

# Flood Investigation Report

## Piddle Valley

7<sup>th</sup> - 8<sup>th</sup> February 2016

---



Report date - October 2016



## Table of Contents

|   |    |
|---|----|
| <b>1. Introduction</b> .....                                      | 3  |
| <b>2. Risk Management Authority Responsibilities</b> .....        | 4  |
| <b>3. Study Area Description</b> .....                            | 6  |
| <b>3.1 Geology and Hydrogeology</b> .....                         | 6  |
| <b>3.2 Hydrology</b> .....  | 7  |
| <b>4. Incident Summary</b> .....                                  | 8  |
| <b>4.1 Rainfall data</b> .....                                    | 9  |
| <b>4.2 Locations Affected</b> .....                               | 10 |
| <b>4.2.1 Plush</b> .....  | 10 |
| <b>4.2.2 Piddletrenthide</b> .....                                | 12 |
| <b>4.2.3 Piddlehinton</b> .....                                   | 15 |
| <b>4.2.4 Alton Pancras</b> .....                                  | 16 |
| <b>5. Quick Wins</b> .....  | 17 |
| <b>6. Recommended Actions</b> .....                               | 18 |
| <b>7. Next Steps</b> .....  | 20 |
| Appendix 1 – Catchment of the Study Area .....                    | 21 |
| Appendix 2 -MET office weather warnings during Storm Imogen ..... | 22 |
| Appendix 3 EA warnings for Storm Imogen .....                     | 23 |
| Appendix 4 - Average Rainfall Data for winter 2015-16 .....       | 24 |



## 1. Introduction

The Flood Risk Regulations 2009 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.

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

Although not all of the locations in this report meet the significance threshold of 5 or more properties flooded, to understand the full extent of the flooding it has been decided to include all locations within the Piddle Valley brought to our attention that experienced internal property flooding.

This report has been produced to comply with legislation and to determine the main causes of the flooding. Each affected area will have a number of recommended actions to be taken forward by the relevant Risk Management Authorities (RMA's) or in some cases, by the land owner or local community action group.



## 2. Risk Management Authority Responsibilities

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

- **The Environment Agency (EA)** 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.
- **Dorset County Council as the Lead Local Flood Authority (DCC LLFA)** is responsible for the management of the flood risk from ordinary watercourses, groundwater and surface water runoff. It is also responsible for consenting to works on and enforcing the removal of any unlawful structure or obstruction within ordinary watercourses. DCC must also prepare a Local Flood Risk Management Strategy, maintain a record of flood risk assets and undertake investigations. It is also a statutory planning consultee for the management of surface water drainage to major developments (ten or more houses and commercial development of floor space greater than 1000m<sup>2</sup> or sites larger than 1Ha)
- **Local District Councils** are classified as land drainage authorities with discretionary powers under the Land Drainage Act 1991, such as the implementation and maintenance of flood defences on ordinary watercourses. They also have powers under the Public Health Act 1936 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, making decisions based on planning policy and for consulting the LLFA for surface water management on all major applications.
- **Dorset County Council as the Highway Authority (DCC HA)** maintains 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 surface water; including the maintenance of highway gullies and culverts.
- **Water and Sewerage Companies (Wessex Water)** Water and Sewerage Companies are responsible for managing the risks of flooding from surface water and foul or combined sewer systems providing drainage from buildings and yards.
- **Highways England (HE)** is responsible for managing, maintaining and improving the motorways 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:
  - To 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 upstream.



- 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 and to keep any structures, such as culverts, trash screens and debris grills, weirs and mill gates, clear of debris.

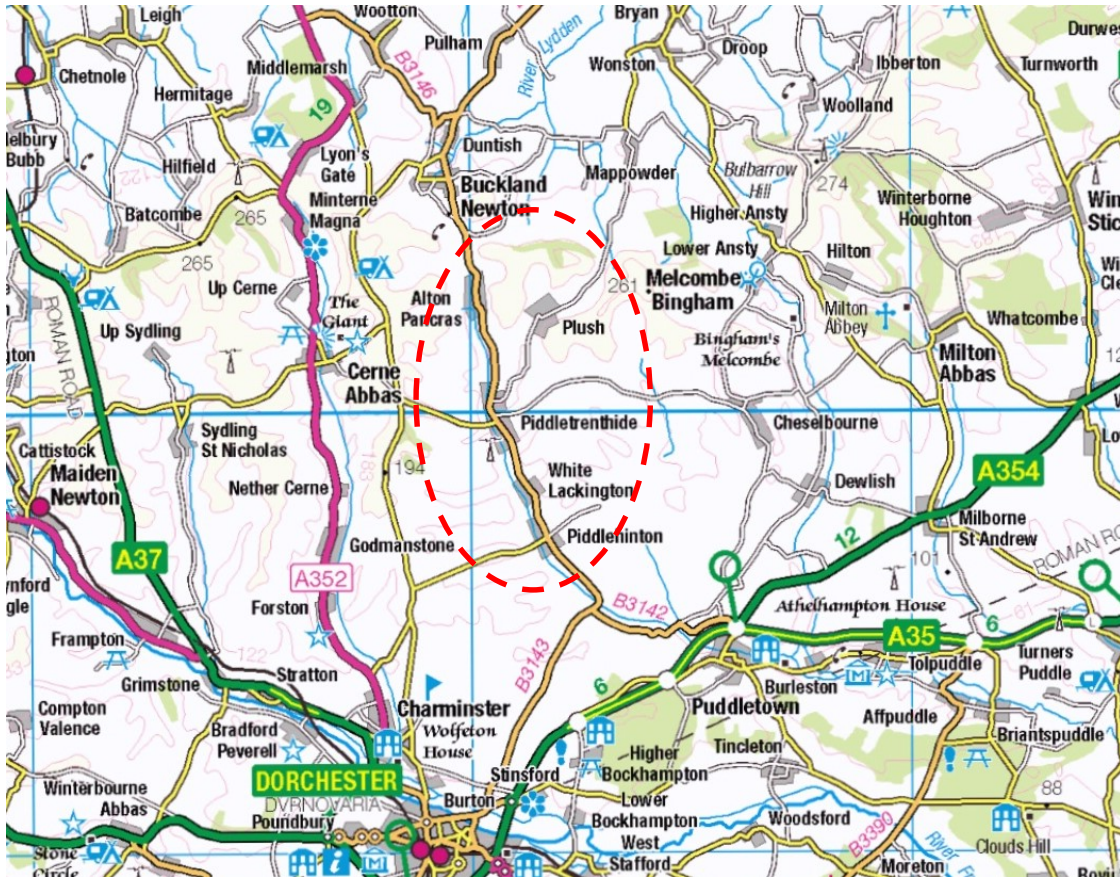
**The LLFA must also take an overseeing role to ensure that all flood risk is being managed appropriately. All RMAs have a duty to co-operate and to share information in relation to their flood risk management functions.**



### 3. Study Area Description

The Piddle Valley is approximately 6 miles north of Dorchester and 9 miles south of Sherborne. The study area relates to 4 settlements located within the Piddle Valley; Alton Pancras, Piddletrenthide and Piddlehinton, which are situated alongside the main route of the River Piddle, and Plush, which lies off this main route on a tributary of the River Piddle.

Figure 1- Study Location

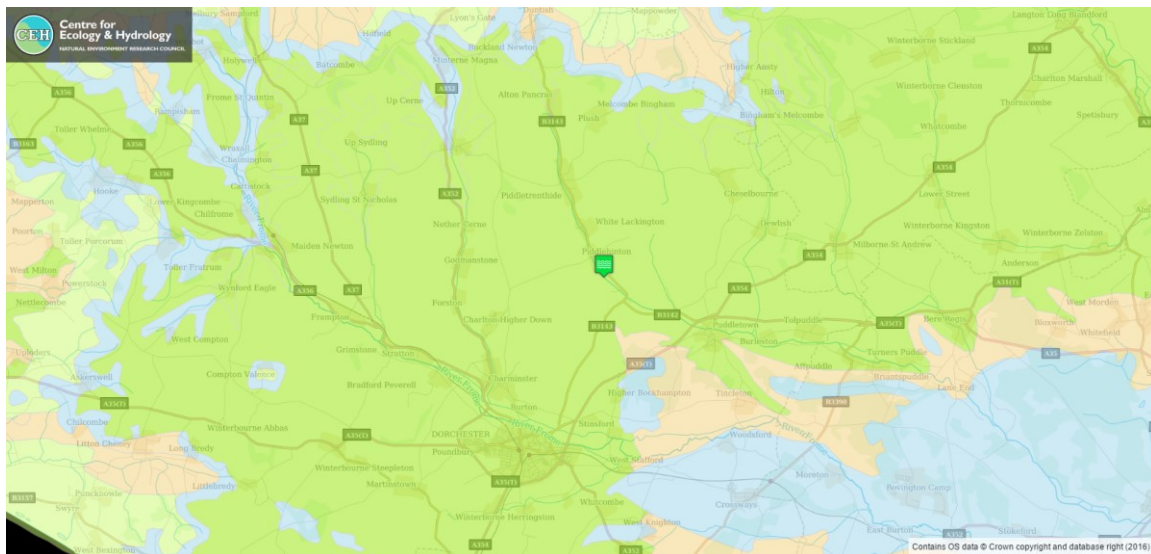


#### 3.1 Geology and Hydrogeology

The study area lies within the Dorset Downs, a chalk down land that consists of steeply sloping 'v' shaped valleys that fall sharply into flat river valleys with alluvial deposits. This is an area of highly permeable fractured chalk which readily absorbs rainfall transmitting it to the groundwater supplies, which in turn influences river flows and springs in the area.

Due to its geology and topography, the Piddle Valley is prone to flooding as a result of surface water run-off, fluvial and groundwater levels, especially during prolonged wet periods. The flooding problems are also exacerbated in Piddletrenthide and Piddlehinton as a result of sewer overflows when groundwater levels are high enough to infiltrate into the sewer network.

**Figure 2- High Permeability of the Chalk Geology (shown as green on map)**



### 3.2 Hydrology

The major watercourse in the area is the River Piddle, this is a chalk-fed stream that rises in Alton Pancras and flows south through Piddletrenthide and Piddlehinton. As the base flow of the River Piddle is groundwater fed, the flood risk will be greatest when groundwater discharge is at maximum capacity.

Plush Brook is a tributary of the River Piddle fed by groundwater and surface water runoff from the steep upper catchment that has an area of 3.15km<sup>2</sup>. The brook joins the River Piddle just north of the Cheselbourne junction in Piddletrenthide.

At the downstream end of the study area, the watercourse, including Plush Brook, has a catchment area of 34.11km<sup>2</sup> (Appendix 1). The Piddle then flows south-east where it discharges into Poole Harbour just downstream of Wareham. Modelling of the River Piddle catchment within Piddletrenthide and Piddlehinton is currently being considered by the EA in order to improve the understanding of flood risk and to improve the accuracy of the existing flood warning systems.



## 4. Incident Summary

During the 7<sup>th</sup>- 8<sup>th</sup> February 2016 Storm Imogen hit the Southwest England bringing with it very strong winds, (up to 80mph recorded on Portland Bill) and heavy localised rainfall. An amber warning for wind was issued by the Met Office and an amber alert was issued for rainfall. (See appendix 2)

The EA operates a flood warning service throughout England and Wales in areas at risk of flooding from rivers and the sea. The levels are forecast using a number of indicators including rainfall, river levels, etc. The EA issued 146 alerts and warnings during Storm Imogen, (see appendix 3). Within West Dorset, flood warnings were issued for the River Bride and the River Char, as well as the Coastal Areas. No warnings or alerts were issued for the River Piddle as the trigger levels had not been reached. The flood warning level has now been lowered as a result of this event (see Section 4.2.2 for more details).

During February, 63% of the rainfall experienced within the Wessex Area fell within the first 8 days. On the evening of the 7<sup>th</sup> February the Piddle Valley experienced extremely heavy, localised rainfall that fell over a very short period of time. The soils were already wet and close to capacity due to the wet weather experienced over the winter months. The rainfall total across the Wessex Area over the previous three months was 136% of the long term average, (see appendix 4). The groundwater levels were above normal for the time of year and river levels were high to exceptionally high in response to the rainfall received over the winter months, (*EA Water Situation Report for the Wessex Area: February 2016*). It was also the second wettest winter for the UK, in a series from 1910, with only the winter of 2013/14 wetter.

As a result of the high intensity rainfall combined with the already saturated ground and raised river levels, 14 properties suffered internal flooding within the Piddle Valley.

**Table 1 Summary of properties flooded,  
(Based on approximate numbers reported and brought to our attention during this investigation).**

| Location               | Number of properties flooded internally | Date      | Main source of flooding during incident    |
|------------------------|---|-----------|--|
| <b>Plush</b>           | 7                                       | 7/02/2016 | Surface water<br>Ordinary watercourse      |
| <b>Piddletrenthide</b> | 4                                       | 7/02/2016 | Surface Water<br>Groundwater<br>Main River |
| <b>Piddlehinton</b>    | 2                                       | 8/02/2016 | Surface water<br>Groundwater<br>Main River |
| <b>Alton Pancras</b>   | 1                                       | 7/02/2016 | Surface water                              |

**NB: It should be noted that this report is based only on the information brought to the attention of DCC, it does not guarantee an exact list of affected properties during this reported event.**

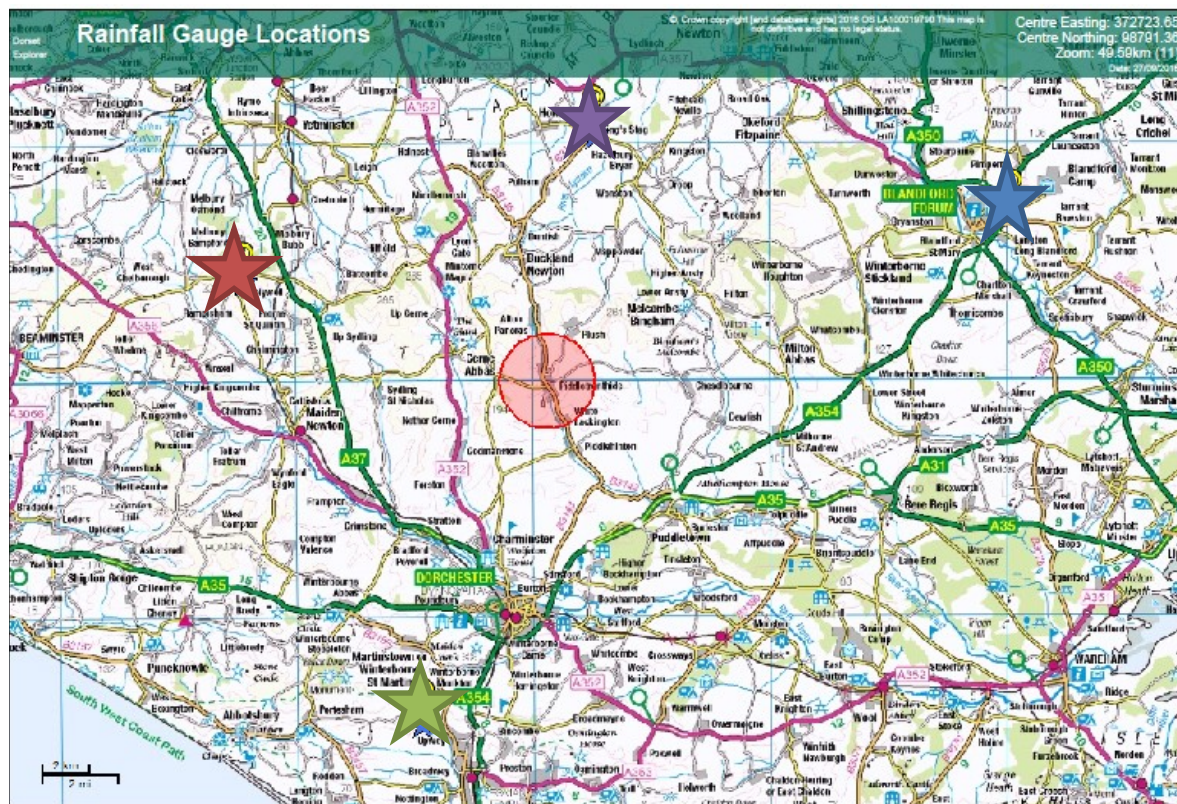


### 4.1 Rainfall data

Rainfall data supplied by Wessex Water shows an average of between 13.5mm - 20.5mm of rain fell over a 24hour period from the 7th-8th February across the four sites surrounding the Piddle Valley (see figures 3 and 4).

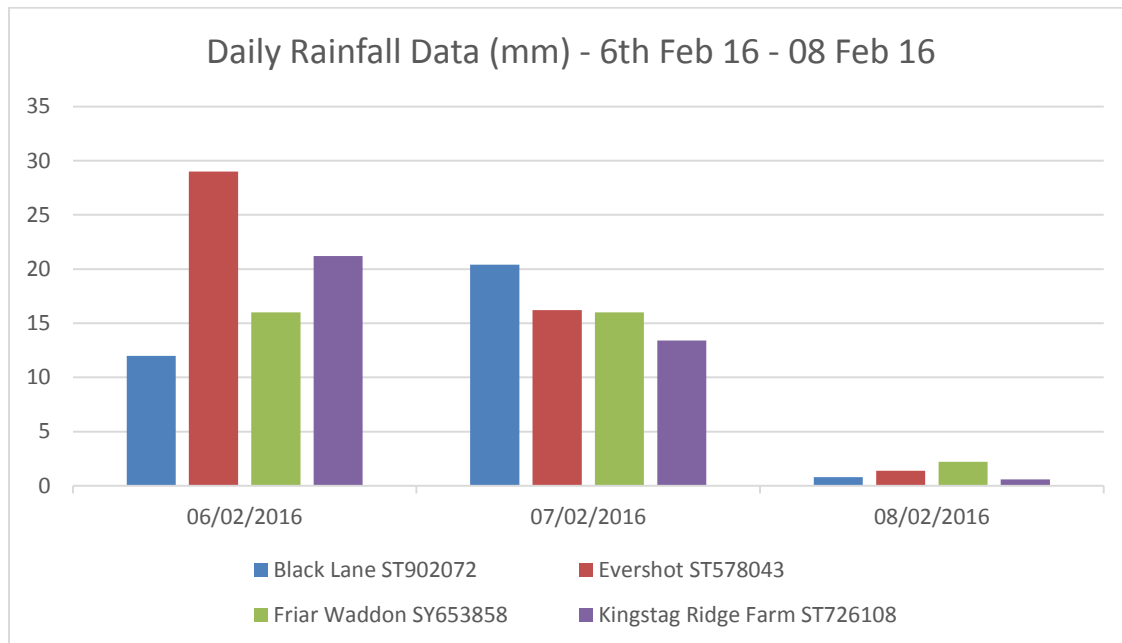
This is inconsistent with the rainfall experienced within the Piddle Valley and as such cannot be used to undertake a return period analysis for this flooding event. As a result of this investigation the EA will be looking at options to collect rainfall data within the Valley to allow for better flood warning predictions

**Figure 3- -Rainfall Gauge Locations**





**Figure 4- Rainfall Data from nearby gauge stations during 6th-8th Feb 2016**



Although the rainfall data was not available for this event, on the 8<sup>th</sup> February at 12.15am the river gauge at South House, in Piddlehinton, recorded a peak flow of six cubic metres per second (6m<sup>3</sup>/s). Flow of this scale was last recorded in 2000, where up to 54 properties within the Valley flooded. As a result of the 2000 flood event, the Piddletrenthide Flood Alleviation Scheme (FAS) was constructed in 2004, to the design capacity of 5m<sup>3</sup>/s. This scheme successfully reduced the impact of flooding during this event, however the report identifies that further actions are necessary in order to reduce the impact further within the Valley.

## 4.2 Locations Affected

The Piddle Valley has experienced flooding historically from a number of sources, including surface water run-off, fluvial & groundwater flooding. Previous studies and reports have been undertaken and improvements have been made to reduce the flooding experienced within the Valley, including the Piddletrenthide FAS and the minor FAS in Rectory Road, Piddlehinton. Further information on each of the settlements affected by Storm Imogen and any previous events are discussed in more detail below.

### 4.2.1 Plush

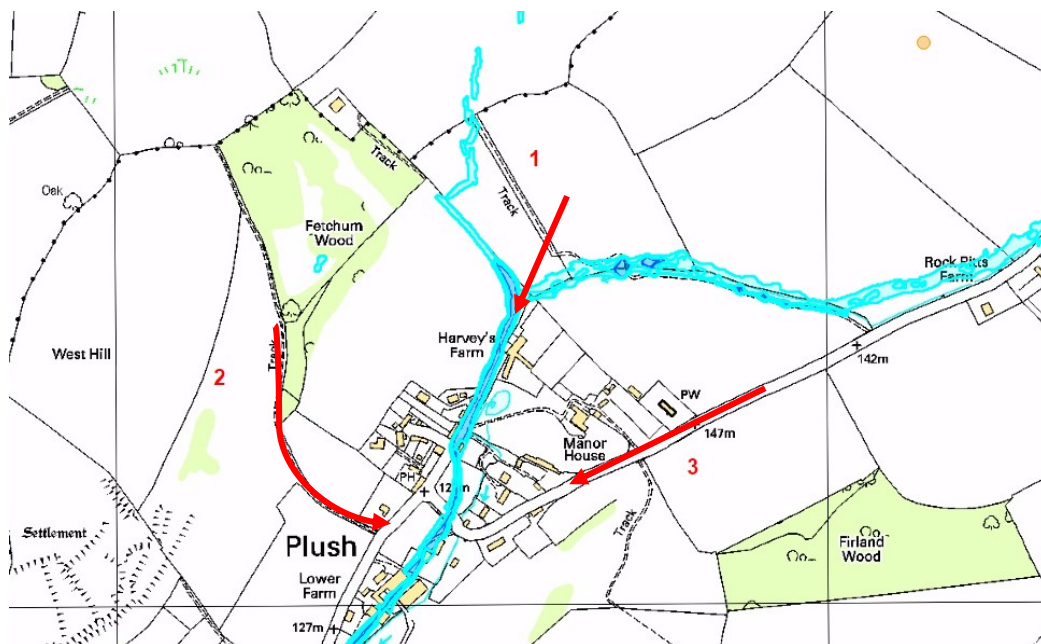
Plush experienced the most extensive impacts as a result of the flooding on the 7<sup>th</sup> February, with seven properties flooding internally. Previous to this event flooding occurred in 2000 and in 2014 one property flooded internally as a result of a blockage in the Highway infrastructure, since then minor highway improvements were made to help resolve the problem.

During the evening of the 7<sup>th</sup> February, at approximately 10.30pm, residents reported hearing a ‘roar of rushing water’ just before the flash flood impacted properties within the village. The predominant flow was from the north of the village (location 1 on the map), this was due to an accumulation of surface water running off the already saturated ground within the watershed above Plush. There was not the channel capacity in Plush Brook to cope with such a high intensity of rainfall and as such the water came out of bank almost immediately causing the internal flooding of 3 properties. The brook rose by approximately 1.5m before coming out of bank again where it converged with two further surface water run-off flows as described below.

Surface water from the steep catchment to the north-east was conveyed via a bridleway known locally as Dead Cat Lane (location 2). There is a drainage system at the end of this bridleway, however due to the existing camber and the amount and rate of flow received, the surface water bypassed the inlet to the drainage system and flowed towards the village, bringing with it a large amount of mud and scalping’s from the bridleway which in turn blocked the road gullies. Surface water was also conveyed down into the village from the from the north east, via the C97 road (location 3), the large volumes of water were unable to enter the highway drainage systems effectively resulting in a combination of fluvial and surface water flooding to 3 properties in the centre of the village. A further property internally flooded as a result of surface water run-off from an adjacent field.

As part of the investigation process it will be recommended to investigate the potential restrictions to flow within Plush Brook, to divert surface water away from the village at Dead Cat Lane and for DCC Highways to repair any faults within the highway drainage through their recent review of the infrastructure here, see Section 6 for further details.

**Figure 5 - Main flow pathways in Plush**





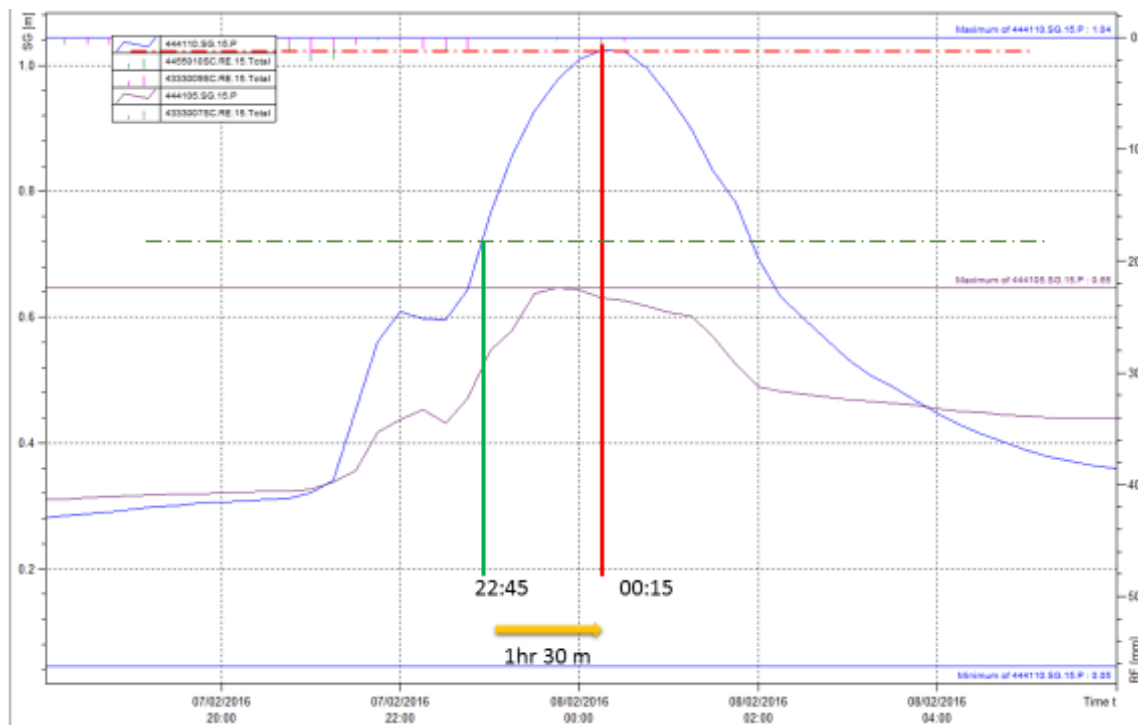


### 4.2.2 Piddletrenthide

There has been a history of flooding within Piddletrenthide from a number of sources, including ground, surface water, fluvial and sewage flooding, the latter as a result of ground and surface water inundation of foul sewers via infiltration. The last major event occurred in 2000 when 54 properties flooded, triggering the Piddletrenthide FAS. This scheme now protects over 50 homes from flooding in Piddletrenthide. Wessex Water also carried out extensive investigations and in 2011 constructed two groundwater surcharge relief pumping stations to reduce the risk of sewer flooding in the catchment. There is also an on-going programme to reduce sewer infiltration and inflows.

During the 7<sup>th</sup> February Piddletrenthide was hit by Storm Imogen at approximately 10.30pm. Properties were flooded as a result of surface water run-off from adjacent fields and Main River flooding. There were no flood warnings issued due to the very localised and short intensity of the rainfall event, however the EA have now reviewed their flood warning level and lowered the trigger level from 1.04m to 0.65m in order to provide a longer lead in time in the event of flooding.

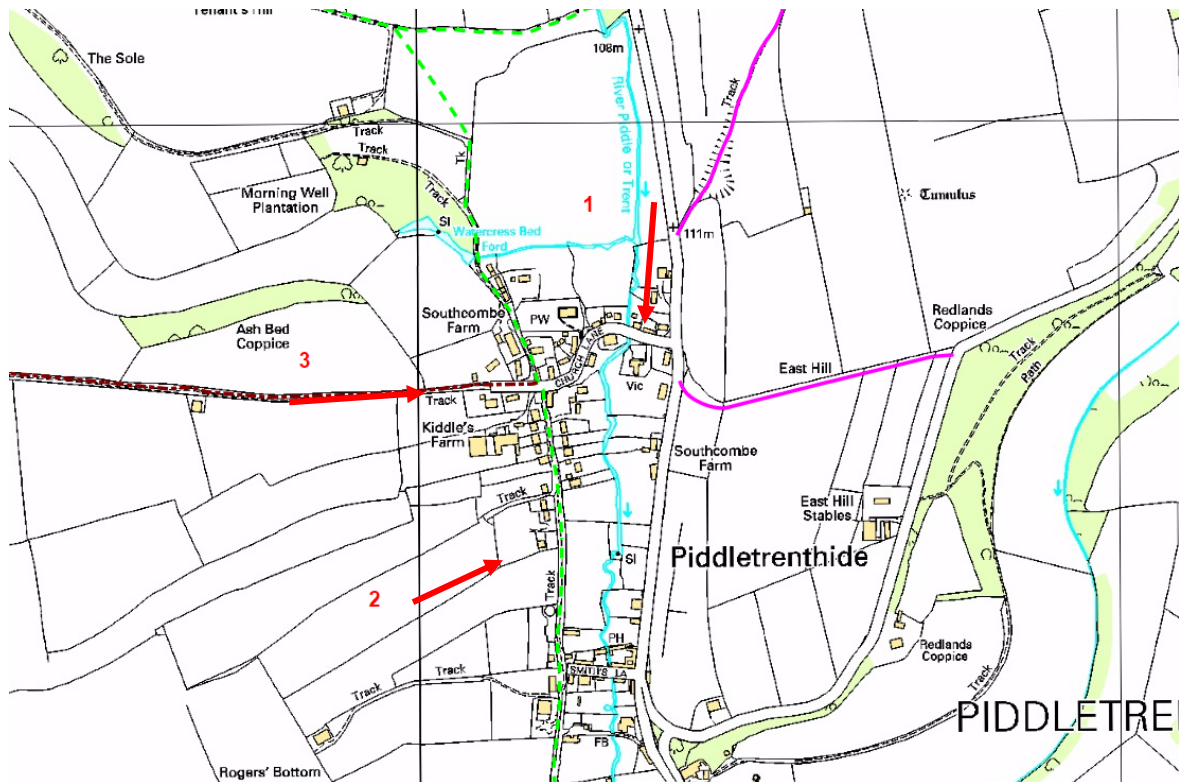
**Figure 6 - New Flood warning threshold level for Piddletrenthide**





The River Piddle came out of bank upstream of the bridge at Church Lane, (see figure 7 location 1) resulting in three properties being flooded internally. The Bridge at Church Lane has been identified as a possible restriction to flow and investigations have since been undertaken by the EA and DCC Highways to explore whether any improvement to the structure could be made. It was found that the bed depth could not be reduced due to the shallow foundations of the bridge, and that there had been no increase in silt levels. However the LLFA will explore whether a by-pass channel would be feasible at this location and this forms part of the recommendations in this report. Investigations into whether Natural Flood Management and Catchment Management options are feasible within the upper catchment of the Piddle Valley are also being explored in advance between the LLFA, EA and other interested parties.

**Figure 7 - Church Lane Bridge & Egypt, Piddletrenthide**



Church Lane was also affected by sewage flooding as a result of ground and surface water inundation of the sewer pipes. Since 2011 Wessex Water has inspected all main sewers in Piddletrenthide at least once, undertaken sewer sealing and reported results annually to the Environment Agency. Since the 2016 event, Wessex Water have inspected 1200m of sewer and identified 4 lengths which require sealing. An Inflow Management Plan has also been published on the Piddle Valley website highlighting the further actions that



Wessex Water will be undertaking within Piddletrenthide. These actions are also recommended within this Section 6 of this report.

Flooding also occurred as a result of surface water run-off from fields to the West of Little Egypt (2). The un-adopted road here has been built up over time with scalping's, creating a bund effect and leading to blockages of the highway drainage. Since the event the drainage system has been cleared but it would be beneficial to explore whether the road surface can be improved via the riparian owners.

Surface water was also conveyed via the BOAT (Byway open to all traffic), from the West into Church Lane (3), resulting in the surface dressing of the byway blocking the road gullies, these have since been cleared but further investigations are needed into improving the surfacing here in order to reduce the potential for blockages in the future.

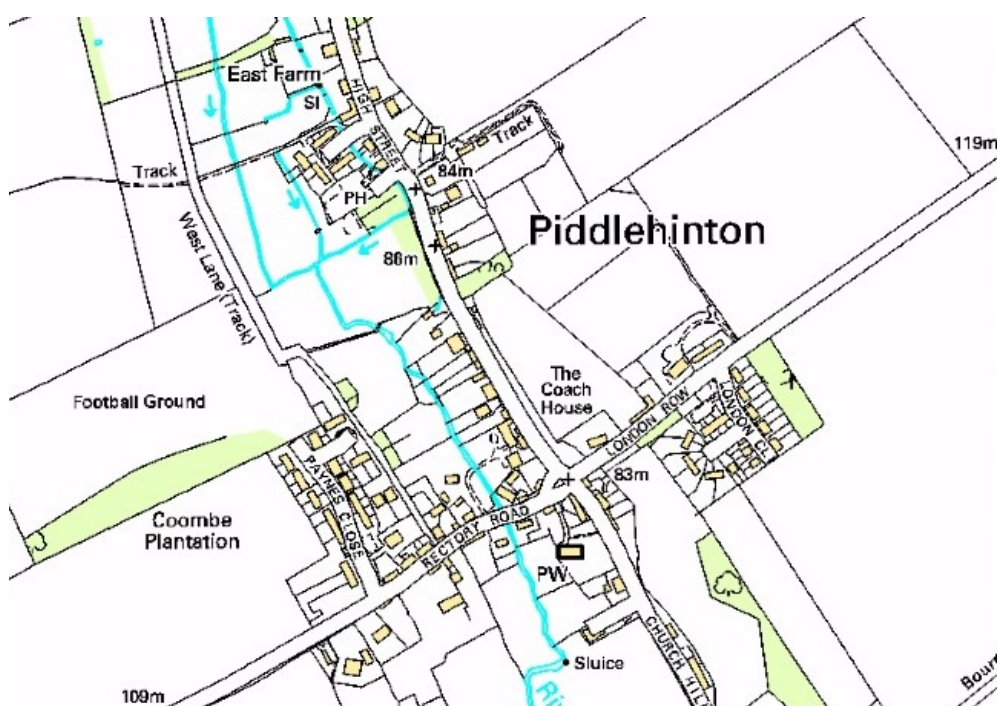
Highway flooding also occurred along the B3143 on the main high street, as the highway drainage systems were unable to cope effectively with the large volume of water. It was reported that water levels dropped within an hour and there were no properties flooded internally although some external garden flooding was reported.

### 4.2.3 Piddlehinton

Previous flooding events have occurred here, and as a result West Dorset District Council constructed a minor flood alleviation scheme (FAS) in Rectory Road in 2004 to reduce the impact of surface water run-off at this location.

During the event, flooding occurred in Piddlehinton between approximately 3.30am-4.30am on the 8<sup>th</sup> February 2016 along Rectory Road. Two properties were internally flooded as a result of Main River and surface water inundation. The EA are currently investigating the cause of the Main River Flooding here.

**Figure 8 – Rectory Road, Piddlehinton**



The FAS intercepted the surface water run-off conveyed via Rectory Road from the south-west, however part of the system was overwhelmed due to the high volumes of surface water and fluvial water received in such a short period of time.

The majority of surface water from West Lane, missed the main inlet to the FAS and flowed onto Rectory Road. Recommendations have been made to explore whether the grill in West Lane (see figure 9 below) can be modified to allow more surface water into the existing drainage system as residents are currently having to divert water using sandbags during a flood event.

**Figure 9 - Entrance to Drainage System in West lane, Piddlehinton**



#### **4.2.4 Alton Pancras**

During the event one property in Alton Pancras flooded internally due to surface water run-off from an adjacent field. This occurred at approximately 9.30pm on the 7<sup>th</sup> February, flooding had previously occurred here during the 2000 event.

It is recommended that further investigations are looked into farming practices and whether field run-off could be reduced here.





## 5. Quick Wins

As part of the on-going investigation, a number of quick win schemes to reduce the impact of flooding were identified, that could be implemented quickly by the RMA's or land owners within a short timescale and at relatively low cost. These have already been completed as this report has been progressed and are summarised in the table below:

**Table 2 Quick Win Schemes for the Piddle Valley**

| Quick wins   |
|--|
| <ul style="list-style-type: none"> <li>The EA have changed the flood warning threshold level for the River Piddle to offer more time to prepare in the event of flooding.</li> </ul>   |
| <ul style="list-style-type: none"> <li>A Groundwater flood warning service is now available from the EA</li> </ul>   |
| <ul style="list-style-type: none"> <li>EA &amp; DCC Highways have assessed areas/structures reported as posing an issue.</li> </ul>  |
| <ul style="list-style-type: none"> <li>EA worked with DCC regarding Church Lane Bridge, and have carried out re-profiling of grass area in front of the Vicarage.</li> </ul>   |
| <ul style="list-style-type: none"> <li>WDDC jetted through the Flood Alleviation Scheme in Egypt, Piddletrenthide and in Rectory Road, Piddlehinton</li> </ul>   |
| <ul style="list-style-type: none"> <li>WDDC replenished sand bag stores in Piddletrenthide and Piddlehinton and a new store has been set up in Plush</li> </ul>  |
| <ul style="list-style-type: none"> <li>WW have inspected 1200 metres of sewer and identified 4 lengths of sewer within the valley which require sealing.</li> </ul>  |
| <ul style="list-style-type: none"> <li>WW Inflow Management Action Plan published on Piddle Valley Parish website.</li> </ul>  |
| <ul style="list-style-type: none"> <li>DCC Highways have reviewed their highway drainage infrastructure in affected areas within Plush and Piddletrenthide and areas identified where further works are required.</li> </ul> |
| <ul style="list-style-type: none"> <li>The LLFA have identified properties that may benefit from Property Level Resilience</li> </ul>  |



## 6. Recommended Actions

As a result of this investigation report, several recommendations have been made for actions to be taken in specific locations. These are either as a result of initial site or desktop investigations, or the continuation of works or investigations already in progress. There are also a series of general actions recommended to be considered in all of the locations

**Table 3 Recommended Actions for the Piddle Valley**

| Action By   | Recommended Action  | How   |
|---|---|---|
| <b>General Actions</b>  |   |   |
| <b>LLFA/EA/ Local Communities</b>   | To increase community resilience to flood events within the Piddle valley                             | The relevant authorities will help assist with the development of community resilience plans                      |
| <b>DCC Highways</b>   | To ensure efficient operation of highway drains and culverts.   | Review highway gullies and consider whether any maintenance issues require attention.                             |
| <b>LLFA/EA/Property Owners</b>  | To consider flood resilience measures to affected properties  | Potential funding for Property Level Resilience to be investigated by the EA with LLFA input                      |
| <b>Property Owners</b>  | Consider flood risk to own properties   | To ensure watercourses in their ownership are maintained and to install property level protection where necessary |
| <b>EA</b>   | To obtain accurate rainfall data within the Piddle Valley in order to provide better flood prediction | To look into options available to collect rainfall data within the Valley   |
| <b>EA,LLFA, Wessex Water, Landowners</b>  | To explore options for Natural Flood Management and Catchment Management within the Piddle Valley     | To set up a working group with stakeholders to look into the options available.                                   |
| <b>In addition to the above, the following should be considered at specific locations</b> |   |   |
| <b>Plush</b>  |   |   |
| <b>LLFA, DCC Highways, Rights of Way/ Landowner</b>                                       | To investigate diversion of surface water from Dead Cat Lane away from the centre of Plush            | Review options with landowners and Rights of Way.   |



|   |   |  |
|---|---|--|
| <b>LLFA/Riparian Owners/Landowners</b>                  | To keep Plush Brook channel clear of obstructions                                     | To work with property owners and land owners to remove any potential obstruction and to increase maintenance of Plush Brook  |
| <b>DCC Highways</b>                                     | To ensure efficient operation of highway drains on the C97                            | To repair broken pipework found.   |
| <b>Piddletrenthide</b>                                  |   |  |
| <b>LLFA</b>   | Feasibility study into reducing flood impacts at Church Lane Bridge, Piddletrenthide. | A study will be carried out to investigate whether a by-pass channel can be constructed in Church Lane   |
| <b>EA</b>   | To further understand flooding mechanisms and improve flood warning techniques.       | To undertake hydraulic modelling of Piddletrenthide and Piddlehinton   |
| <b>LLFA/DCC Highways/Rights of Way/ Riparian Owners</b> | To reduce surface water flood risk in Little Egypt, and Church Lane                   | To explore surfacing options of the un-adopted highway and BOAT (Byway open to all traffic)  |
| <b>Wessex Water</b>                                     | To reduce sewage flooding   | To continue the implementation of the Inflow Management Plan including investigation and sealing of the sewer system.<br>To consider the viability of both engineering (eg additional pumped relief stations) and groundwater management sewer flooding alleviation schemes. |
| <b>Piddlehinton</b>                                     |   |  |
| <b>LLFA, Rights of Way, DCC Highways</b>                | To improve surface water drainage in Rectory Road                                     | To explore whether the entrance to West Lane in Rectory Road, Piddlehinton, can be modified to allow more surface water into the existing drainage system.   |
| <b>Alton Pancras</b>                                    |   |  |
| <b>LLFA/EA/Landowners</b>                               | To reduce run-off from fields   | To work in partnership with Landowners to explore options of reducing SW run-off   |

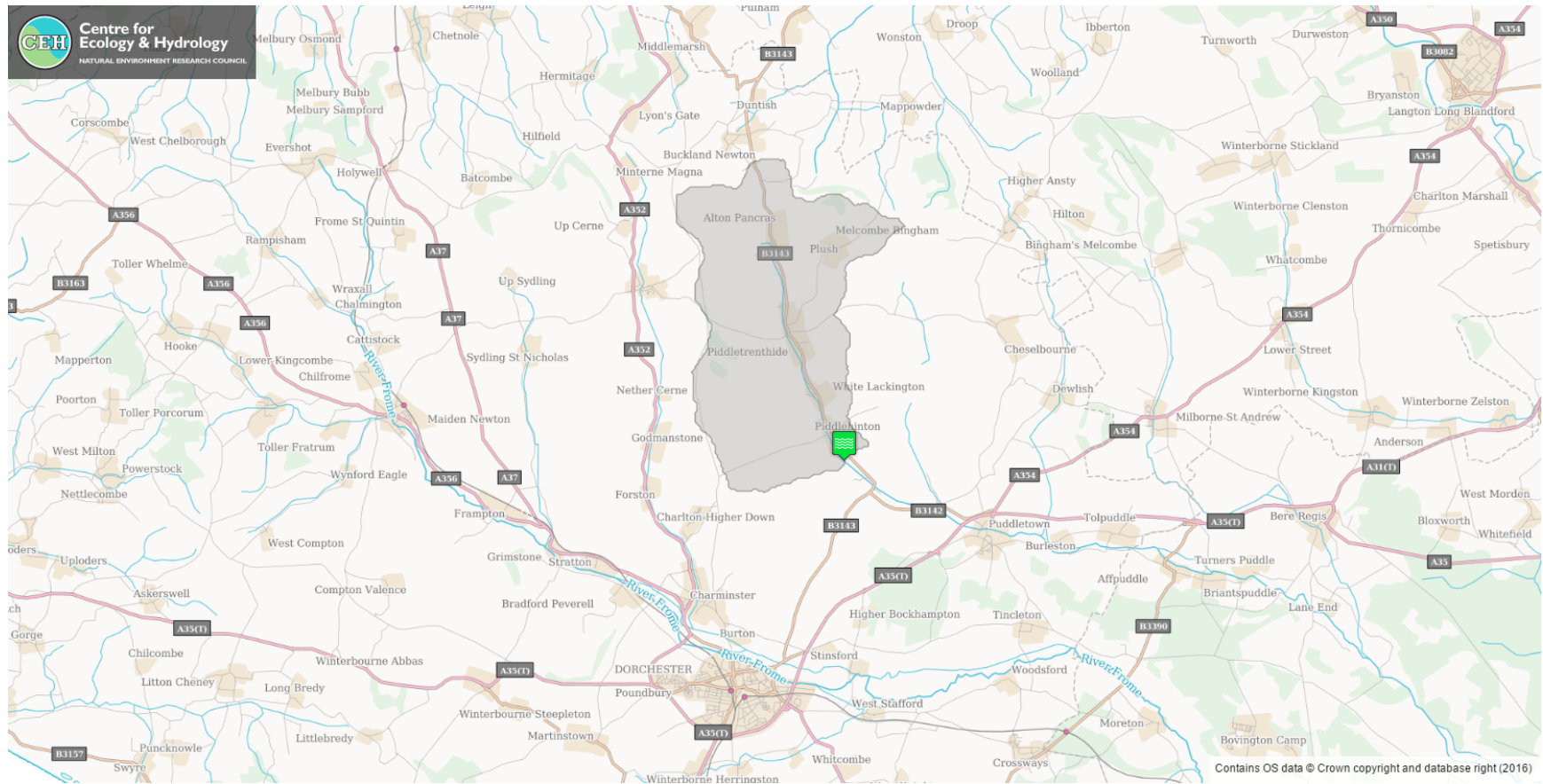
## 7. Next Steps

The next steps following this report will be for DCC as the LLFA to ensure that the recommended actions are taken forward by the identified Risk Management Authorities. DCC will monitor actions through regular reviews, whilst working in partnership with the EA, District Councils, Wessex Water and the local communities affected.



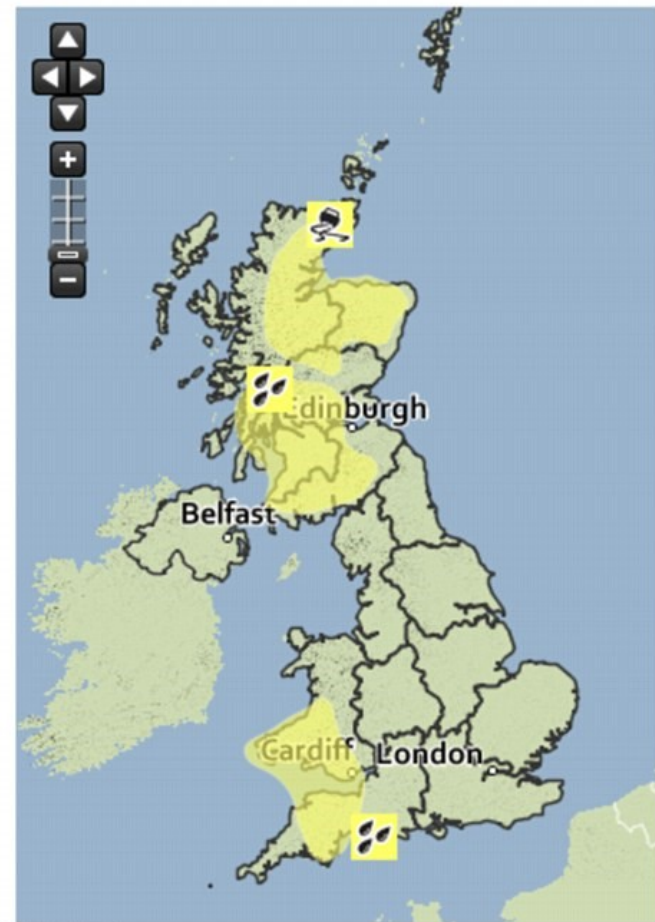
## Appendix 1 – Catchment of the Study Area

Total = 34.11km<sup>2</sup>

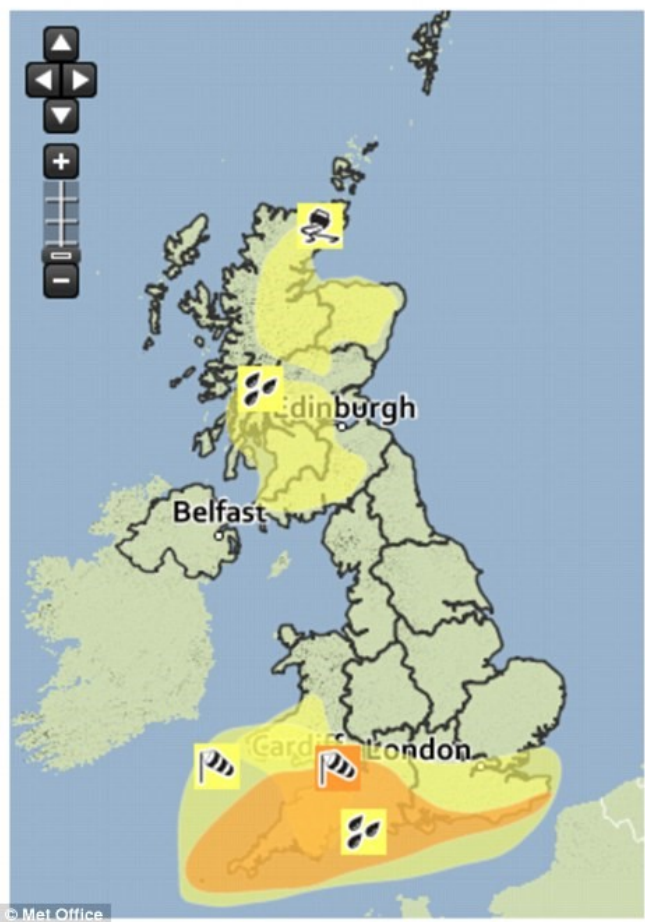


Appendix 2 -MET office weather warnings during Storm Imogen

Sun 7 Feb



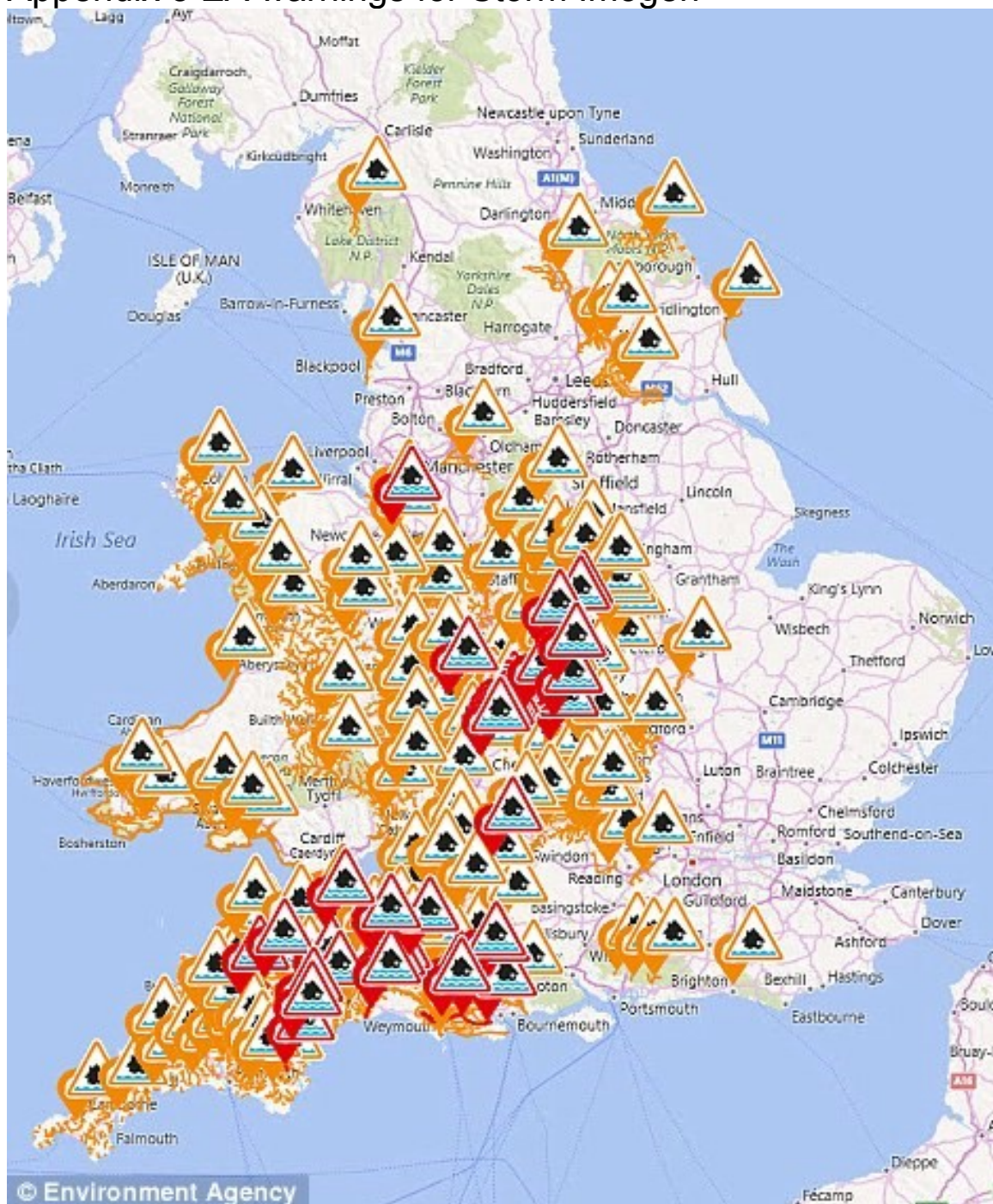
Mon 8 Feb







### Appendix 3 EA warnings for Storm Imogen



Appendix 4 - Average Rainfall Data for winter 2015-16

