PARSONS BRINCKERHOFF

July 2013

SOUTH WINTERBOURNE FLOOD INVESTIGATION

Dorset County Council

285400K-HLT

Final

South Winterbourne Flood Investigation

285400K-HLT

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EXECUTIVE SUMMARY

Project background	In July 2012 heavy rainfall led to flooding of 42 properties in Winterbourne Abbas, Winterbourne Steepleton and Martinstown in west Dorset. This was followed by further flooding in these villages in November and December 2012. Parsons Brinckerhoff was appointed by Dorset County Council to undertake a review of the flooding to identify its causes and to make recommendations for possible flood alleviation or protection schemes.
2012 flooding	Extreme rainfall on the night of the 6th July and the following 36 hours led to groundwater, fluvial and surface water flooding, with 42 properties suffering internal flooding and high flood levels causing the closure of the A35 trunk road. Flood levels remained high for over two weeks. Further flooding occurred in November and December 2012, with a number of properties affected on multiple occasions.
Causes of flooding	The factors contributing to the flood risk in South Winterbourne have been assessed. This has been based on reports of the nature of the flooding, photographs of the flood events and data from groundwater boreholes, rainfall records and flow data from the South Winterbourne stream. The assessment has determined that the primary source of flooding in the catchment is from groundwater, due to the underlying chalk geology, exacerbated by extreme heavy rainfall events. Contributing factors to flooding in the villages include restrictions in the capacity of the South Winterbourne as it flows through the affected villages and high volumes of surface water runoff from agricultural land. During the collection of evidence for this assessment, a widely held view was reported that activities by Wessex Water in the catchment contributed to the flooding experienced in 2012. The impact of Wessex Water's activities has been assessed and is determined to have been a negligible factor on the flooding.
Flood alleviation and protection options	Measures to alleviate the flooding in the affected villages have been considered, with the review incorporating schemes ranging from catchment scale approaches to household level protection. The review found that large scale catchment wide approaches are unlikely to be appropriate for the study area. Household flood protection approaches in coordination with improved management and maintenance of surface water infrastructure are the best approach for managing future flood risk.
Recommended flood alleviation measures	As a result of the assessment, recommendations have been made to improve flood management in the study area. The recommendations include the formation of Community Flood Action Group to improve management and maintenance of the South Winterbourne and create a representative voice for flood concerns for the community. Specific recommendations to help alleviate localised flood issues in each of the villages have also been identified.
This sheet is intended as a summary only.	

SECTION 1

INTRODUCTION

1 INTRODUCTION

1.1 Project Background

1.1.1 Parsons Brinckerhoff Ltd (PB) was appointed by Dorset County Council to undertake an investigation into the causes of flooding in the villages of Martinstown, Winterbourne Steepleton and Winterbourne Abbas in Dorset.

1.1.2 The purpose of the study was to improve understanding of the flood risks in the area and to identify possible measures for flood alleviation. The appointment follows incidences of flooding in the three villages, in July, November and December 2012.

1.2 Objectives

1.2.1 The objectives of this study were as follows:

i. Investigate the flooding in the three identified villages in July 2012 and the subsequent flooding in November and December 2012.

ii. Undertake a desk-based assessment of the existing flood risk in the study area and identify any existing flood protection measures;

iii. Identify potential alleviation or protection measures to reduce the impact of future flooding.

1.3 Consultation

1.3.1 Consultation was undertaken with a number of stakeholders in order to improve understanding of the flooding history in the area and to obtain input into the identification of measures to reduce flood risk.

1.3.2 The views of local residents were obtained from flood workshops undertaken by Dorset County Council and the Environment Agency (EA) in August 2012, followed by further consultation with residents undertaken by PB in January 2013.

1.3.3 In addition, the views of the following organisations were sought to ensure a wide range of inputs into the study: Records of these consultations are included in Appendix C and photographs provided by residents of the recent flooding are included in Appendix E.

- West Dorset District Council;
- Environment Agency;
- Wessex Water;
- Winterborne St. Martin (Martinstown) Parish Council; and
- Winterbourne Abbas and Steepleton Parish Council.

SECTION 2

ASSESSMENT METHODOLOGY

2 ASSESSMENT METHODOLOGY

2.1 Overview

2.1.1 As set out in the introduction, three objectives were identified for the flood investigation. These objectives were used as a framework to develop the following methodology which was used in this assessment:

Investigate the flooding in the three identified villages in July 2012 and the subsequent flooding in November and December 2012.

2.1.2 An investigation will be undertaken into the flooding in the study area in 2012, focusing on the July flooding with consideration also given to the later flood events in November and December 2012.

2.1.3 This investigation will be based on consultation with residents, landowners and other stakeholders, as well as assessment of rainfall, flow and groundwater data for the 2012 events and other historic flood events in the affected villages and surrounding area.

Undertake a desk study assessment of the existing flood risk in the study area and identify any existing flood protection measures;

2.1.4 Existing data from a range of sources will be used to prepare a desk study assessment of the flood risk to the study area from all sources of flooding.

2.1.5 Hydrological and geological data as well as rainfall, groundwater and river flow records will be used in combination with consultation with stakeholders in the affected villages to form a comprehensive understanding of flood risk.

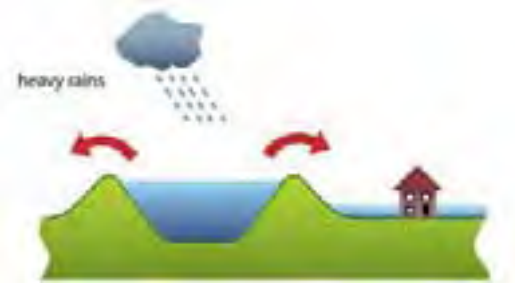
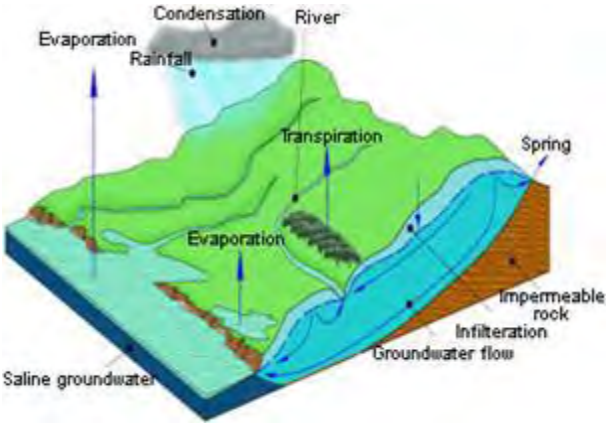
Identify potential alleviation or protection measures to reduce the impact of future flooding.

2.1.6 Following assessment of the sources and causes of flooding in the three affected villages, potential alleviation and/or protection measures will be identified to reduce the impact of future flooding.

2.2 Sources of Flooding

2.2.1 Flooding can be caused by one of, or a combination of, four primary sources, summarised in Table 1.

Table 1 – Sources of flooding

Flood Source	Example
River (or fluvial) flooding: occurs when the flow in a river or watercourse exceeds the capacity of the river channel and causes overtopping or a breach. It can happen, for example, when heavy rain falls on an already waterlogged catchment. A blockage caused by natural material or manmade objects/litter can also cause rivers to overtop their banks.	
Coastal and tidal flooding: results from a combination of high tides and stormy conditions, which lead to overtopping of existing defences.	
Surface water (or pluvial) flooding: flooding caused by intense rainfall, which exceeds the capacity of the installed drainage system. This type of flooding is typically localised and happens very quickly after the rain has fallen.	
Groundwater flooding: occurs when water levels in the ground rise above surface levels. It is most likely to occur in areas underlain by permeable rocks or granular layers, called aquifers.	

2.3 Definition of Flood Risk

2.3.1 Flood risk is the product of the likelihood (or chance) of a flood occurring (flood frequency) and the consequence or impact of the flooding (flood consequence).

Flood Frequency

2.3.2 Flood frequency is identified in terms of the return period and annual probability. For example, a 1 in 100 year flood event has a 1% annual probability of occurring. Table 2 below provides a conversion between return periods and annual flood probabilities.

Table 2 - Flood probability conversion table

Return Period (years)	2	5	10	20	50	100	200	1000
Annual Flood Probability (%)	50	20	10	5	2	1	0.5	0.1

Flood Consequence

2.3.3 The 'consequence' of a flood event describes the potential damage, danger and disruption caused by flooding. This is dependent on the mechanism and characteristics of the flood event and the vulnerability of the affected land and land use.

2.4 Potential Impact of Climate Change

2.4.1 Scientific consensus is that the global climate is changing as a result of human activity. While there remain uncertainties in how a changing climate will affect areas already vulnerable to flooding, it is expected to increase risk significantly over time. For the UK, projections of future climate change indicate that more frequent short-duration, high-intensity rainfall events and more frequent periods of long-duration rainfall could be expected.

2.4.2 The Department for Communities and Local Government has provided recommended national precautionary sensitivity ranges for possible peak rainfall intensities resulting from climate change for the next 100 years, shown in Table 3.

Table 3 - Recommended national precautionary sensitivity ranges for climate change

Parameter	1990 to 2025	2025 to 2055	2055 to 2085	2085 to 2115
Peak rainfall intensity	+5%	+10%	+20%	+30%
River flow	+10%	+20%		

2.5 Limitations and Assumptions

2.5.1 This study provides an assessment of the flood risk in Winterbourne Abbas, Winterbourne Steepleton and Martinstown based on the best information currently available. The analysis is dependent on the accuracy of the information obtained from third parties, such as rainfall data and groundwater and river flow records.

SECTION 3

PROJECT BACKGROUND

3 PROJECT BACKGROUND

3.1 Study Location

3.1.1 This study relates to properties located within three villages situated alongside the South Winterbourne in Dorset, approximately 3 miles to the west of Dorchester.

3.1.2 The study area is shown in Figure 1 and in Figure A1 in Appendix A.

Figure 1 – Study location with study area marked in red

Winterbourne Abbas

3.1.3 Winterbourne Abbas is located alongside the A35 at the western end of the study area, 7 km to the west of Dorchester. The village extends approximately 0.6 km from west to east, from National Grid Reference (NGR) SY614905 to SY620903.

3.1.4 The South Winterbourne flows from west to east directly to the south of A35 throughout the length of the village

Winterbourne Steepleton

3.1.5 Winterbourne Steepleton is located immediately to the south east of Winterbourne Abbas alongside the B3159 from NGR SY620903 to SY629897.

3.1.6 The South Winterbourne flows from west to east directly to the north of B3159 throughout the length of the village.

Martinstown (Winterborne St Martin)

3.1.7 Martinstown is located 1.5 km to the south east of Winterbourne Steepleton, 4 km to the south west of the centre of Dorchester. The village follows the B3159 from NGR SY643889 to SY653887.

3.1.8 The South Winterbourne flows alongside the northern side of the B3159 , as far as The Brewers Arms Public House before crossing under the road and

flowing along the southern side of the road through the remainder of the village. At the western end of the village, the river crosses back underneath the road and continues to the east.

3.1.9 This study also concerns one property in Winterborne Monkton, 2.5 km to the east of Martinstown at NGR SY677879.

3.2 Hydrology

3.2.1 The South Winterbourne is a chalk-fed stream which rises in springs to the west of Winterbourne Abbas and flows to the south east, running through Winterbourne Abbas, Winterbourne Steepleton and Martinstown before joining the River Frome near West Stafford.

3.2.2 At the downstream end of the study area the watercourse has a hydrological catchment area of 34 km^2, with the hills of Long Bredy, Kingston Russell and Compton Valence forming the western extent of the catchment. The catchment of the watercourse as assessed in the Flood Estimation Handbook (FEH) is shown in Figure A3 in Appendix A.

3.2.3 As a 'winterbourne' stream, both the location of the source and the flow in the watercourse tends to vary greatly by season. The majority of flow is groundwater-derived and so when groundwater levels rise, the flow in the watercourse increases. As a consequence, the springs that form the source of the watercourse migrate 'up' and 'down' topography with the rise and fall of the water table.

3.2.4 Historically, the river used to run dry in summer months as the groundwater level receded. A flow augmentation scheme is now operated, however, in which groundwater is pumped from a borehole into the upper reaches of the watercourse to maintain a flow in the stream. This is discussed further in Section 5.4.

3.3 Geology and Hydrogeology

3.3.1 The study area lies within the Dorset Downs, an area of chalk downland that forms part of the wider Southern England Chalk Formation. This is part of a large area of chalk that extends from south-west to north-east across England. The chalk is the largest groundwater resource in the UK, providing more than half of the groundwater in the country and approximately one fifth of all water used in the UK.

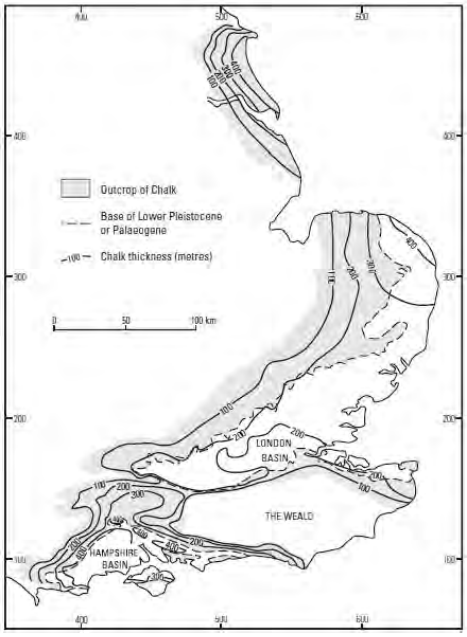


Figure 2 – Outcrop and thickness of the chalk aquifer in England (Ref: BGS Technical Report WD/97/34)

3.3.2 Chalk is a dual porosity medium, with groundwater held within both the rock matrix (pores) and its fractures. The rock matrix is highly porous (~40%) but the small size of the apertures means that groundwater within the matrix is virtually immobile, being held by capillary forces. The majority of groundwater movement within the chalk is within the fractures, which typically occupy between about 1% and 2% of the rock volume (Figure 3). These can be highly permeable, meaning that water can move rapidly through the chalk.

3.3.3 There are two important consequences of the fracturing present within the chalk in relation to this study. The first is that groundwater levels within the chalk can respond rapidly to rainfall events. The second, is that because the water can only move through the fractures, infiltrating rainwater tends to cause greater rise in groundwater level than witnessed in other strata with a higher porosity, such as sand and gravel, for example.

3.3.4 The combination of the potential for rapid changes in the groundwater level and a large amount of water level rise within the chalk means there is an increased risk of groundwater flooding on this type of rock. The risk of groundwater flooding is greatest in chalk valleys, where the water table is naturally closer to the ground surface, than on the valley sides (Figure 4).

Figure 3 – Illustration of fractures within chalk geology (supplied by EA)

Figure 4 – Illustration of topographic impact on aquifer (Ref: BGS Technical Report WD/97/34)

SECTION 4

ASSESSMENT OF FLOOD RISK

4 ASSESSMENT OF FLOOD RISK

4.1 Introduction

4.1.1 This section identifies the principle sources of flood risk in the study area and also provides an overview of the flood history in the three villages prior to the July 2012 event.

4.2 Flood History

4.2.1 Historical records indicate a number of instances of flooding in the villages of Martinstown, Winterbourne Steepleton and Winterbourne Abbas. Information on the flood events in 2012 is provided in Section 5, with details of previous flood events below:

July 1955

4.2.2 On 19th July 1955, 280mm of rain fell in the village of Martinstown, leading to extensive flooding. Until 2009, this was the highest recorded amount of rainfall in a 24 hour period in the UK.

Figure 5 – Flood water outside The Brewers Arms, Martinstown in July 1955 (supplied by Richard Knight & Margaret Hearing)

4.2.3 Accounts of the flooding are consistent with groundwater and surface water flooding and are similar to the accounts given by residents following the 2012 floods.

Other Records of Historic Flooding

4.2.4 The Winterbourne Abbas and Steepleton Parish Council records make a number of references to flooding in the study area.

- 31st March, 1930 - Winterbourne Steepleton Parish Council Meeting, held in old school room.

'It was agreed…."That in view of the discomfort caused and danger to school children's health by the overflowing of the river especially where it flows into the upper pond in the winter" the county council be requested to place a sloping concrete wall by the drinking place in order to prevent the flow of water down the road and also generally to survey the cause of the storm flow of water in front of the 4 cottages opposite the lower pond also the flooding of

the road opposite the rows of cottages lower down and opposite Champs Barn.'

- 14th April 1936 – Winterbourne Steepleton Parish Council Meeting, Rectory Hall.

It was agreed to write to all concerned "That this meeting desires to call the attention of the Roads and Bridges committee of Dorset County Council to the constant flooding of the main road from Boxen Hedge Farm to the Dairy House (Legg) at Steepleton and asks that means may be taken to keep the road dryer especially having regard to the number of young children who have to attend school and who must use this road"

4.2.5 Residents in Martinstown also reported flooding occurring in the village in 1985.

More Recent Flood Events

4.2.6 The EA have records of a number of flood events in the study area between 1960 to 1996, which are summarised in Table 4.

Table 4 – Flood record for Winterbourne Abbas, Winterbourne Steepleton and Martinstown 1960 -2012 (Supplied by EA).

Location	Details	Flood Source(s)	Date
Winterbourne Steepleton	Winterbourne Steepleton: Steepleton ponds. Flood depth reached 0.3. Lasting for a duration of 12 hours. Flooding frequency 2-3 times a year. Old ref: C4	Ordinary w/c	12/08/1994
Winterbourne Steepleton	WINTERBOURNE STEEPLETON: Old ref S75.:EA Blandford Office (Grid Ref approx)	Ordinary w/c	*01/01/1960*
Winterbourne Steepleton	Winterbourne Steepleton: Six cottages flooded, Old ref 3/15-34. Exact date of the event unknown.	Ordinary w/c	*03/01/1979*
Winterbourne Steepleton	Winterbourne Steepleton: Six cottages flooded. Number of properties affected unknown.	Ordinary w/c	*05/01/1996*
Winterborne Monkton	Winterborne Monkton: Six cottages flooded, Old ref 3/15-35. Exact date of the event unknown.	Ordinary w/c	*03/01/1979*
Martinstown	Martinstown: Properties flood.	Surface Water Runoff	*03/01/1979*
Winterborne Monkton	Winterbourne Monkton: Road through Winterbourne Monkton and surrounding land. Flooding occurred for one week at a depth of 0.3m.	Ditch Water, Groundwater	01/01/1995
Winterborne Monkton	Winterborne Monkton: Six cottages flooded, Old ref 3/15-35. Exact date of the event unknown.	Ordinary w/c	*03/01/1979*

4.2.7 In addition to these records, flooding occurred in early January 2003 in Winterbourne Abbas, Winterbourne Steepleton and Martinstown following heavy rainfall. A number of residents have also reported further localised

flooding events between 2003 and 2011, which are not recorded on the EA database.

4.3 Assessment of Flood Risk

4.3.1 The three villages are assessed as being at risk from groundwater flooding as well as fluvial flooding from the South Winterbourne.

Groundwater Flooding

4.3.2 The study area is susceptible to groundwater flooding due to it being within a large expanse of unconstrained chalk aquifer and the location of the three villages at the base of the river valley.

4.3.3 The causes of groundwater flooding at a particular location can be difficult to understand as they are often dependent on the individual characteristics of the aquifer as well as antecedent rainfall patterns. In addition, groundwater flooding is often associated with other forms of flooding (see below). As a result, statistical analysis of historic groundwater flooding events or assessing the likelihood of groundwater flooding occurring in the future is complex.

4.3.4 The relatively rare occurrence of groundwater flooding also means that it is less well understood than more common causes of flooding. The geology of the south of England would suggest that there is a widescale risk of groundwater flooding, however there are no records of groundwater flooding in Dorset, Hampshire or Wiltshire for the period 1959 – 1989.

4.3.5 Therefore, whilst it can be stated that the three villages are at increased risk of groundwater flooding, it is not possible to provide accurate guidance on the likelihood or extent of future groundwater flood events.

Fluvial (River) Flooding

4.3.6 The EA indicative flood map for the study area is shown in Figure 6 and in Figure A4 in Appendix A. This map shows the flood risk from river flooding.

Figure 6 – Extract of EA Indicative Flood Map for the study area

4.3.7 Properties adjacent to the watercourse throughout the study area are assessed to be at high risk of fluvial flooding from the South Winterbourne. The steep rise of the topography away from the river means the fluvial flood risk is limited to a small margin either side of the watercourse.

4.3.8 The fluvial flood risk is closely related to the groundwater flood risk, with the geology of the river catchment meaning the flow in the river is closely linked to the groundwater level.

Surface Water Flooding

4.3.9 Surface water flooding is primarily driven by heavy intense rain falling on land and then running off. Surface water flooding in rural areas is most likely to occur in steep-sided catchments and when intense rainfall occurs when the ground is already saturated.

4.3.10 High groundwater levels also contribute to the risk of surface water flooding in a number of ways:

- When groundwater levels are high, surface water cannot infiltrate to ground, leading to increased run-off.
- Very high groundwater will infiltrate into below ground drainage, reducing the effective capacity of the drainage network. Rainfall unable to drain into the drainage network will flow overland, increasing the risk of flooding.
- Groundwater emerging in springs can flow overland, with potential for flood water to enter properties through doorways and other vulnerable points.

Future Flood Risk

4.3.11 As discussed in Section 2.4, climate projections for the next 100 years in the UK indicate that in the future there may be more short-duration high-intensity rainfall events and periods of long-duration rainfall may become more frequent. This may result in increased risk of surface water, groundwater and fluvial flooding.

Summary of Flood Risk

4.3.12 Historic information indicates that flooding has occurred in the three villages several times over the last 60 years. The flooding events appear to have been worst immediately following large amounts of rainfall occurring within relatively short periods of about 24 hours.

4.3.13 The principle flooding mechanisms in the three villages are a combination of groundwater and fluvial flooding, with those properties closest to the watercourse being at most risk.

4.3.14 As a result of predicted climate change, the flood risk in the study area is likely to increase over the next 100 years as higher intensity rainfall events are likely to become more common.

SECTION 5

2012 FLOOD EVENTS

5 2012 FLOOD EVENTS

5.1 Introduction

5.1.1 This report was commissioned following the extensive flooding in Winterbourne Abbas, Winterbourne Steepleton and Martinstown on three occasions in 2012.

5.2 July 2012 Flooding

Summary

5.2.2 On the night of 7th July 2012, significant flooding started to occur in the South Winterbourne area resulting in 42 properties being flooded in Winterbourne Abbas, Winterbourne Steepleton and Martinstown and the A35 trunk road closed for an extended period.

5.2.3 Flood waters remained high for approximately two weeks.

Mechanism of flooding

- On the night of the 6th July, very heavy rainfall led to overland flow of surface water from the hills to the north and south of the study area, causing localised flooding. This rainfall was further to high levels of rain in April and June, meaning the ground was already saturated.
- The high rainfall infiltrated into the fractures in the underlying chalk aquifer causing a rise in groundwater of 9.7m from the 7th to the 9th July.
- As the rainfall continued, rising groundwater levels and overland flow from across the hydrological catchment of the watercourse increased the flow in the South Winterbourne causing the river level to rise. Flooding occurred first at restrictions in the channel, such as at low bridges, before exceeding the capacity of the watercourse along much of the length of the study area.
- The sharp rise in groundwater level caused groundwater to emerge through springs at the base of the valley, causing direct groundwater flooding where springs emerged beneath properties and indirect groundwater flooding where springs emerge outside properties and flowed overland to affect people and property.
- The high level of groundwater meant that further rain could not infiltrate to ground, causing localised surface water flooding and further overland flow. The hydrostatic pressure of the groundwater resulted in high levels of infiltration to below ground services, such as foul drainage and telecommunication services access chambers.
- The high level water within the watercourse meant that below surface water drainage could not discharge into the watercourse, causing drains to backup and overflow, causing further localised flooding.

5.2.4 Further details on the rainfall, groundwater and flow in the South Winterbourne are set out in the following sections.

Rainfall

Dorset Overview

5.2.5 From September 2011 to March 2012, Dorset received lower than average rainfall, with rainfall records showing less than half of the long term monthly average for this period.

5.2.6 This period of low rainfall came to an abrupt end with very high rainfall in April 2012, over three times the long term average and the highest monthly total for April in the record. The total rainfall for April to July 2012 was 459.8mm, close to twice the long term average for this four month period, with April, June and July all approximately three times the average monthly totals. This is illustrated below, with the monthly rainfall totals for 2012 compared against the long-term average shown in Figure 7 and Table 5.

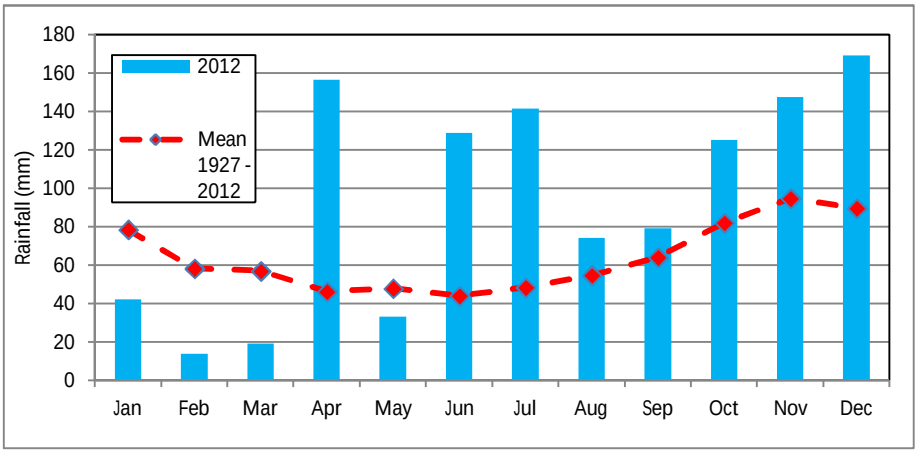


Figure 7 – 2012 Dorset rainfall against the Dorset 1927-2012 long-term average

Table 5 – Dorset rainfall September 2011 to July 2012

Month	Monthly Rainfall (mm)	Total rainfall for period (mm)	Long term average rainfall for period (mm)	Change from long-term average
Sep-11	32.4	267.0	524.7	-49.1%
Oct-11	34.9			
Nov-11	48			
Dec-11	76.3			
Jan-12	42.2			
Feb-12	13.9			
Mar-12	19.3			
Apr-12	156.4	459.8	243.8	+88.6%
May-12	33.2			
Jun-12	128.8			
Jul-12	141.4			

Local Rainfall Gauges

5.2.7 The EA have supplied rainfall data for the rainfall gauges at Friar Waddon (NGR SY652858, 3 km south Martinstown) and Eggardon Hill (NGR SY550939, 6 km north-west of Winterbourne Abbas).

5.2.8 Daily rainfall records at Friar Waddon for June and July 2012 are shown in Figure 8, showing clearly the high rainfall on 6th – 8th July.

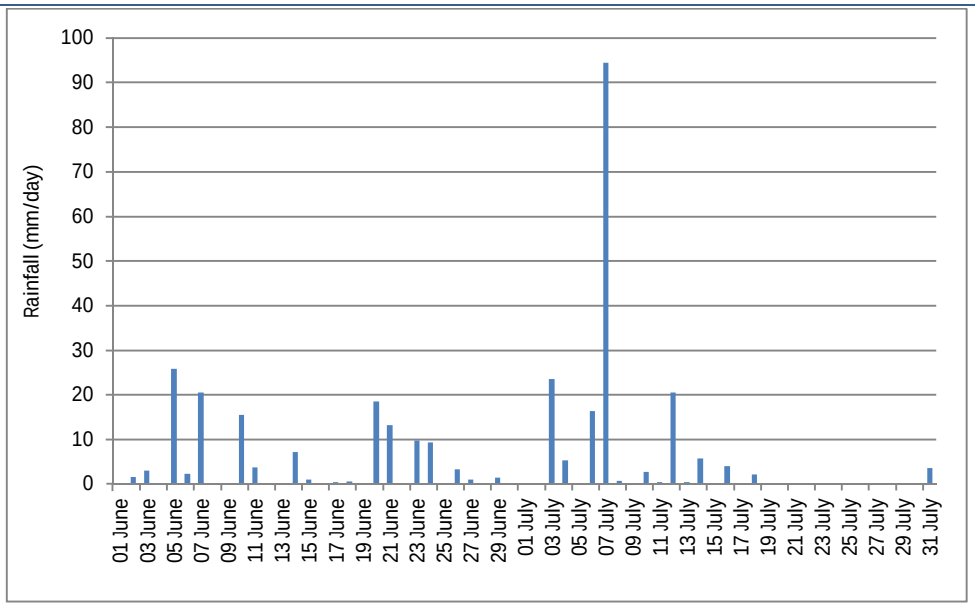


Figure 8 – Daily rainfall June – July 2012, Friar Waddon rainfall gauge

5.2.9 The details of the extreme rainfall from 6th – 8th July are summarised in Table 6. The rainfall was assessed using the Flood Estimation Handbook (FEH) CD-Rom (Version 3) to have an annual probability of 1.3% - 2.2%, meaning an event of this magnitude is expected to occur once every 40 – 80 years.

Table 6 – Recorded rainfall and assessed probability

Gauge Name	Time Period	Rainfall (mm)	Duration (Hrs)	Return Period	AEP
Eggardon Hill	6th July 2012, 13:15 – 8th July 2012, 03:45	114.8	38.5	80	1.3%
Friar Waddon	6th July 2012, 13:30 – 8th July 2012, 01:45	111.2	36.25	46	2.2%

Groundwater Records

5.2.10 The EA maintains a network of groundwater monitoring boreholes across the country, which are used to monitor and inform management of groundwater resources.

5.2.11 The nearest monitoring borehole to the study area is at Kingston Russell, 2.5 km to the west of Winterbourne Abbas at SY591905. Records for the Kingston Russell borehole dating back to November 2003 have been obtained from the EA and are included in Figure B1 in Appendix B.

5.2.12 The record (or groundwater hydrograph) shows the seasonal variation in groundwater level within the aquifer, with groundwater levels typically rising during winter as the aquifer is recharged with winter rainfall and falling during summer, as shown by the years 2007-2010. This general pattern did not occur in 2012, however. Monitored groundwater elevations were low at the beginning of 2012, as a result of limited recharge occurring in winter as a result of the low rainfall.

5.2.13 The record indicates two periods where the groundwater levels rose above 120m AOD: between 30th December 2003 and 5th January 2003, and

between 9th July 2012 and 20th July 2012. The second of these periods started two days after the flooding in the South Winterbourne began.

5.2.14 Figure B4 in Appendix B shows the groundwater record for the Kingston Russell borehole for 2011 and 2012, plotted alongside the daily rainfall totals from the rainfall gauge at Friar Waddon. There is a close correlation between groundwater level and the rainfall pattern, with levels falling during periods of low rainfall and rising following intense rainfall.

5.2.15 The borehole records show a rapid rise in the groundwater level between 7th July and 9th July, with groundwater levels rising from 110.7m AOD on the morning of 7th July to 120.4m AOD at midnight on 9th July, a rise of 9.7m. Groundwater levels from midnight on 6th July to midnight on 9th July are listed in Table 7.

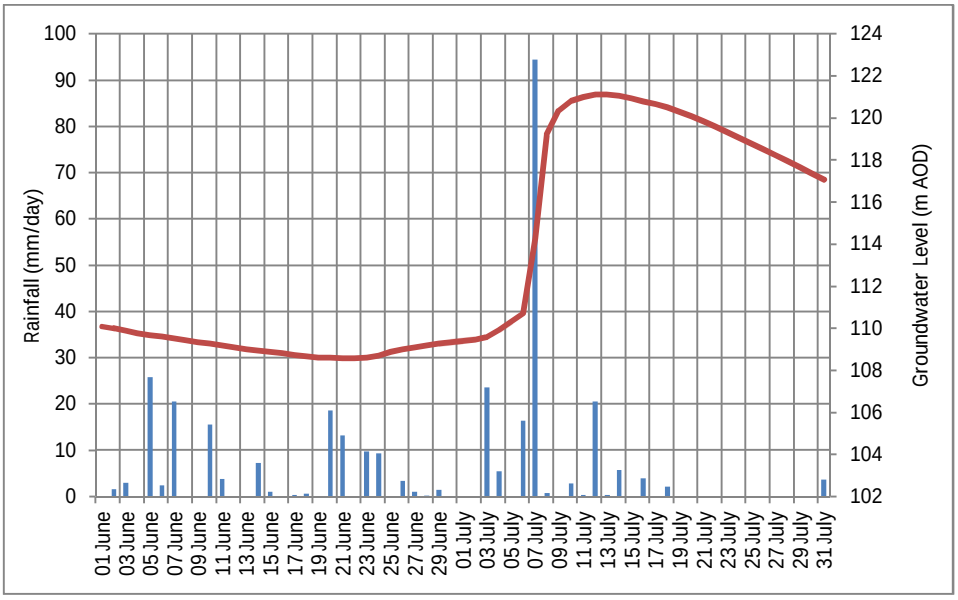


Figure 9 – Groundwater elevation, Kingston Russell and Rainfall, Friar Waddon

5.2.16 Groundwater levels peaked at 121.14m AOD on the morning of 13th July and had receded to 117.0m AOD by the end of the month.

Table 7 – Summary of groundwater, Kingston Russell Borehole July 2012

Date	Time	Groundwater level (m AOD)	6 hour rise (m)	24 hour rise (m)
7/7/2012	00:00	110.71		3.99
	06:00	110.81	0.10	
	12:00	111.24	0.42	
	18:00	112.91	1.67	
8/7/2012	00:00	114.70	1.79	
	06:00	116.84	2.14	4.79
	12:00	118.19	1.34	
	18:00	118.99	0.80	
9/7/2012	00:00	119.49	0.49	
	06:00	119.82	0.34	0.92
	12:00	120.06	0.24	
	18:00	120.25	0.19	
10/7/2012	00:00	120.41	0.16	

5.2.17 Figure B3 in Appendix B shows the daily peaks in groundwater level at the Kingston Russell Borehole, rainfall at Friar Waddon and flow and stage in the South Winterbourne for June and July 2012. The graphs show the groundwater increasing following the extreme rainfall on 7th July with the flow and stage in the South Winterbourne increasing with the sharp rise in groundwater level.

5.2.18 While the intense rainfall on 7th July was the primary reason for the sharp rise in groundwater in July, consultation with stakeholders identified a number of additional potential contributing factors:

- In a typical summer, ground cover of vegetation promotes retention and evapo-transpiration of rainfall, reducing infiltration to ground. The low rainfall in winter 2011-2012 meant ground cover in July was lower than normal, potentially leading to greater infiltration to ground;
- Heavy rainfall in April led to delayed ploughing and increased runoff of topsoil. This may have increased potential for direct infiltration to the aquifer.
- Due to high rainfall in April and June, soil in the catchment was close to saturated, leading to unseasonal summer groundwater recharge following the heavy rainfall in July.

South Winterbourne Flow

5.2.19 The EA maintain a gauging station on the South Winterbourne at the eastern end of Winterbourne Steepleton at NGR SY630898. Records for this gauging station date back to 1992 (a record of 21 years) and are included in Appendix B.

5.2.20 A plot of the long term flow level record is provided in Figure B8 in Appendix B. The plot shows a number of peaks in flow, with the highest recorded flows being 1.33m^3/s on 8th July 2012 and 1.17m^3/s on 2nd January 2003.

5.2.21 Figure B2 in Appendix B shows the close correlation between flow and river level in the South Winterbourne, with peaks in flow coinciding with peaks in groundwater level.

5.3 Impact of Flooding

Winterbourne Abbas

5.3.1 Fourteen properties in Winterbourne Abbas suffered internal flooding in July 2012. The location of the flooded properties in Winterbourne Abbas are shown in Figure A8 in Appendix A.

5.3.2 Flooding occurred from surface water flowing overland and into properties, as well as from direct groundwater emergence into properties. Descriptions from residents of the clear nature of the flood water indicates that the overland flow was from predominantly groundwater emerging from springs outside of the properties.

5.3.3 Flooding to properties to the north of the A35 was perceived to be due to drainage beneath the highway being damaged during resurfacing works in the early 2000's. The A35 was closed for several days as a result of the flooding.

5.3.4 In the west of the village, overland flow spilled rapidly off the hills to the south, flowed across the Little Chef car park and caused flooding to Valley Cottages.

5.3.5 In the east of the village, properties at the junction of the A35/B3159 were affected by overland flow spilling from the A35 and cascading into properties, as well as flooding resulting from the capacity of the watercourse being exceeded.

5.3.6 Residents also reported significant surcharging of foul and surface water drainage, and also emergence from other utilities access chambers.

Winterbourne Steepleton

5.3.7 The eight properties flooded in Winterbourne Steepleton in the July 2012 event are shown in Figure A9 in Appendix A. A number of these properties were flooded again in November and December 2012.

5.3.8 The flooding in Winterbourne Steepleton can be attributed to both direct groundwater emergence and from overland flow from groundwater emerging outside of properties, as well as fluvial flooding resulting from overtopping of the watercourse.

5.3.9 The restricted capacity of the watercourse and the close proximity of properties to the watercourse in the village mean that some properties within Winterbourne Steepleton are particularly vulnerable to fluvial flooding.

5.3.10 Consultation with residents in the west of the village also identified issues relating to heavily silted runoff from agricultural land, particularly in the Rew Lane area to the west of Winterbourne Steepleton.

Martinstown

5.3.11 A total of twenty properties were flooded in Martinstown and Winterbourne Monkton in July 2012, with the flooding attributable to direct groundwater flooding, surface water flooding from groundwater emergence and fluvial flooding resulting from overtopping of the watercourse. The affected properties are shown in Figure A10 in Appendix A.

5.3.12 Reports from residents described surface water flooding occurring both from direct runoff from the surrounding hills and from groundwater emerging in springs and flowing overland.

5.3.13 Throughout the village, a lack of maintenance and restrictions in capacity of the watercourse from low lying bridges contributed to increasing the impact of flooding from the river.

5.3.14 The impact of flooding in the village was exacerbated by vehicles travelling along the B3159, with 'bow-waves' pushing flood water above thresholds and into properties.

5.4 Impact of Wessex Water Activities

5.4.1 In the resident consultation, a number of residents raised concerns actions taken by Wessex Water may have contributed to the flooding in July 2012.

5.4.2 The concerns included:

- The impact of the Wessex Water augmentation discharge to the South Winterbourne.
- Potential impact of construction of a new water main to the north of Winterbourne Abbas in the period of the flooding.
- A large number of WW tankers were seen operating downstream of the watercourse, the purpose of which was not known.
- Reports of a 'reservoir being let go' during the July flood event, resulting in very large volumes of water entering the watercourse.

Wessex Water Augmentation Flow

5.4.3 Within the study area, WW have a groundwater drinking water extraction at Kingston Russell at NGR SY591905, 2.5 km to the west of Winterbourne Abbas. From this extraction, water is pumped to a below ground reservoir at Long Bredy, where it supplies approximately 20 properties. From this reservoir, water flows by gravity to Litton Cheney where it is combined with other sources to provide water supply to Bridport.

5.4.4 Whilst the majority of the water extracted is utilised for water supply, WW operate a consented discharge to the South Winterbourne. This discharge serves two purposes:

1. For ecological reasons, WW discharge a flow into the South Winterbourne during periods of low flow in the watercourse. This is to maintain a flow in the watercourse during dry periods and to compensate for downstream abstraction and is a requirement of the Wessex Water abstraction license.
2. The WW extraction at Kingston Russell has high levels of nitrates, particularly during periods of high groundwater levels. The high nitrate levels result from historical high levels of fertiliser application to

agricultural land in the catchment and can cause health issues when the concentration is too high. When nitrate levels in the abstraction are high, WW discharge flow to the South Winterbourne, allowing lower nitrate concentration groundwater to be utilised for water supply.

5.4.5 Figure 10 shows the average daily discharge into the South Winterbourne via the compensation flow for 2012. The maximum consented rate of discharge from the Wessex Water abstraction into the South Winterbourne is 1.7 Ml/day (0.02 m^3/s). This graph is also shown in Figure B6 in Appendix B.

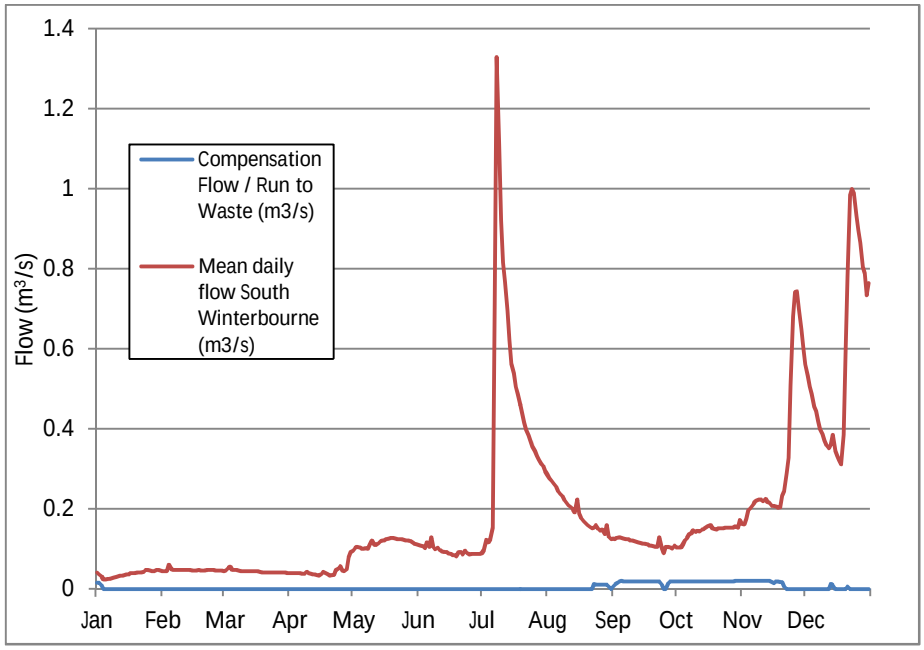


Figure 10 – Wessex Water Discharge to South Winterbourne for 2012

5.4.6 As illustrated in Table 8 below, the discharge from Wessex Water forms a very small component of the total flow, on average 3.3% over 2012.

Table 8 – Wessex Water discharge as proportion of total flow, 2012

Month	Wessex Water Contribution as Average % of Total Flow
January 2012	3.5%
February 2012	0.0%
March 2012	0.0%
April 2012	0.0%
May 2012	0.0%
June 2012	0.0%
July 2012	0.0%
August 2012	1.8%
September 2012	14.7%
October 2012	13.6%
November 2012	6.4%
December 2012	0.2%
Average	3.3%

5.4.7 The Wessex Water records show negligible (0.0006 l/s) or zero discharge to the South Winterbourne during July 2012 and the compensation flow had no impact on the July 2012 flooding.

5.4.8 In the November 2012, the contribution from the augmentation discharge was greater (average 6.4%), suggesting potential impact on the flooding in this month. However, as shown in Figure B7 in Appendix B, the Wessex Water discharge was suspended before the river level rose and did not impact on this event.

5.4.9 To remove the risk of the Wessex Water discharge contributing to flooding in the future periods of high rainfall, the EA, Dorset County Council and Wessex Water have agreed that the augmentation discharge will not be operated when the flow rate in the South Winterbourne exceeds 0.4 m^3/s.

Construction of new pipeline, Lamberts Hill to Winterbourne Abbas

5.4.10 In March 2012 Wessex Water commenced construction of a £2.5million scheme to construct a new 5.4 km water pipeline from the reservoir at Lambert's Hill to the water treatment works in Winterbourne Abbas. These works are part of a wider programme to improve the security and quality of water supply.

5.4.11 A concern was raised that the new pipeline would act as a preferential pathway for groundwater emergence. In the July 2012 event the groundwater volumes were so great and the pressure so high that groundwater was emerging through concrete floors and it is considered unlikely that the water main construction would have any impact on flooding.

5.4.12 A further concern was pressure testing of the water main carried out during the July 2012 event, with the potential for large volumes of testing water from the pipeline to be discharged. Wessex Water has advised that there were no significant losses from the pipeline during the flood event.

5.4.13 In summary, no connection has been shown between the pipeline construction and the flooding in July 2012.

Tankering of water pre and post July 2012 Flooding

5.4.14 A number of residents reported concern with the high volume of Wessex Water tanker movements in the area during and after the July 2012 flood event. WW have advised that the purpose of this tankering was to remove flow from the foul drainage network, which had been inundated by very high infiltration from groundwater.

Long Bredy Reservoir

5.4.15 In the consultations with residents held in January 2013 a widespread belief was reported that Wessex Water had released a large volume of water from the Wessex Water reservoir at Long Bredy. In correspondence, Wessex Water has advised that no such release occurred. The only discharge from the Wessex Water infrastructure at Winterbourne Abbas is through the consented discharge to the South Winterbourne and, as discussed above, there was no discharge through this outfall during the July 2012 flood event.

5.4.16 In summary, no connection has been found between Wessex Water's operations and the flooding in the three villages in 2012.

5.5 Assessment of Probability of July 2012 Flood Event

5.5.1 As discussed in Section 4, it is very difficult to assess the probability of groundwater flooding events, as the duration and severity of the flooding is affected by the rainfall patterns in the preceding months as well as the specific event.

5.5.2 The rainfall event leading to the July 2012 flooding has been assessed to have an annual probability of 1.3% - 2.2% (return period of 46 – 80 years).

5.5.3 The flood history in the village would appear to support this assessment, with the flooding in July 2012 being the worst flooding in the area since the flooding of 1955.

5.6 Further Flooding in November and December 2012

5.6.1 For the remainder of 2012 and continuing into 2013, the groundwater level in the aquifer has remained high, with the groundwater level in the Kingston Russell Borehole maintaining a level above 113m AOD.

5.6.2 Further flooding occurred in all three villages in November 2012 and December 2012 following further periods of intense rainfall and the villages have remained on flood alert for extended periods.

SECTION 6

FLOOD ALLEVIATION AND PROTECTION MEASURES

6 FLOOD ALLEVIATION AND PROTECTION MEASURES

6.1 Introduction

6.1.1 It has been identified in Section 4 that the primary flood risks in the study area are:

- Direct groundwater flooding, from groundwater emerging directly beneath a property and entering through the floor or below ground walls;
- Indirect groundwater flooding, from groundwater emerging outside properties and flowing overland to enter properties above ground;
- Fluvial flooding, with flow overtopping the banks of the river and entering properties above ground.

6.1.2 In the affected villages, some properties have been affected by just one of these sources and some properties were affected by all three. This section sets out the potential measures that could be implemented to alleviate and protect against flooding in the three villages.

6.2 Catchment Wide Approaches

River Diversion / Widening

6.2.2 Increasing the capacity of the watercourse or diverting flow away from the channel as it flows through the affected villages would reduce the risk of groundwater and fluvial flooding.

6.2.3 The potential for such a scheme in South Winterbourne is limited. Through the affected villages, the river is constrained by properties and the road and there is little potential for widening of the channel.

6.2.4 Diverting flows through an alleviation tunnel into an adjacent catchment is not considered practical. Such a scheme would be prohibitively expensive and would be likely to increase the flood risk in the receiving catchment.

6.2.5 Constructing a secondary channel away from the route of the watercourse has been assessed and is not considered feasible due to the steep slopes and constraints along the South Winterbourne valley. There may be, however, potential for localised secondary channels, especially in Winterbourne Steepleton where existing disused channels may be utilised (this is discussed further in Section 6.8).

Groundwater Pumping

6.2.6 An alternative to increasing the conveyance of the watercourse is to implement wide-scale groundwater pumping, with the aim of lowering the groundwater level in the affected area. This approach is not feasible for a number of reasons:

- The size of the chalk aquifer - the area of chalk is extensive and the volume of water that would have to be removed and disposed of to protect the affected area is too large to be feasible;
- The cost and scale of the required pumping infrastructure and the costs of operation would not be justifiable;
- Abstracted water would need to be discharged to an appropriate downstream location without increasing fluvial flood risk and the only practical discharge route would be along the South Winterbourne.

Alterations and Improved Maintenance of South Winterbourne Watercourse

6.2.7 The limited capacity the South Winterbourne through the study area is a key contributing factor to the risk of fluvial flooding in the three villages. Improving the maintenance of the watercourse would increase the capacity of the channel and reduce the risk of blockage, reducing the flood risk. Alterations to the channel to remove permanent blockage risks, such as low bridges, would also have a positive impact on flood risk upstream. However, the downstream effects would need careful consideration.

6.2.8 The South Winterbourne is designated an 'Ordinary Watercourse'. This designation covers all watercourses in the UK which are not designated as 'Main River'. The EA has a supervisory duty to manage flood risk from main rivers. For Ordinary Watercourses this duty rests with the Lead Local Flood Authority (LLFA) for the area, which for the South Winterbourne is Dorset County Council.

6.2.9 Under the Flood and Water Management Act (FWMA) 2010, LLFAs have powers to:

- To manage flood risk from ordinary watercourses, surface water and groundwater;
- Serve notice on riparian owners who have not maintained a watercourse for which they have responsibility.

6.2.10 It should be noted that the LLFA is not responsible for maintenance of these watercourses.

6.2.11 Responsibility for the maintenance of the South Winterbourne lies with riparian owners. Riparian owners are defined as those with land adjoining, above or with a watercourse running through it. The rights and responsibilities of riparian owners are set out in the EA document 'Living on the Edge' which is available from the EA website. Key rights and responsibilities relating to flooding are summarised in Table 9.

Table 9 – Riparian owner's rights and responsibilities

Key Riparian Rights	Key Riparian Responsibilities
- If your land is next to a watercourse it is assumed you own the land up to the centre of the watercourse, unless it is owned by someone else. - You have the right to protect your property against flooding from the watercourse, however any in-channel works must be agreed with the LLFA.	- You must let water flow through your land without obstruction or diversion. - You must accept flood flows through your land, even if these flows are caused by inadequate capacity downstream. - You are responsible for maintaining the bed and banks of the watercourse and vegetation growing on the banks. - You must keep any structures, such as culverts, trash screens, weirs, low bridges, clear of debris.

6.2.12 It should be noted that where a watercourse runs between a property and the road, it is assumed that the property owner has riparian ownership of the whole of the width of the watercourse. The Highways Agency and local authorities do not have maintenance responsibilities for watercourses that run

alongside roads, unless they have been specifically constructed to drain the road.

6.2.13 In Winterbourne Abbas, Winterbourne Steepleton and Martinstown there are many properties with riparian rights and responsibilities. In practice, this makes maintenance for the watercourse difficult to implement, as the responsibility is shared between a wide number of parties.

6.2.14 It is recognised that improved maintenance of the South Winterbourne is needed to reduce flood risk from future high rainfall / groundwater events. In all three villages, this is problematic as the responsibility is shared between a large number of parties with a wide range of capability, expertise and enthusiasm for carrying out maintenance of the watercourse.

6.2.15 It is recommended that a community approach is implemented, in which responsibility for maintenance of the watercourse is shared between all members of the community, rather than just those with riparian ownership responsibilities.

6.2.16 This could be implemented either through existing structures, such as the Parish Councils, or preferably through a Community Flood Action Group. Such groups have been set up in a number of locations throughout the UK, with the aims of bringing together local residents to work together to reduce flood risk, creating a representative voice for their community and building links with other parties with responsibility for flood risk , such as the EA, the LLFA and water companies. The National Flood Forum (www.nationalfloodforum.org.uk) is a useful source of guidance on forming and running a successful Community Flood Action Group (CFAG). Appendix F contains further information on CFAGs, including a case study of a successful group in Buckingham.

Surface and sub-surface drainage maintenance and improvements

6.2.17 In a number of areas throughout the catchment, inadequate and poorly maintained drainage leads to localised flooding as surface water cannot drain away to the watercourse. This should be addressed by localised drainage improvements and clarification of the responsibility for maintenance of surface water drainage. Specific recommendations for improvements are in each of the three villages are identified in Section 6.8.

6.2.18 Parties with responsibilities for drainage maintenance within the study area are set out in Table 10.

Table 10 – Maintenance responsibilities

Stakeholder	Powers / Responsibility
Highways Agency as the Highways Authority	Responsible for maintenance of highway drainage serving A35 trunk road through Winterbourne Abbas
West Dorset District Council	Incident management responsibility (including sandbag provision) and development control through its planning responsibilities.
Dorset County Council as the Lead Local Flood Authority	Have responsibility for managing flood risk from the South Winterbourne, groundwater and surface water.
Dorset County Council as the Highways Authority	Responsible for maintenance of highway drainage serving B3159 through Winterbourne Steepleton and Martinstown.
Riparian Owners	Responsible for maintenance of South Winterbourne watercourse.

6.2.19 Increasing capacity of below ground drainage and underutilised ditches running parallel to the primary watercourse would facilitate the conveyance of water between Winterbourne Abbas and Martinstown, contributing to lowering the risk of groundwater and fluvial flooding. This would be of most benefit in areas where the existing capacity in the South Winterbourne is limited and where the river runs close to vulnerable properties. However, this approach may not provide great benefit in high return period events and the disruption caused by construction could outweigh any flood risk benefits. Additionally, any such works would have to be carefully considered in terms of the whole study area to ensure no adverse impact on flood risk downstream.

Other Measures

Traffic diversion and calming

6.2.20 In the July 2012 flood event it was identified that bow waves caused by traffic moving along the B3159 through Winterbourne Steepleton and Martinstown exacerbated the impact of flooding. This was worsened by the closure of the A35, diverting traffic through the village.

6.2.21 It is recommended that procedures are put in place involving media releases, temporary traffic diversions and calming measures. Highway traffic needs to be effectively managed by the Highway Authorities with input from stakeholders including Dorset Police,

Land Management

6.2.22 There may be opportunities to alter farming practices on the land draining to the watercourse with the aim of increasing retention of surface water above ground, delaying surface water runoff and infiltration to ground. Additionally, there are issues in parts of the study area of heavily silted runoff from agricultural land. This causes erosion and removes topsoil from the land, increasing the rate of infiltration to the aquifer.

6.2.23 Wessex Water already work with farmers in the area as part of the Frome and Piddle Catchment Initiative and have indicated that there may be opportunity in the future to look at how local land management techniques could be altered to improve flood management in the area. It is recommended that the

potential for working with Wessex Water is explored further, alongside other potential partners including the Farming and Wildlife Action Group South West and the West Countries Rivers Trust.

Public awareness, communication and education

6.2.24 The relatively rare occurrence of ground water flooding can mean that the mechanisms and impact of this form of flooding are poorly understood. Efforts should be made to continue raising awareness of the causes and effects of groundwater flooding, the responsibilities of riparian owners and the importance of people contributing to the management of flood risk in their communities.

Controlling development

6.2.25 Without mitigation, further development in the study area will increase surface water runoff and remove space for flood water, increasing the risk and impact of flooding. Development must be directed away from the high flood risk areas and be adequately designed not to increase flood risk.

6.3 Property Level Flood Protection

6.3.1 In addition to preventing flooding on a wider scale, efforts can be made to improve the resistance and resilience of individual properties against flooding. This approach is most effective in fluvial and surface water flooding when flooding is typically of short duration and originates outside of the property. With groundwater flooding, flooding can last for longer periods and groundwater can emerge from directly beneath the property. However, a number of approaches are available:

Interception Drainage

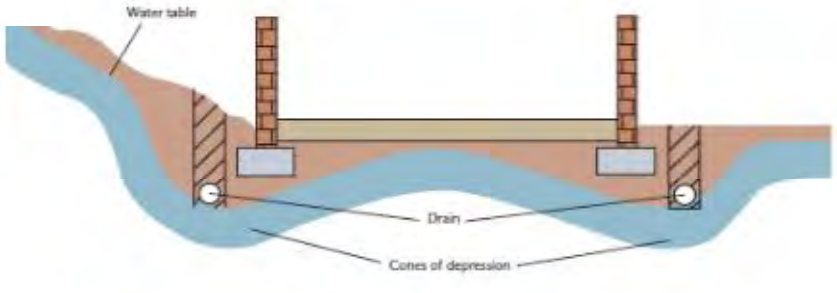


Figure 11 – Example of improved drainage to create a 'cone of depression' to prevent against groundwater emergence.

6.3.2 The most effective method of keeping groundwater out of property is to intercept the water by means of a drainage system and divert it away from the house. The technique involves creating a localised lowering of the groundwater level beneath the property to prevent groundwater rising to floor level. In some cases this can be achieved with a gravity drainage system but often a pump and sump arrangement is required.

Floor raising

6.3.3 Groundwater emerges through the ground at springs, where groundwater has found a weak point in the surface geology. Construction of a reinforced concrete slab floor, either directly onto the existing floor or suspended above

the existing, could help to prevent groundwater emerging beneath the property.

6.3.4 In practice, the high pressure of emerging groundwater means that this approach is unlikely to be fully successful, with groundwater liable to find a route through a point of weakness such as the join between the slab and the property walls. As a result, floor raising is only recommended alongside measures to reduce the pressure beneath the building, such as improved gravity or pumped drainage systems.

6.3.5 This approach will have limited impact against external flood water, where water flows overland and enters property through doorways or other vulnerable points.

Doorway threshold raising/protection

6.3.6 Raising floor levels or doorway thresholds to above the flood risk level would protect against the ingress of floodwater from fluvial flow and surface water runoff as well as groundwater that has emerged outside of the property. Raising the door threshold is recommended over installing a flood barrier as with groundwater flooding there is potential for the flooding to be of long duration, lasting several weeks.

Historic Properties

6.3.7 Traditional construction methods used in historic properties means installation of property level protection measures in historic properties must be carefully considered to ensure no adverse impacts on the property. Specialist advice should be sought before any works are undertaken.

6.4 Flood Resilience

6.4.1 Where it is not possible to fully protect a property against the ingress of flood water, measures can be taken to reduce the impact of water entering the property. Potential measures for high risk properties include:

- Raising electrical sockets and connections to reduce the risk of being affected by flood water;
- Moving boiler units to the first floor of two storey buildings and raising thermostats to reduce the risk of damage;
- Consider installing durable fixtures and fittings, such as tiled floors, steel or plastic kitchen units;
- Consider drainage paths within the property to ensure water can drain from the property once the flood subsides. A sump and small capacity pump may improve drainage.

6.5 Warning and Preparedness

Flood Warning

6.5.2 The Environment Agency operates a flood warning service throughout England and Wales in areas at risk of flooding from rivers, the sea and groundwater. EA staff monitor indicators including rainfall, river levels, tidal conditions and groundwater levels to forecast the possibility of flooding and issue warnings to indicate the level of risk. The three levels of risk, *Flood Alert*, *Flood Warning* and *Severe Flood Warning*, are described in Table 11.

Table 11 – Flood warning levels

Warning Level	Key Message:	Timing
Flood Alert 	Flooding is possible. Be prepared	2 hours to 2 days in advance of flooding
Flood Warning 	Flooding is expected. Immediate action required	Half an hour to 1 day in advance of flooding
Severe Flood Warning 	Severe flooding. Danger to life	When flooding poses a significant threat to life and different actions are required
Warnings no longer in force (no icon)	No further flooding is currently expected for your area	When river or sea conditions begin to return to normal

6.5.3 For the South Winterbourne catchment, the EA flood warning is based on groundwater levels at the Kingston Russell using the following trigger levels:

- Flood Alert: 113m AOD;
- Flood Warning: 116m AOD;
- Flood Warning Update: 120m AOD.

6.5.4 The Severe Flood Warning level is not used for this flood warning, as the groundwater flooding is not considered to pose a risk to life.

6.5.5 It is recommended that all householders, property owners and businesses are registered with the EA Floodline Warning service in order to receive up-to-date information on the latest assessment of the flood risk in the catchment.

Flood Wardens

6.5.6 The EA in Wessex have recently implemented a scheme utilising 'flood wardens' to improve the communication of groundwater flood risk. Flood wardens are to be a point of contact for flooding in the community and to provide a communication link between stakeholders such as the EA and the community. There is a clear potential for crossover between this role and the community flood action group

Emergency Flood Protection Measures

6.5.7 A number of residents reported issues with obtaining emergency flood protection support and items such as sandbags to limit the inflow of water. Clear guidance should be provided of the support that is available from stakeholders such as the EA, WDDC and Dorset County Council and how these agencies interact during a flood event.

6.5.8 The community should also consider how they can help more vulnerable residents during a flood event, and consider the provision of a centralised store of flood protection and recovery items. This could be implemented through a community flood action group, as discussed in Section 6.2.

6.6 Property Flood Insurance

6.6.1 In the event of flooding, buildings insurance typically covers the costs of drying out, repairing and restoring of property and its fixtures and fittings. It will also typically cover the cost of removing debris, professional fees and other charges and may cover the cost of alternative accommodation whilst the property is made habitable. Contents insurance will typically cover the cost of repair or replacement of damaged furniture, equipment and other belongings.

6.6.2 Insurance premiums reflect the insurers' assessment of the likely incidence and severity of flooding and properties in areas at risk of flooding, or where flooding has occurred previously, are likely to have higher insurance premiums and excesses to reflect that risk.

6.6.3 Residents with properties in high risk areas may struggle to obtain affordable cover through normal insurance providers. In consultation it was highlighted that some residents in the affected villages have not been able to renew their building and contents insurance with their previous insurance supplier. Specialist flood insurance brokers may be able to negotiate with insurers and arrange appropriate cover for at risk properties. The best source of up-to-date advice on this issue is the National Flood Forum – www.nationalfloodforum.org.uk – who can supply contact details of specialist providers.

6.7 Review of catchment scale flood alleviation, property level flood protection and other measures

6.7.1 The potential benefits of the approaches discussed are set out in Table 12. The review has shown there is limited potential for large-scale catchment wide approaches to alleviate flooding in the three villages. However, minor improvements to the South Winterbourne and improved maintenance would help to increase flow conveyance, reduce the risk of blockage and lower the risk of fluvial flooding. Measures such as traffic diversion would also help to reduce the impact of flooding on households.

6.7.2 Household protection and other measures have also been considered. It has been identified that a number of approaches can be used in combination to provide protection against the range of flooding that is likely to occur in the future.

Table 12 – Review of identified measures

Flood Protection / Alleviation Measure		Flood Risk		
		Direct groundwater flooding	**Indirect groundwater flooding and surface water flooding**	**Fluvial flooding**
Catchment wide approaches	River diversion works	Could provide benefit but not feasible for study area.	Could provide benefit but not feasible for study area.	Could provide benefit but not feasible for study area.
	Catchment scale groundwater pumping	Could provide benefit but not feasible for study area.	Could provide benefit but not feasible for study area.	Could provide benefit but not feasible for study area.
	Alterations and improved maintenance of South Winterbourne	Would increase capacity of watercourse, with possible positive impact on groundwater levels, but unlikely to have major impact in extreme flood events.	Would increase capacity of watercourse, with possible positive impact on groundwater levels, but unlikely to have significant impact in major flood events.	Would increase capacity of watercourse and reduce the risk of blockage, but unlikely to have major impact in extreme flood events.
	Improvements and maintenance to surface water drainage	Could have minor impact, increasing below ground capacity	Would improve flow paths for surface water, reducing the risk of impact to properties, but unlikely to have major impact in extreme flood events.	No impact.
	Traffic diversion and calming	No impact	Limit 'bow-wave' impacts, reducing impact and extent of flooding.	Limit 'bow-wave' impacts, reducing impact and extent of flooding.
	Land management	Could reduce infiltration to ground, lowering groundwater levels.	Changes to land management methods could reduce surface water runoff, reducing surface water flooding.	Could reduce infiltration to ground and overland flow, reducing flow in the watercourse.
Household Level Protection	Floor raising	Reduces risk of groundwater emergence.	Would provide some protection against low depths of external flooding.	Would provide some protection against low depths of external flooding.
	Below ground drainage incl. pumping	Reduces risk of groundwater emergence.	No impact.	No impact.
	Threshold raising / protection	No impact.	Provides protection against low to medium depths of external flooding.	Provides protection against low to medium depths of external flooding.

KEY: RED = No impact / not feasible. AMBER = Provides some protection. GREEN = Reduced flood risk

6.8 Localised Flood Alleviation

6.8.1 In addition to generalised area-wide approaches there are a number of smaller scale interventions that could reduce the risk of flooding to parts of the affected study area. These proposals are shown in Figures D1, D2 and D3 in Appendix D.

Winterbourne Abbas

6.8.2 Consultations with residents and preliminary investigations have highlighted localised issues with surface water drainage throughout Winterbourne Abbas. It has been speculated that the drainage running beneath the A35 was damaged during resurfacing of the highway in the early 2000s.

6.8.3 Following consultation between Dorset County Council and the Highways Agency a number of works have been agreed to investigate the highway drainage in Winterbourne Abbas and to implement measures to reduce future flood risk:

- Highways Agency to carry out jetting and CCTV survey of drainage beneath the A35 to prove drains are obstruction free;
- Highways Agency to carry out annual clearance of South Winterbourne watercourse alongside A35;
- Highways Agency to investigate and agree with Dorset Highway Operations responsibility for gully maintenance in Copyhold Lane to ensure no gaps in coverage;
- Highways Agency to investigate how highway drainage discharges into the South Winterbourne and establish future maintenance.

6.8.4 In the July 2012 event, flood water flowed overland across the hills in the south-west of the village, across the Little Chef car park and flooded properties in Valley Cottages. Temporary alleviation was provided using sandbags, but a more permanent solution should be indentified to provide a safe flow path for overland flow to reach the watercourse.

Winterbourne Steepleton

6.8.5 Increasing the capacity of the watercourse through Winterbourne Steepleton would decrease the risk of fluvial flooding and could also help to lower groundwater levels in the immediate vicinity. A number of potential approaches have been identified:

- Widening the river channel through the village would improve conveyance, particularly at the most restricted points, though the potential for this is limited by the close proximity of the road and properties to the channel.
- Works to remove obstructions in the channel, such as the small weirs and sluice structures downstream of the B3159 would improve conveyance and could lower water levels. The raising of bridge soffits would also help the situation locally.
- Re-use of the disused mill leat and other secondary channels that run through the village would increase conveyance and storage and could have a beneficial impact on flow levels, particularly in lower return period events.

6.8.6 Any works to the watercourse would require consent and cooperation from the riparian owners and the impact on flood risk downstream would need to be carefully considered.

Martinstown

6.8.7 Through Martinstown, numerous low bridges restrict flow in the watercourse and provide potential for blockage. Where possible, these bridges should be raised to increase conveyance and regular maintenance is essential to minimise the risk of blockage. Any new or replacement bridge structures must be designed to ensure no further increase in flood risk.

6.8.8 Improvements to drainage connections from the north of the B3159 into the South Winterbourne should be considered, to improve conveyance of surface water to the South Winterbourne.

6.8.9 At the eastern end of Martinstown, Turnpike Cottage and Turnpike House have been heavily affected by fluvial flooding from the South Winterbourne. There may be scope in this area for localised alterations to the left bank of the watercourse to allow floodwater to spill across the farmland to the east before overtopping the right bank, thereby reducing the risk of flooding to the two properties. Any such works would be subject to approval from the owner of the agricultural land and the impact on flow downstream would need to be carefully considered.

6.9 Potential for Detailed Hydraulic Assessment

6.9.1 Assessment has been made of the potential for undertaking hydraulic or hydro-geological modelling in the South Winterbourne catchment to improve understanding of flood risk.

6.9.2 There are two potential approaches for undertaking modelling in the catchment: hydraulic modelling of the watercourse; or modelling of the hydrogeology in the catchment.

6.9.3 Modelling of the local hydrogeology is currently being considered by the EA. This modelling would be large scale and would be used to improve the accuracy of the existing flood warning systems.

6.9.4 Creating a hydraulic model of the South Winterbourne as it runs through the three villages would be expensive due to the complexity of the channel, the large number of structures and the detailed surveying which would be required. Additionally, the points of restricted flow in the channel are well understood from review of past events and modelling of the channel would not add greatly to understanding of the flood risk in the study area. As a result, detailed hydraulic modelling of the watercourse is not recommended unless significant alterations to the channel are proposed.

SECTION 7

SUMMARY AND RECOMMENDATIONS

7 SUMMARY AND RECOMMENDATIONS

7.1 Project Background

7.1.1 From the 6th- 8th July 2012 over 110mm rainfall fell in a 36 hour period in the South Winterbourne valley. This resulted in localised surface water flooding, extreme high flows in the South Winterbourne watercourse and a rapid rise in groundwater, with the groundwater elevation at the Kingston Russell borehole rising by close to 10m and exceeding 120m AOD. As a result, 42 properties in Winterbourne Abbas, Winterbourne Steepleton and Martinstown suffered flooding.

7.1.2 PB were appointed to undertake an investigation into the flooding in the three villages, informed by consultation with landowners, residents and other stakeholders and data obtained from the EA, Wessex Water and Dorset County Council.

7.1.3 Correspondence with property owners and residents and review of rainfall, river and groundwater data has shown the flooding to be caused by the extreme rise in groundwater level following intense rainfall on the 6th – 8th July 2012.

7.1.4 The high groundwater led to three different types of flooding: direct groundwater flooding from groundwater emerging through the floors and basements of properties; indirect groundwater flooding, with groundwater emerging outside properties and entering through doorways and other vulnerable points; and fluvial flooding, with very high flow levels caused by the high groundwater levels resulting in overtopping of the watercourse.

7.1.5 Throughout the remainder of 2012 the groundwater level has remained high, causing a raised risk of flooding. This has led to further flooding in November 2012 and December 2012 with a number of properties impacted in all three events.

7.2 Review of Potential Flood Alleviation and Protection Measures

7.2.1 A review has been undertaken of potential measures to alleviate and protect against the flood risks in the study area. This review considered a range of approaches, from large-scale catchment wide approaches to measures designed to protect individual properties.

7.2.2 It was identified that there is limited potential for widescale catchment scale flood alleviation, with these approaches likely to be too large to be feasible for the study area, with no guarantee of having significant impact on flooding.

7.2.3 Recommended area wide approaches which would have some positive impact on flood risk include improved maintenance and management of the South Winterbourne watercourse, enhanced surface water drainage and improved management of surface water runoff from the agricultural land to the north and south of the catchment.

7.2.4 A key recommendation is for a community led approach which will have the largest impact on reducing flood risk. This should be implemented through a new Community Flood Action Group. This approach will create a representative voice for flood concerns and help with the management of issues that affect the whole community. This will include the management and maintenance of the South Winterbourne and other surface water management infrastructure.

7.2.5 In addition to this, household level measures can be used to improve the flood protection of individual properties. Due to the range of flooding that has occurred in

the villages, different approaches will be required for different locations depending on the flooding mechanism. Potential measures identified include floor raising, localised below ground drainage (either by gravity or with a pumped outfall) and threshold protection.

7.2.6 Localised measures to alleviate specific flood risk issues in each of the villages have also been identified. These include improvements to areas of inadequate surface water drainage in Winterbourne Abbas and Martinstown and potential remediation of the disused mill leat in Winterbourne Steepleton to improve flood conveyance.

7.3 Recommendations

7.3.1 The following recommendations are made to improve management of flood risk across all three villages:

- A Community Flood Action Group is to be formed to create a representative voice for flood concerns for the community and to share responsibility for management and maintenance of the South Winterbourne.
- Household level flood protection is to be implemented to protect individual properties against groundwater, surface water and fluvial flooding.
- The potential for encouraging improved land management techniques in the catchment to reduce flood risk in the catchment is to be explored, working in collaboration with Wessex Water and other potential partners such as the West Countries River Trust and the Farming and Wildlife Action Group South West.

7.3.2 Additionally, specific recommendations are made to improve management of flood risk for each village:

<u>Winterbourne Abbas</u>

- Drainage connections from the north of the A35 to the watercourse are to be investigated in coordination with the Highways Agency to assess the condition and adequacy of the existing drainage. Where appropriate, works are to be undertaken to improve the drainage to reduce flood risk.
- An improved maintenance regime is to be implemented to reduce flood risk from surface water and highway drainage infrastructure.
- A permanent flood barrier is to be considered along the eastern wall of the Little Chef restaurant car park in the west of the village to direct overland flow into the watercourse.
- Improvements to channel pinch point at the junction of the A35/B3159 are recommended to reduce flood risk to properties in Steepleton Water.

<u>Winterbourne Steepleton</u>

- Alterations to the numerous small bridges across the watercourse are recommended to reduce the risk of blockage and improve conveyance. Additional works to structures in the watercourse to lower river levels locally should also be considered, though the impact on flooding downstream must be carefully considered.
- Re-use of the existing mill leat and other secondary channels should be considered to enhance conveyance through the village.

Martinstown

- Alterations to the numerous small bridges across the watercourse are recommended to reduce the risk of blockage and improve conveyance.
- Improvements to drainage connections from the north of the B3159 into the South Winterbourne and road camber should be considered. This will improve conveyance of surface water into the South Winterbourne.

SECTION 8

REFERENCES

8 REFERENCES

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10 Environment Agency. August 2012. *Living on the Edge – A guide to the rights and responsibilities of riparian ownership*

PARSONS BRINCKERHOFF

July 2013

SOUTH WINTERBOURNE FLOOD INVESTIGATION

APPENDICES

Dorset County Council

285400K-HLT

FINAL

South Winterbourne Flood Investigation

285400K-HLT

Prepared for
Dorset County Council
County Hall
Colliton Park
Dorchester
DT1 1XJ

Prepared by
Parsons Brinckerhoff
Queen Victoria House
Redland Hill
Bristol
BS6 6US

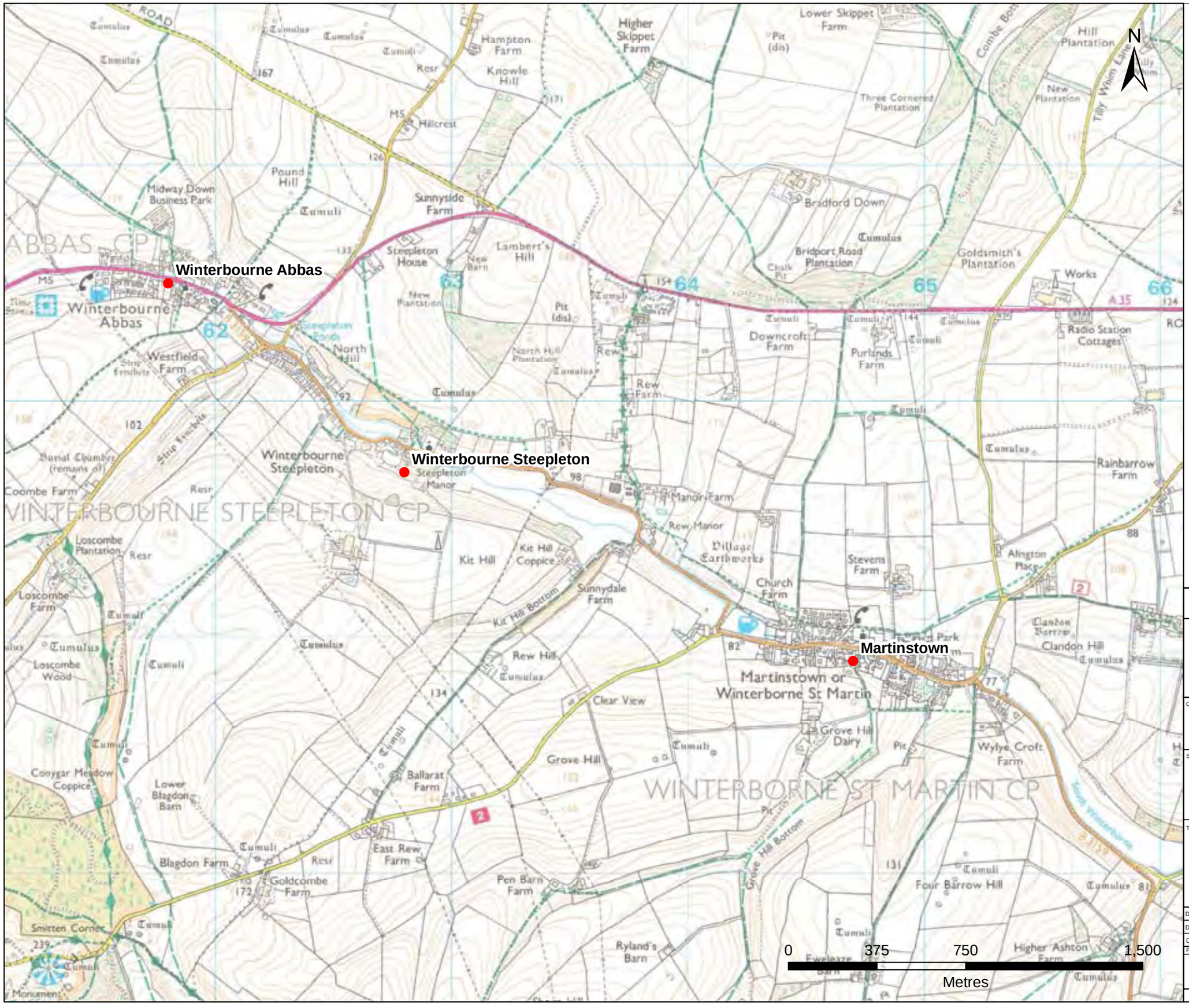
0117 933 9300 www.pbworld.com

APPENDIX A

STUDY AREA MAPS

FIGURES

FIGURE A1	STUDY AREA LOCATION
FIGURE A2	ENVIRONMENT AGENCY FLOOD ZONES
FIGURE A3	FEH CATCHMENT BOUNDARY, SOUTH WINTERBOURNE
FIGURE A4	SUPERFICIAL GEOLOGY
FIGURE A5	BEDROCK GEOLOGY
FIGURE A6	GROUNDWATER SOURCE PROTECTION ZONES
FIGURE A7	AQUIFER DESIGNATIONS
FIGURE A8	FLOODED PROPERTIES JULY 2012



Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton

PARSONS BRINCKERHOFF
Queen Victoria House
Redland Hill, Redland
Bristol BS6 6US
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Client:
DORSET COUNTY COUNCIL

Site/Project:
SOUTH WINTERBOURNE FAS

Title:
STUDY AREA LOCATION

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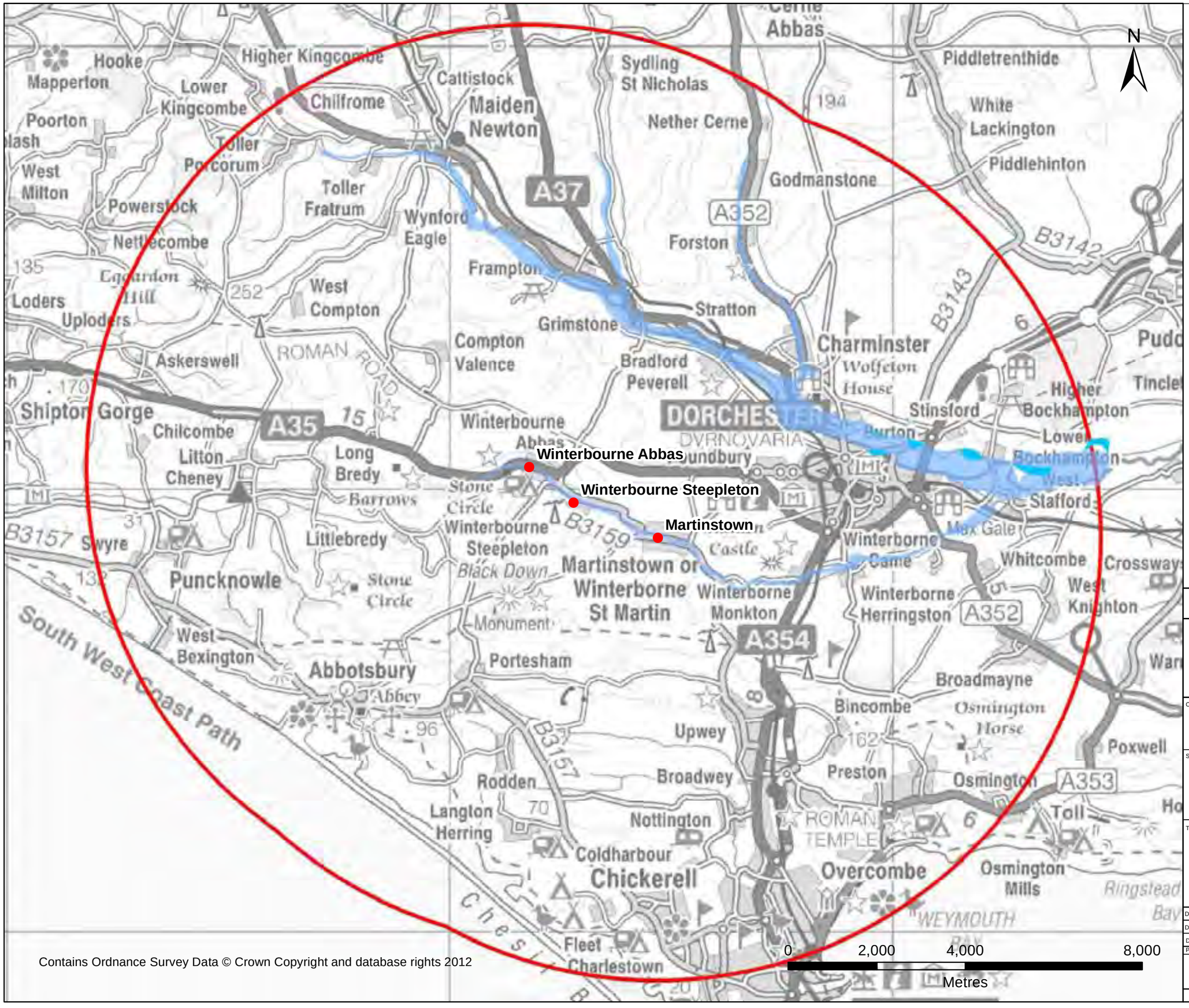

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Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton
- 10km buffer

Environment Agency Flood Zones

- Extreme Flooding from River or Sea without Defences (Zone 3)
- Flooding from River or Sea without Defences (Zone 2)

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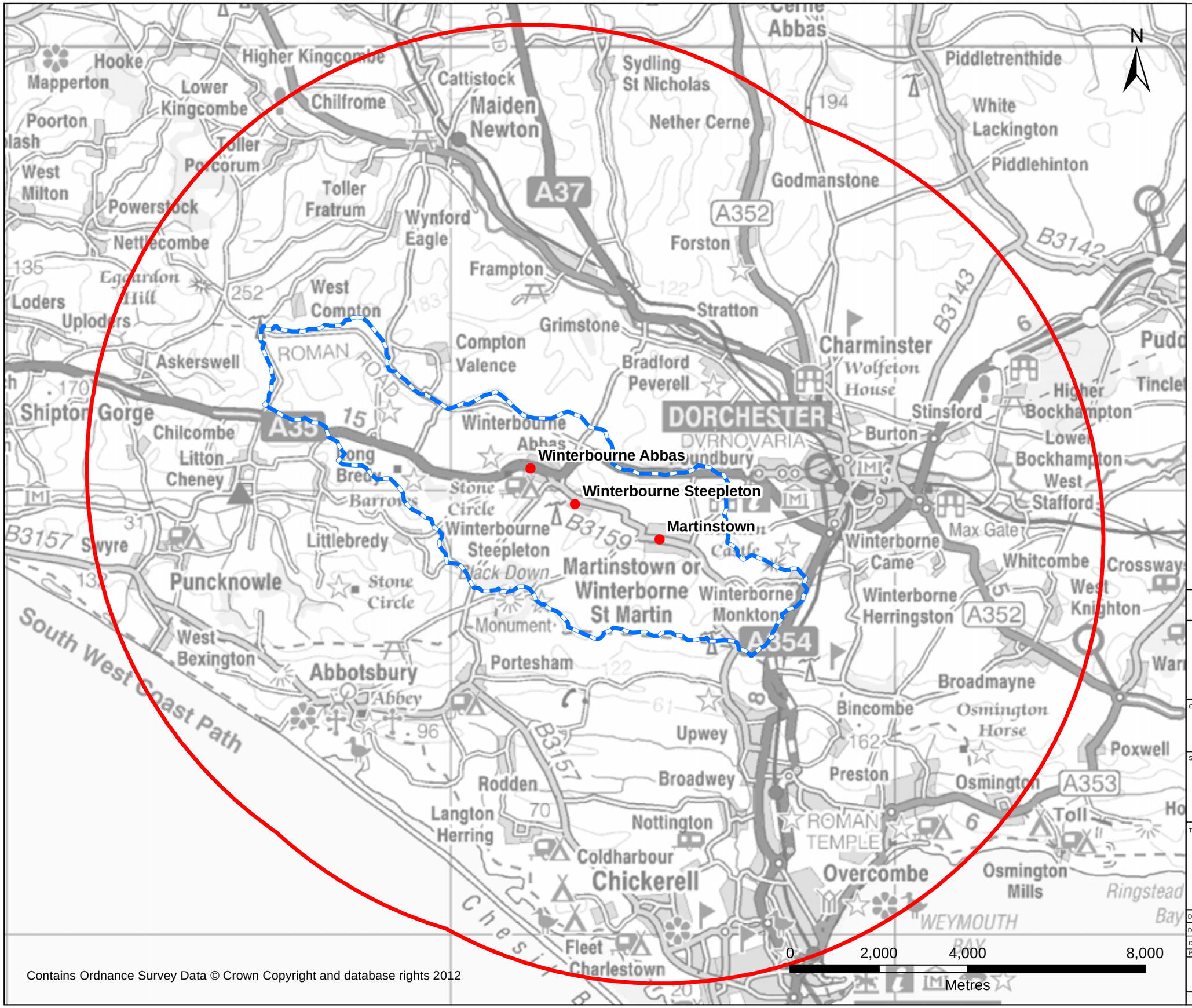

Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton
- 10km buffer
- South Winterbourne FEH hydraulic catchment

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Title: FEH CATCHMENT BOUNDARY

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Winterbourne Abbas

Winterbourne Steepleton

Martinstown

ALLUVIUM
CLAY-WITH-FLINTS
DRIFT GEOLOGY NOT MAPPED [FOR DIGITAL MAP USE ONLY]
LANDSLIP
RAISED MARINE DEPOSITS (UNDIFFERENTIATED)
RIVER TERRACE DEPOSITS (UNDIFFERENTIATED)
SAND AND GRAVEL OF UNCERTAIN AGE AND ORIGIN

0 2,000 4,000 8,000
Metres

N

Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton
- 10km buffer

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Title: SUPERFICIAL GEOLOGY

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Author:

Winterbourne Abbas

Winterbourne Steepleton

Martinstown

N

0 2,000 4,000 8,000

Metres

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Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton
- 10km buffer

Bedrock geology

- BRBA-SSCL
- CR-LSSM
- GOG-SLAR
- GUGS-MDSL
- GYCK-CHLK
- KLOX-MDSS
- PB-LMCS
- PL-LMCS
- THAM-CLSSG
- W-MDSS
- WHCK-CHLK
- WWAK-MDSS

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Site/Project: SOUTH WINTERBOURNE FAS

Title: BEDROCK GEOLOGY

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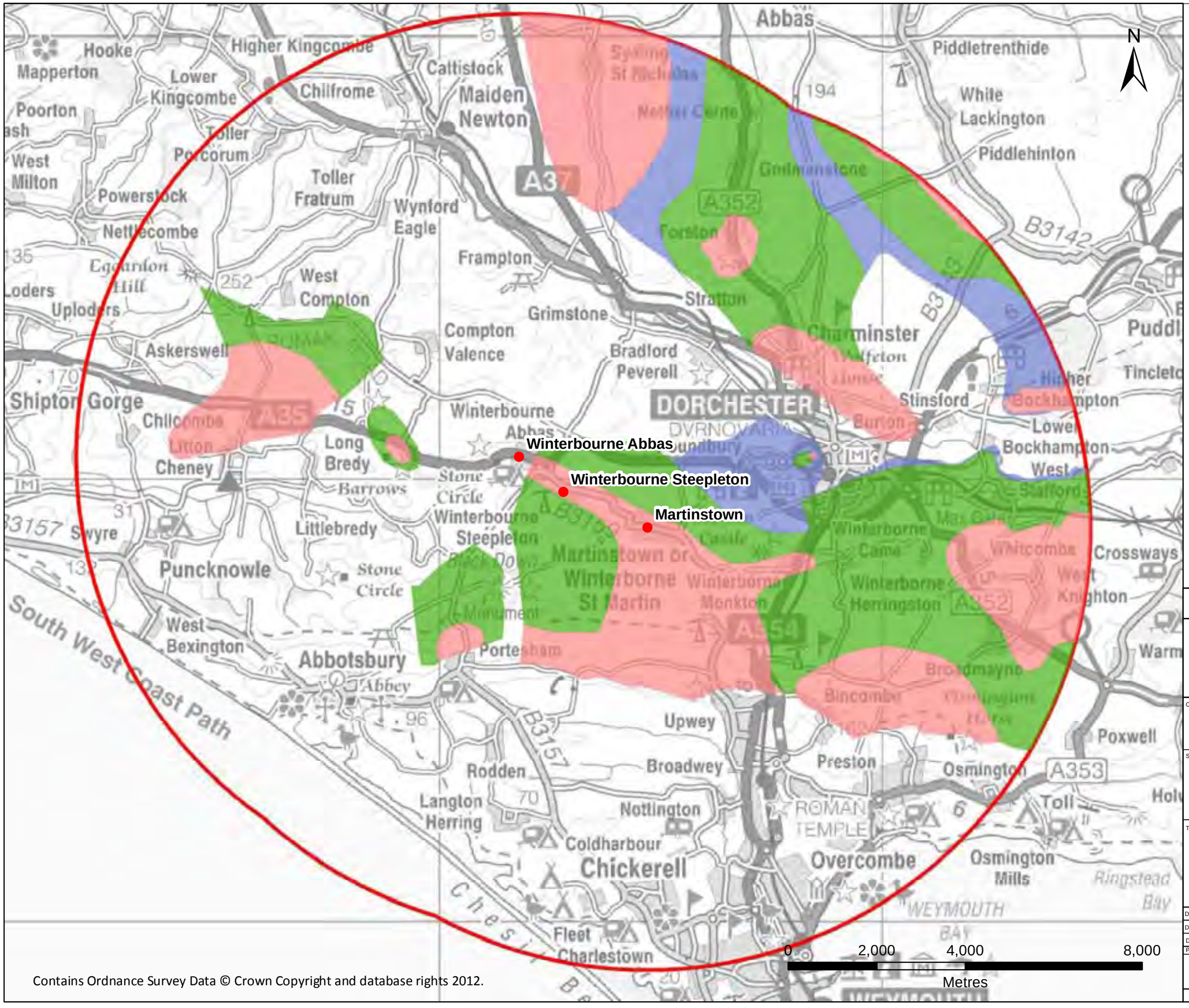

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Site/Project:
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Title:
GROUNDWATER SOURCE PROTECTION ZONES

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Winterbourne Abbas

Winterbourne Steepleton

Martinstown

N

0 2,000 4,000 8,000

Metres

Sites of investigation

- Martinstown
- Winterbourne Abbas
- Winterbourne Steepleton
- 10km buffer

Aquifer Designations

- Principal Aquifer
- Secondary A Aquifer
- Secondary B Aquifer
- Secondary (undifferentiated)

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Site/Project: SOUTH WINTERBOURNE FAS

Title: AQUIFER DESIGNATIONS

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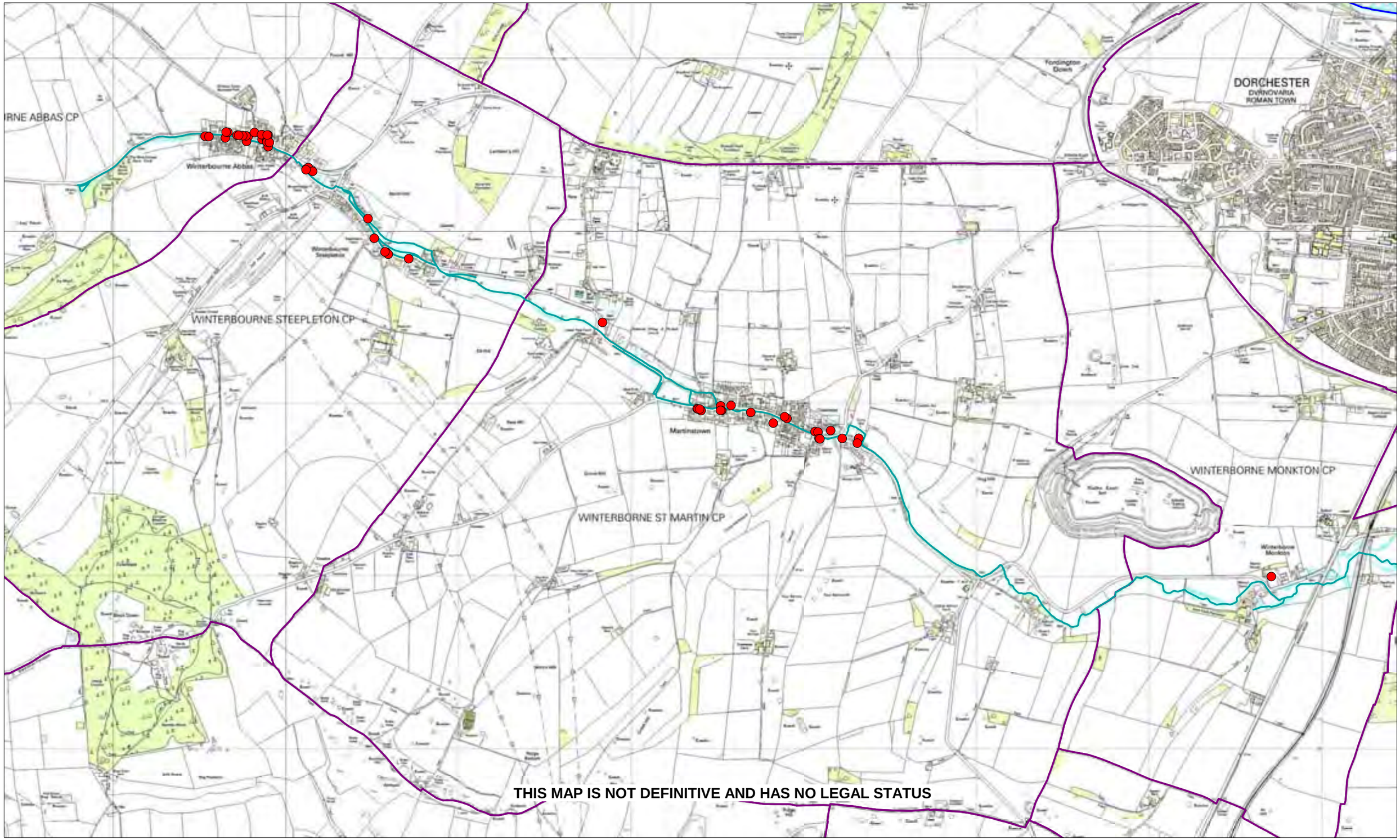

Winterborne

Key

- Internal Property Flooding
- Main Rivers
- Ordinary Watercourses

Ref:

Date: 18/10/2012

Scale 1:20000

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Cent X: 364401

Cent Y: 88901

GEOGRAPHICAL INFORMATION SYSTEMS
DORSET County Council

APPENDIX B

HYDROLOGICAL AND HYDROGEOLOGICAL DATA

FIGURE B1	GROUNDWATER, KINGSTON RUSSELL AND FLOW, SOUTH WINTERBOURNE 2003 - 2013
FIGURE B2	GROUNDWATER RECORD KINGSTON RUSSELL
FIGURE B3	GROUNDWATER, KINGSTON RUSSELL, JUNE – JULY 2012
FIGURE B4	RAINFALL FRIAR WADDON, JUNE – JULY 2012
FIGURE B5	RAINFALL, FRIAR WADDON AND GROUNDWATER, KINGSTON RUSSELL, 2011 - 2012
FIGURE B6	WESSEX WATER DISCHARGE AND SOUTH WINTERBOURNE FLOW, 2012
FIGURE B7	WESSEX WATER DISCHARGE AND SOUTH WINTERBOURNE FLOW, NOVEMBER 2012
FIGURE B8	FLOW IN SOUTH WINTERBOURNE 1992 - 2013

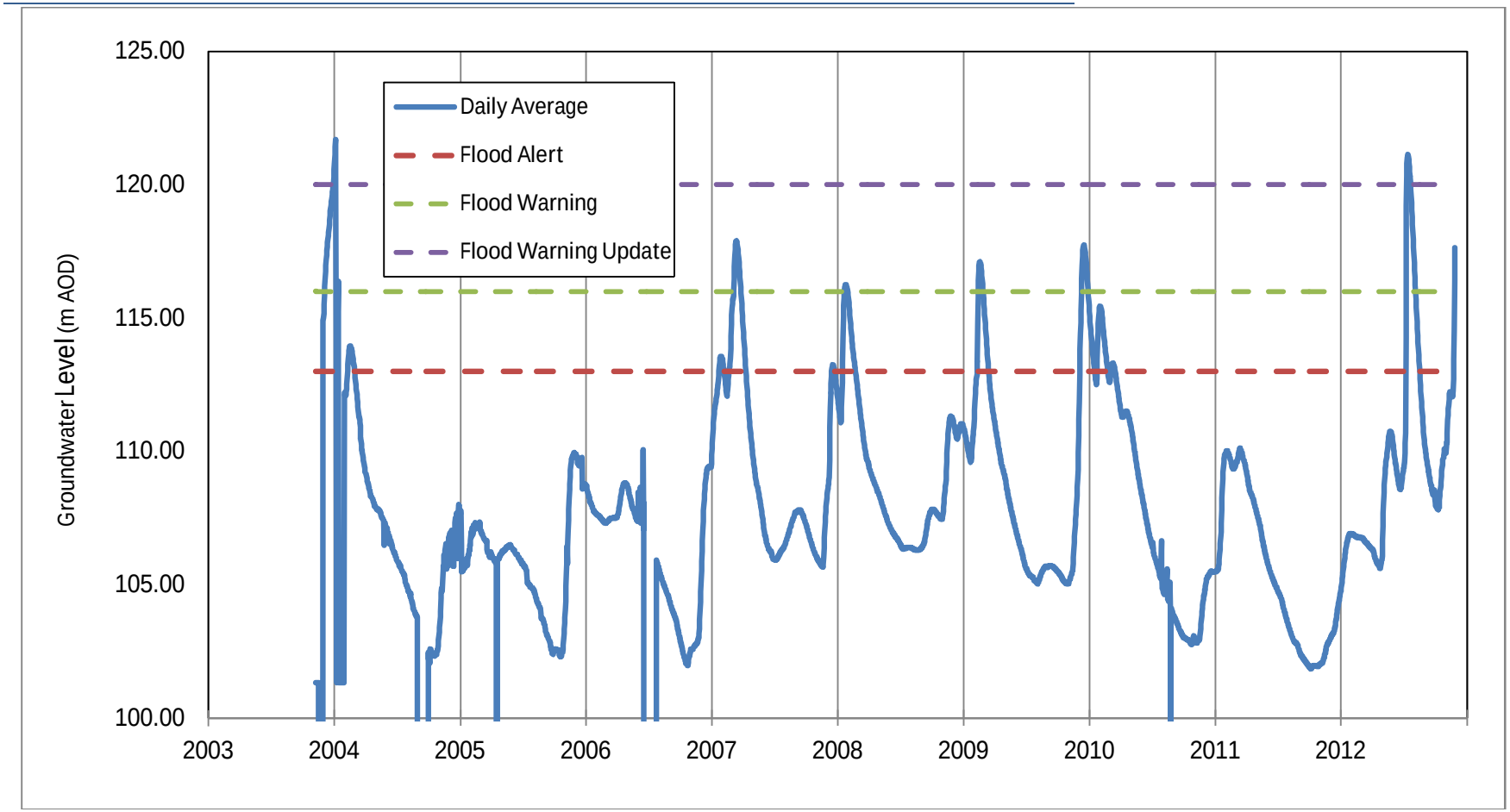


FIGURE B1: GROUNDWATER LEVEL, KINGSTON RUSSELL. 2003 – 2012.

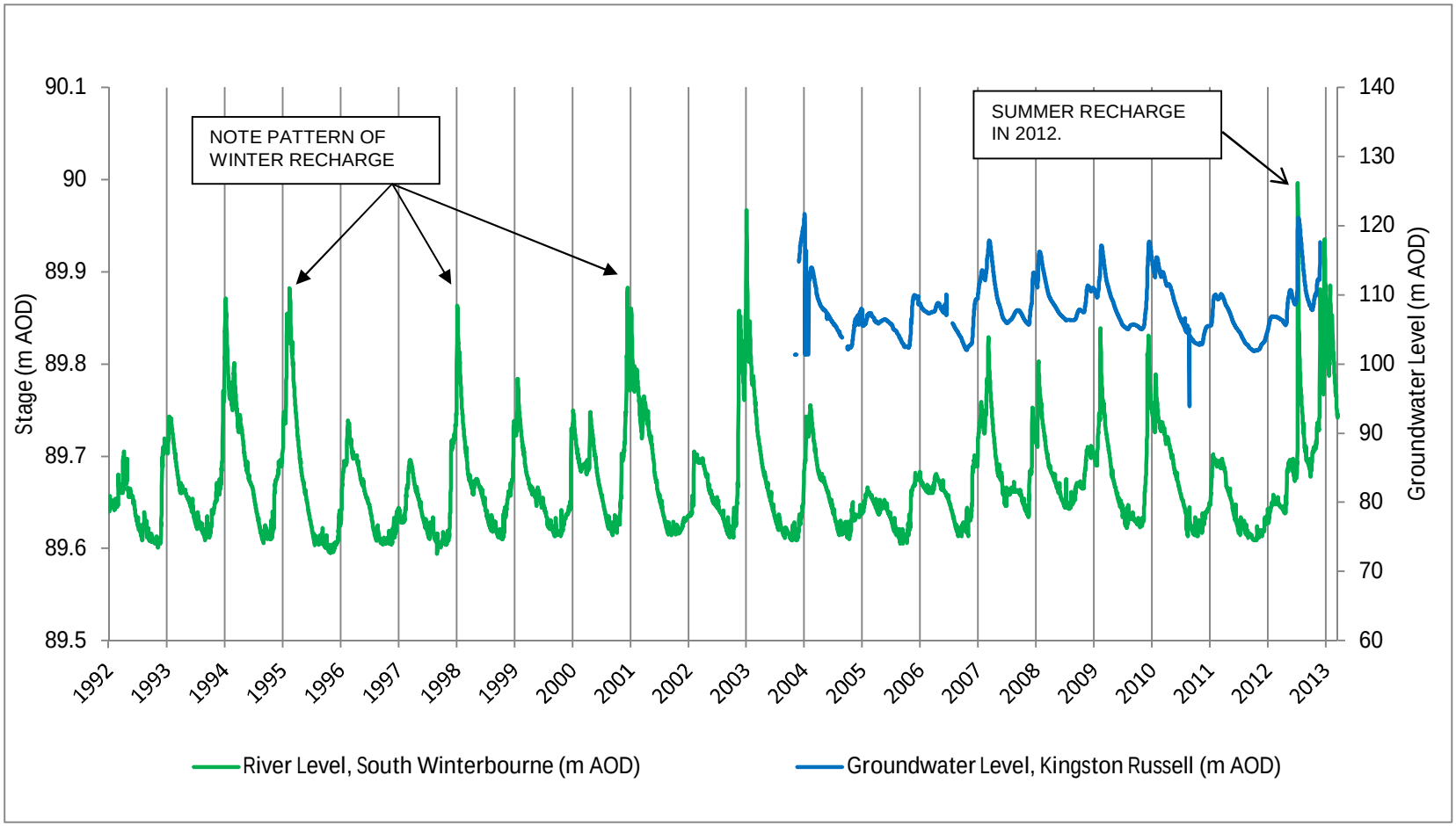


FIGURE B2: GROUNDWATER LEVEL, KINGSTON RUSSELL AND RIVER LEVEL, SOUTH WINTERBOURNE. 2003 - 2012

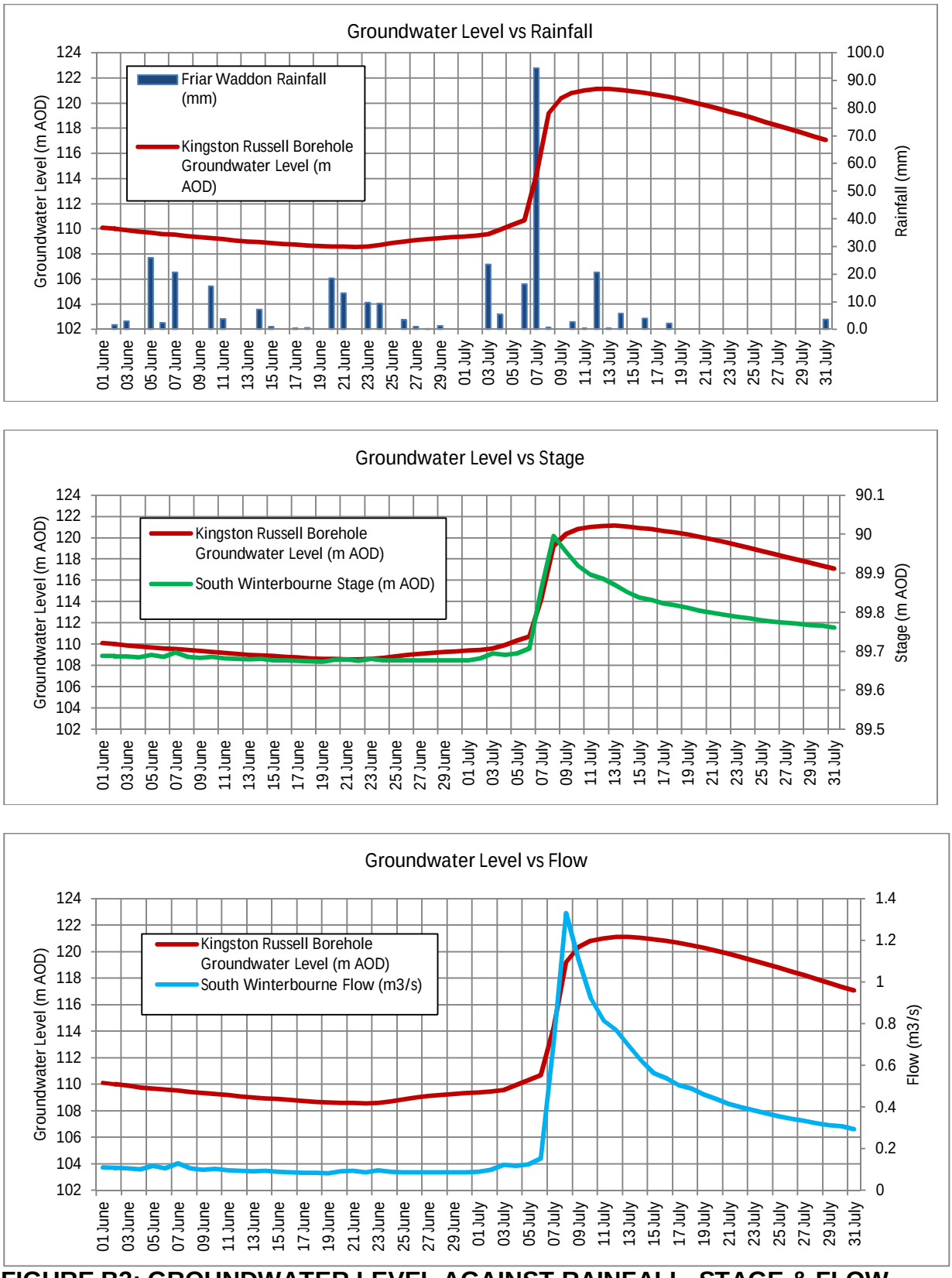


FIGURE B3: GROUNDWATER LEVEL AGAINST RAINFALL, STAGE & FLOW. JUNE – JULY 2012

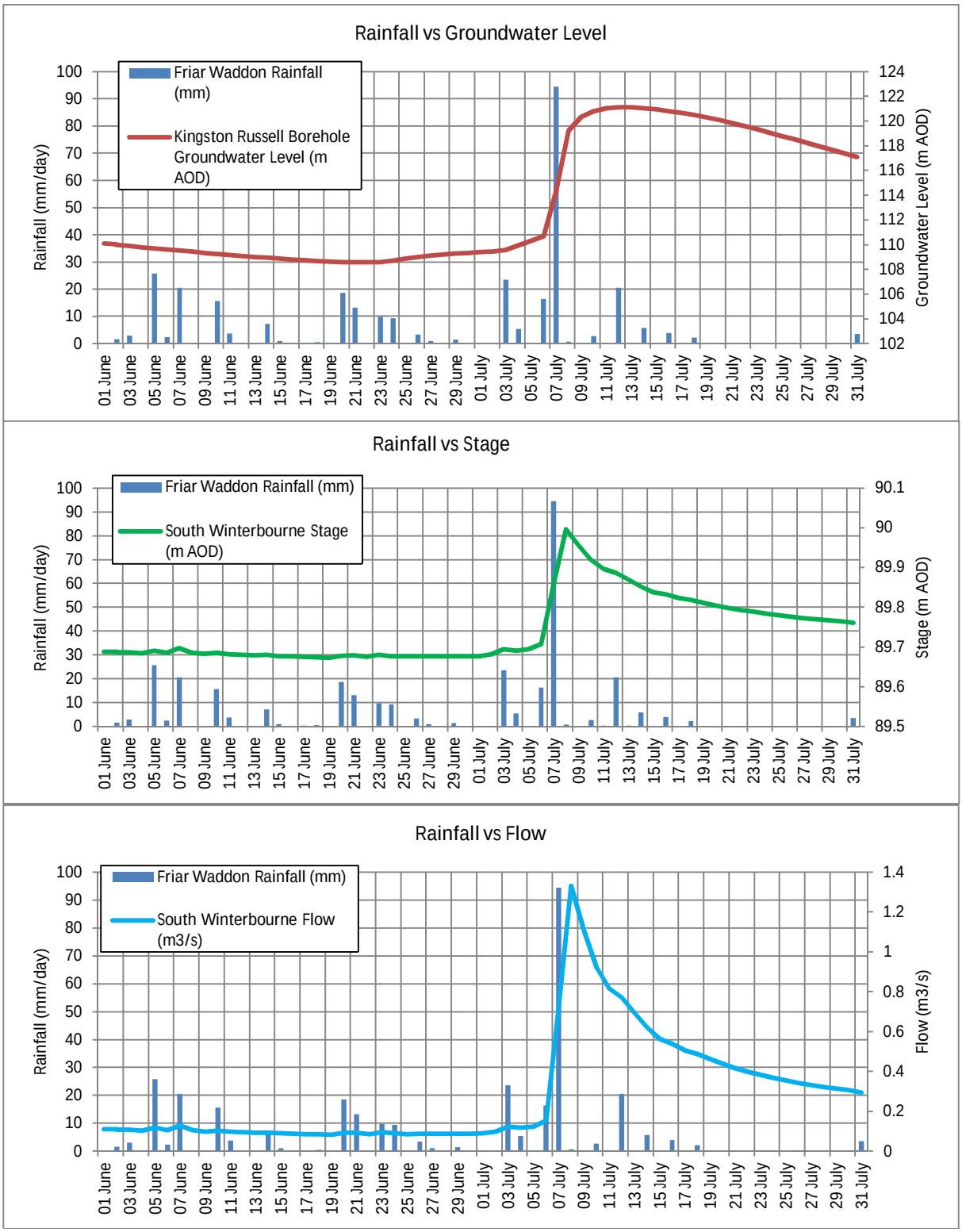


FIGURE B4: RAINFALL AGAINST GROUNDWATER, STAGE & FLOW. JUNE – JULY 2012

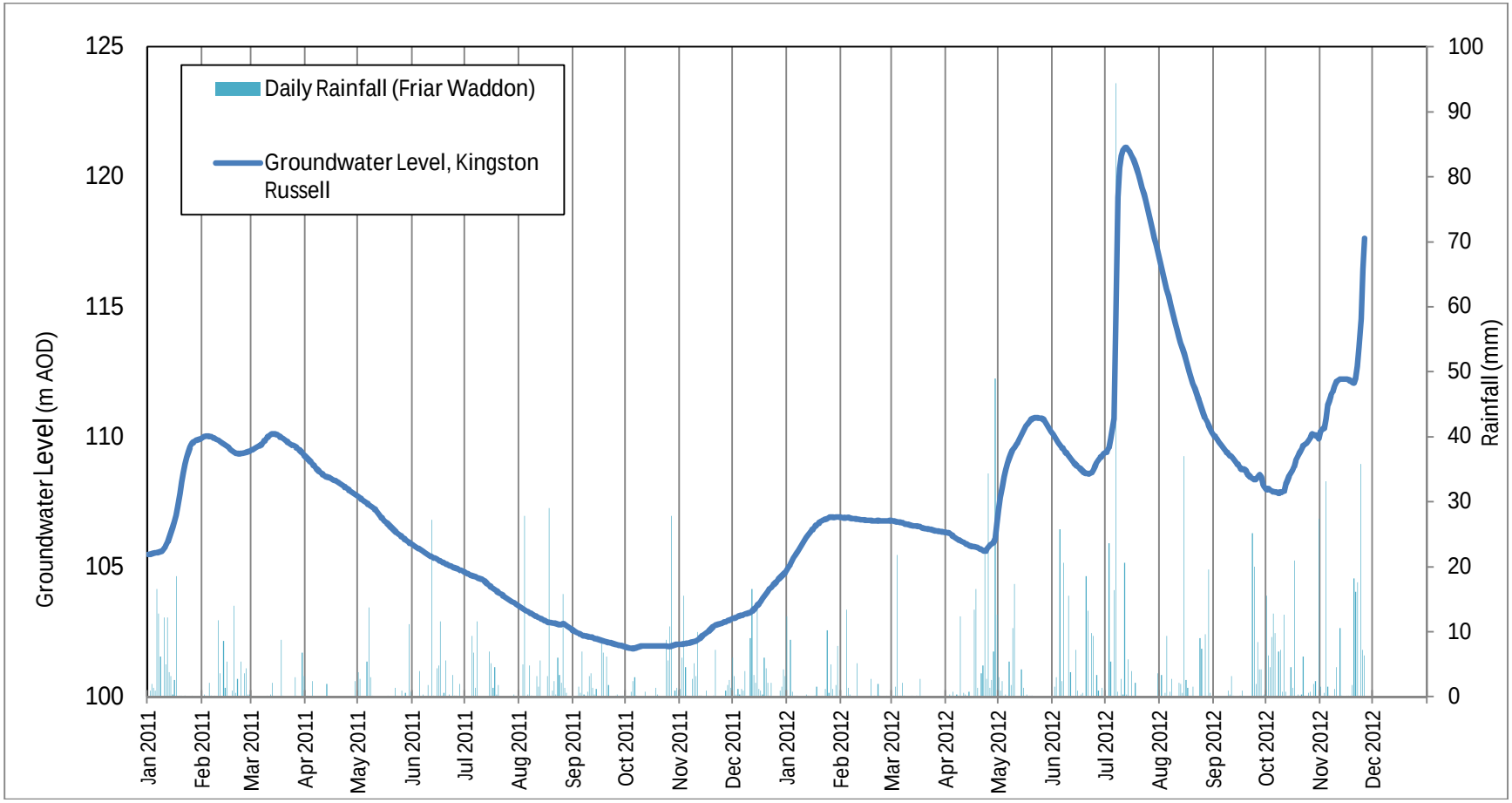


FIGURE B5: RAINFALL, FRIAR WADDON AND GROUNDWATER, KINGSTON RUSSELL, 2011 - 2012

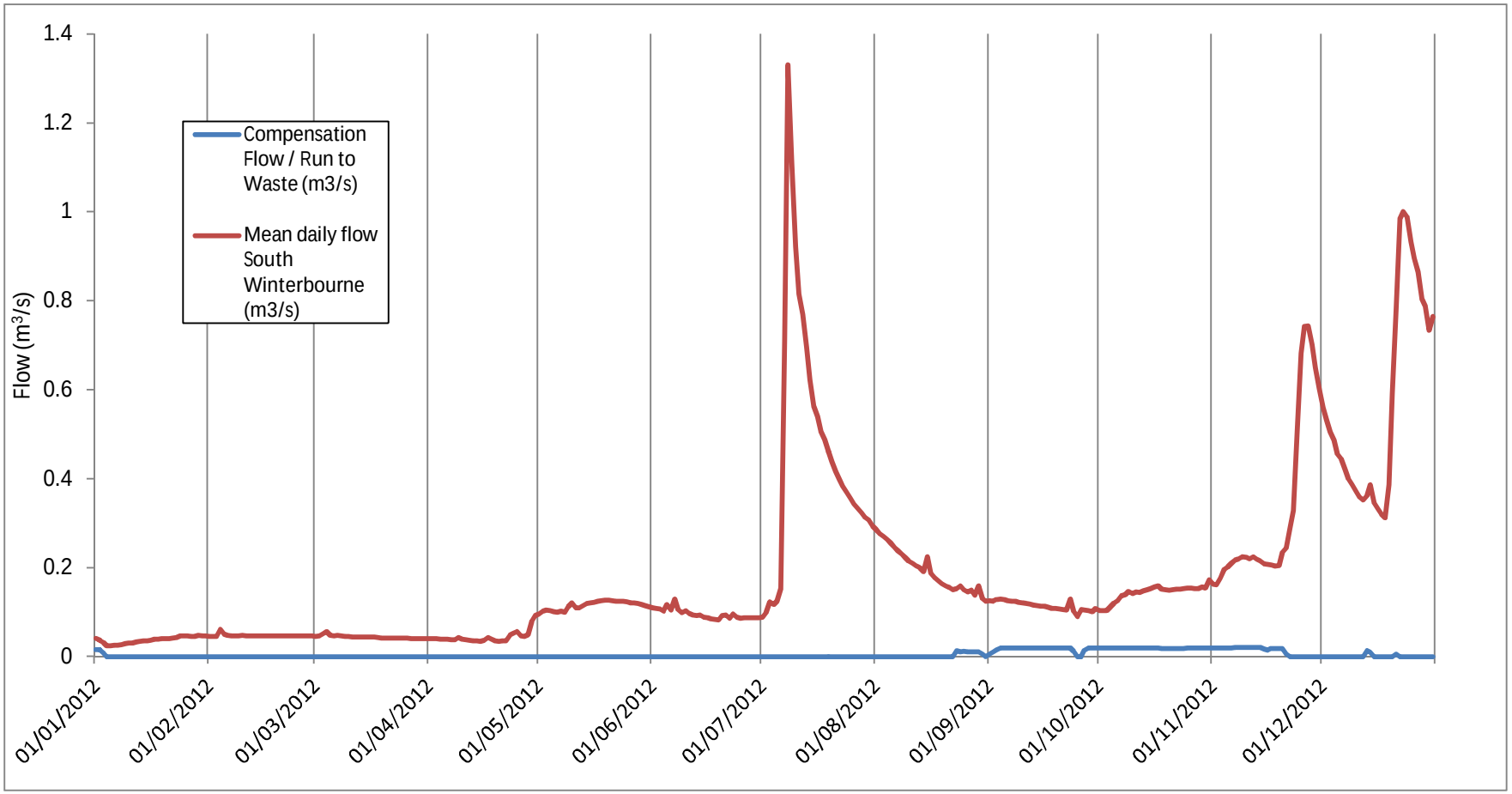


FIGURE B6: WESSEX WATER DISCHARGE AND SOUTH WINTERBOURNE FLOW, 2012

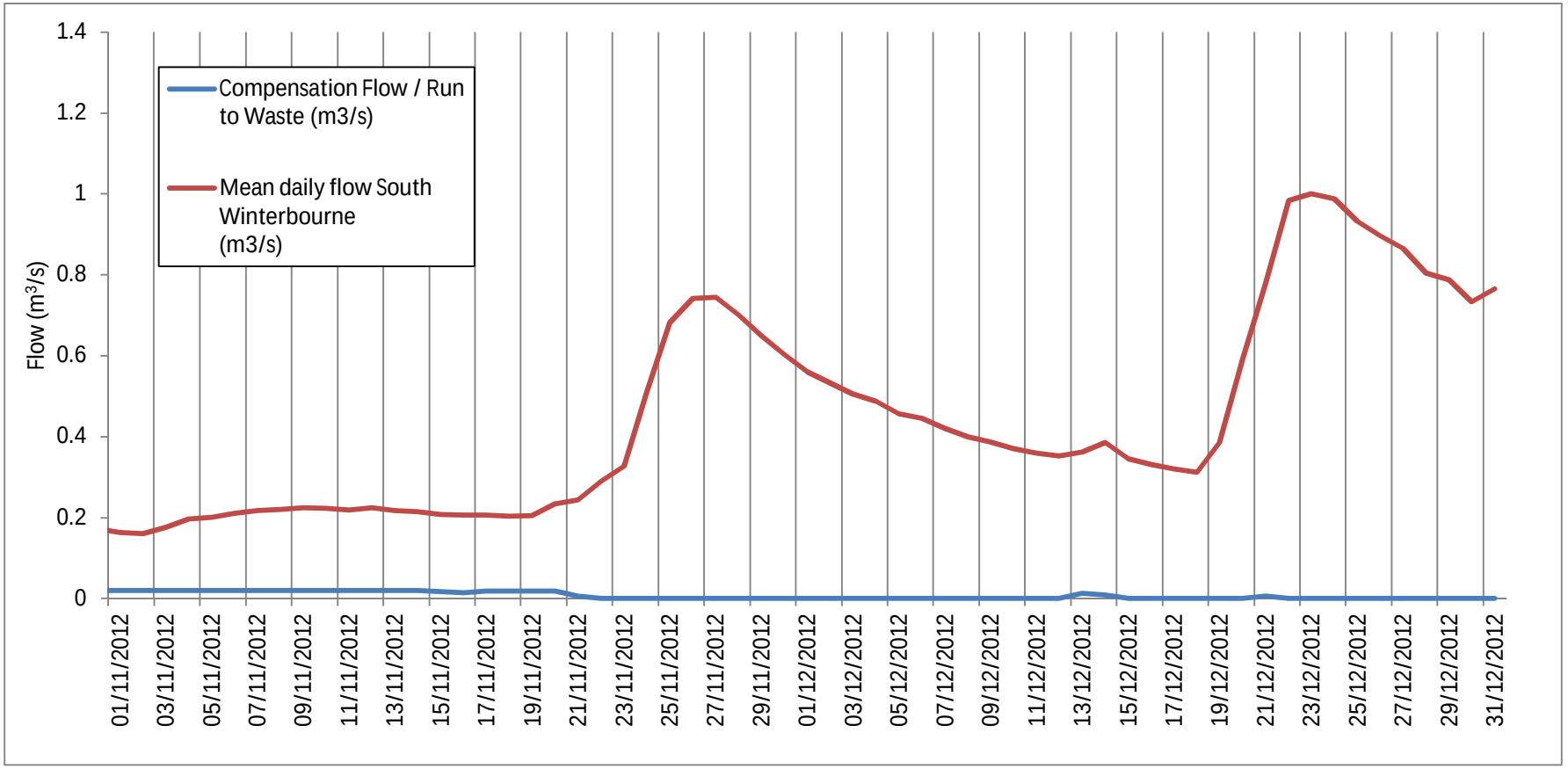


FIGURE B7: WESSEX WATER DISCHARGE AND SOUTH WINTERBOURNE FLOW, NOVEMBER 2012

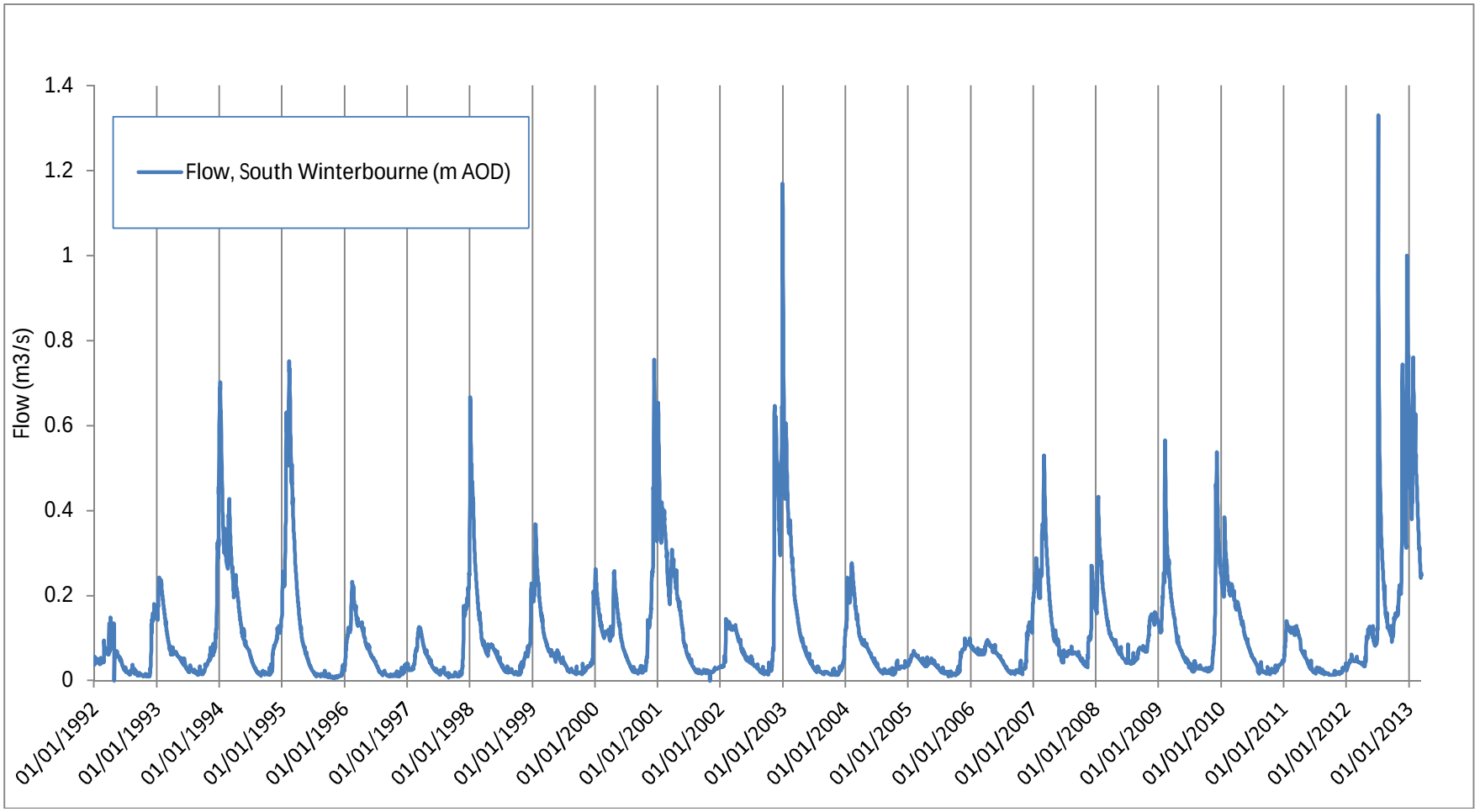


FIGURE B8: FLOW IN SOUTH WINTERBOURNE 1992 - 2013

APPENDIX C

STAKEHOLDER CONSULTATION

STAKEHOLDER CONSULTATION

Introduction

Consultation was undertaken with a number of stakeholders to inform this assessment. This was further to information already collected on the study area by the EA and Dorset County Council, including feedback from residents from Flood Clinics held in the villages in August 2012.

Consultation with Residents

On 21st and 22nd January 2012, Charles Bennett and Ela Szostak of PB undertook consultation with residents of the three affected villages.

Meetings were arranged with the residents of the properties listed in TableC1. The PB representatives also attended a meeting of the Martinstown Parish Council office, where views of a number of additional residents were gained.

Further correspondence with residents was undertaken by telephone and email.

TableC1 – Flood consultation

Resident	Property	Village
Mr & Mrs Robertson	Turnpike Cottage	Martinstown
Mr & Mrs Hutton-Penman	Turnpike House	Martinstown
Mrs Rootham	Old Post Office	Martinstown
Mr and Mrs Priddle	Park Farm	Martinstown
Mrs Grassby	Number 27	Martinstown
Mrs Pearce	4 Manor Farm Court	Martinstown
Mr Norman	Manor Farm	Winterbourne Monkton
Mrs Cumberland	1 Steepleton Water	Winterbourne Steepleton
Mr & Mrs Lockwood	3 Steepleton Water	Winterbourne Steepleton
Mrs Alexander	Corner Cottage	Winterbourne Steepleton
Mrs Bluett	Riverside Cottage	Winterbourne Steepleton
	Manor Farmhouse	Winterbourne Steepleton
Mrs Alison	Darach	Winterbourne Abbas
Mrs Gale	Ash Cottage	Winterbourne Abbas
Mr & Mrs Brown	Meadow Cottage	Winterbourne Abbas
Mr & Mrs Deller	Churchview Guesthouse	Winterbourne Abbas
	Hadley Lodge	Winterbourne Abbas
Mr & Mrs Ferne	School House	Winterbourne Abbas
Mr & Mrs Parsons	Laburnham Cottage	Winterbourne Abbas
Mr & Mrs Watson	6 Valley Cottages	Winterbourne Abbas
Mr Hallett	3 Grange Cottage	Winterbourne Abbas
Mr Hallett	4 Grange Cottage	Winterbourne Abbas

A summary of the key points raised in each village is provided below. Photographs provided by residents of the flooding in the valley are included in Appendix E.

Martinstown

- Residents at the downstream end of the village at Turnpike Cottage and Turnpike House highlighted that former water meadows and flood plains were not flooding, with floodwater spilling across their gardens before flowing onto the agricultural land. The residents suggested that the left bank of the channel could be lowered to allow flow to spill across the fields to the east of the watercourse.
- A number of residents highlighted that ash from vehicles travelling through the village during the floods exacerbated the impact of the flooding on properties.
- A number of residents reported concern about the lack of clarity on the ownership and responsibility for maintenance of the South Winterbourne as it flows through the village.

Winterbourne Steepleton

- Residents in the Steepleton Water area raised the issue of surface runoff from the A35 spilling across their properties with existing drainage not maintained and not adequate to manage the large flows.
- Mr Crimblehome of Old Manor Cottage provided a map of the watercourses in Winterbourne Steepleton, showing the route of previous course of the river carrying flows to a mill to the north of Winterbourne Steepleton.
- Mr Laderski of Steepleton Manor Farm and Mrs Alexander of Corner Cottage showed the severe impact of the flooding on three properties in South Winterbourne, with the properties still unoccupied 6 months after the flood event. During the flood event flows were diverted to a sump at the rear of the properties with a pump used to discharge flows into the watercourse.

Winterbourne Abbas

Residents in Winterbourne Abbas identified the following key issues in the village

- There is a lack of drainage connections from the north side of the A35 into the watercourse on the southern side of the highway. Residents suspect that this dates back to the early 2000s when the highway was planed and resurfaced. This is demonstrated by a number of outfalls into the channel which no longer discharge flow.
- A number of residents highlighted issues with maintenance of road gullys, in particular those directly located within the highway. Issues with gully maintenance worsened by silty runoff from agricultural land to the north.
- Lack of maintenance of the watercourse and surface water drainage, resulting in blockage and reduced capacity.

Residents also reported a number of concerns regarding Wessex Water's activities in the period around the July 2012 floods. These included:

- Potential impact of construction of a new water main to the north of Winterbourne Abbas in the period of the flooding.
- Impact of the Wessex Water augmentation discharge to the South Winterbourne.
- A large number of WW tankers were seen operating downstream of the watercourse, the purpose of which was not known.
- Rumours of a 'reservoir being let go' during the July flood event, resulting in very large volumes of water entering the watercourse.

Wessex Water

Wessex Water (WW) is the water and sewerage utility company for the study area and surrounding region.

Figure C1 – Wesesx Water region

Input into this study was provided by Luke de Vial, Head of Water Resources at Wessex Water. The following is record from a telephone conversation between Charles Bennett of PB and Mr de Vial on 28th January 2013.

- WW have a drinking water extraction at Kingston Russell (license no 13/44/56/G/103). From this extraction, water is pumped to a local below ground reservoir at Long Bredy, where it supplies local properties and excess water is pumped to Litton Cheney where it is combined with other sources to provide water supply to Bridport.
- WW have a license to discharge flows into the South Winterbourne stream for two purposes:
    1. For ecological reasons, WW discharge a flow into the South Winterbourne during periods of low flow in the watercourse. This is to maintain a flow in the watercourse during dry periods.

2. The WW extraction at Kingston Russell has high levels of nitrate, particularly during periods of high groundwater levels. The high nitrate levels result from historical high levels of fertiliser application to agricultural land in the catchment. WW discharge proportion of the flow to waste, allowing lower concentration groundwater to be utilised for water supply.

- WW now have an agreement with the EA that the discharge to the South Winterbourne will be suspended if flow in the South Winterbourne exceeds 400 l/s.
- WW agreed to supply data on their abstraction at Kingston Russell and the discharge to the South Winterbourne.
- WW provided details on their catchment management scheme with local farmers, using improved land management techniques to reduce the infiltration of nitrates to ground.

Environment Agency

A meeting with Mr Guy Parker of the EA, 12th February 2013, was held to gain input into the study from the EA.

Mr Parker is the Flood Incident Management Team Leader for the Wessex region, which includes the study area.

Mr Parker highlighted the following contributing factors to the flooding in July 2012.

- In July there is usually a good level of cover of vegetation, which promotes retention and dispersion of water through evapotranspiration. Due to the low rainfall in winter and wet April, ground cover was low.
- In summer, there is typically low recharge of groundwater as water is soaked up by dry soil and held in vegetation. In 2012 there was high recharge of groundwater due to lower than average ground cover.
- The non-typical weather may also have contributed to increased runoff from fields with high silt loads. Farmers were not able to plough land, leading to scouring and high runoff. The loss of silt cover may also have contributed to higher recharge of groundwater.
- The main factor, however, was the extreme rainfall experienced in June and July.

Mr Parker discussed the long-term borehole record at Chillgrove which dates back to the 1840s. The record shows very limited evidence of summer recharge of groundwater. Also discussed the lack of groundwater flooding from 1960 – 1990 in the UK. This may have been due to longterm weather patterns, with the UK experiencing generally drier weather in this period.

Mr Parker discussed the potential under reporting of groundwater flooding in the past, suggesting that people were less likely to report flooding previously as the impact on houses was less – hard floors, limited soft furnishings, no electricity etc.

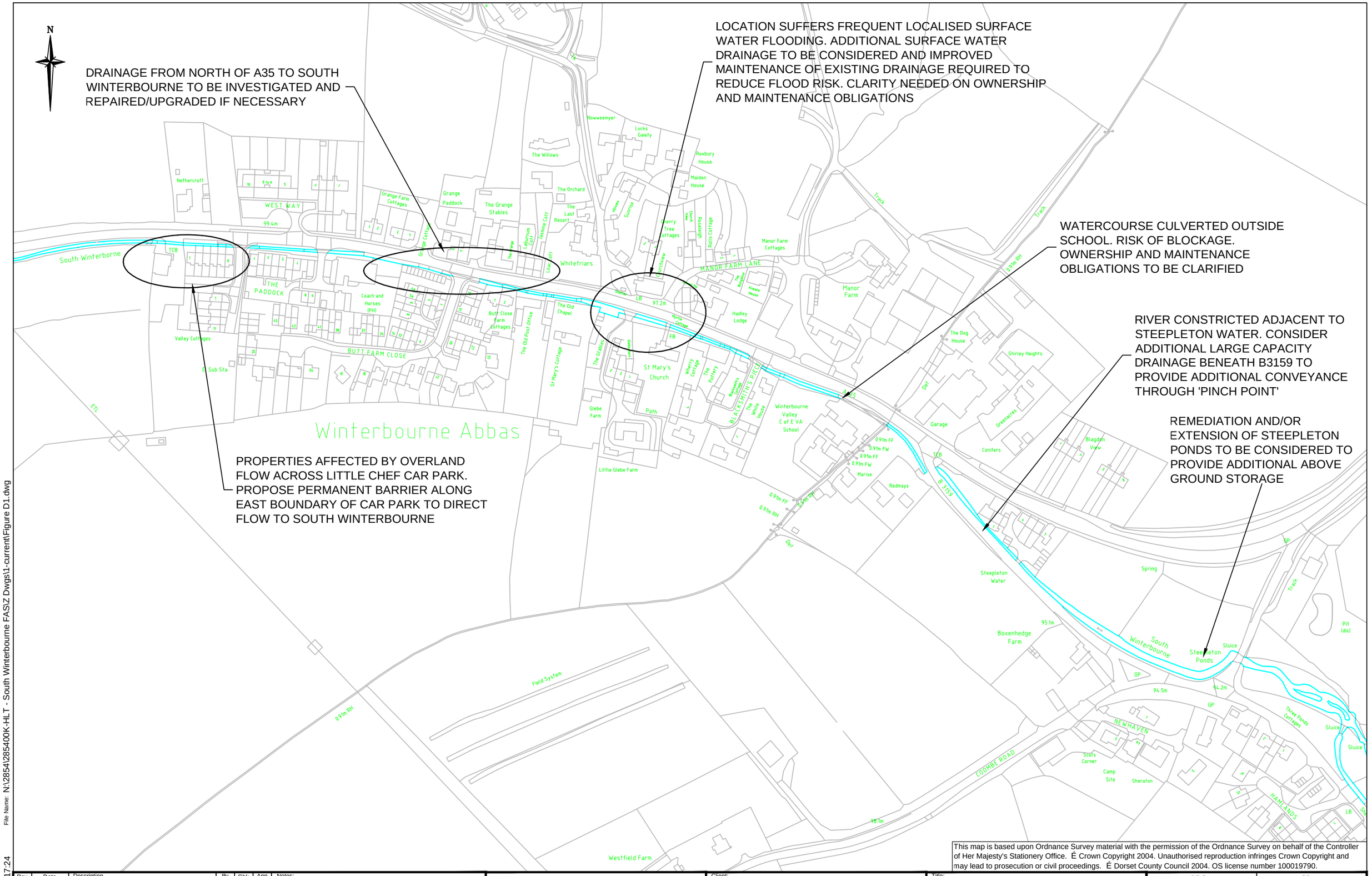
The local conditions in the South Winterbourne valley were also discussed. Mr Parker queried the impact of compensation pumping on groundwater emergence in the stream, suggesting that decreased sediments deposits in the river could increase groundwater emergence through the villages. Mr Parker highlighted two focus areas for reducing flooding – (i) reducing runoff, and (ii) reducing blockage in the watercourse from low bridges and obstructions.

Mr Parker provided groundwater, rainfall and flow records for the study area.

APPENDIX D

PROPOSED RECOMMENDATIONS

FIGURE D1	PROPOSED RECOMMENDATIONS, WINTERBOURNE ABBAS
FIGURE D2	PROPOSED RECOMMENDATIONS, WINTERBOURNE STEEPLETON
FIGURE D2	PROPOSED RECOMMENDATIONS, MARTINSTOWN



Rev	Date	Description	By	Chk	App

Notes:

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Client: DORSET COUNTY COUNCIL

Project: SOUTH WINTERBOURNE FAS

Title: RECOMMENDED FLOOD ALLEVIATION AND PROTECTION MEASURES WINTERBOURNE ABBAS

Drawn:	BRG	Checked:	CB
Designed:	CB	Approved:	
Date:	03/04/2013	Scale: 1:2500	A3 Sheet:
Project Number:		Drawing Number:	Revision:
285400K-HLT		FIGURE D1	

Login: Giles, Ben
Plot Date: 04/04/2013 09:17:24
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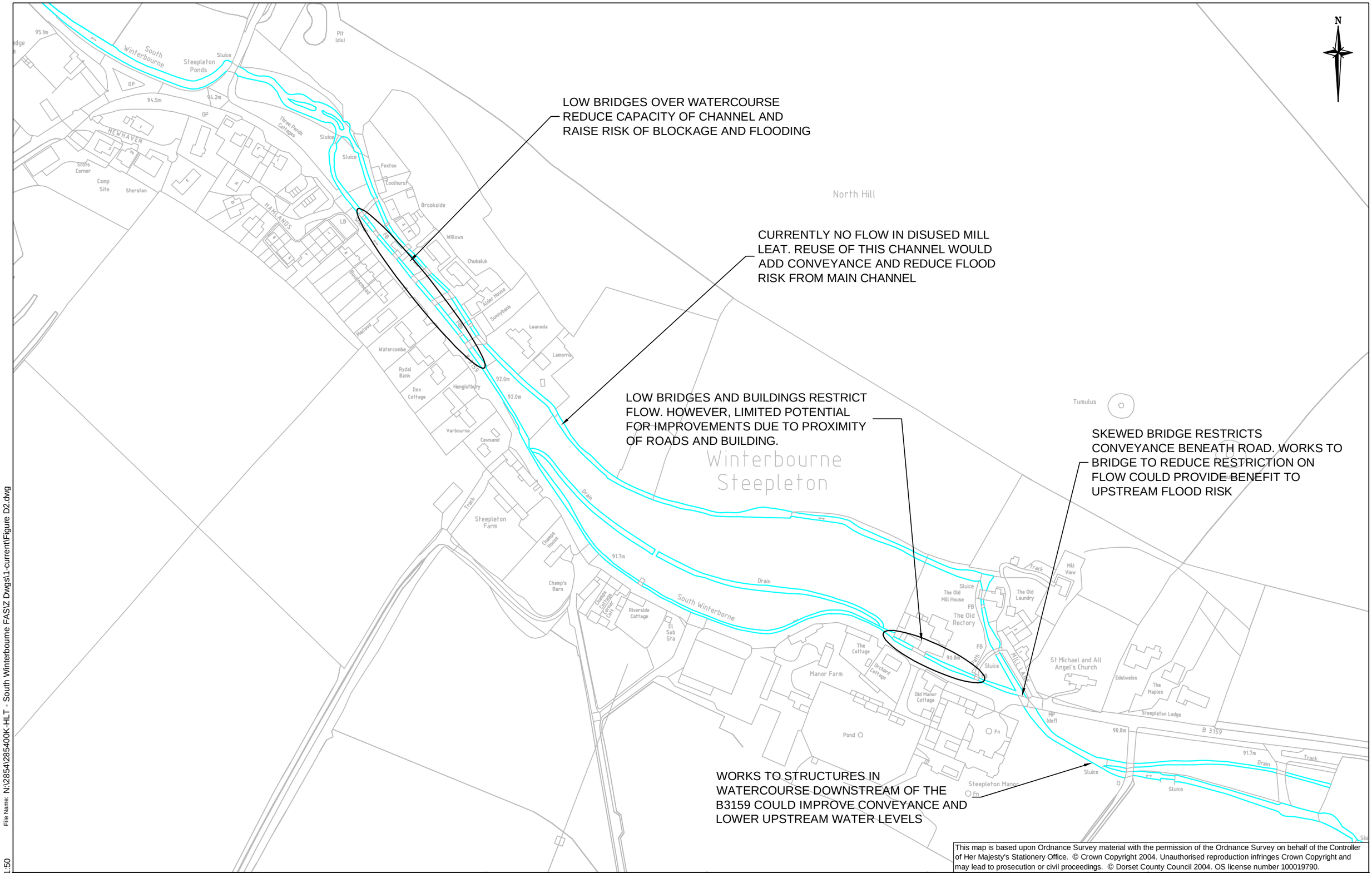

Rev	Date	Description	By	Chk	App

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Client: DORSET COUNTY COUNCIL

Project: SOUTH WINTERBOURNE FAS

Title: RECOMMENDED FLOOD ALLEVIATION AND PROTECTION MEASURES **WINTERBOURNE STEEPLETON**

Drawn: BRG		Checked: CB	
Designed: CB		Approved:	
Date: 04/04/2013	Scale: 1:2500	A3	Sheet:
Project Number: 285400K-HLT	Drawing Number: FIGURE D2		Revision: B

Login: Bennett, Charles
Plot Date: 31/05/2013 10:51:50
File Name: N:\2854\285400K-HLT - South Winterbourne FAS\Z Dwgs\1-current\Figure D2.dwg

PROPERTY REPORTED HEAVILY SILTED RUN-OFF FROM AGRICULTURAL LAND TO THE NORTH. ALTERATIONS TO LAND MANAGEMENT COULD REDUCE IMPACT

LOW BRIDGES RESTRICT FLOW IN WATERCOURSE AND RAISE RISK OF BLOCKAGE

FLOW OVERTOPPING THE CHANNEL SPILLS ACROSS PROPERTIES TO THE WEST BEFORE SPILLING ON TO MEADOWS TO THE EAST. LOCALISED ALTERATIONS TO BANK LEVELS TO BE CONSIDERED TO REDUCE FLOOD RISK TO PROPERTIES

CAMBER OF ROAD PREVENTS SURFACE WATER FROM FLOWING INTO CHANNEL. ALTERATIONS TO SURFACE WATER DRAINAGE MAY REDUCE FLOOD RISK LOCALLY

HIGH VOLUMES OF RUN-OFF FROM AGRICULTURAL LAND. ALTERED LAND MANAGEMENT COULD REDUCE IMPACT

Rev	Date	Description	By	Chk	App

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Title: RECOMMENDED FLOOD ALLEVIATION AND PROTECTION MEASURES MARTINSTOWN

Drawn: BRG		Checked: CB	
Designed: CB		Approved:	
Date: 04/04/2013	Scale: 1:4500 A3	Sheet:	
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Login: Giles, Ben
Plot Date: 04/04/2013 09:18:30

APPENDIX E

PHOTOGRAPHS OF RECENT FLOODING


Mace
ultimate
Collect points here
Servicing and MOT's at amazing prices


RAC


FREE WIFI



VALLEY
COTTAGES


GUEST
HOUSE


ROAD
CLOSED


ROAD
CLOSED


MANOR FARM LANE

APPENDIX F

COMMUNITY FLOOD ACTION GROUP GUIDANCE

National Flood Forum
Old Snuff Mill Warehouse
Park Lane, Bewdley
Worcestershire DY12 2EL
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01743 741725
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Flood Action Groups

The prime focus of the National Flood Forum's activities is with those communities that have either been affected by flooding or are at risk of flooding because of their location.
Since its inception The National Flood Forum has sought to be a focal point for all those who find their lives disrupted by flooding.

We have found that the best way of making things happen locally is by communities working together with those who can make a difference; Local Authorities, The Environment Agency and Water Companies collectively.

Forming a community based flood action group to work on behalf of the wider community in finding ways to reduce flood risk, has proved very effective across England and Wales.

Flood Action Groups are a representative voice for their community and their aim is to work in partnership with the Agencies and Authorities whose work involves flood risk.

Through these 'grass-root' groups, communities are able to;

- Address their concerns over malfunctioning assets/and other issues
- Be constantly in touch with what is intended for their community
- Know procedures that are already in place regards routine maintenance
- Have a voice as to the future flood risk of their community through consultation.
- Instigate 'flood watchers'
- Create awareness of flood risk to the wider community
- Prepare to reduce the impact on the community should a flood event occur

The National Flood Forum supports communities in the formation of Flood Action Groups, gives tools to ensure their success and sustainability and initiates the first meeting with all the right professionals needed.

We believe in simplicity, realising that we all have lives to live and spare time is short.

- Flood Awareness Trailer

The National Flood Forum's Flood Awareness Trailer is a 5m consultation/display trailer, designed for partnership working. This is an outreach vehicle to take information/messages to communities at risk of flooding. It has on board all available products that can be purchased to protect homes along with all corresponding leaflets and fact sheets about how to find out if you are at risk, how to prepare, what to do should flooding occur, how to protect your home. It contains other useful information and contacts together with very experienced staff who can give specialist independent advice on all issues related to flooding, and in particular flood mitigation products.

This trailer has been set up to accommodate partners, such as local authorities, Environment Agency, allowing them to promote their information, personnel, logo etc.

The trailer is intended to go right into the heart of the area at risk, and can either be placed in the local pub/village hall car park or be moved to a variety of locations relatively easily.

- Flood Exhibitions

The National Flood Forum has for many years, set up flood exhibitions which aim to cover a wider area of engagement, such as a large town or city. They involve the individual product manufacturers that attend with their products and displays as well as our partners; local authorities, Environment Agency, Water Company, and others that might be relevant such as a flood group, riparian owners, business support groups, fire and police.

The National Flood Forum provides guidance on the logistics for the event, such as venue and event promotion, we can also if needed, manage the whole event. Included is The National Flood Forums presence, providing advice and literature and to manage the day.

- Flood Surgeries

Flood surgeries give focus to targeted areas and are ideal for flood protection grant schemes and to target small areas for flood awareness. The National Flood Forum provides a wide range of flood protection products along with all corresponding leaflets for people to examine. We are also able to provide independent knowledgeable advice about the products and suitability for the individual.

The National Flood Forum provides a range of other useful information and is able to advice or signpost on a wide range of flood related issues. . These Surgeries are always done in partnership and include the Environment Agency, Local Authority and Water Company.

- Community Engagement

Community engagement involves The National Flood Forum going into the heart of targeted areas, engaging with the community, and bringing them together to form a core group. This group is then ready for partnership engagement, the group charged with disseminating messages out into their wider community. They are empowered to move forward issues in the area, looking for ways to reduce their flood risk and going on to form an emergency plan. This sort of engagement works

particularly well before a property level grant scheme is implemented, and is essential after a flood event.

- Training

The National Flood Forum provides training for different authorities and organisations. Some of the topics include:

- Learning "what's out there" in the way of property protection, how products work, and their suitability for different individuals and types of property – pro's/con's, what's needed for implementation.
- Understanding & developing community resilience – engaging with groups, roles of different participants, functions of groups and different organisations, and achieving and maintaining sustainability of flood action groups.
- Learning about flood trauma and its impact on individuals and communities
- Business continuity
- Recovery – post incident welfare, strategic & operational needs and approaches

- Recovery

The National Flood Forum has supported the Environment Agency and Local Authorities all over the country to cope with floods and is able to advise councils on the likely issues that will need to be addressed. We have provided both short term interventions and worked for much longer periods to help communities recover from much more serious floods. In Cumbria for, example, the National Flood Forum was on the ground supporting communities for sixteen months.

The support involves working in and with communities, adapting the support through the different stages of recovery, including:

- Setting up an initial all day/evening flood support centre, involving partners for information, guidance and support alongside sustenance and respite
- Providing a series of surgeries, general support, insurance, resilience & resistance. We also make home visits
- Developing community groups, preparing them for engagement with agencies, voluntary groups and the wider community and continuing to support them for the life of the group

The National Flood Forum has a wealth of experience in flood related issues, including; insurance, property transactions, understanding property resilience, resistance, initiating community groups, and supporting flood plans. They are also heavily involved in current national policy developments and would be happy to discuss issues around how these are implemented in your area.

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Good Practice Case Study

Flood Action 4 Buckingham (FA4B)

Good practice in supporting the community to implement flood resilience can be found in Buckingham where with support and guidance from the National Flood Forum, a group of people who had previously been affected by flooding was established – Flood Action 4 Buckingham (FA4B). Alongside FA4B an existing local charity, in this case 'Churches Together' was also used to create and support an emergency plan.

FA4B works with relevant official agencies and authorities on a 'rolling' action plan to collectively address on-going community flood concerns. Messages, information and discussions are fed into the group and they take responsibility to ensure that the wider community is kept informed. An emergency plan for the community was made alongside 'Churches Together' who have non-flooded members and, usefully, are aware of the skills of their membership. The plan is implemented when required and supports those that do flood. To date, FA4B has organised a dry-run of their plan, held a flood fair in Buckingham to enable residents to gain information, learn more about the emergency plan, speak of flood concerns that they may have, and view a platform of flood resilience technologies. It is anticipated that such dry-runs will be undertaken yearly and 'Churches Together' volunteers are about to embark on a flood training day through the National Flood Forum's training programme.

Source: The National Flood Forum.