

Flood Investigation Report

Market Weighton Flooding Event

on 20 July 2014

CES\188b

December 2014



EAST RIDING
OF YORKSHIRE COUNCIL

Revision Schedule

East Riding of Yorkshire Council

Flood Investigation Report Market Weighton Flooding Event on 20 July 2014.

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Records of the public sewer system included are a facsimile of the statutory record provided by Yorkshire Water Services. For the purposes of this report minor sewers and other non- relevant data have been omitted from the plans for clarity. The statutory public sewer record is held by Yorkshire Water Services Ltd.

Acknowledgements

East Riding of Yorkshire Council would like to thank the following for their co-operation and assistance throughout this investigation.

Environment Agency

Yorkshire Water Services Ltd

Market Weighton Town Council

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Lead Local Flood Authority and Responsibilities

East Riding of Yorkshire Council, as the Lead Local Flood Authority (LLFA), has a responsibility under Section 19 of the Flood and Water Management Act 2010 to investigate significant flood incidents in its area. Section 19 states:

- (1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate -*
 - (a) Which risk management authorities have relevant flood risk management functions, and*
 - (b) Whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*
- (2) Where an authority carries out an investigation under subsection (1) it must -*
 - (a) Publish the results of its investigation, and*
 - (b) Notify any relevant risk management authorities.*
- (3) The LLFA has lead responsibility for managing the risk of flooding from surface water, groundwater and ordinary water courses.*

This report has been prepared by East Riding of Yorkshire Council in its role as LLFA in response to extensive flooding which affected properties in Market Weighton and Shiptonthorpe.

This report provides an overview of flooding that has occurred, describes the conditions which led to the flooding, considers the response to the flooding thus far and makes technical recommendations for the flood risk authorities concerned.

Relevant Flood Risk Management Authorities

The risk management authorities that have relevant flood risk management functions are:

East Riding of Yorkshire Council

East Riding of Yorkshire Council is the Lead Local Flood Authority responsible for managing flood risk from surface runoff, groundwater and ordinary watercourses, development of a Local Flood Risk Strategy, Asset Plans and Investigations under the Flood and Water Management Act 2010. East Riding of Yorkshire Council also has responsibility for some Coastal erosion risk management, and is the Highway Authority with responsibility for highway drainage under the Highways Act 1980.

Environment Agency

Responsible for managing the flood risk from main rivers, the sea and reservoirs including coastal erosion risk management, permissive powers to maintain main rivers, strategic overview over all forms of flooding and development of a national Flood Risk Strategy.

Yorkshire Water Services

Yorkshire Water Services is the statutory sewerage undertaker for the Yorkshire region with a duty to effectually drain sewers pursuant to the Water Industries Act 1991.

In addition:

Riparian Landowners

Riparian landowners are those who own land adjoining a watercourse and have certain responsibilities, including the following:

- They must maintain the bed and banks of an open watercourse, and also the trees and shrubs growing on the banks.
- They must clear any debris, even if it did not originate from their land, this debris may be natural or man-made.
- They must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates.

If they do not carry out their responsibilities, they could face legal action under the Land Drainage Act 1991. Details of a riparian landowners responsibilities can be found in 'Living on the Edge' published by the Environment Agency.

1 Executive Summary

On the 20 July an extremely intense rainfall event was experienced in parts of the East Riding, including Market Weighton, resulting in significant localised flooding. The main surface water drainage for the town is the Weighton Beck which flows from northeast to southwest through the town. The entire town drainage system including the Beck and the sewer network, private drains and highway drains were rapidly overwhelmed.

The worst affected areas were Southgate, High Street, Scotts Croft, Croft Close, Croft View, Market Place and Wicstun Way. Some 97 Properties were affected (see Appendix 2) with 76 suffering internal flooding.

Whilst the Council has made every effort to secure funding, flash flooding and the capacity of the public sewerage system for which water companies/Ofwat have responsibility still remains an issue that can only be addressed through regulated investment.

The peak recorded rainfall intensity for the storm in Market Weighton was 139mm/hr in a 5 minute period, with 60mm falling in one hour, and some 50mm in 30 minutes. Therefore the rainfall return period for this event is estimated to be greater than 1 in 100 years. This compares to the normal average July rainfall total for Market Weighton of 74mm per month. The report concludes that on 20 July 2014 the rainfall was of exceptional intensity and exceeded the current or historic design standards for the drainage infrastructure, and that the relevant flood risk management authorities exercised their functions in response to the flooding incident.

2 Location of Flooding

On the 20 July Market Weighton and South Cave were both hit by summer storms which resulted in flash flooding.

Flooding affected the following areas in Market Weighton and Shiptonthorpe:

Croft Close	Potter Close	Shipman Road	Spring Road
St Helens Square	The Green	Wicstun Way	Bedale Court
Beverley Road	Croft Close	Croft View	Hanson Close
High Street	Holme Road	Linegate	Market Place
Scotts Croft	Southgate	Northgate Vale	Meadow Drive
Hawling Road	Londesborough Road	Langdale Road	Shipman Road
Wold Avenue	Bedale Court	Eastfield Road	Medforth Street
Clay Lane			

(Shiptonthorpe)
York Road

See Appendix 1 -.Plan of the Reported Affected Areas

Appendix 2 Properties and Areas Affected

2.1 The Areas Affected

In general the areas affected were the lower lying areas where surface flows unable to enter the drainage system accumulated as they were flowing overland towards the beck. (see Appendix 1 Plan of the Affected Areas). Water flowed along Southgate, Finkle Street and Beverley Road into Chapel Corner and High Street. Water also flowed from Southgate down Hawling Road into Scotts Croft, Croft Close and Wicstun Way.

Other more isolated areas were also affected such as Clay Lane, Holme Road, Potter Close, Bedale Court and Shiptonthorpe.

The Town

The Chapel Corner junction where High Street, Southgate, Finkle Street, and Beverley Road meet is a low spot in the town with four roads sloping towards the junction. (see Appendix 7 Photos of the Event). The line of the beck (culverted) through the town centre runs close to this junction and so any surface flows will naturally flow into this area.

With surface flows running down Southgate and off Beverley Road, Chapel Corner and along part of High Street flooded. Flood waters also flowed off Southgate down Hawling Road and into Scotts Croft, again following the natural contours leading to the course of the Beck. This led to flooding of properties in Scotts Croft, Croft Close and Wicstun Way, although there were no reports or indications that water had escaped from the Beck itself; the flooding was due to surface flows being unable to enter the drainage system.

2.2 The Flood Route

See Appendix 2a Surface Water Flow Routes

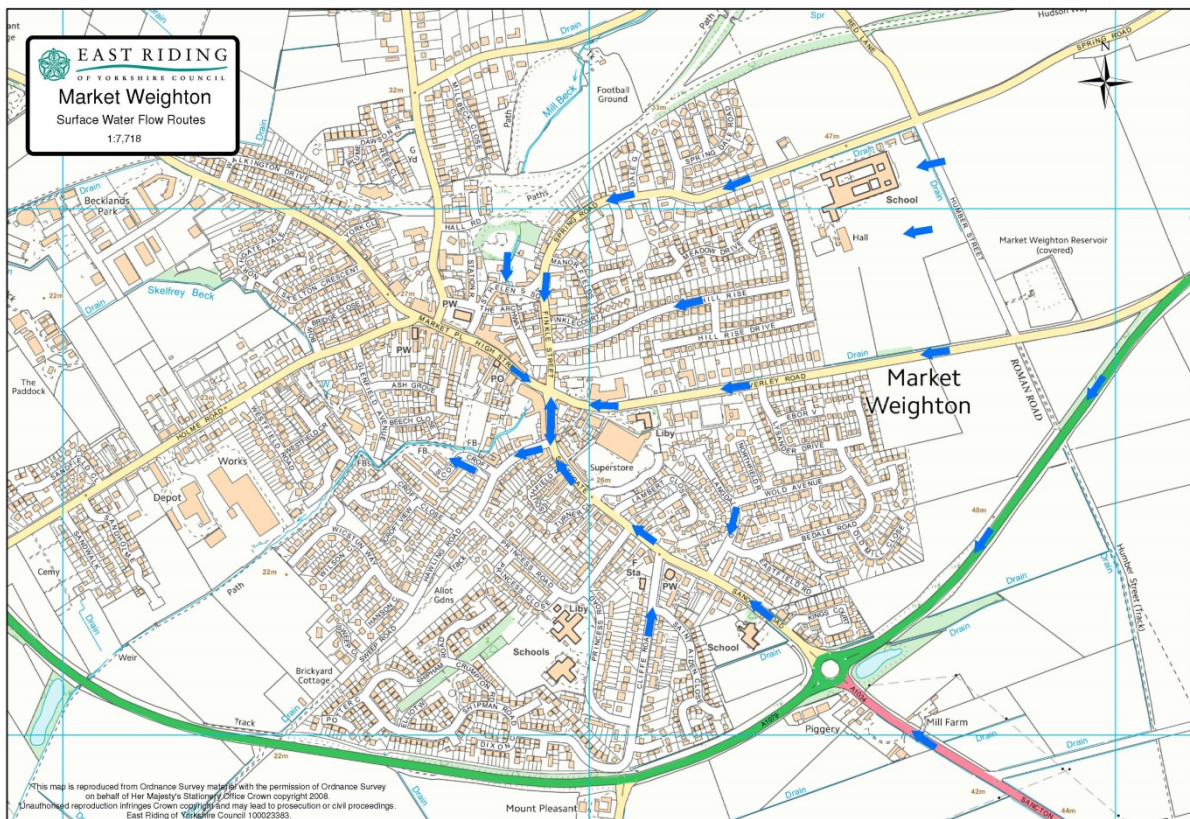


Figure 1: Indicating the overland flow paths of the flood water

The beck flows into the town from the north east, and out towards the south west, with higher ground to the north east. This leads to rapid run off from the Beverley Road, Hill Rise and Spring Road area towards Finkle Street and Chapel Corner during heavy rain. There is also significant run-off from Sancton Road and Cliffe Road into Southgate, leading to flows along Hawling Road and into Scotts Croft, Croft View and Wicstun Way.

In Shiptonthorpe water was unable to enter the drainage system and quickly ran off the road down into garden areas which were lower than the road, flowing towards the beck.

3 Drainage System

3.1 Environment Agency - Watercourses

The EA has the strategic overview for flooding from the sea and main rivers. This means they are largely responsible for flood defences along the coast and main rivers, exercising permissive powers (not statutory) to carry out work to construct and maintain flood defences.

The EA uses these permissive powers to maintain the Beck through the town. Mill Beck flows into the town from the north, and becomes the Weighton Beck below the culverted section under the Archway and High Street.

3.1.1 The Mill Beck Spillway

The EA had recently completed a £3.5M scheme to the north of the town on the Mill Beck Spillway. This was a legal requirement, as the old railway embankment is used as a structure to retain water and is effectively a dam, it therefore falls under the Reservoirs Act (1975). As the structure could potentially retain a large volume of water above ground level, it is a requirement that if the retaining structure is ever overtopped there should be a safe route for the water to escape without causing damage to the dam.

It is apparent that the flooding on this occasion was flash flooding caused by rainfall on the town itself, rather than up on the Wolds which is what the dam and penstock controlled storage area is designed to alleviate.

The spillway work has not affected the way that the reservoir operates. It has simply ensured that the reservoir dam will be structurally safe under the worst conceivable flood/storm conditions, which is a return period of 1 in 10,000 years.

3.1.2 Weighton Beck

Mill Beck drains an area of the Wolds to the north of the town. The flow can be controlled at a culvert under the old railway line by a penstock operated by the EA. The area upstream of the penstock is used as a flood alleviation area where excess flows can be stored, flooding a sports field. The beck is then an open watercourse to St Helen's Square/The Green when it enters a culvert which passes under The Archway, High Street and the town centre. It then becomes an open watercourse the Weighton Beck, down to cross under the A1079, where it continues as an open watercourse across agricultural land before entering the Market Weighton Canal.

The Archway culvert runs from St Helen's Square/The Green under The Archway, High Street and under the Armstrong Building (Asda) before continuing as an open watercourse. This culvert takes flows from the Mill Beck, with a culvert from Beverley Road which appears to take flows from along Southgate, and surface water sewers which drain Hill Rise/Meadow Drive and parts of Finkle Street, as well as Beverley Road and parts of High Street.

3.3 East Riding of Yorkshire Council –LLFA and Highway Drainage

LLFAs are responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets. They also have lead responsibility for managing the risk of flooding from surface water, groundwater and ordinary watercourses.

As Highway Authority the council is responsible for maintaining the public highway network and for effectively draining the public highway.

3.3.1 Highway Drainage

The highway drainage within the town either discharges directly into to the beck or into surface water sewers which also discharge into the beck. Some drainage discharges into the combined sewers which in turn flows to the waste water treatment works.

In many cases where the highway flooded, gullies were reported to be not working. However they were unable to discharge into the receiving drain or sewer as these will have been overwhelmed by the volume of rainfall. This was confirmed when witnesses reported flood water which had been standing, starting to flow away down the gullies once the rain had eased and the drains began to empty, indicating that the receiving drain or sewer had been full and gullies and branch sewers had had restricted discharge.

3.4 Yorkshire Water Services - Sewer System

There is a combined sewer network draining the town, which takes flows to the waste water treatment works on Weighton Common to the south. There are also surface water sewers in some parts of the town, particularly in the more recent developments which discharge into the beck within the town.

3.5 Flooding History

There is a long history of flooding in the town centre, due to the geography and layout of the town itself and the route of the Beck through the town, with large areas sloping steeply down into the town centre.

Following repeated flooding incidents at The Archway the council had carried out improvement works to the drainage in the area.

Many properties were affected in the 2007 event.

Note:

There were further flooding incidents, with various roads in the town affected during heavy rainfall on 8 August 2014 as ex-Hurricane Bertha caused problems in many parts of the country including the East Riding. No property flooding was reported in Market Weighton as a result. This event is the subject of a separate Section 19 investigation.

3.5.1 Investment in Flood Alleviation Measures

The Council have recently made funding available for flood alleviation schemes in the town, with further works planned.

Completed Works

The Archway **£32,000** To divert surface water away from the town centre into the beck.

Clay Lane **£20,000** To improve flow characteristics of the watercourse.

High School **£59,000** To install a sustainable drainage system to reduce runoff from school.

Planned Works

Londesborough Road **£25,000** (14/15 start) to divert water away from the town centre into the land drainage systems.

Beverley Road **£60,000** (14/15 start) to repair existing culverts to carry water away from the town centre.

4 The Flooding Event

4.1 Weather Data

The rainfall data available was collected from a council rain gauge within Market Weighton, and from the nearest EA rain gauge which is at North Newbald. Also from an interpretation of the Met Office rainfall radar data (see Appendix 3 Rainfall Data).

The Council rainfall gauge in Market Weighton recorded a peak rate of 139mm/hr in a 5 minute period, with 60mm falling in one hour, and some 50mm in 30 minutes.

The EA rain gauge at North Newbald recorded a peak rainfall rate of 36mm/hr in a 5 minute period, with 7.2mm falling in one hour.

The Met Office Rainfall Radar for Market Weighton indicated a peak rainfall rate of 59mm/hr in a 5 minute period, and a total of 30mm in an hour.

The EA estimated that in places up to 30mm of rain fell in 1 hour.

The long term average rainfall for the whole of July is 74mm.

4.2 Forecast

The forecast was for a scattering of locally heavy and thundery showers which could develop by the afternoon, mainly across the eastern half of the region.

4.3 Flood Warning System - Details

The National Severe Weather Warning Service issues various warnings when forecast weather conditions are expected to cause disruption.

4.3.1 Severe Weather Warnings

For heavy rainfall, high winds, fog, ice and snow etc.

- Yellow warning - be aware
- Amber warning - be prepared
- Red warning - take action

The joint Met Office and Environment Agency Flood Forecasting Centre provide a flood warning service based on weather forecasts and forecast river and tide levels.

The EA routinely issue alerts and warnings for forecast flooding, with warnings graded dependent on the expected severity.

4.4 Reports

From an inspection of the Beck adjacent to Scotts Croft by the EA the morning after the event, there was no evidence that water had come out of bank from the beck. Flooding was caused by water running across the surface unable to enter the drainage system and flowing towards the beck.

With surface run-off from the A1079, and the A1034 Sancton Road running overland into Southgate, the watercourses and drainage systems were overwhelmed. With run-off from Cliff Road also flowing into Southgate, running along Southgate into Hawling Road (see photo 7) and Scotts Croft following the natural contours of the land flowing towards the line of the Beck, surface flows also ran into Chapel Corner (see photos 1 to 4)

At Chapel Corner flows arrived along Southgate, Beverley Road and Finkle Street, as water followed the natural contours flowing towards the line of the beck.

With the drains inundated, surface flows also affected lower lying properties in the area.

It has been reported that water flowed down The Archway from the St Helen's Square/The Green area and into High Street. (see photos 8 to 10).

Northgate Vale (see photo 15) which drains into the combined sewer network, suffered extensive highway flooding when the rainfall overwhelmed the drainage system. In the on-going development in Medforth Street the new health centre which was due to be opening imminently was flooded, it is believed from the buildings own drainage system, and this delayed the opening by several weeks.

In Clay Lane water flowed across the fields from the north east and overwhelmed the drainage system. Land drainage from the east of Londesborough Road crossed under the road in a culvert but this was overwhelmed. This led to a build-up of water above the road, once this overflows across the road, it flows across the fields west of Londesborough Road missing the drainage ditches and inundates Clay Lane. The Council is investigating the drainage system in Clay Lane with a view to making improvements subject to further funding.

4.5 The Response

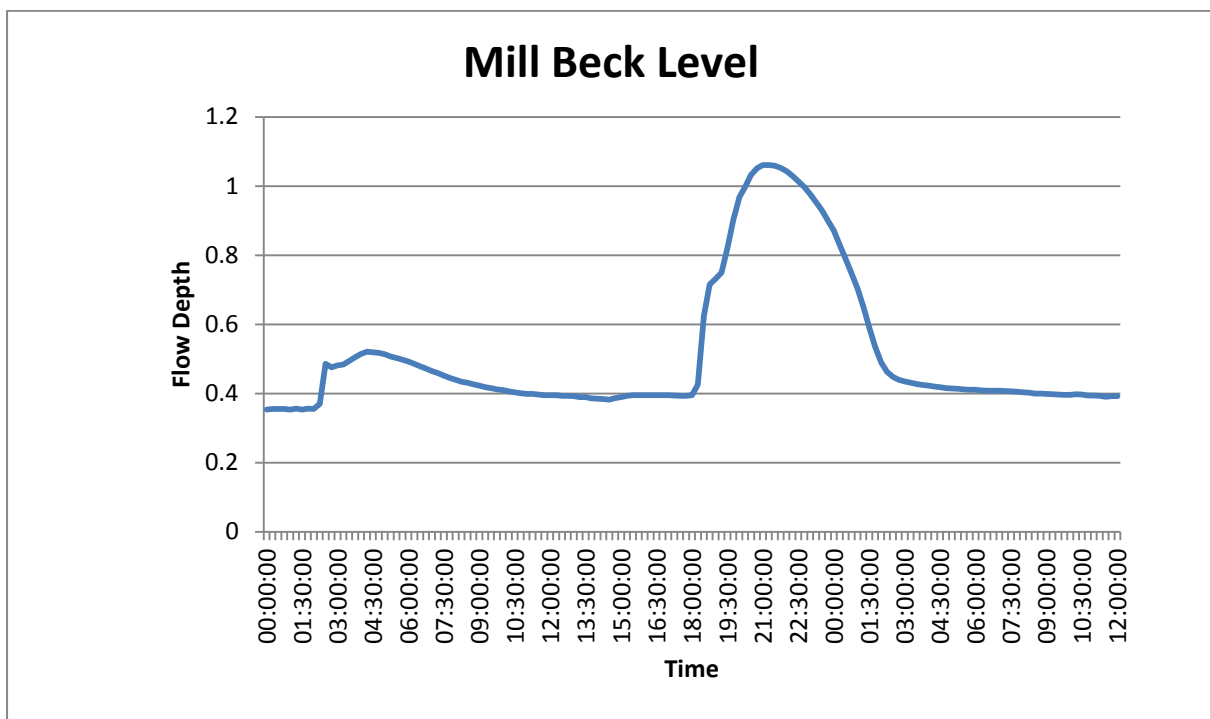
EA - July 20

At 20:30 hours the EA started to get reports from the police and fire and rescue service regarding surface water flooding in Brough, Market Weighton and South Cave.

EA staff were deployed to the above locations, with their flood wardens out and reporting back. It would appear that most of the issues were surface water related.

At the request of the Town Council (Cllr Hemmerman) the penstock at Mill Beck reservoir was lowered to reduce any inflow into the town. As a result of the intense rainfall a flood warning had been issued for North Cave at 22:50 hours.

Mill Beck water levels through 20 July and up to 12:00 noon on the 21 July. (EA data)



This shows the Beck levels rose sharply at 02:30 in the morning on 20 July, peaked at 04:30 and slowly dropped back to the previous level by 12:00, then rose sharply again at 18:00, peaked at 21:00 then dropped back to a normal level by 03:00 on 21 July. This corresponds with the timing of the intense rainfall and reports of flooding in the town. It should be noted that there were no reports of water flowing out of the Beck, however it is believed that many drains which discharge directly into the Beck will have been held back by the high flows in the Beck itself.

The Humberside Fire and Rescue Service reportedly attended the following locations:

Southgate
Croft View
Wicstun Way
Langdale Road
Bedale Court
Clay Lane

Hight Street
Croft Close
Scotts Croft
Shipman Road
Eastfield Road

Hawling Road
Cliffe Road
Londesborough Road
Wold Avenue
Meadow Lane

Police Attended the town and temporarily closed flooded roads, including the A1079.

Yorkshire Water Services received reports from various areas in the town and have investigated reported issues, using CCTV and sewer cleaning. No significant issues with the sewer network were identified (see Appendix 6).

Some issues with fat build-up were found upon investigation around the Croft Close/Croft View area, this has now been cleared.

The verified hydraulic model under development for Market Weighton is expected to be completed towards the end of October.

5 The Effects

The town centre was extensively flooded, with residents, businesses and visitors experiencing severe disruption. The police were in attendance and closed the roads until the flood water subsided (see Appendix 7 Photographs). In addition residential and commercial premises were flooded in Southgate, High Street and Market Place.

In Scotts Croft (see photos 11 & 12) where properties are Council owned bungalows for elderly people the effects were particularly severe as many of the properties are lower than the road, and the water flowed down Scotts Croft off Hawling Road. Water also flowed through into Croft Close and on into Wicstun Way (see photos 13 & 14) and into the beck.

Some of the residents in a care home in Londesborough Road had to be moved to the first floor.

The A1079 road was temporarily closed by flood water.

6 The Recovery

As is the nature of flash floods the water drained away relatively quickly once the rain stopped and the system started to drain down. This left many areas together with a number of properties in need of a clean-up. The Council arranged to collect large items of flood-damaged household goods from domestic properties for free of charge but from commercial premises at-cost, as commercial operators are assumed to be covered by insurance. This service is offered to residents in an attempt to help them return to normal life as quickly as possible following flooding.

Council staff also contacted vulnerable residents to ensure that they had access to all available services to meet their needs.

7 Causes and Investigation Findings

From the analysis of the rainfall data obtained the flooding was caused by the intensity and quantity of the rainfall which overwhelmed the drainage system. This led to overland flows and surcharging of the drainage including the sewer system, which caused flooding to many parts of the town and to properties particularly in lower areas.

The peak estimated rainfall intensity for the storm was 139mm/hr with a total estimated rainfall volume of 60mm in 1 hour, this compares to the normal average July rainfall for Market Weighton of 74 mm per month. Some 97 properties were affected with 76 properties suffering internal flooding.

With flooding occurring around The Archway culvert entrance at St Helens Square/The Green leading to overland flows through the town, the capacity of the culvert was clearly exceeded. No reports were received of the beck downstream of the culvert overflowing its banks, although many properties were flooded in areas adjacent to the beck. It is therefore concluded that the water was unable to enter the drainage system, which in turn was unable to discharge to the beck due to the very high flows.

With significant overland flows entering the town along Southgate in particular, flooding could be reduced if these flows could be intercepted and diverted away from the town centre.

8 Conclusions

This Section 19 investigation concludes that on this occasion the rainfall was of exceptional intensity and exceeded current or historic design standards for drainage infrastructure. With overland flows and an overwhelmed public sewer system, some 97 residential and commercial properties flooded with 76 properties suffering internal flooding.

The peak rainfall intensity for the storm was measured at 139mm/hr with a total estimated rainfall volume of 60mm in one hour, and some 50mm in 30 minutes. This compares to the normal average July rainfall for Market Weighton of 74mm per month.

The topography of the town is largely flat area below a steep hill, which leads to rapid run off during heavy rain and flash flooding as has been experienced.

It is concluded that the capacity of the culvert from St Helen's Square/The Green under The Archway and High Street was exceeded by the volume of flow coming down Mill Beck and by flows from the drainage system within the town trying to enter the culvert. It is also concluded that if surface flows along Southgate could be intercepted and diverted away from the town centre, flooding could be reduced.

The Council is required to conclude whether each of the flood risk management authorities identified has exercised, or is proposing to exercise, their functions in response to the flood incident. Following the investigation it can be concluded that the flood risk management authorities have or are proposing to exercise their relevant functions appropriately.

9 Recommendations

The investigation has identified a number of measures that potentially should improve flood resilience and these are set out in the following recommendations:

9.1 Recommendation 1

That the Council as Highway Authority clean out the drainage balancing pond near the junction of the A1079 and the A1034 following this event and review the current maintenance regime.

That the Council as Highway Authority also give consideration to improving the highway drainage in the High Street and to installing additional inlets into the culvert under the road.

9.2 Recommendation 2

As part of the planned Flood Risk Management Plan for the Market Weighton Catchment, that the Council as LLFA undertake an optioneering works that considers diverting the flows from the bottom of Arras Hill at the junction of A1079 and A1034 away from Sancton Road/Southgate and the town centre, into Weighton Beck to the south of the town.

That the Council complete proposed flood alleviation works at Beverley Road, which includes options for improvements to existing drainage infrastructure and new storage.

9.3 Recommendation 3

That, without prejudice, the Council as LLFA undertakes a study to understand the potential demand for property level flood protection solutions, including establishing the potential level of customer/public contributions to such a scheme where a community level flood protection scheme is not planned. This would allow the Council to understand if a business case can be made for capital funding to support such a scheme.

Abbreviations and Acronyms

Abbreviations	Description
AOD	Above Ordnance Datum
Dia	Diameter
EA	Environment Agency
ERYC	East Riding of Yorkshire Council
FCRM	Flood and Coastal Risk Management (Environment and Neighbourhood Services)
GWL	Ground Water Level
HFRS	Humberside Fire and Rescue Service
HVP	High Volume Pump
LLFA	Lead Local Flood Authority
IDB	Internal Drainage Board
ABP	Associated British Ports
Km	Kilometre
Km ²	Square Kilometres
Km/h	Kilometres per hour
Ha	Hectare
FWA	Flood Warning Area
m/s	Metres per second
mm/hr	Millimetres per Hour (Rainfall)
YWS	Yorkshire Water Services

Glossary

Foul sewer

This is a pipe laid to convey waste water (foul) only away from properties and to a waste water treatment plant, and maintained by Yorkshire Water Services.

Surface Water sewer

This is a pipe laid to convey surface water only away from properties to a proper outfall, and maintained by Yorkshire Water Services.

Combined Sewer

This is a pipe laid to convey both waste water and surface water away from properties to a waste water treatment plant, and maintained by Yorkshire Water Services.

Private Drains

These are pipes laid to convey both waste water and surface water away from properties which are the responsibility of the property owners, and are not maintained by Yorkshire Water Services.

Watercourse

This can be an open channel or piped/culverted to convey surface water away from an area, this will include land drainage as well as surface water from properties and highways. Watercourses, known as ordinary watercourses or main river, are generally maintained by riparian land owners with the Environment Agency using permissive powers to maintain main river.

Yorkshire Water's investment programme is funded on a 5 year plan with the new plan due to commence in 2015. As part of this, the company will be looking to work more closely with other flood risk management authorities to reduce flood risk in partnership.

Funding is generally allocated on the basis of the severity and frequency of the flooding, and by the costs of protection; "does the scheme give good value for money?"

Flood Protection Measures

Measures taken to prevent a property from flooding, also known as flood resistance measures i.e. Demountable door guards, air-brick covers, flood doors, barriers etc.

Flood Resilience Measures

Measures taken to reduce the impact of flooding on a property and to speed up the recovery after a flood i.e. raise floor above most likely flood level, Replace chipboard flooring with solid floor (dense screed), replace gypsum plaster with Lime plaster, move electrical outlets above flood level etc.

Design Standards and Return Periods

Return Period

Any drainage system or flood defence should be designed to a nationally accepted standard, this standard is often expressed as a return period (in years). It is an internationally accepted methodology.

A **return period**, is the chance of an event occurring in any year.

For example, a 1 in 100 year event has a 0.01 probability or 1% chance of occurring in any one year. It does not mean that a 100 year event will happen regularly every 100 years, or only once in 100 years.

Design Standard

The standards for sewer systems used in England and Wales are designed to provide protection from flooding from a 1 in 30 year event, (with a 0.33 or 3% chance of occurring each year). This generally means that no sewage should escape from a sewer in a 1 in 30 year event at the time when the sewer was constructed.

The current design standard for highway drainage is the Department for Transport; Design Manual for Roads and Bridges. The design standard for new highways is that flooding should not encroach into the main carriageway as a result of 1 in 5 year event (20% chance of occurring each year).

In contrast River and Coastal Flood defences are currently designed for a 1 in 100 year event and a 1 in 200 year event respectively with an allowance for climate change, as determined by Defra.

Funding for Flood Risk Management schemes

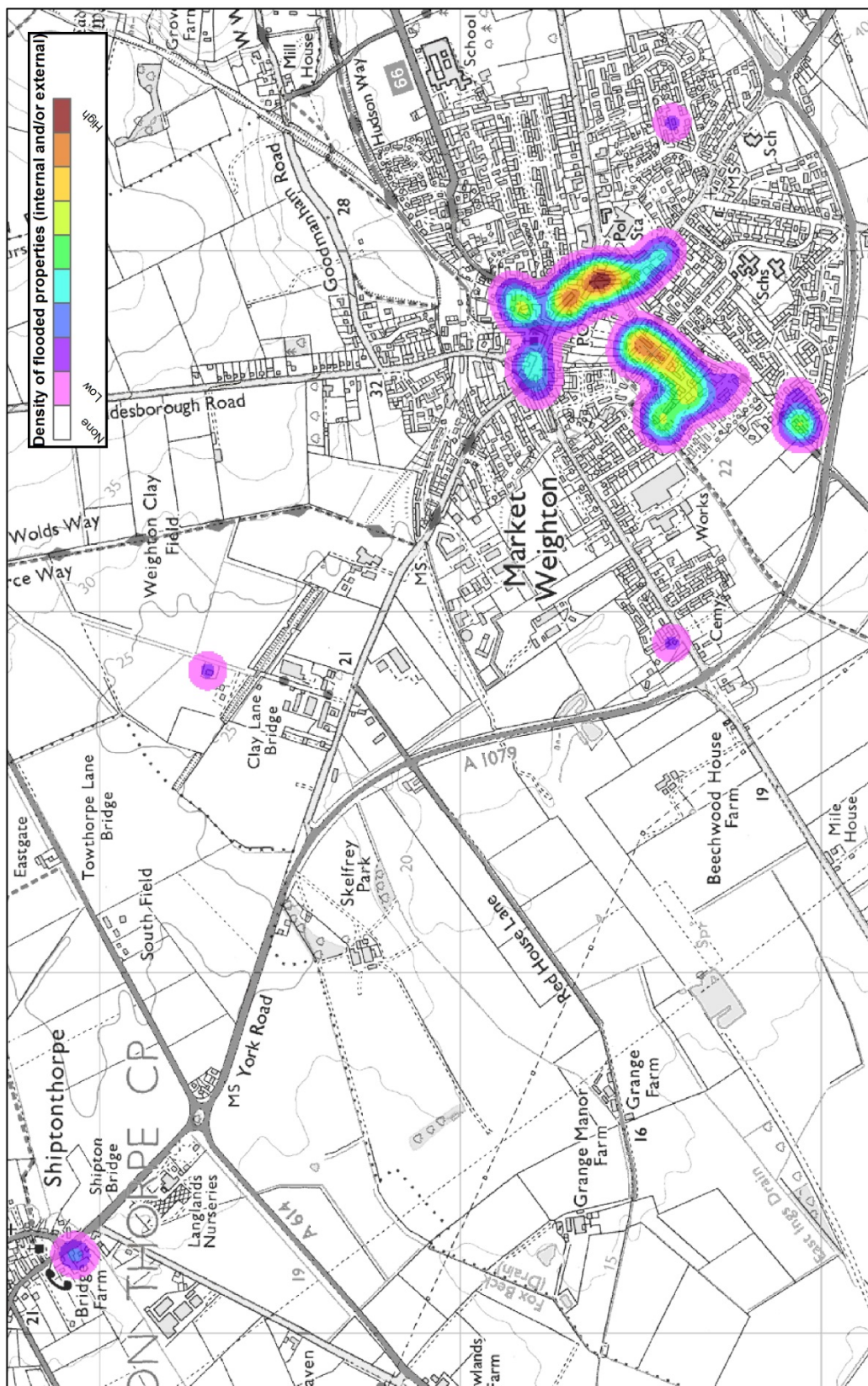
One of the main criteria for successful applications for funding for drainage works is that the proposed scheme must be designed to provide a standard level of protection, normally defined by a set return period.

Funding is generally allocated on the basis of the severity and frequency of the flooding, and by the costs of protection; “does the scheme give good value for money?”

Future Developments and Sustainable Drainage

Any new residential or commercial development planned within the town would be required, under planning conditions, to manage surface water within the development. The discharge of surface water into the existing drainage system must be restricted to no more than the existing rate, and if possible to reduce it. This must be achieved within the development itself usually by attenuating flows during storm conditions or times of high flows and discharging at a controlled rate to prevent any increased flood risk to any other area.

Appendix 1: Plan showing reported affected areas



Appendix 2: Properties and Areas Affected

Market Weighton

External

Croft Close	5
Potter Close	5
Shipman Road	1
Spring Road	1
St Helens	
Square	1
The Green	4
Wicstun Way	2
Total	19

Internal

Bedale Court	1
Beverley Road	1
Clay Lane	1
Croft Close	8
Croft View	7
Hanson Close	1
High Street	12
Holme Road	1
Linegate	1
Market Place	5
Scotts Croft	12
Southgate	21
The Green	1
Wicstun Way	4
Total	76

Siptonthorpe **2**

External

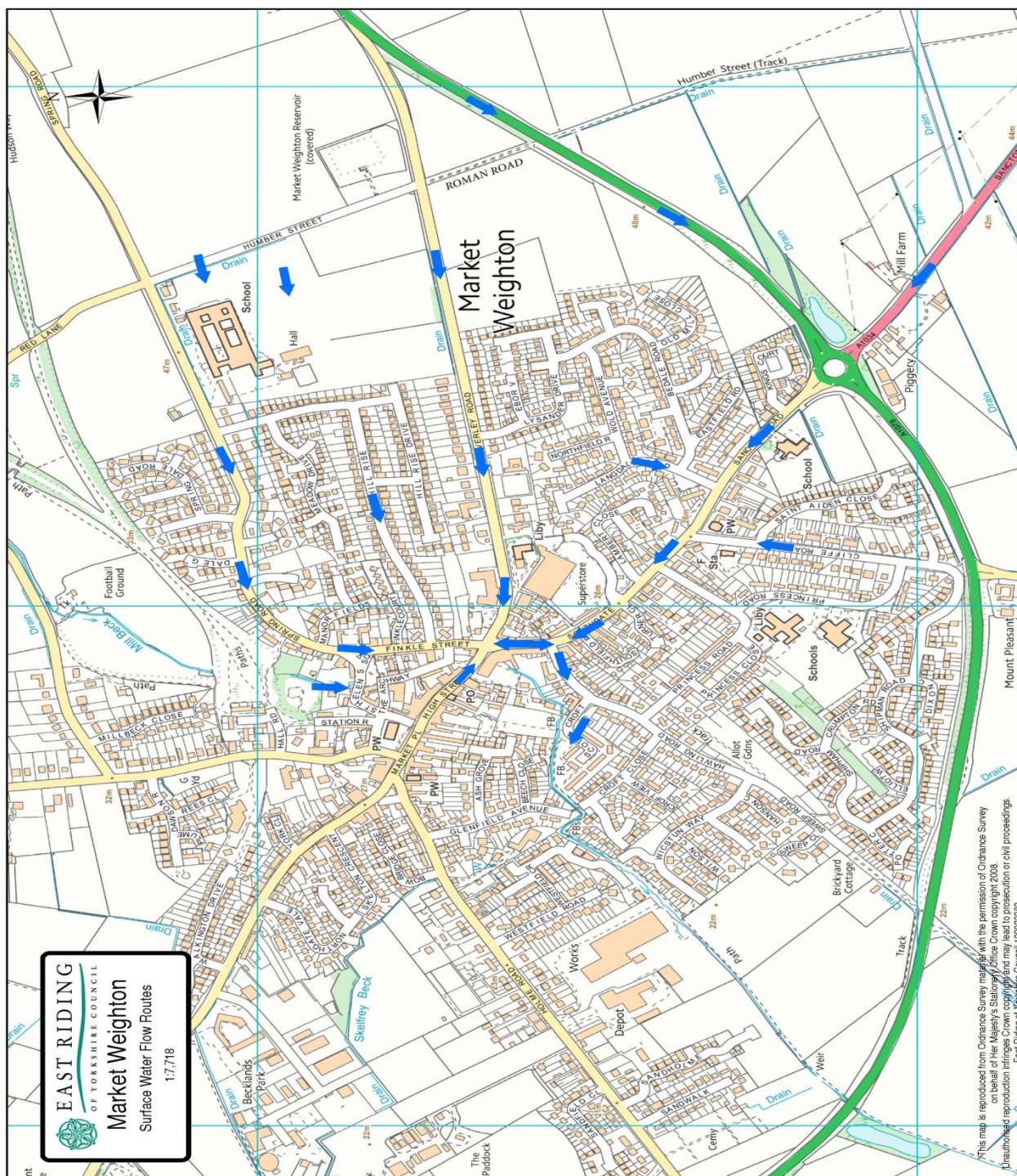
York Road	2
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Total Affected 97

Flooding affected the following areas in Market Weighton and Shiptonthorpe:

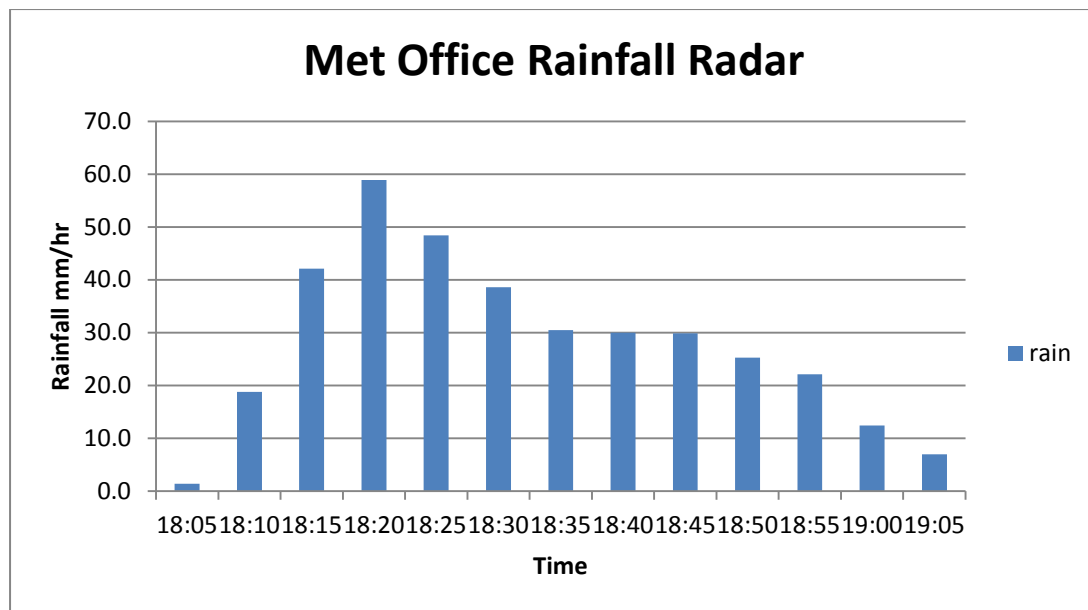
Croft Close	Potter Close	Shipman Road	Spring Road
St Helens Square	The Green	Wicstun Way	Bedale Court
Beverley Road	Croft Close	Croft View	Hanson Close
High Street	Holme Road	Linegate	Market Place
Scotts Croft	Southgate	Northgate Vale	Meadow Drive
Hawling Road	Londesborough Road	Langdale Road	Shipman Road
Wold Avenue	Bedale Court	Eastfield Road	Medforth Street
Clay Lane			
(Shiptonthorpe)			
York Road			

Appendix 2a: Surface Water Flow Routes



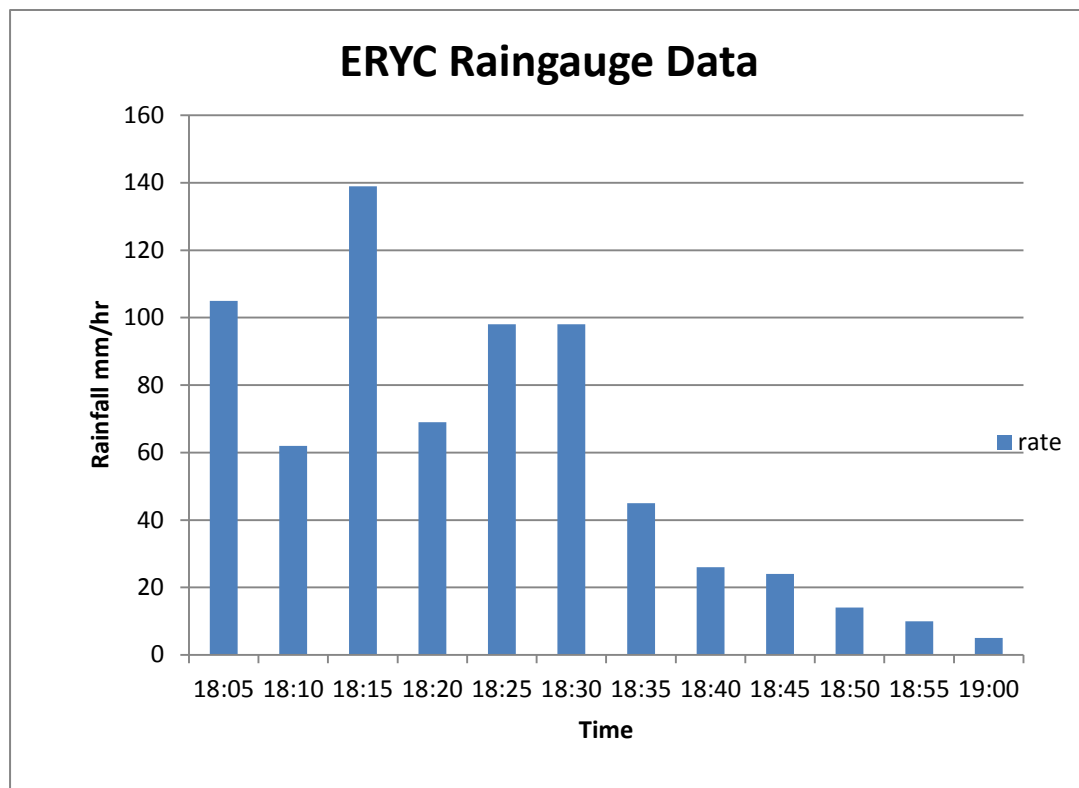
Appendix 3: Rainfall data

Rainfall Radar from the Met Office for Market Weighton.



This shows the peak rainfall rate of 59mm/hr in a 5 minute period, and a total of 30mm in an hour.

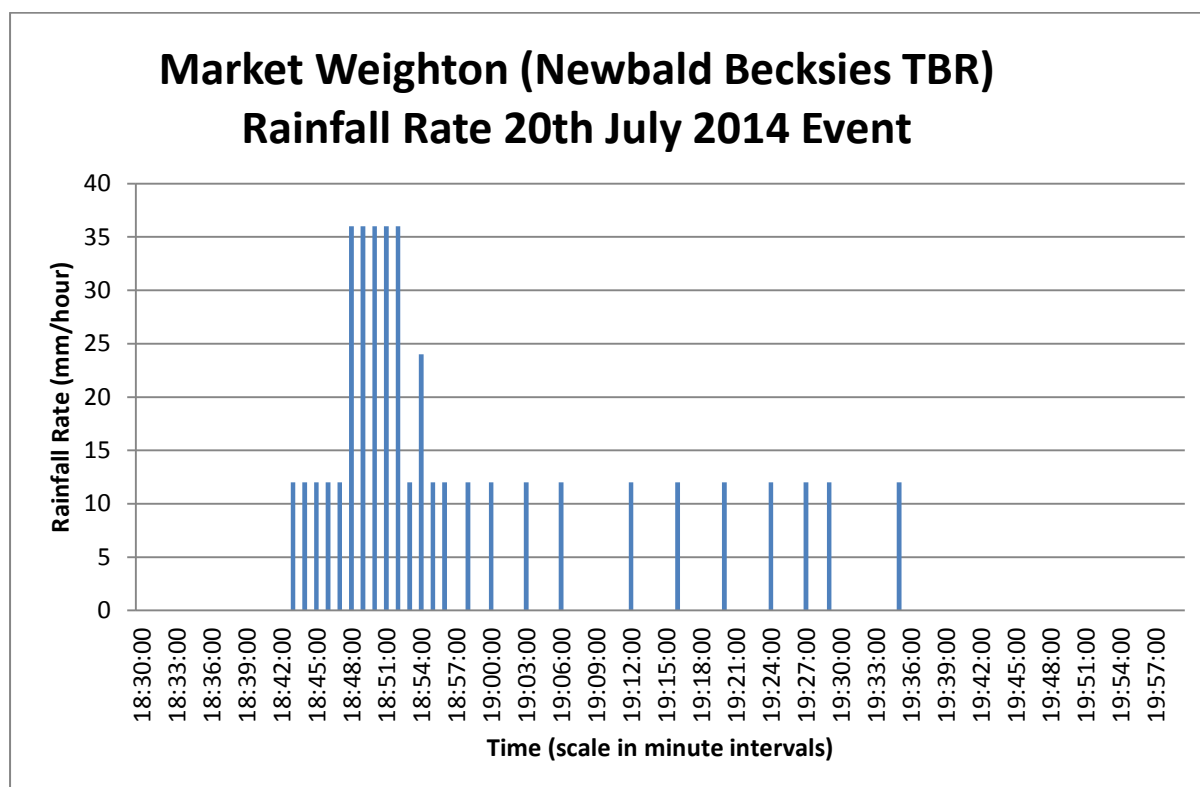
The council rainfall gauge in Market Weighton



This shows the peak rainfall rate of 139mm/hr in a 5 minute period, with 60mm falling in one hour, with some 50mm of rain in 30 minutes.

The long term average rainfall for the whole of July is 74mm.

EA rainfall data from the rain gauge at North Newbald



This shows the peak rainfall rate of 36mm/hr in a 5 minute period, with 7.2mm falling in one hour.

Although the rain gauge is only 6km (3.5 miles) to the south of Market Weighton the recorded rainfall was much less than the estimated rainfall. This is consistent with the nature of summer storms, which often result in very localised intense rainfall such as has been experienced during the summer of 2014.

Return Periods for the recorded or estimated rainfall:

Met Office Estimate (radar): 29.3mm in 1hr return period 43 years

31.9mm in 2hrs return period 25 years

EA Data (Newbald raingauge) 7mm in 1hr return period 7 years

7.2mm in 2hrs return period 0.1 years

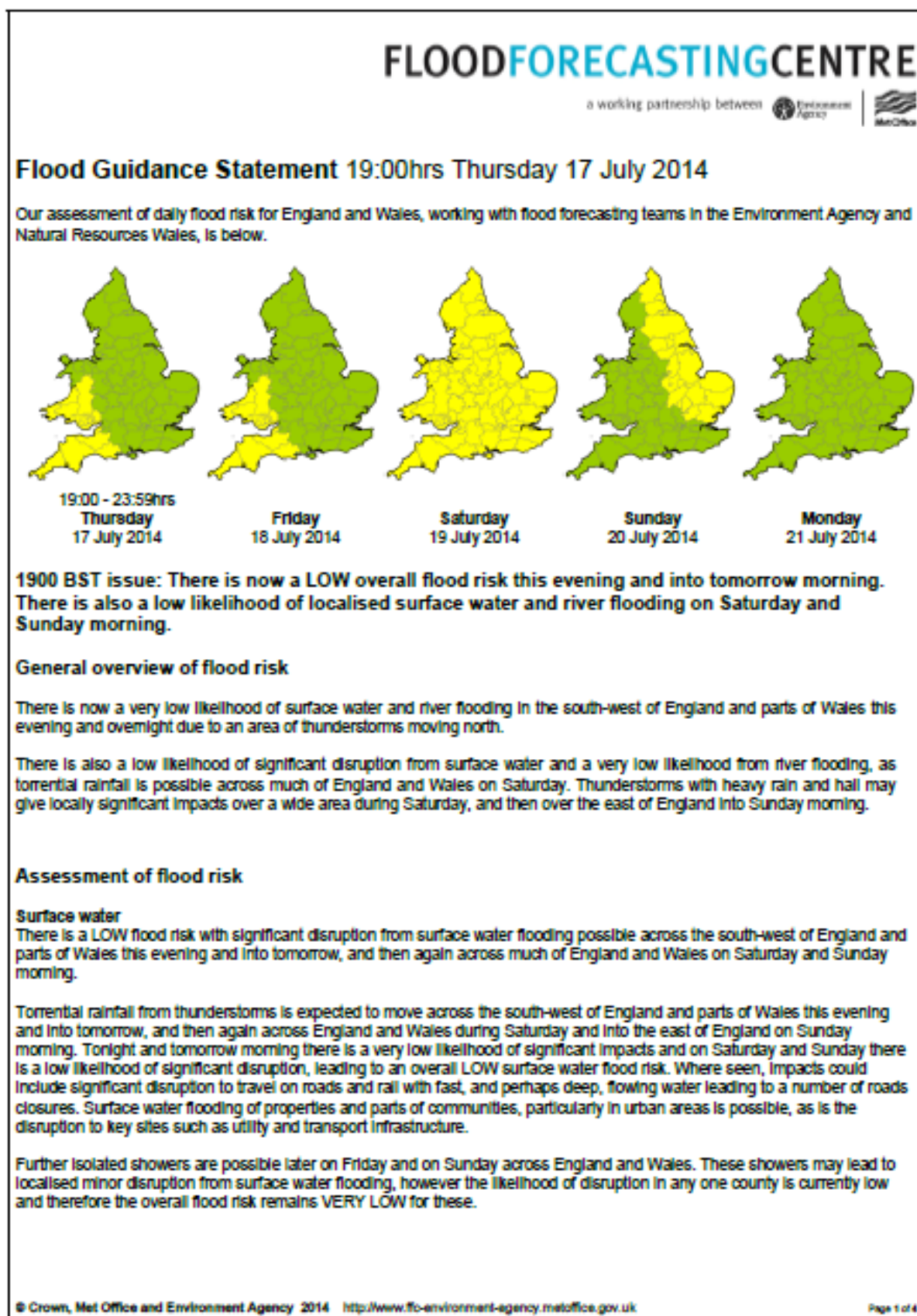
Estimated 30mm in 1hr giving a return period of 101 years

ERYC Data (raingauge in the town) 50mm in 0.5hrs return period greater than 1 in 200 years

60mm in 1hr return period greater than 1 in 200 years

Therefore it is concluded that the rainfall return period for this event can be estimated as greater than 1 in 100 years.

Appendix 4: Flood and Weather Warnings



Flood Guidance Statement Issued 10:30 20 July

Rivers

Heavy rainfall and thunderstorms are expected to develop across the east and north of England through this afternoon (Sunday), bringing a very low likelihood of localised significant river flooding impacts, particularly in fast responding river catchments and rivers in urban areas, giving a LOW overall river flood risk. Larger river catchments are unlikely to see significant flooding impacts owing to the localised nature of the heavy rain.

Where the heavy rain occurs, impacts may include significant disruption to travel on roads and rail networks with fast, and perhaps deep, flowing water leading to a number of roads closures.

Elsewhere and at other times the overall river flood risk is VERY LOW.

Coastal / tidal

The coastal / tidal flood risk is VERY LOW for the next five days.

Groundwater

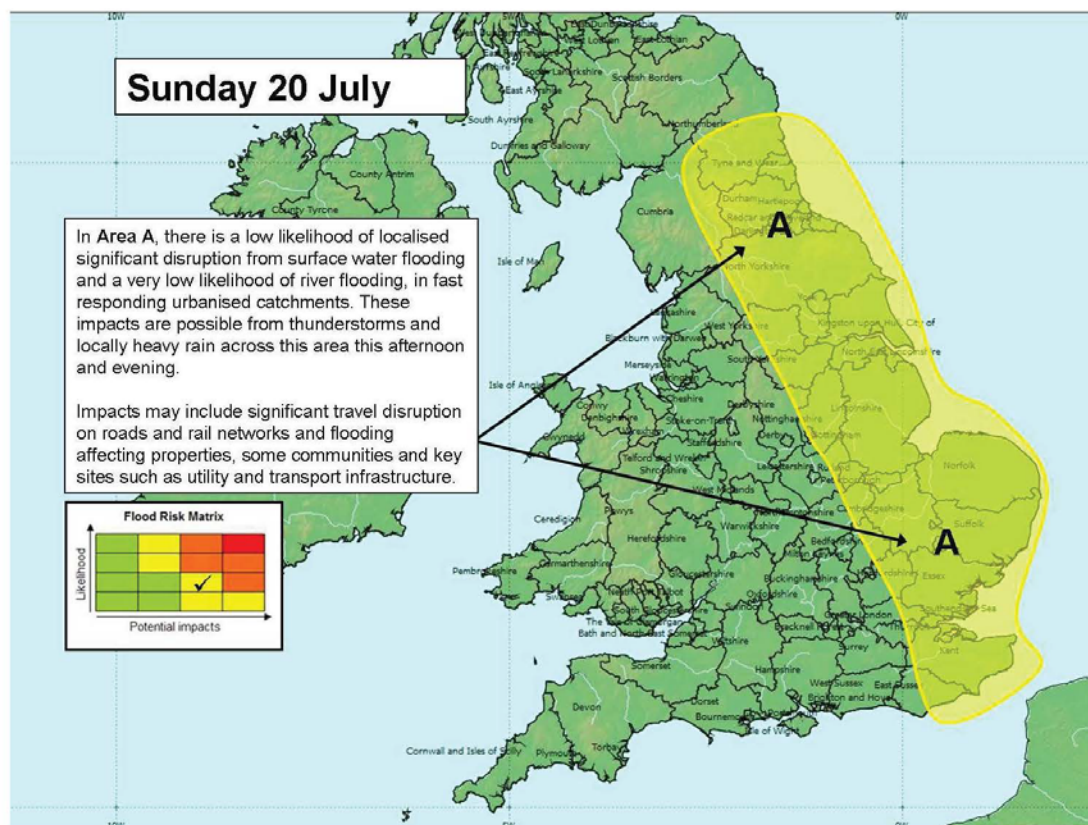
The groundwater flood risk is VERY LOW for the next five days.

Warnings and Alerts in force in England and Wales at 10:30hrs

Flood (click here)	
Severe Flood Warnings	0
Flood Warnings	0
Flood Alerts	38

Severe Weather (click here)	
Warnings	Yes
Alerts	No

Specific areas of concern



Next statement due: 10:30hrs Monday 21 July 2014

Advice issued by the Civil Contingencies Office at the Met Office on 19 July

Areas of rain, locally heavy, continue to wend their way northwards across the country this morning. My sense at this stage in proceedings is that with the rain across Yorkshire and the Humber more of a steady nature, we've so far got off reasonably well. However, we're not out of the woods yet, as I will explain below.

The forecast sequence for the rest of today is for further patchy rain to transfer northwards across Yorkshire and the Humber, but with a tendency towards something of a drier, brighter spell this afternoon. Whilst these initial areas of rain will not cause any issues the concern is that within any sustained brighter periods, the rising temperatures and high humidity will trigger some 'locally-generated' storms (initiated either directly within the region or drawn northwards from the Midlands) later this afternoon and into this evening and it is these that could produce the locally very high rainfall rates and frequent lightning activity with consequent disruption to transport and possibly power supplies. Hence we need to keep a watching brief on the rainfall radar, especially if we do get into a brighter interlude and the sun raises the temperature sufficiently to initiate the afore-mentioned locally produced storms.

This morning's Flood Guidance Statement was issued early this morning (0700) and retains all of Yorkshire and the Humber on Amber (medium) flood risk. In tandem with this the existing Amber Warning for rain will be re-issued shortly for the remainder of today (medium likelihood of some significant impacts) again containing all of the region within its borders. Please refer to the FGS for a full description of the flood risk across the region.

Overnight tonight activity should steadily wane with many parts dry by tomorrow morning. Through tomorrow, after a dry, bright morning, a scattering of heavy and locally thundery showers will develop by the afternoon, mainly across the eastern half of the region (approx east of the A1). Yesterday's Yellow Alert (low likelihood of significant impacts) for these remains in force.

On the plus side it's back to more settled, warm weather for the first half of next week.

No further updates are planned in relation to the current event but I would again emphasise the wisdom of continued radar monitoring, especially later this afternoon/evening.

Appendix 5: Yorkshire Water Services Response

S14 Market Weighton Information Request

Areas Reporting Problems:

Croft Close, EXT flooding to garden, fire service pumped out
Princess Close, EXT flooding to garden. Blockage found on 150mm combined
Croft Close, EXT escape from MH in garden. CCTV found no issues
Eastfield Road, INT reported over door threshold
Croft Close, EXT escape found, no issues found
Croft View, INT to property. EXT to garden and drive also
Westfield Road, EXT flooding from MH on shared drive
Hawling Road, EXT flooding garden
Wicstun Way, EXT flooding garden
Southgate, INT flooding to living area
Springdale Road, EXT flooding to garden, water from highway
Northgate Vale, EXT flooding to garden
Croft View, EXT flooding to garden
Meadow Drive, EXT flooding to garden
Croft View, INT flooding to property
Northgate Vale, EXT flooding to gardens
Springdale Road, EXT flooding highways
Bow Bridge Close, EXT flooding to garden
Croft Close, EXT flooding on drive from MH chamber
Southgate, EXT Flooding to drive from culvert
Southgate, Internal Flooding at. Checked all assets public and private

Any estimates of Rainfall figures, and return periods for the event on 20 July

The rainfall radar shows average rainfall for the area was 1 in 33 year return period with highs of 1 in 48

Details of the reported affected areas and properties in the Market Weighton area

Please see attached contact information (above)

Details of works done post event, ie CCTV surveys and sewer cleaning

Croft Close- CCTV & De-silt
3 Princess Close- CCTV and Clean up
43 Croft Close- CCTV of YW assets, clean up carried out
2 Eastfield Road- CCTV of assets, no issues found
48 Croft Close- CCTV of T2011 sewer, no issues found
22 Croft View- Clean up carried out
The Bungalow, 9 Hawling Road- Clean up carried out
34 Wicstun Way- Clean up undertaken
52 Southgate- CCTV of T2011 assets, clean up done
32 Northgate Vale- Clean up carried out
10 Croft View- Clean up carried out
45 Meadow Drive- CCTV & De-silt
24 Croft View- CCTV & De-silt carried out
28 Northgate Vale- Clean up carried out
6 Springdale Road- Clean up carried out
1 Bow Bridge Close- Clean up carried out
Shop, 2 Southgate- CCTV and clean up

Any faults or significant defects found? ie blockages, pump failures etc?

Some issues with fat build up were found upon investigation around the Croft Close/Croft View area, this has now been cleared.

Progress on the hydraulic model for Market Weighton, does this indicate any deficiencies in the network?

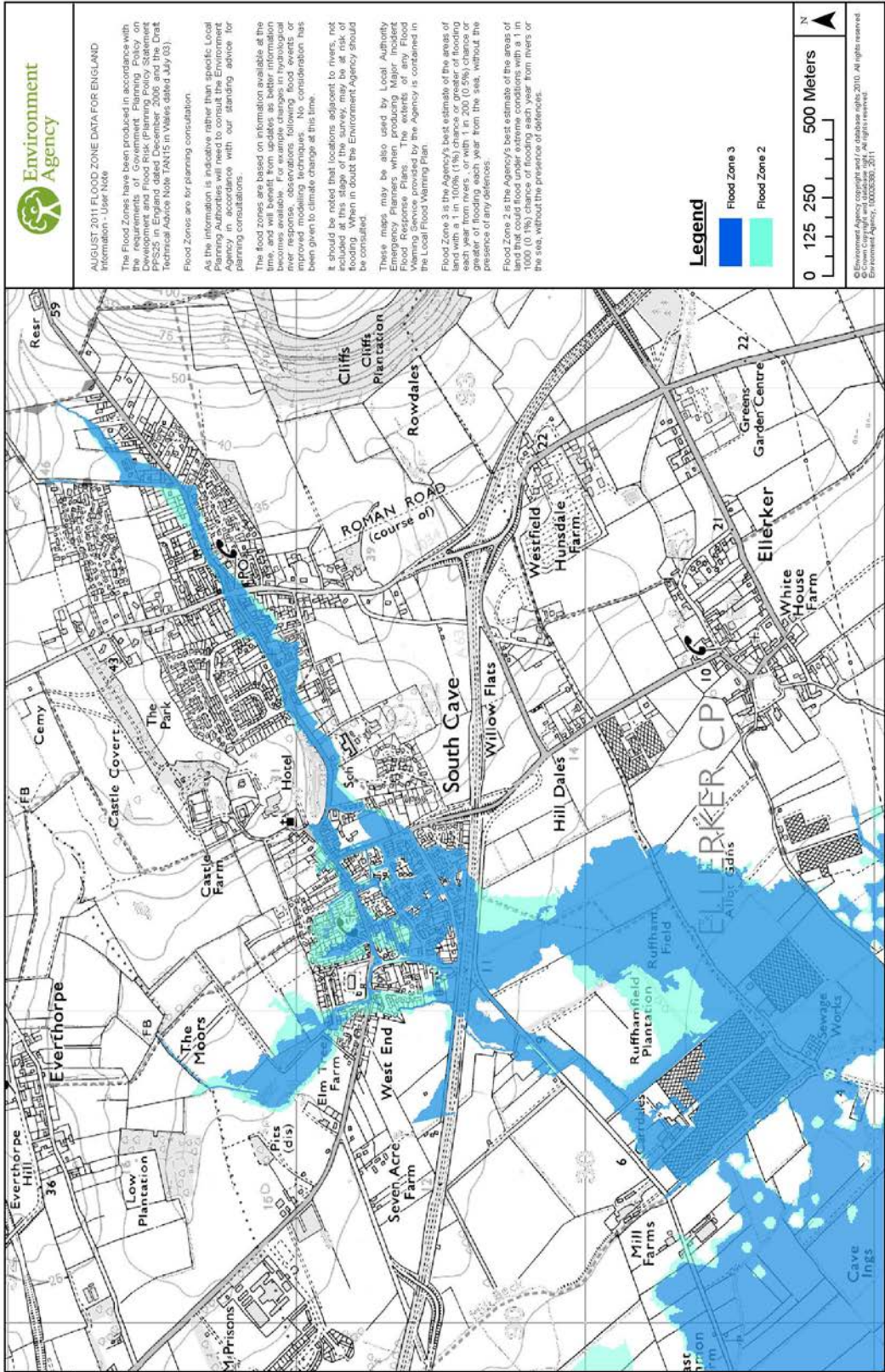
The verified hydraulic model for market Weighton is expected to be completed towards the end of October; we will not know any indicated deficiencies until this point.

The model took longer than expected due to issues obtaining flow information during long periods of dry weather

Any level or flow data available for the network

Flow data will be available once the sewer model is complete

Appendix 6: The EA Flood Map for Market Weighton



Appendix 7: Photographs



Photo 1: High Street and the Archway from Chapel Corner.



Photo 2: The Archway, as levels subsided



Photo 3: High Street looking west, from Chapel Corner.



Photo 4: High Street looking east, from Market Place.



Photo 5: Southgate from Chapel Corner



Photo 6: Southgate at Chapel Corner



Photo 7: Southgate, showing water flowing down Hawling Road



Photo 8: The Green, pond where the beck enters the culvert



Photo 9: The Green/St Helens Square area



Photo 10: The Green/St Helens Square area after the rain

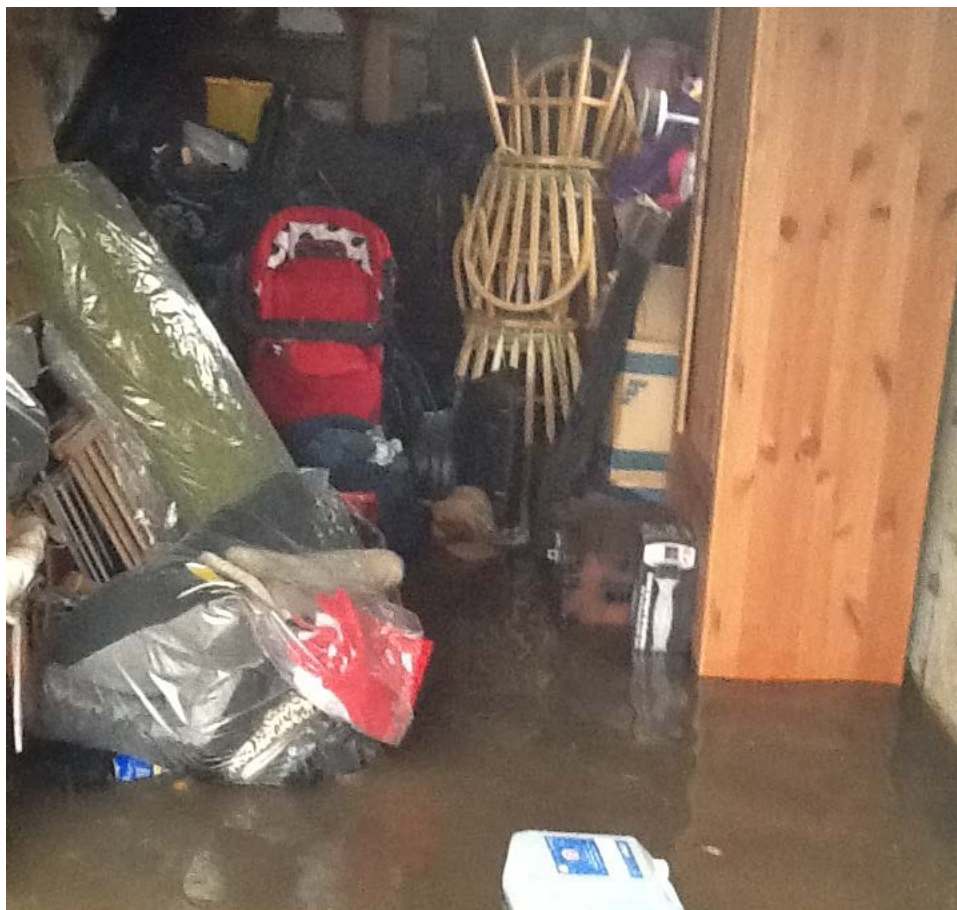


Photo 11: Flooded garage in Croft Close



Photo 12: Croft Close with Fire Brigade in attendance



Photo 13: Gardens to rear of Wicstun Way

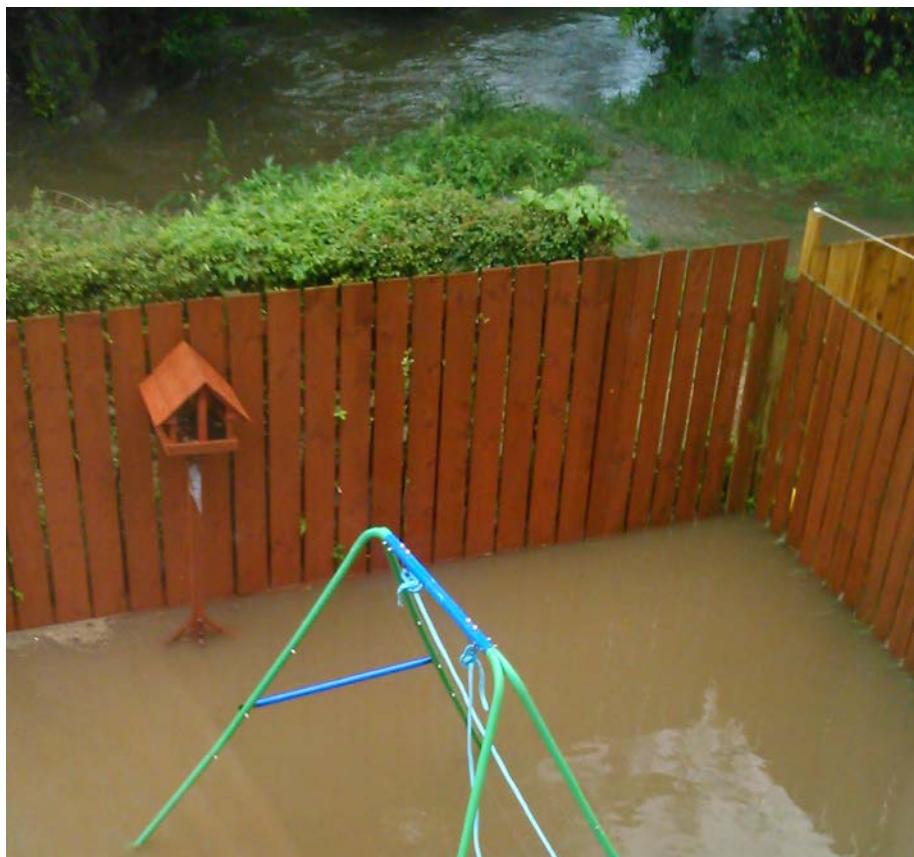


Photo 14: Gardens at Rear of Wicstun Way showing the beck



Photo 15: Northgate Vale, off York Road



Photo 16: Storage lagoon off A1079/A1034

Appendix 8: Flood resilience information for property owners

People who have been flooded before have found the following guides helpful:

The Environment Agency's flood advice can be accessed here:

<http://www.environment-agency.gov.uk/homeandleisure/floods/default.aspx>

Two Environment Agency documents that might be particularly useful are: Protecting your home:

<http://cdn.environment-agency.gov.uk/geho1009brdl-e-e.pdf>

and Temporary and Demountable Defences:

<http://evidence.environment-agency.gov.uk/FCERM/en/FluvialDesignGuide/Chapter9.aspx?pagenum=10>

Homeowners guide to flood resilience:

<http://www.knowyourfloodrisk.co.uk/pdf/protection-guide.pdf>

The National Flood Forum. Ready for flooding:

<http://nationalfloodforum.org.uk/wp-content/uploads/Ready-for-flooding.pdf>

The British Insurance Brokers Association (www.biba.org.uk). Guide on getting insurance for high risk flood areas:

<http://www.biba.org.uk/UploadedFiles/600floodguide.pdf>

The Royal Institute of Chartered Surveyors. A clear guide to flooding for property owners:

http://www.rics.org/Global/Downloads/A_clear_guide_to_Flooding_for_property_owners.pdf

The Association of British Insurers. A guide to resistant and resilient repair after a flood:

http://www.abi.org.uk/Publications/ABI_Publications_A_guide_to_resistant_and_resilient_repair_after_a_flood_670.aspx

More information is available on the ERYC Website, on the A to Z, F - 8 Flooding, Flooding and Flood Preparation.

Appendix 9: Useful Links and Contact Details:

Lead Local Flood Authority

East Riding of Yorkshire
Council County Hall
BEVERLEY
East Riding of Yorkshire
HU17 9BA

(01482) 887700

www.eastriding.gov.uk

fcerm@eastriding.gov.uk

Statutory Sewerage Undertaker

Yorkshire Water Services Ltd
Western House
Halifax Road
BRADFORD
BD6 2SZ

(08451) 242424

www.yorkshirewater.co.uk

Environment Agency

Dales Area Office
Coverdale House
Amy Johnson Way
Clifton Moor
YORK
YO30 4UZ

General Enquiries:
0870 850 6506
(Mon-Fri, 8am -6pm)

www.environment-agency.gov.uk

Incident Hotline:
0800 807060
(24hrs)

