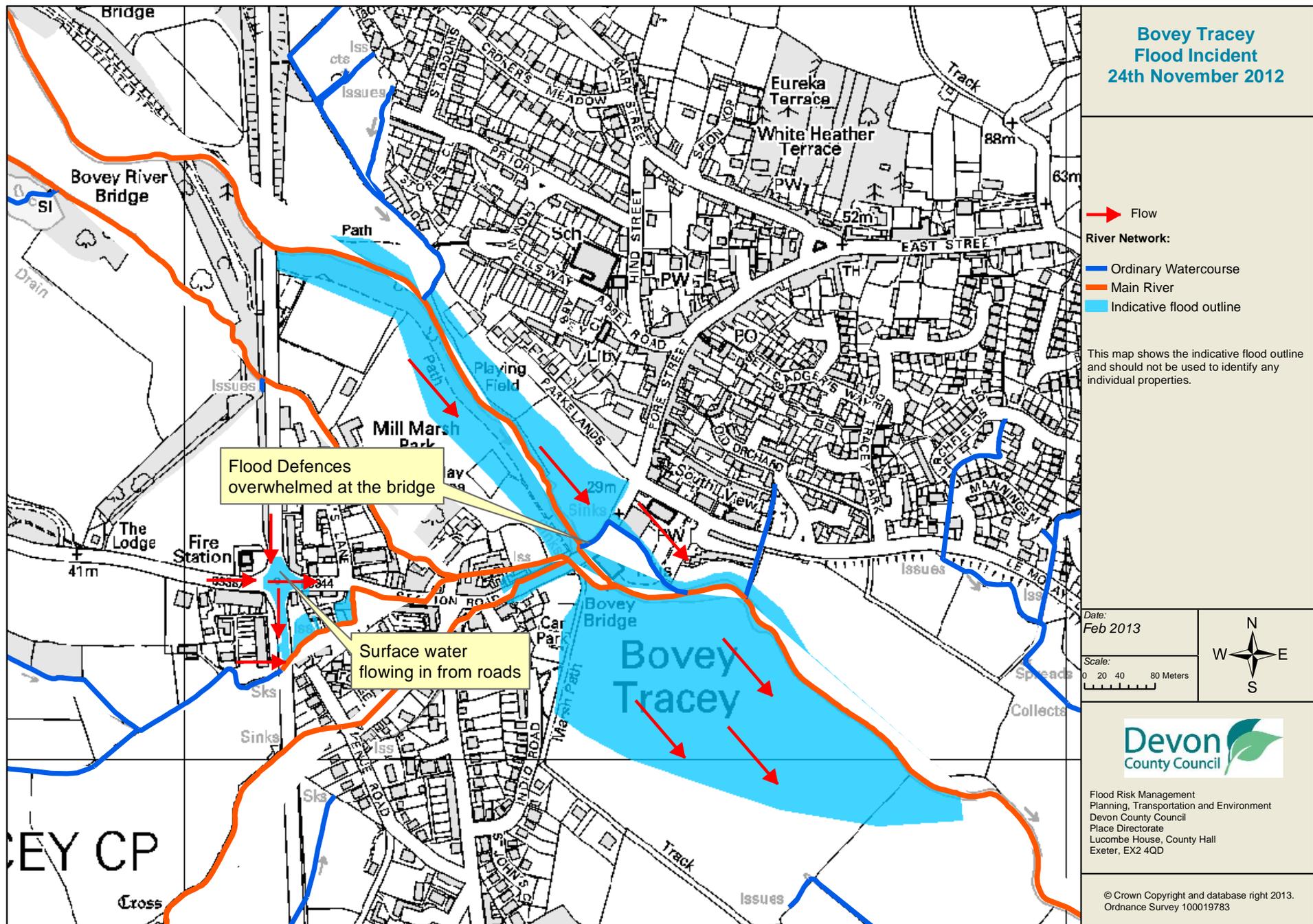


Figure 12.1. November flood extent and impact in Bovey Tracey

## 13.2. Historic Flooding

Flooding from the River Bovey has occurred previously in the town's history. The list below is an example of some of the past flood events and is not a comprehensive history of flooding.

12/12/2008	6 properties were affected by flooding
07/12/2000	At least 11 properties were flooded
29/10/2000	Up to 11 properties flooded
12/08/2000	9 properties flooded
12/07/2000	2 properties flooded
30/04/1993	At least 1 property affected by flooding
22/08/1984	Number of properties affected is unknown

## 13.3. Evidence Collected

### 13.3.1. Environment Agency Flood Reconnaissance

Information compiled by the EA Flood Reconnaissance Teams has been used to assess the impacts of the event on 24<sup>th</sup> November from photos, wrack marks of water levels and observation of flooded locations and the invaluable contribution of accounts provided from the residents of Bovey Tracey. The site was visited on 27<sup>th</sup> November.

### 13.3.2. Local Knowledge and Flood Drop In Session

Information from a 'drop in' flood session at Bovey Tracey on 12<sup>th</sup> December and from discussions with local residents the main issues raised for the flooding that occurred were the supply of sandbags for future events, the capacity restrictions at bridges and the impact of works done within the flood plain by landowners. There were also reports of sewerage combined with surface water with storm overflows not working effectively. The community have developed an emergency plan and would like to share the plan and share the lessons that have been learned.

### 13.3.3. Development and Planning

The Waterside Housing development performed as the EA had expected and has contributed to the reduction in flood risk overall in Bovey Tracey as the floodplain was restored and performed well in this location.

The proposals for development at Challabrook are currently being reviewed by the EA, which include improvements to the minor watercourse and increased storage capacity to the West of the bypass. They have also recently considered a development proposal for a large mixed development at Bradley bends. The EA are satisfied that if this goes ahead as proposed it will not increase flooding risk to third parties and will be safe and sustainable.

## 13.4. Likely Cause of Flood Incident

The evidence collected for this flood event shows that the main cause of the flooding experienced in Bovey Tracey in November 2012 were the exceptionally high flows in the River Bovey and other tributaries flowing into the town. Flood defences were overtopped by the high river flows and the channel capacities through the town were not large enough to convey the volume of water created by the flood. The flood defences did not fail in their design to reduce flood risk however it was evident that this flood event was larger than the design capacity of some of these structures. Large volumes of surface water also added to the flooding in Bovey Tracey.

## 13.5. Recommended Actions

The actions that DCC recommend to be taken forward are listed in Table 13.1

**Table 13.1.** In order to reduce the risk of flooding in Bovey Tracey in future, it is recommended that several actions are taken.

Action By	Recommended Action	How
TDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
LLFA / TDC	Look at works undertaken in floodplain by landowners.	Survey area and enforce LDA as appropriate.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
Property Owners / LLFA / EA	Ensure efficient operation of culvert under gardens in Moretonhampstead Road and under houses in Staddons View.	Look into culvert condition and maintain as appropriate. Possibly look at the capacity and assess if appropriate.
EA	Continue community engagement	To develop work with the community of the flood plan to share lessons learned. Consider development of community flood action plan.
EA	Consideration of flood management options and river/bridge capacities.	Calibrate 2D river model for Bovey Tracey.
EA	Watercourse maintenance	Shoal removal. COMPLETED
TDC	Investigate supply of sandbags	Review sandbag policy
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.

## 14. Buckfastleigh

### 14.1. Flood Extent and Impact

The small town of Buckfastleigh is situated on the South West edge of Dartmoor. The Rivers Mardle and Dean Burn converge in the town at Station Road and have a combined catchment area of approximately 28km<sup>2</sup>. The rivers that drain Dartmoor can react very quickly to rainfall and due to the prolonged period of wet weather leading up to the end of November many catchments in Devon were already saturated causing any further rainfall to enter the river systems very quickly.

Two flood events on Wednesday 21<sup>st</sup> and Saturday 24<sup>th</sup> November 2012 affected the town with the latter being the larger of the two.

On Wednesday 21<sup>st</sup> November torrential rain affected approximately 6 residential properties, and one public house. The town centre and Market street were affected. In the town centre water rushed down Plymouth road and down Fore street. The road design and house steps kept this out of properties on the main street, except for the White Hart pub where flood water did enter. The flood water also flooded two properties down a pedestrian accessed alleyway on Plymouth Road. Properties at Hoskins court had sandbags at their doors, but no firm evidence that they had flooded internally. Surface water flowed down Market Street and Bridge Street which pooled on the South side of the bridge. Due to the volume and debris, it failed to get away and flooded a property in Market street up to a metre deep. The adjacent factory had water internally but permanent pumps removed the water before any damage was done.

On Saturday 24<sup>th</sup> November heavy rainfall caused both the River Mardle and the Dean Burn to flow at full capacity (within bank). At the confluence of both rivers at Station Road Bridge, there is not enough capacity for both rivers to flow out causing both to back up. Firstly the levels in the River Mardle backed up. This causes the Mardle to break its banks in several places upstream of the Station Road bridge. The water flowed over walls and through several properties by entering the rear of the buildings and exiting through the front door. The Mardle was also forced out of bank at the bridge and flooded properties on Station road, before rejoining the main channel. The Dean Burn also backed up flooding the cellars of two properties and bursting its banks just after Elliot Road Bridge. This then filled up the whole car park area and equalised flood levels in houses from both watercourses. Further flooding was caused to a shop and two residential properties as the river water was forced up a surface water drain.

A total of 32 properties were internally flooded over the two flood events with at least a further 3 being affected by the flooding. Cars in the car park were also damaged as a result of the floods. Figure 14.1 shows the extent of the flooding in Buckfastleigh.

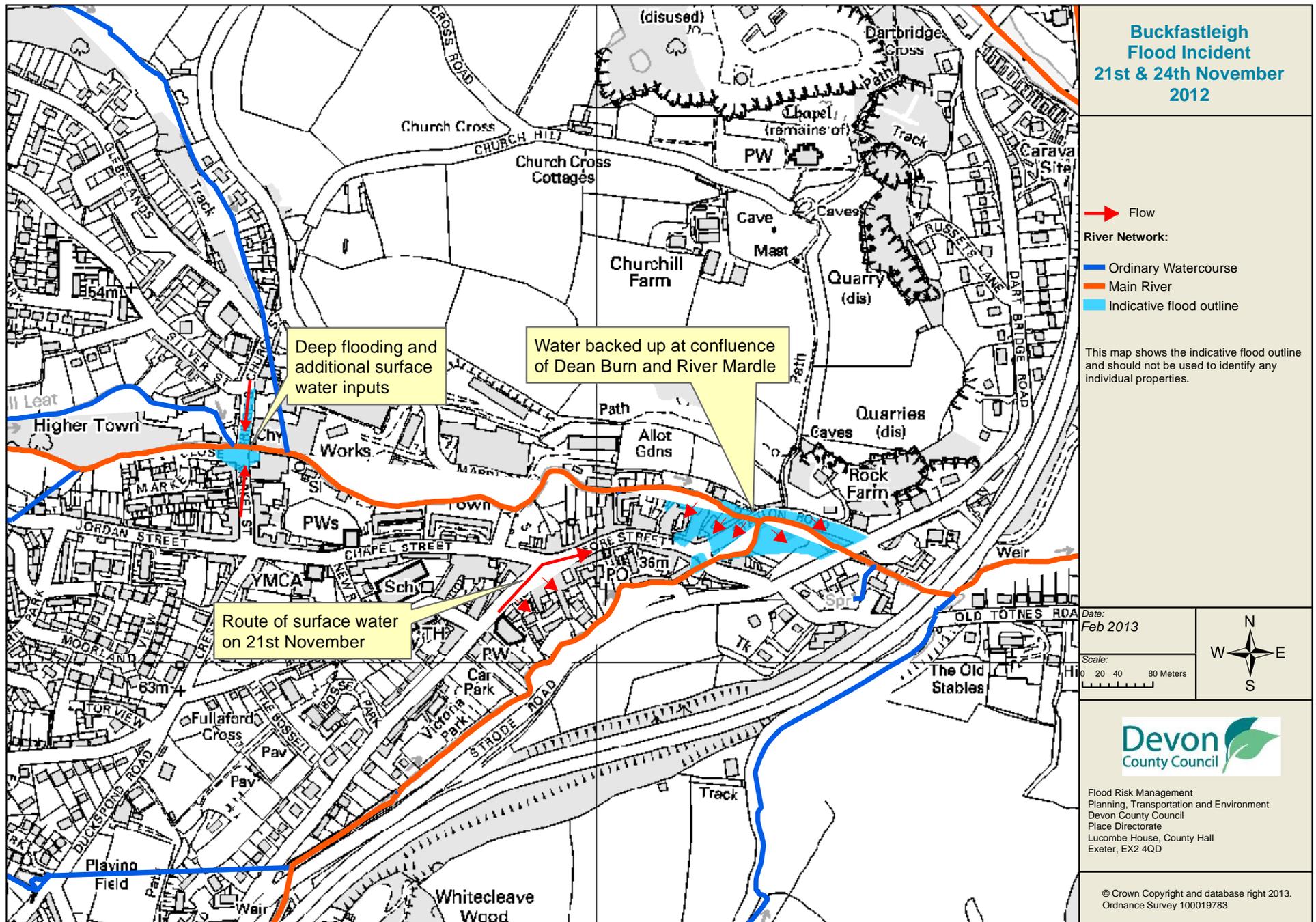


Figure 14.1. November flood extent and impact in Buckfastleigh

## 14.2. Historic Flooding

Flooding from the Dean Burn and the River Mardle has occurred previously in the villages history. The list below is an example of some of the past flood events and is not a comprehensive history of flooding.

07/12/2000	Church street, Market Street & Plymouth road flooded. Number of properties affected unknown
30/10/2000	Property numbers flooded is unknown
23/12/1999	5 Properties affected by flooding
22/01/1999	1 property flooded
30/12/1993	Church Cottages flooded by surface water
12/03/1981	Flooding affected an unknown number of properties
26/12/1979	78 properties and businesses flooded

## 14.3. Evidence Collected

### 14.3.1. Environment Agency Flood Reconnaissance

Information compiled by the EA Flood Reconnaissance Teams has been used to assess the impacts of the events on 21<sup>st</sup> and 24<sup>th</sup> November from photos, wrack marks of water levels and observation of flooded locations and the invaluable contribution of accounts provided from the residents of Buckfastleigh. The site was visited on 26th November.

### 14.3.2. Local Knowledge and Flood Drop in Session

Information from a 'drop in' flood session on 13th December at Buckfastleigh and from discussions with local residents the main issues raised were the backing up of sewage, capacity of Station Road bridge, the functioning and capacity of highway drains and the impact of debris in the river channel.

### 14.3.3. Development and Planning

Teignbridge District Council and Dartmoor National Park are the local planning authorities for the area and are responsible for ensuring that development takes account of flood risk. The EA offer advice on proposed developments to prevent increases in flood risk and where possible to reduce the current flood risk to local communities.

## 14.4. Likely Cause of Flood Incident

The evidence collected for this flood event shows that the main cause of the flooding experienced in Buckfastleigh in November 2012 were the exceptionally high flows in the River Mardle and Dean Burn flowing into the town. Some of the flood defences were overtopped by the high river flows and the channel capacities through Station Road bridge were not large enough to convey the volume of water created by the flood. The flood defences did not fail in their design to reduce flood risk however it was evident that this flood event was larger than the design capacity of some of these structures. Surface water also played a role in this flood event and highways drainage systems were overwhelmed leading to roads becoming flow routes for flood water.

## 14.5. Recommended Actions

The actions that DCC recommend to be taken forward are listed in Table 14.1

**Table 14.1.** Recommended actions for Buckfastleigh.

Action By	Recommended Action	How
TDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
South West Water	Ensure efficient operation of sewerage system.	Investigate sewer issue in Bossell Road where a 90 degree bend causes sewage to back up and flood property, to improve capacity and reduce flood risk.
DCC Highways	Ensure efficient operation of highway drainage	Investigate reports of camber directing surface water at property in Glebelands
DCC Highways	Ensure efficient operation of highway drainage	Investigate flooding to property at bottom of Market street and consider geometric layout.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
EA	Consideration of flood management options.	Update existing 2D river model.
EA	Watercourse maintenance	Shoal removal at Church Bridge (complete).
EA	Watercourse maintenance – Wall collapse / tree blocking river	Investigate conveyance on River Mardle / advice to riparian owners
EA	Investigate community preparedness	Review current warning systems and community engagement and consider development of community emergency/flood action plan.
EA / TDC	Improve car park drainage / review defence levels	Consider flapped relief drains and flood gates

## 15. Kennford

### 15.1. Flood Extent and Impact

Kennford is a small village located 4 miles South of Exeter. The River Kenn flows through the village and drains the valley from North of Dunchideock and along the North east slopes of Haldon Forrest until it reaches the Exe Estuary at Kenton.

Intense rainfall between 17:00 to 20:00 on Sat 24<sup>th</sup> November, following persistent light rain from 9am that day caused high flows in the River Kenn. Surface water problems occurred at first then the River Kenn overtopped its banks and flood walls and within 30 minutes the river had flooded the low lying area of the village. Fluvial inundation of the village started between 9:30pm to 10pm and had receded by 1:30am on Sunday. The flows were larger than the design standard of the flood defences and the channel capacity was exceeded leading to the internal flooding of 40 properties (32 residential). Flood walls at the rear of April Cottage were overtopped by approximately 100mm of flood water and those on the opposite bank at the rear of the Kenn Centre and Milford Cottages also overtopped. Figure 15.1 shows the extent of the flooding in Kennford.

### 15.2. Historic Flooding

Flooding from the River Kenn has occurred previously in the villages history. The list below is an example of some of the past flood events and is not a comprehensive history of flooding.

22/06/2007	1 property reported as flooded
07/12/2000	At least 16 properties were flooded
17/12/1992	2 properties flooded
30/12/1981	2 properties and a garage were affected by flooding
30/09/1960	46 properties affected by flooding

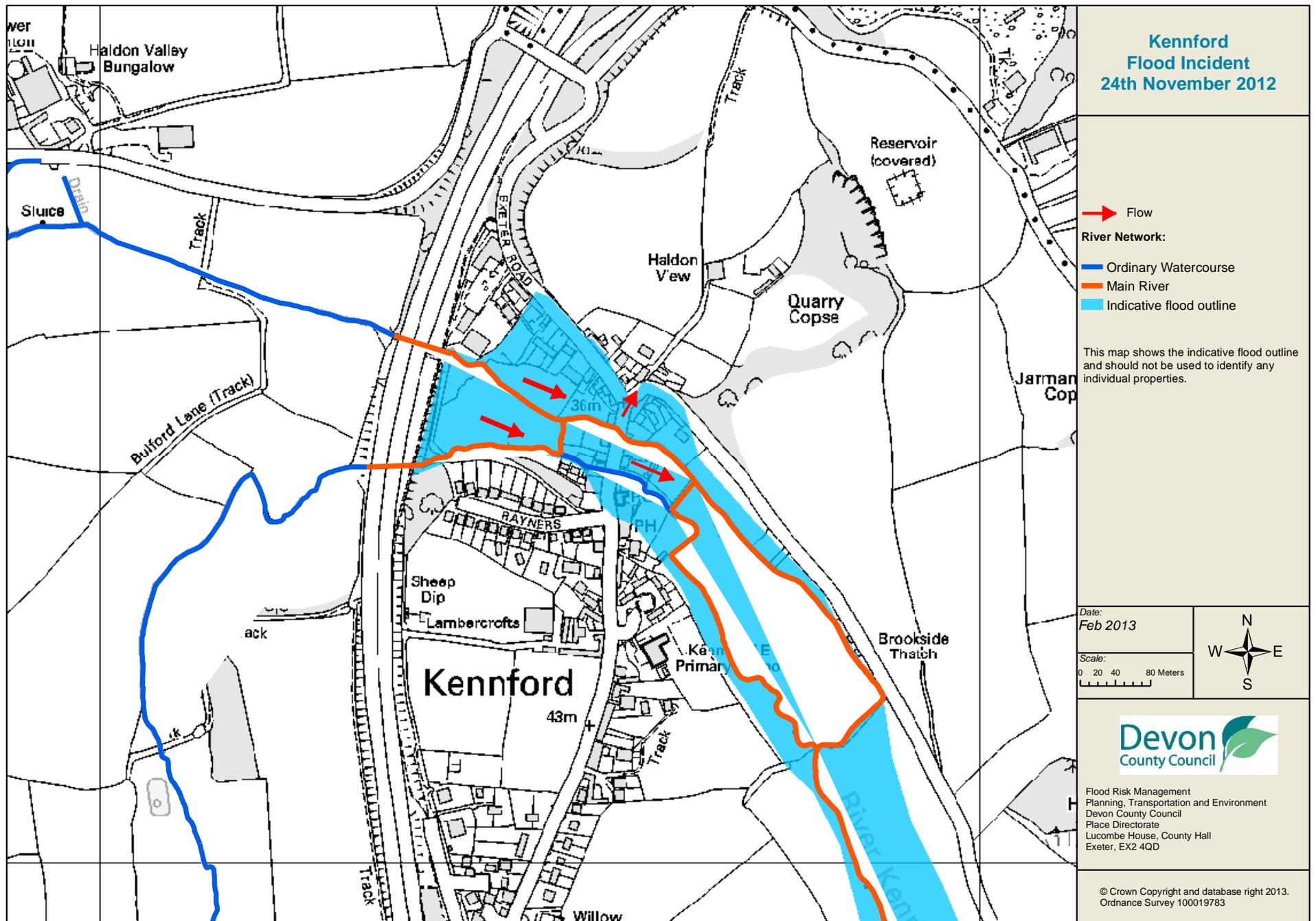


Figure 15.1. November flood extent and impact in Kennford

## 15.3. Evidence Collected

### 15.3.1. Environment Agency Flood Reconnaissance

Information compiled by the EA Flood Reconnaissance Teams has been used to assess the impacts of the event on 24<sup>th</sup> November from photos, wrack marks of water levels and observation of flooded locations and the invaluable contribution of accounts provided from the residents of Kennford. The site was visited on 25<sup>th</sup> November and subsequent visits were conducted to collect further information, assess the condition of flood defences and river channels and survey flood levels.

### 15.3.2. Local Knowledge and Flood Drop In Session

Information from a 'drop in' flood session on Friday 7<sup>th</sup> December at Kennford and from discussions with local residents the main issues raised for the flooding that occurred are the limited capacity of the road bridge, the maintenance of local drainage ditches and culverts, management of the surface water runoff from the A38 and the concerns over the impact that development upstream will have on the flood risk in Kennford.

### 15.3.3. Development and Planning

Proposed development at the top of the village is currently having the Flood Risk Assessment document reviewed by the EA. There are no objections in principle to the proposal but they have advised that surface water must be managed by a SuDS in order to reduce surface water runoff and flood risk in the village.

## 15.4. Likely Cause of Flood Incident

The evidence collected for this flood event shows that the main cause of the flooding experienced in Kennford in November 2012 were the exceptionally high flows in the River Kenn. Flood defences were overtopped by very high river flows because the channel capacity through the town was not large enough to convey the volume of water created by the flood. None of these systems failed in their design to reduce flood risk however it was evident that this flood event was larger than the design capacity of some of these structures.

## 15.5. Recommended Actions

The actions that DCC recommend to be taken forward are listed in Table 15.1.

**Table 15.1.** Recommended actions for Kennford.

Action By	Recommended Action	How
EA	Monitoring for River Kenn	EA to review options for monitoring flows
EA	Watercourse maintenance – vegetation removal	Completed
EA	Channel repairs	Contract awarded.
EA	Improve understanding of flood event	Investigate hydrology of catchment
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.

Kennford

DCC Highways	Ensure efficient operation of highway drainage	Investigate reports of camber directing surface water towards Lantern Cottage since resurfacing works.
DCC Bridges and Structures	To ensure sufficient capacity for flows under bridge.	Carry out routine maintenance under bridge
TDC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
EA / Local community	Increase community resilience.	Develop community emergency/flood action plan.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.

## 16. Torridge

### 16.1. Flood Incident Extent and Impact

The flooding in Torridge was very localised to a few small areas, including Littleford, Weare Gifford and the more urbanised area of Great Torrington. 3 properties in total are reported to have flooded, although more are expected to have been affected, in addition to many roads in the District also being flooded.

### 16.2. Historic Flooding

The Torridge communities covered in this chapter have a fairly brief history of flooding. This includes several recurring incidents of flooding at Taddiport, Great Torrington. This has mainly been flooding of the road at Taddiport Bridge with approximately 6 properties affected in 1979, 1981, 1983 and more recently in October 2012. The centre of Great Torrington has seen a handful of isolated incident of properties flooded from the highway in recent years. At Littleford near Bradworthy there has been recent records of recurring blocked surface water drainage and some flooding of the road in December 2009.

### 16.3. Evidence Collected

#### 16.3.1. Great Torrington

EA reconnaissance visited the area on 6<sup>th</sup> December. The Sewage Treatment Works flooded but the extent of the internal depths are unknown, although significant wrack marks of approximately 1.1m were found on the gates. Flooding was noted at Taddiport seemed to not flood the Toll house or Buckingham House but levels were out of bank and not far from the threshold of these properties.

Just outside of Great Torrington, at Stevenstone, 2 properties at Little Silver were flooded. Water was recorded on the highway here and it was reported that water was coming in through property windows.

#### 16.3.2. Littleford, Bradworthy

1 property was reported to have flooded in Littleford, just outside of Bradworthy. There are ongoing drainage problems in the area here.

#### 16.3.3. Weare Giffard

EA reconnaissance was carried out in the Torridge area on 6<sup>th</sup> Dec. At Annery Kiln properties were protected by the flood bank. Water overflowed from the intertidal marshland over the flood bank upstream of the bridge and into the river. Low lying land and roads in this area are frequently flooded and this event was no exception.

## 16.4. Recommended Actions

The actions that DCC recommend to be taken forward are listed in Table 16.1.

**Table 16.1.** Recommended actions for the Torrige area.

Action By	Recommended Action	How
SWW	Ensure flood resilience of infrastructure	Investigate the flood resilience of the sewage treatment works at Great Torrington and how it operates during times of flood.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
Torrige DC / EA / LLFA	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.

## 17. West Devon

### 17.1. Flood Incident Extent and Impact

Flooding events in West Devon were scattered throughout the borough. Localised flooding was experienced in a number of locations with a total of 13 properties being flooded. Figure 15.1 shows the extent of the flooding.

### 17.2. Historic Flooding

Records show that the communities affected by the events of November 2012, did not have a history of significant flooding. Some areas have suffered localised flooding from minor watercourses and surface water runoff, but it should be noted that highway drainage and flooding records available for this report only date back to 2005.

The village of Buckland Monachorum suffered flooding in 1979 as a result of excessive stream and ditchwater flows, which affected the public house, The Drake Manor, which sits at a low point in the village and close to the watercourse. In October 2006, heavy rainfall resulting in surface water runoff and raised stream levels was reported to be the source of flooding to 2 properties and the public house. Highway records covering the past 7 years indicate blocked surface water drainage systems close to the centre of the village as being the source of problems.

Local records show that the village of Milton Combe has suffered several instances of flooding as a result of fluvial, surface water and highway runoff.

Hatherleigh has seen numerous instances of flooding with records dating back to 1866. Reoccurring fluvial flooding affected a single property in the 1960's through to the 1990's. More recently in 2012, surface runoff caused flooding to the garage of 1 property. Highway records show blocked surface water drainage in the area over recent years, with 7 instances of flooding on private property in 2006 to 2011.

Other areas including Lewdown, Lydford have suffered minor flooding from surface runoff from roads, often as a result of blocked highway drainage systems.

### 17.3. Evidence Collected

#### 17.3.1. Buckland Monachorum , Yelverton

The village of Buckland Monachorum has a history of flooding from surface water runoff from land, the highway and from a watercourse. Figure 17.1 shows the extent of the flooding.

In the November 2012 event, 5 properties were flooded. Properties adjacent to the watercourse and the Pub were inundated. Anecdotal evidence is that combinations of blockages and debris build up and the culverted watercourse being overwhelmed was the cause of much of the flooding.

1 property by the watercourse to the North of the village lost electricity due to flood water entering the property through air bricks. The source of flooding in this case was two blocked storm drains outside the property.

#### 17.3.2. Hatherleigh

Environment Agency reconnaissance was undertaken on 6th December. In Hatherleigh the flood defence scheme was functioning during the flood event and prevented flows from flooding low lying property. Flows were up to bank full at the Cricket ground, came just out of bank at the Community Centre and a small area of the playing field was flooded.

Riverside Cattery and Kennels (just outside the town) suffered flooding to outbuildings but the property itself was not flooded internally. Boarding animals were moved from the flood affected area, but the access road was impassable due to flood water.

The property suffers fluvial flooding from the river and a large ditch on the main road. The entrance to the culvert is restricted and this can result in flows backing up and flowing out of bank. During the November floods the river levels increased significantly.

### **17.3.3. Lewdown**

Reports were that 1 property flooded in Lewdown. The property suffered internal flooding up to the level of the electric sockets, causing the supply to be lost. The source of the flooding is likely to have been surface water runoff from the highway.

### **17.3.4. Lifton**

In Lifton, 1 property was flooded due to erosion of watercourse bank resulting in the blockage of a culvert grill. Flood water overtopped the bank resulting in flooding to the property and the highway.

### **17.3.5. Lydford/Brentor**

A single property flooded at Lydford. The property is a converted public house and sits at the bottom of a steep hill. The basement of the property was flooded on this occasion and has flooded several times previously. The sources of flooding are a combination of surface and highway runoff.

In November, it was reported that the culvert pipe and 4 drainage channels which make up the highway drainage system were blocked on both sides of the road. In addition to this water flowing from the adjacent car park added to the overwhelmed the drainage system. Flow eventually backed up and flowed onto the road adding to the problem.

Adjacent to the property is an unusual sump arrangement and the purpose of this is not fully known. It is understood that the sump is somehow connected to a culverted watercourse which is adjacent to the properties, beneath the access driveway.

West Devon Borough Council (WDBC) has provided flood protection and resilience advice to residents in the past.

### **17.3.6. Milton Coombe**

The village of Milton Coombe suffered flooding the early hours of 21st November. The source of the flooding was a combination of runoff from adjacent land, highway runoff and flooding from Milton Brook and Yeoland Stream, both of which are classified as Main River by the Environment Agency.

During this event 4 properties were flooded and the Fire Service was called to pump water out 2 properties. Narrowing of the road hindered the Fire Service and made access to the affected properties difficult. SWW was called to deal flooding from the foul sewage system which surcharged.

A drop-in event was held on 10th December 2012 where residents reported surface water and fluvial flooding issues. The main concerns were that the culverted section of watercourse, under Chapel Cottage and by the bridge close to the church, could not cope with the volume of water. The resulting out of bank flows cause surface water flooding downstream. Flooding also affected properties along the road, at Leys Villas causing flooding to the cul-de-sac at The Green.

Residents were concerned about insurance issues after flooding and the devaluation of properties. The erosion of the watercourse banks as a result of "flashy" flows was also a concern.

### **17.3.7. Throwleigh**

In Throwleigh, 1 property was reported to have flooded at Barton Cottages. A nearby culvert is believed to be blocked and causing the flooding.

## 17.4. Recommended Actions

The actions that DCC recommend to be taken forward are listed in Table 17.1.

**Table 17.1.** Recommended actions for the West Devon Borough.

Action By	Recommended Action	How
<b>General actions recommended for the areas featured in this chapter:</b>		
EA / Local communities	Increase community resilience to all affected communities.	Where applicable develop community emergency/flood action plans.
DCC Highways	To ensure efficient operation of highway drains and culverts.	Review and carry out maintenance in problem areas
WDDC / EA / LLFA / SWW	To ensure flood risk is managed from new development.	Encourage sustainable drainage practices for new developments.
Property Owners / LLFA / EA	Consider flood risk to own properties.	To install property level protection where necessary.
SWW	Ensure efficient operation of public combined and surface water sewers.	Continue maintenance regime and consider storm separation where appropriate.
<b>In addition to the general actions the following should be considered at specific locations:</b>		
<b>Buckland Monochorum:</b>		
DCC Highways / WDBC	Ensure efficient operation of highway and surface water drainage systems.	Investigate and improve surface water drainage. Scheme designed and approved awaiting start date.
<b>Lydford:</b>		
LLFA / WDBC / DCC Highways	Ensure efficient operation of highway culverts and drainage	Investigate reports of blocked drains and consider options for flood improvements "Mucky Duck", Lydford.
<b>Milton Combe:</b>		
LLFA / WDBC	Watercourse maintenance	Survey watercourse through Milton Combe and advise riparian owners of their responsibilities.
LLFA/ WDBC / DCC Highways	Ensure efficient operation of highway culverts and drainage	Investigate reports of blocked drains near "Ingledene" and consider options for flood improvements near "Brook House" in Milton Combe.

## 18. Next Steps

The next steps following this report will be for DCC as the LLFA to ensure that the recommended action tables in each chapter are taken forward by the identified responsible Risk Management Authority. DCC will prioritise the actions and monitor delivery through regular reviews, whilst working in partnership with the EA, District Councils, South West Water and the local communities affected.

There is an expectation from DCC of itself and its partners that all authorities involved will cooperate and work together to improve the flood risk in the vulnerable areas identified in this report by completing the recommended actions. It should be noted however that actions will be carried out using permissive powers and are not a duty of the RMA. As the LLFA, DCC has a responsibility to oversee the delivery of these actions and will continue to support the relevant authority in achieving the desired outcomes.

Where minor works and quick win schemes have been 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 EA's Medium Term Plan process.

A review of the actions will be carried out by DCC as the LLFA in order to monitor progress and encourage delivery of recommended actions.