



Norfolk County Council

Investigation Report into the flooding in South Norfolk & Breckland on the 2nd June 2018

Report Reference: 032

Draft Report prepared by Nathan Harris on 28 February 2019



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Executive Summary

(a) Flooding incidents and causes

Flooding occurred in various location across Norfolk on 2 June 2018. The rainfall event on this date generated 60 reports of flooding, 47 of which were located in the South North and Breckland Districts, this in turn led to the identification of 24 properties that had suffered internal flooding within these districts. The properties affected were predominantly located to the South of Wymondham with a further two individual properties located to the South East of the town.

For ease of presentation we have set out the report based on the sub-catchments within which the incidents were located. A summary of the 28 properties affected in each sub-catchment are set out below;

- Upper Besthorpe catchment – 13 properties
- Wymondham catchment – 4 properties
- Dyke Beck catchment – 3 properties
- Morley catchment – 2 properties
- Mulbarton catchment – 1 property
- Silfield catchment – 1 property

The incidents of internal flooding in South Norfolk/Breckland and its environs occurred in the following parishes and at the approximate locations listed below;

- **Morley Parish:** 12 Properties affected
Hill Road, Attleborough Road, Deopham Road, Church Road & Chapel Road.
- **Wymondham Parish:** 5 Properties affected
Suton Street, London Road & Silfield Street
- **Besthorpe Parish:** 6 Properties affected
Norwich Road
- **Mulbarton Parish:** 1 Property affected
Rectory Lane

(b) Flooding causes

The flooding that occurred across South Norfolk can be attributed to several factors, as listed below

- The rainfall experienced on 2 June 2018 was recorded at the Morley St Botolph RG GSM monitoring station as being a 1 in 126 year event¹.
- A large number of the properties impacted are situated on overland flow paths and/or are below the level of the nearest highway.
- The flooding in several locations was exacerbated by the loss of drainage features within the catchment (such as ditches) and the amendments of principal drains and watercourses and their connections through culverting, infilling and lack of maintenance which caused a loss of integrity and capacity of the drainage network.
- The capacity of surface water drainage including land drains, highway drainage and private property drainage was exceeded due to the significant levels of rainfall that fell during the event.
- The capacity of the foul network was also exceeded due to the ingress of surface water into the foul network. This caused the foul network to surcharge in a number of locations during the event.
- Features such as kerbs or verges had the effect of containing or channelling flood water near to properties.
- Flood water entered properties through the unprotected structure of the building. This included via features such as low thresholds at entrances, unprotected air bricks and services conduits.

¹ Recent rainfall - This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced across the catchments that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded. Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns across each catchment. Where there is no available data within this radius this will be stated.

(c) Key recommendations

The recommendations set out in the report have been summarised below. Specific recommendations for each individual catchment are set out within the report. Please note a number of these recommendations have already been followed up by the respective organisations identified. Progress against these recommendations will be assessed as part of an addendum to this report to be undertaken a year from the date of publication of this report.

Risk Management Authorities should;

- Communicate with affected residents where their assets have given rise to the flooding of properties.
- Review the appropriateness of their response to flooding.
- Determine the integrity and/or capacity of their assets and their maintenance where they have contributed to the flooding of properties to understand the systems role in accommodating rainfall events as well as mitigating flooding.

Property owners of affected properties should;

- Confirm the integrity, capacity and appropriateness of their property drainage
- Determine if works are needed to remove the risk posed by structures that form obstructions to flows.
- Determine if it is appropriate for them to protect their buildings through flood protection measures.
- Seek their own legal advice if they are concerned about the responsibilities and liabilities of themselves and/or others.
- **All property owners** should remove any inappropriate surface water connections to the foul sewer system and direct flows to alternative points of discharge where it doesn't increase flood risk.

Norfolk County Council should;

- Work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce run-off and increase the attenuation of flood water to reduce the impacts of flooding.
- Work with property owners to consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.
- Communicate with residents to advise them of the measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.
- Determine if works are needed to remove the risk posed by structures that form obstructions to watercourse flows and communicate with affected parties and riparian owners.
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

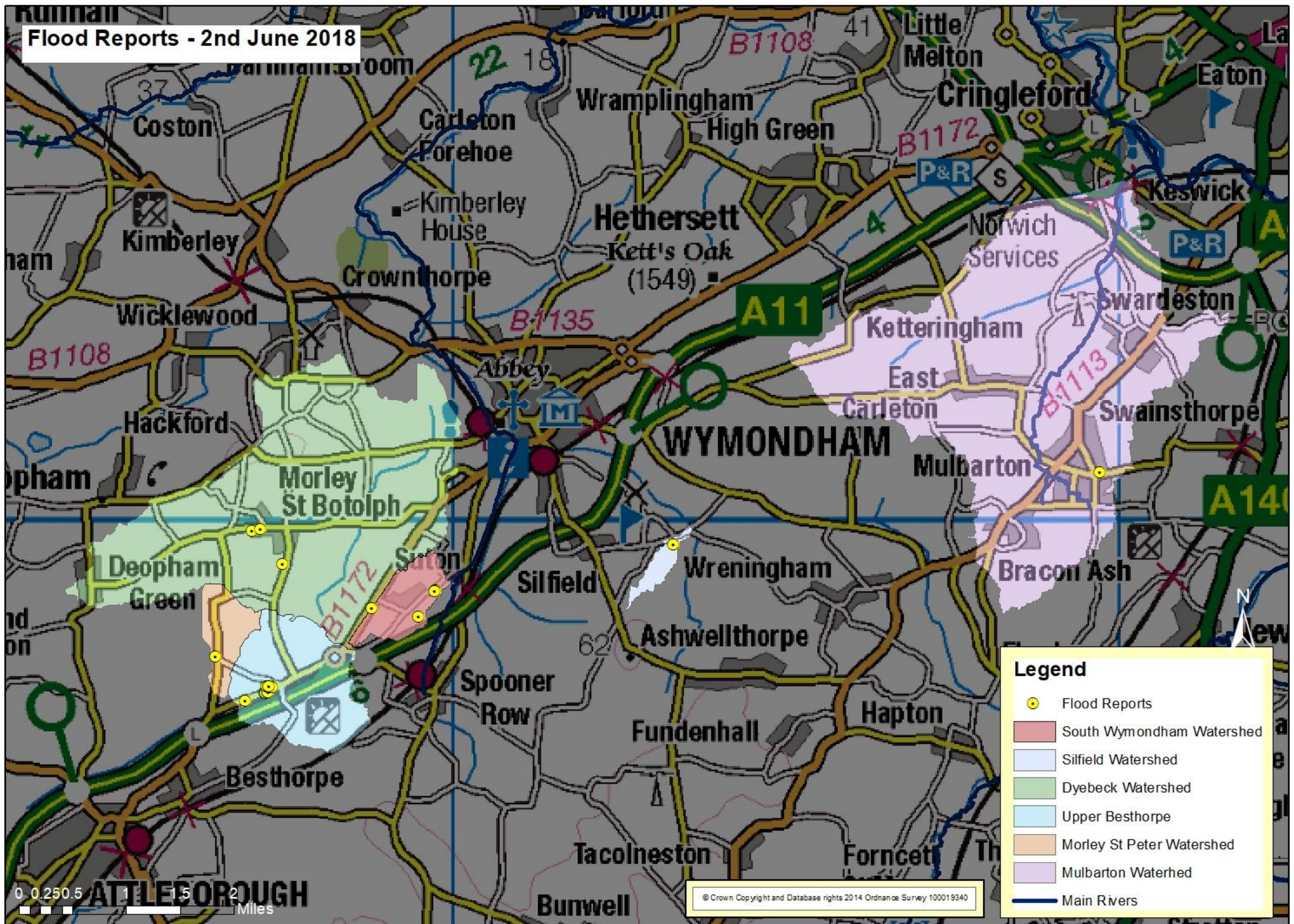
Anglian Water should;

- Work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.

Highways England should;

- Work with partner organisations to identify the potential for managing the amount of surface water entering their drainage system in flood events.

Flood Reports - 2nd June 2018



Legend

- Flood Reports
- South Wymondham Watershed
- Silfield Watershed
- Dyebeck Watershed
- Upper Besthorpe
- Morley St Peter Watershed
- Mulbarton Watershed
- Main Rivers

Justification for Flood Investigation

The purpose of this report relates to Section 19 of the Flood and Water Management Act 2010. This legislation sets out that the County Council, in its role as Lead Local Flood Authority for Norfolk, should investigate the role and response of organisations to significant flooding incidents. Significant flooding is deemed to be those incidents that impact upon people, property and infrastructure.

The Norfolk Local Flood Risk Management Strategy Policy UC2 (Flood Investigation) sets out the thresholds the Lead Local Flood Authority will apply to its formal flood investigation role. This states an investigation will be undertaken where it is determined that;

- (a) There is ambiguity surrounding the source or responsibility for a flood incident, and/or;
- (b) There is cause to investigate the flood incident, due to either its impact, or consequence

In judging the impact or consequence of a flood event Norfolk County Council uses the criteria set out below;

- Any risk to loss of life or serious injury.
- One or more residential or business property flooded internally.
- One or more critical services/installations and vulnerable person's properties flooded internally; and/or rendered inoperable or their functions severely compromised due to the access to the premises being impassable; and/or resulting in a loss of service impacting on the local community.
- Any section of a national category 3 road or above made impassable due to flooding; and/or flooding to priority 1 and 2 gritting routes.
- Flooding adversely impacting a rail link by making it impassable.

It was deemed necessary to complete a formal Investigation Report into the flooding in Various locations in Norfolk in 2nd June 2018 as:

- multiple residential properties were internally flooded.

This impact met Norfolk County Council's threshold for triggering the undertaking of a formal flood investigation.

The flood investigation report aims to:

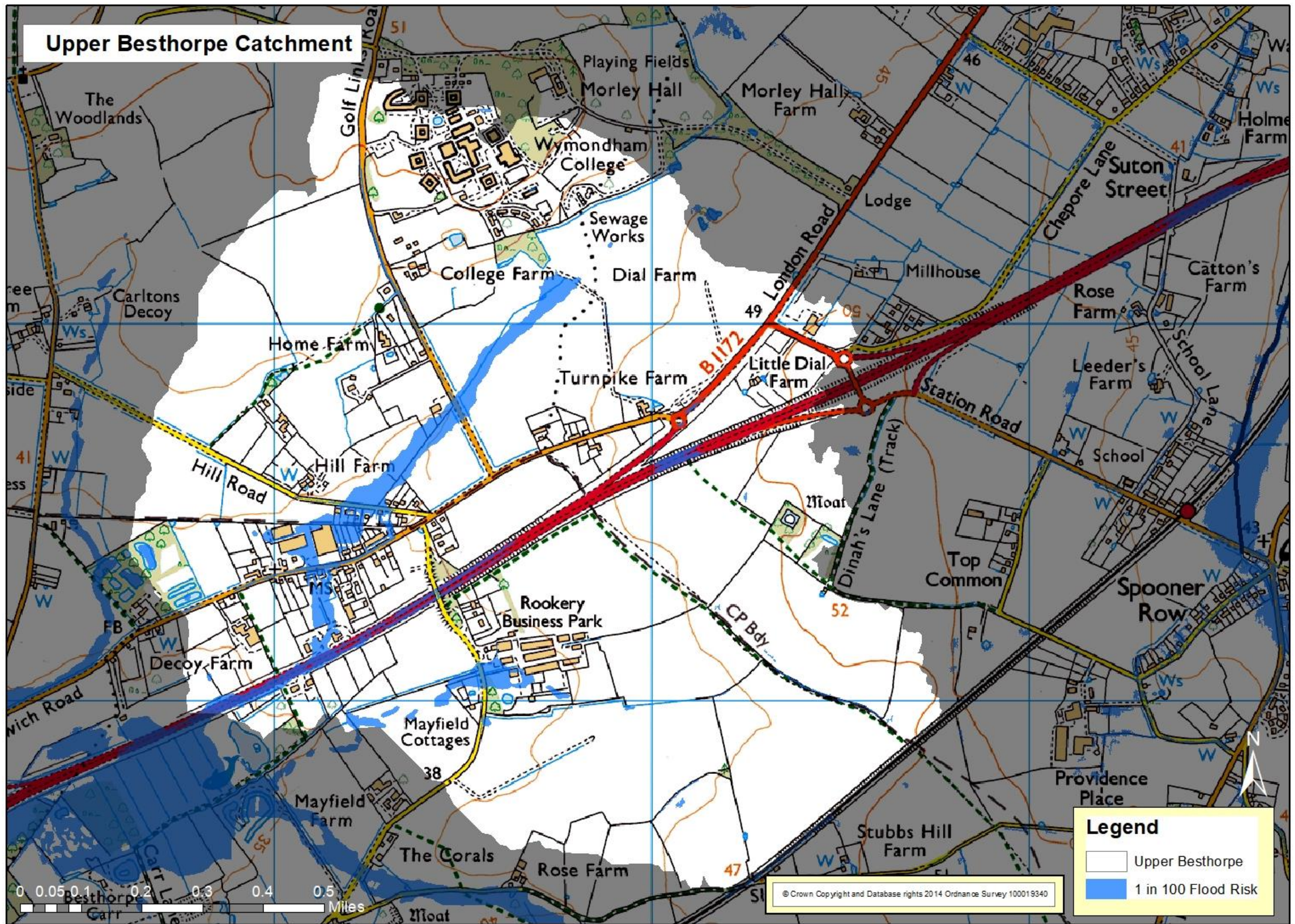
- provide a transparent and consistent review of recent flooding.
- identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- identify what their response has been or will be to the flooding.
- make recommendations as to how the flood risk could be mitigated or reduced.
- provide new evidence of the level of risk faced by communities in Norfolk that can be used in current funding bids in support of flood mitigation schemes.

Mitigation measures include property level protection: reinstating lost drainage features: reviewing or increasing maintenance regimes and increasing the capacity of the drainage network.

The flood investigation report cannot:

- Resolve the flooding issues or provide designed solutions.
- Force authorities to undertake any of the recommended actions.

Upper Besthorpe Catchment



Legend

- Upper Besthorpe
- 1 in 100 Flood Risk

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What are catchments?

To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations. Hydrological catchments catch water and discharge it at locations known as outlets. Individual hydrological catchment boundaries are usually formed by ridges of surrounding higher ground, which separate the lower lying areas at a line known as a watershed.

Flooding and flood risk within the Upper Besthorpe Catchment

Description of catchment

The catchment is largely rural and covers Besthorpe to the north of the A11. Water flows from the north east and gathers at the bottom of the catchment. All the flood reports are concentrated on two roads at the bottom of the catchment.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|--------------------------|--------------------|------------------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 2 | 17 | 6 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 2 | 28 | 8 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 0 | 0 |

Flood incidents within this catchment

Within this catchment 13 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|---|--|
| 02/06/2018 | <p>On the 02/06/2018 - 7 properties were internally flooded on Hill Road, Morley. These incidents were reported by:</p> <p>a resident via an online flood report form on the 18 June 2018, (FWF/18/7/6723)</p> <p>a resident via an online flood report form on the 18 June 2018, (FWF/18/7/6722)</p> <p>a resident via email correspondence on the 11 June 2018, (FWF/18/7/6638)</p> <p>a resident via email correspondence on the 7 June 2018, (FWF/18/7/6637)</p> <p>a resident via a flood questionnaire on the 7 June 2018, (FWF/18/7/6625)</p> <p>a resident via email correspondence on the 6 June 2018, (FWF/18/7/6619)</p> <p>a resident via email correspondence on the 11 June 2018, (FWF/18/7/6700)</p> | <p>Anglian Water Services Ltd responded and pumped out after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>The Fire and Rescue Service carried out measures to minimise the impact of flooding during the incident.</p> |
| | <p>On the 02/06/2018 - 6 properties were internally flooded on Norwich Road, Besthorpe. These incidents were reported by:</p> <p>a resident via email correspondence on the 11 June 2018, (FWF/18/3/6697)</p> <p>a member of the public via email correspondence on the 11 June 2018, (FWF/18/3/6671)</p> <p>a resident via email correspondence on the 11 June 2018, (FWF/18/3/6696)</p> <p>a resident via a flood questionnaire on the 2 August 2018, (FWF/18/3/6670)</p> <p>a resident via email correspondence on the 8 June 2018, (FWF/18/3/6744)</p> <p>by a member of the public via email correspondence on the 11 June 2018, (FWF/18/3/6672)</p> | <p>Anglian Water Services Ltd carried out measures to minimise the impact of flooding after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>British Red Cross visited affected residents to offer advice and to gather information after the incident.</p> <p>Police visited affected residents to offer advice and to gather information after the incident.</p> <p>Anglian Water Services Ltd visited affected residents to offer advice and to gather information after the incident.</p> <p>The Fire and Rescue Service responded and pumped out during the incident.</p> |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

11 of the incidents (91.7%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

2 June 2018 – 52.8mm rainfall was recorded as falling in 1 hours 30 minutes at the Morley St Botolph RG GSM rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 126 year rainfall event.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

Following flooding to people, property and infrastructure;

- Risk Management Authorities should
 - communicate with affected residents where their assets have given rise to the flooding of properties.
 - review the appropriateness of their response to flooding.
 - Determine the integrity and/or capacity of their assets where they have contributed to the flooding of properties to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.
- Property owners of affected properties should seek their own legal advice.
- NCC should
 - incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (“PFRA”).
 - review and monitor the delivery of recommendations within this and other relevant flood investigation reports.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|--|--|---|
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned. | Property Owners |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Surface run-off from significant rainfall that had made its way onto the highway flowed over the road network and onto the accesses of affected properties that were situated lower than these features. | NCC Highways |
| Hill Road, Morley, 02/06/2018 | The surface water/foul drainage system network was partially obstructed by debris and/or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. | NCC Highways Riparian Owner |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Run-off from significant rainfall was directed towards the surface water drainage network. These flows could not be accommodating as the system was already overloaded. This directed flood water towards the affected properties. | NCC Highways Anglian Water |
| Norwich Road, Besthorpe, 02/06/2018 | Significant rainfall was directed into the surface water system causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected properties. | NCC Highways |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Due to periods of dry weather localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowners |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | The flood water entered the properties through low thresholds at entrances and the air bricks. | Property Owners |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|--|--|--|-----------|
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution. | Property owners, Land owners, Riparian owners, Anglian Water, Norfolk County Council | 12 Months |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 Months |
| Norwich Road, Besthorpe, 02/06/2018 | Norfolk County Council & Anglian Water will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. | Norfolk County Council, Anglian Water | 12 Months |
| Hill Road, Morley, 02/06/2018 | Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. | Norfolk County Council | 12 Months |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | NCC should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. | Norfolk County Council | 12 Months |
| Hill Road, Morley, 02/06/2018 Norwich Road, Besthorpe, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Property owners & Norfolk County Council | 12 Months |

Flooding on Norwich Road and Hill Road

Location: Upper Besthorpe

Hill Road – Seven reports of internal and external flooding experienced on the 2nd June 2016

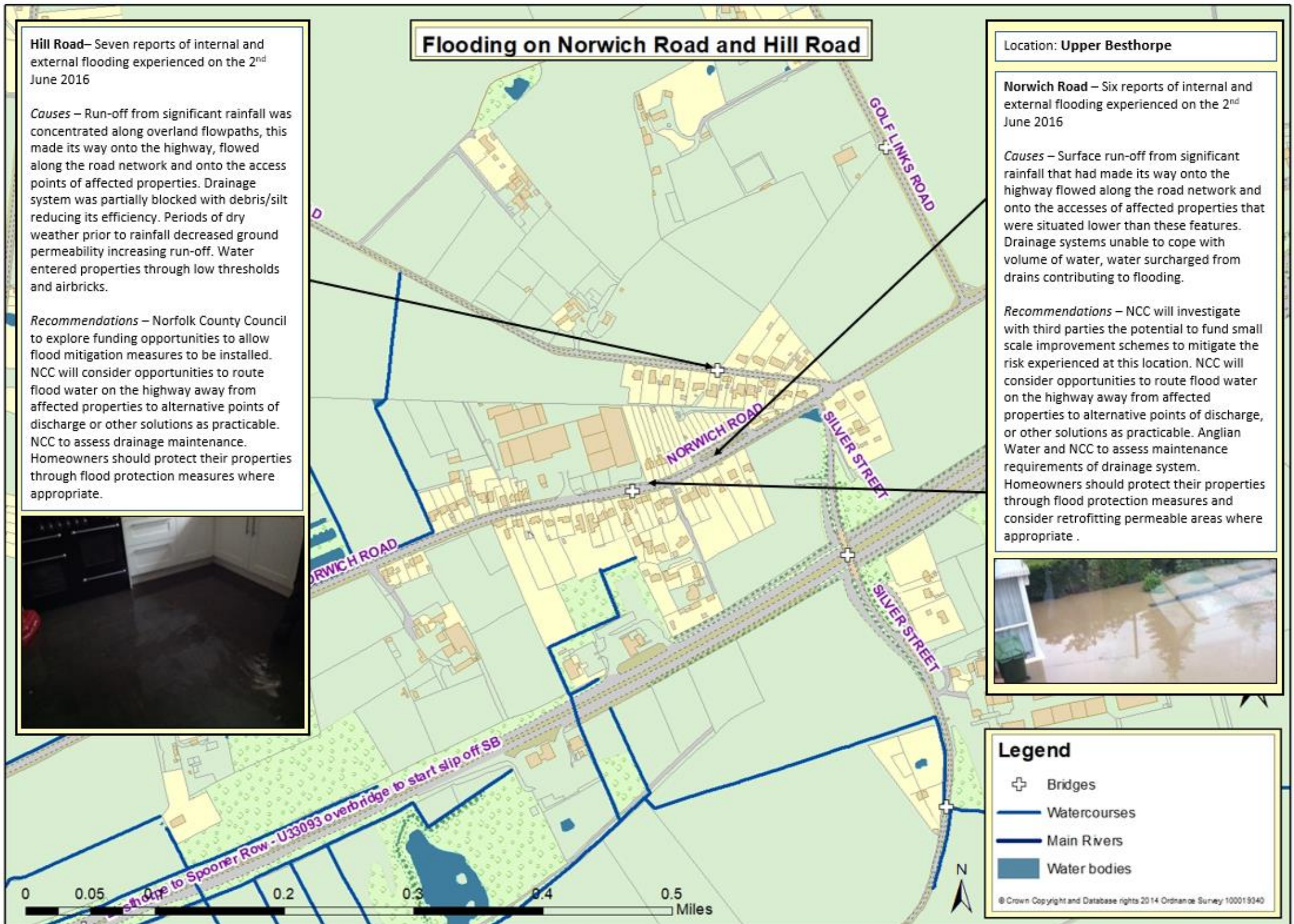
Causes – Run-off from significant rainfall was concentrated along overland flowpaths, this made its way onto the highway, flowed along the road network and onto the access points of affected properties. Drainage system was partially blocked with debris/silt reducing its efficiency. Periods of dry weather prior to rainfall decreased ground permeability increasing run-off. Water entered properties through low thresholds and airbricks.

Recommendations – Norfolk County Council to explore funding opportunities to allow flood mitigation measures to be installed. NCC will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge or other solutions as practicable. NCC to assess drainage maintenance. Homeowners should protect their properties through flood protection measures where appropriate.

Norwich Road – Six reports of internal and external flooding experienced on the 2nd June 2016

Causes – Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. Drainage systems unable to cope with volume of water, water surcharged from drains contributing to flooding.

Recommendations – NCC will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. NCC will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. Anglian Water and NCC to assess maintenance requirements of drainage system. Homeowners should protect their properties through flood protection measures and consider retrofitting permeable areas where appropriate.

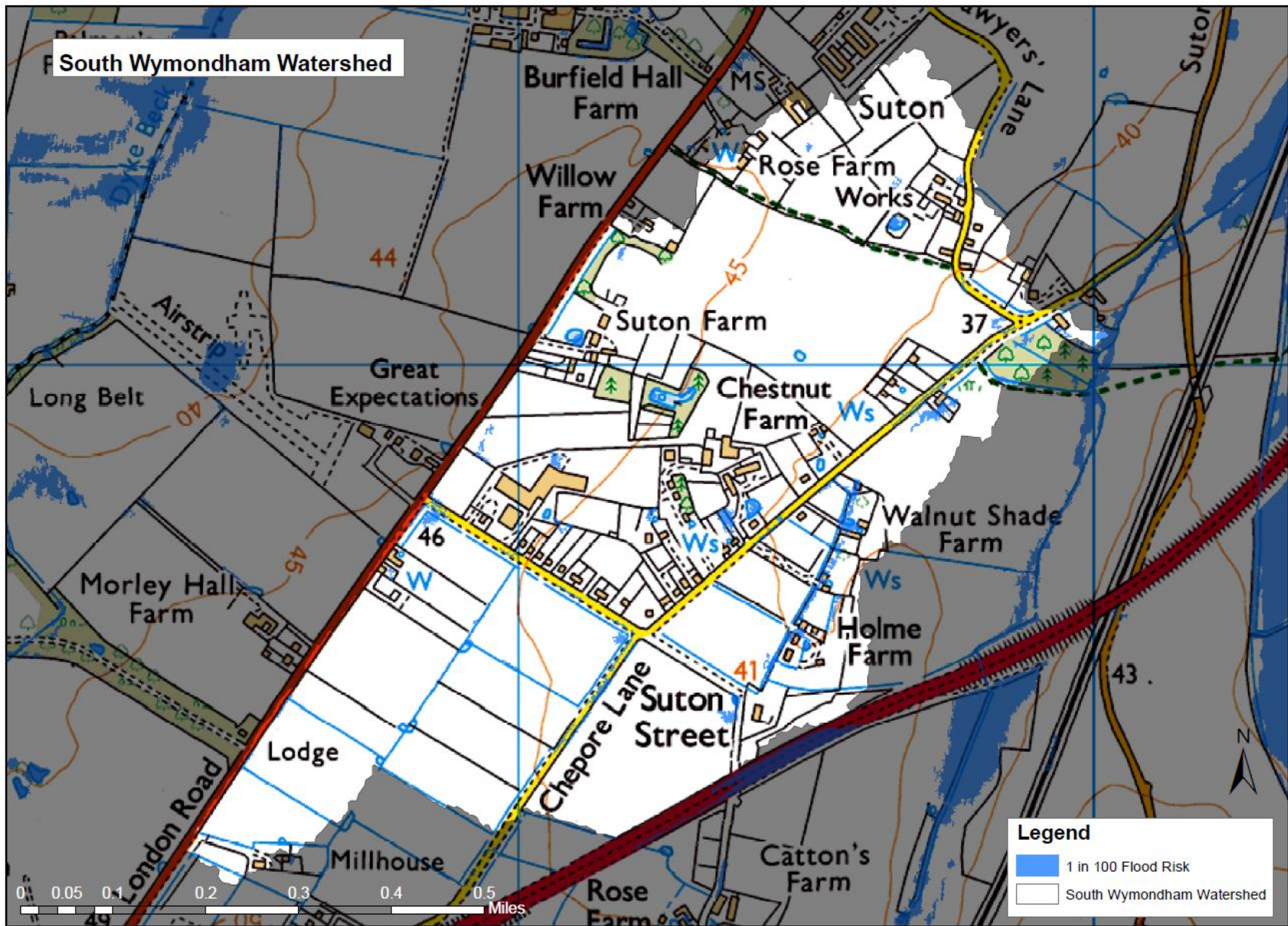


Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

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South Wymondham Watershed



Legend

- 1 in 100 Flood Risk
- South Wymondham Watershed

0 0.05 0.1 0.2 0.3 0.4 0.5 Miles

Flooding and flood risk within the Wymondham Catchment

Description of catchment

A small, largely rural catchment to the South of Wymondham located between the A11 & the B1172. Water flows through several smaller watercourses to the North East of the catchment and outfalls at the Bays River. Flood incidents were located adjacent to the upper reaches of the watercourse.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|-------------------|-------------|-----------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 0 | 5 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 9 | 3 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 0 | 0 |

Flood incidents within this catchment

Within this catchment 4 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|--|--|
| 02/06/2018 | <p>On the 02/06/2018 - 3 properties were internally flooded on Sutton Street, Wymondham. These incidents were reported by:</p> <p>a resident via email correspondence on the 15 June 2018, (FWF/18/7/6592)</p> <p>a resident via email correspondence on the 3 June 2018, (FWF/18/7/6591)</p> <p>the Fire and Rescue Service via an electronic report on the 5 September 2018, (FWF/18/7/7087)</p> | <p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> |

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|---|--|
| 02/06/2018 | <p>On the 02/06/2018 - 1 property was internally flooded on London Road, Wymondham. This incident was reported by:</p> <p>the Fire and Rescue Service via an electronic report on the 5 September 2018, (FWF/18/7/7089)</p> | <p>The Fire and Rescue Service responded and pumped out during the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Causes of flooding within the catchment and recommendations

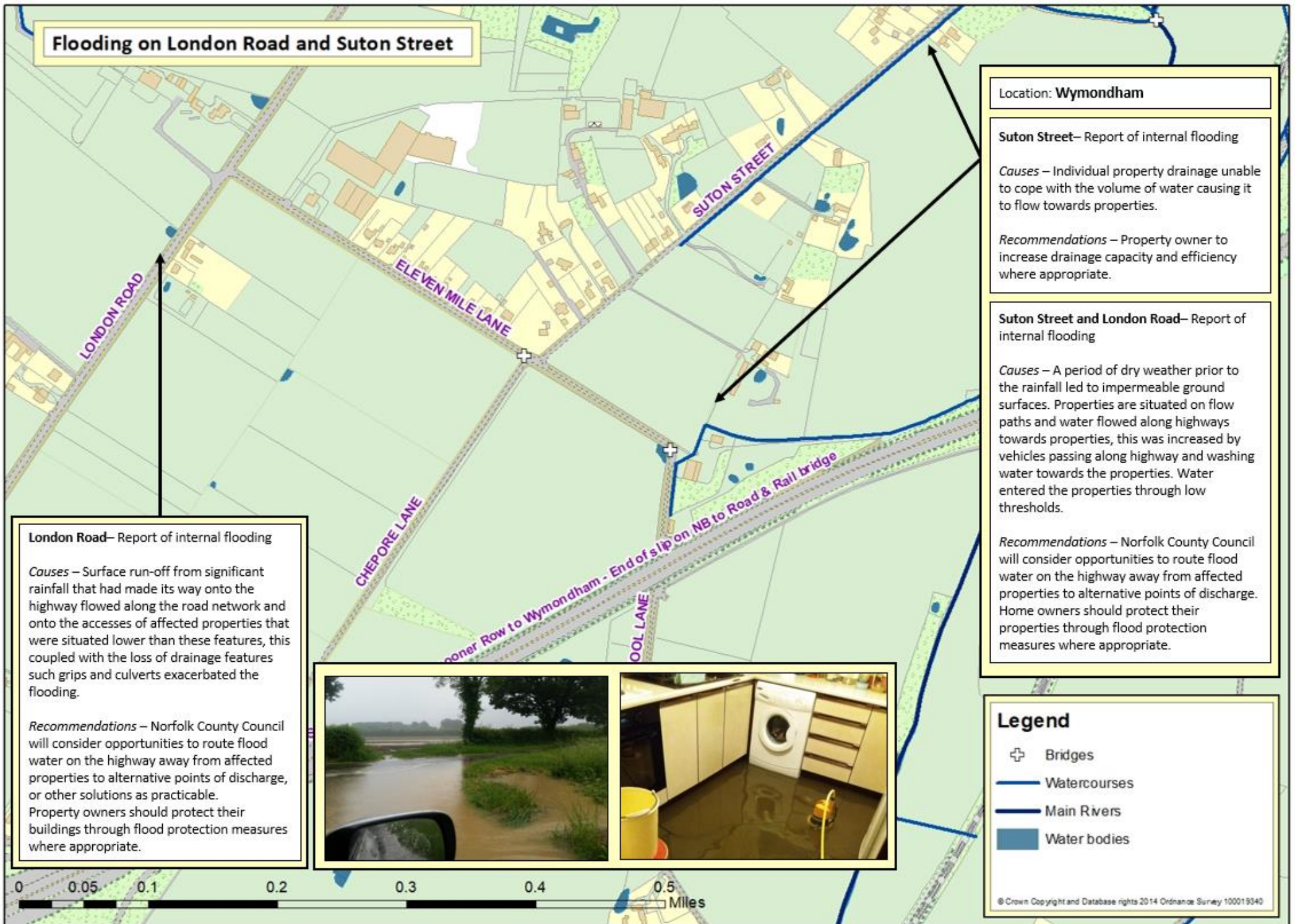
The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|---|--|--|
| Suton Street, Wymondham, 02/06/2018 | Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned. | Property owner |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties. | Norfolk County Council |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Due to periods of dry weather the localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowners |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | The flood water entered the properties through low thresholds at entrances & the air bricks. | Property owner |
| London Road, Wymondham, 02/06/2018 | The loss of pre-existing drainage features such as grips, kerb offlets & culverts within the catchment exacerbated the flooding. | Norfolk County Council |
| Suton Street, Wymondham, 02/06/2018 | Run-off from significant rainfall was directed towards Individual property drainage. These flows could not be accommodated as the system is of insufficient capacity to deal with this amount of water. This directed flood water towards the affected properties. | Land owners Riparian owners |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---|--|--|-----------|
| Suton Street, Wymondham, 02/06/2018 | Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution. | Property Owners, Land owners, Riparian owners, Norfolk County Council | 12 months |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 months |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Norfolk County Council will consider options that would ensure water does not pool on the highway. | Norfolk County Council | 12 months |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. | Norfolk County Council | 12 months |
| Suton Street, Wymondham, 02/06/2018 London Road, Wymondham, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Property owners | 12 months |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|-------------------------------------|---|---|-----------|
| London Road, Wymondham, 02/06/2018 | The property owner could confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to. | Property owner | 12 months |
| Suton Street, Wymondham, 02/06/2018 | The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency. | Property owners & Norfolk County Council | 12 months |

Flooding on London Road and Sutton Street



Location: **Wymondham**

Suton Street– Report of internal flooding

Causes – Individual property drainage unable to cope with the volume of water causing it to flow towards properties.

Recommendations – Property owner to increase drainage capacity and efficiency where appropriate.

Suton Street and London Road– Report of internal flooding

Causes – A period of dry weather prior to the rainfall led to impermeable ground surfaces. Properties are situated on flow paths and water flowed along highways towards properties, this was increased by vehicles passing along highway and washing water towards the properties. Water entered the properties through low thresholds.

Recommendations – Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge. Home owners should protect their properties through flood protection measures where appropriate.

London Road– Report of internal flooding

Causes – Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features, this coupled with the loss of drainage features such as grips and culverts exacerbated the flooding.

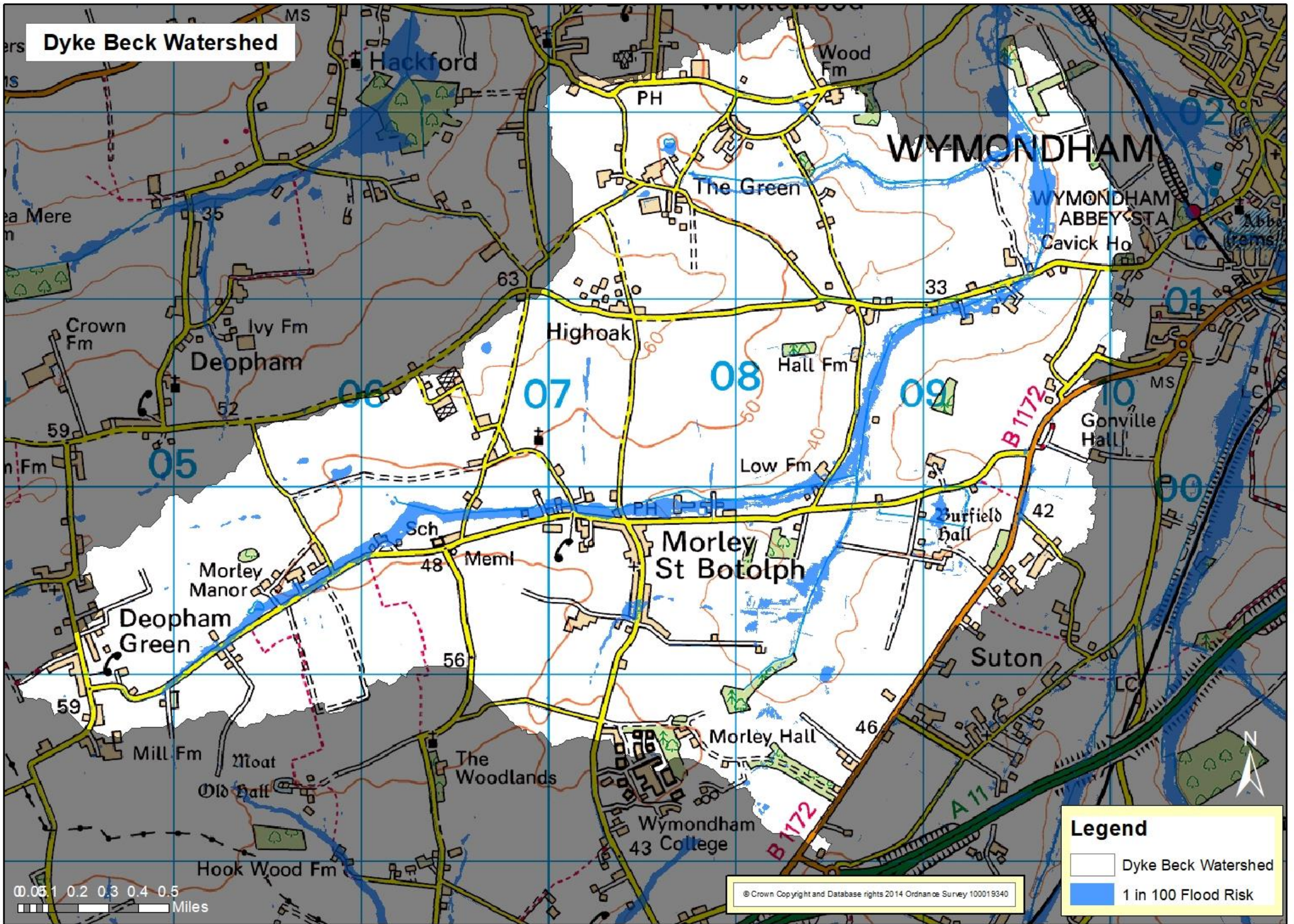
Recommendations – Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. Property owners should protect their buildings through flood protection measures where appropriate.



Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

Dyke Beck Watershed



Flooding and flood risk within the Dyke Beck Catchment:

Description of catchment

Dyke Beck is a largely rural catchment which covers Wicklewood CP and the upper reaches of Morley CP. With Morley St Boltoph at the centre, the water flows north east through a series of small watercourses and eventually outfalls into the Lake Kimberley and the River Tiffey.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|-------------------|-------------|-----------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 0 | 18 | 5 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 23 | 6 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 2 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 2 | 0 |

Flood incidents within this catchment

Within this catchment 3 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|---|---|
| 02/06/2018 | On the 02/06/2018 - 1 property was internally flooded on Chapel Road, Morley St Boltoph. This incident was reported by a resident via a flood questionnaire on the 10 September 2018, (FWF/18/7/7079) | The Fire and Rescue Service responded and pumped out during the incident. |
| | On the 02/06/2018 - 1 property was internally flooded on Church Road, Morley. This incident was reported by the Fire and Rescue Service via an electronic report on the 5 September 2018, (FWF/18/7/7092) | The Fire and Rescue Service responded and pumped out during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. |

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|--|---|
| | On the 02/06/2018 - 1 property was internally flooded on Deopham Road, Morley. This incident was reported by the Fire and Rescue Service via an electronic report on the 5 September 2018, (FWF/18/7/7093) | The Fire and Rescue Service None during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

3 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

2 June 2018 - 52mm rainfall was recorded as falling in 1 hours 30 minutes at the MORLEY ST BOLTOPH RG GSM (TELEM) rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 126 year rainfall event.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|---|--|--|
| Chapel Road, Morley St Boltoph, 02/06/2018 | Run-off from significant rainfall was concentrated along overland on which the affected property is positioned. | Property owner |
| Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Church Road, Morley, 02/06/2018 | Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property. | Norfolk County Council |
| Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | The surface water drainage system outfall was fully obstructed by potentially unconsented works. This the caused the failure of the upstream drainage system contributing to flooding at the affected properties. | Norfolk County Council Riparian Owners |
| Chapel Road, Morley St Boltoph, 02/06/2018 | The surface water network was partially obstructed by debris, vegetation and silt. This reduced overall capacity and the efficiency of the upstream drainage system contributing to flooding at the affected properties. | Norfolk County Council Riparian Owners Land owner |
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Run-off from significant rainfall was directed towards the surface water drainage network. These flows could not be accommodating as the system was already overloaded. This directed flood water towards the affected properties. | Norfolk County Council Riparian Owners Land Owners |
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Due to periods of dry weather localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowners |
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 | The flood water entered the properties through low thresholds at entrances. | Property owner |
| Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | The loss of pre-existing drainage features such as drains, dykes, ditches, culverts) within the catchment exacerbated the flooding. | Norfolk County Council Riparian Owners |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---|--|---|-----------|
| Chapel Road, Morley St Boltoph, 02/06/2018 | Norfolk County Council will investigate with third parties the potential to fund small scale improvement schemes to mitigate the risk experienced at this location. This could be either through the submission of a bid to secure Partnership funding or through negotiation with other organisations and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution. | Norfolk County Council, Property Owners, Land owners, Riparian owners | 12 months |
| Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 months |
| Church Road, Morley, 02/06/2018 | NCC Highways will consider options that would ensure water does not pool on the highway. | Norfolk County Council | 12 months |
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. | Norfolk County Council | 12 months |
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Norfolk County Council will identify the potential for providing or increasing attenuation to reduce the amount of water entering drainage systems. Norfolk County Council will assess the costs and benefits of undertaking a capital flood alleviation scheme to reduce risk to people, property and infrastructure. | Norfolk County Council | 12 months |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---|--|---|-----------|
| Chapel Road, Morley St Boltoph, 02/06/2018 Church Road, Morley, 02/06/2018 Deopham Road, Morley, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Property owners, Norfolk County Council | 12 months |
| Chapel Road, Morley St Boltoph, 02/06/2018 | Norfolk County Council & the property owner can confirm, where possible, the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to. | Norfolk County Council, Property owners | 12 months |

Flooding on Chapel Road, Deopham Road and Church Road

Location: Dyke Beck

Church Road– Report of internal flooding

Causes – Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. These flows were exacerbated by the loss of drainage features such as dykes and ditches.

Recommendations – Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable, possibly with provision of raised kerbs to property frontage. Home owners should protect their properties through flood protection measures.

Chapel Road– Report of internal flooding

Causes – Run-off from significant rainfall was directed towards the surface water drainage network, these flows could not be accommodating as the system was already overloaded coupled with the property being situated on a flow path.

Recommendations – NCC will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location along with the potential for providing or increasing attenuation to reduce the amount of water entering drainage systems.

Deopham Road– Report of internal flooding

Causes – Dry weather prior to the rainfall led to decreased permeability of ground surfaces increasing surface run-off. High volumes of surface water were directed from adjacent fields to towards the highway, these flows could not be accommodated as the system was already overloaded, this coupled with the loss of drainage features such as dykes and ditches increased and directed surface run-off towards the property.

Recommendations – NCC to assess drainage maintenance and reinstatement of lost system. Home owners should protect their properties through flood protection measures.

Deopham Road– Report of internal flooding

Causes – Loss of drainage features such as dykes and ditches surface run-off was increased and directed towards the property.

Recommendations – NCC to assess drainage maintenance and reinstatement of ditches and/or culverts.



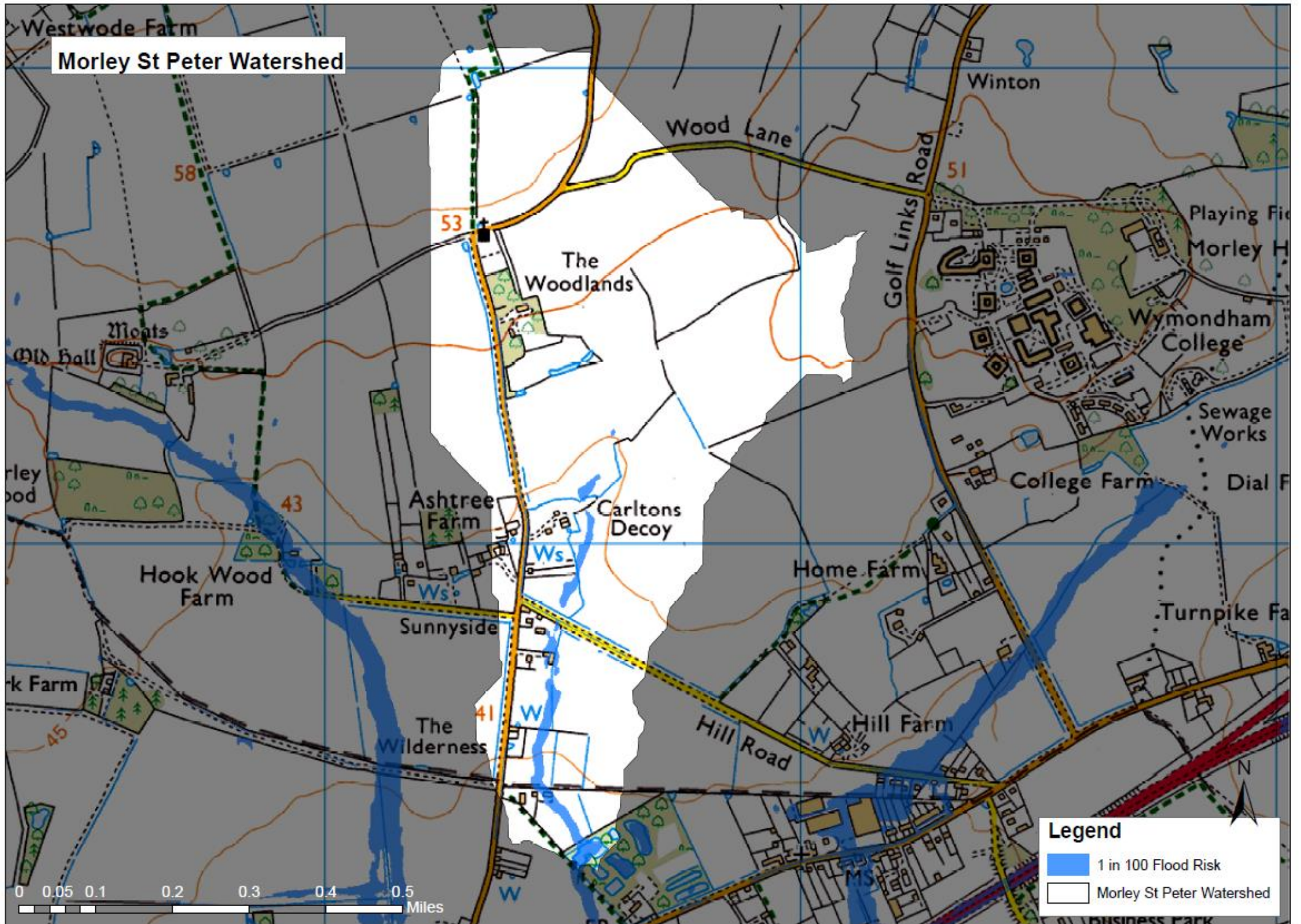
0 0.05 0.1 0.2 0.3 0.4 0.5 Miles

Legend

- Bridges
- Watercourses
- Main Rivers
- Water bodies

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Morley St Peter Watershed



Flooding and flood risk within the Morley Catchment:

Description of catchment

A small, largely rural catchment covering the village of Morley St Peter. The water flows north to south through a series of dykes. Flood reports were located in the centre of the catchment.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|-------------------|-------------|-----------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 0 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 0 | 0 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 0 | 0 |

Flood incidents within this catchment

Within this catchment 6 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|------------------|--|---|
| 02/06/2018 | On the 02/06/2018 - 2 properties were internally flooded on Attleborough Road, Morley. These incidents were reported by: Norfolk County Council (Highways) via email correspondence on the 26 June 2018, (FWF/18/7/6742) a resident via a flood questionnaire on the 19 July 2018, (FWF/18/7/6794) | The Fire and Rescue Service responded and pumped out during the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

2 of the incidents (100%) of internal flooding in this catchment are within 2.5km of a rain gauge. The rainfall events recorded by gauges for this catchment are;

2 June 2018 - 52mm rainfall was recorded as falling in 1 hours 30 minutes at the MORLEY ST BOLTOPH RG GSM (TELEM) rainfall monitoring station. This intensity of rainfall for the total duration equates to a 126.2 year rainfall event.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|---------------------------------------|---|--|
| Attleborough Road, Morley, 02/06/2018 | Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned adjacent to. | Property owner |
| Attleborough Road, Morley, 02/06/2018 | Surface run-off from significant rainfall that had made its way onto the highway, flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Attleborough Road, Morley, 02/06/2018 | Significant rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties. | Norfolk County Council |
| Attleborough Road, Morley, 02/06/2018 | The surface water drainage system was partially obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. | Land owners Riparian owners |
| Attleborough Road, Morley, 02/06/2018 | Run-off from significant rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected properties. This was due to lost sections i.e. field accesses, of the existing drainage networks. | Land owners Riparian owners |
| Attleborough Road, Morley, 02/06/2018 | Due to periods of dry weather localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowners |
| Attleborough Road, Morley, 02/06/2018 | The flood water entered the properties through low thresholds at entrances and the air bricks | Property owners |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---------------------------------------|--|--|------------------|
| Attleborough Road, Morley, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 months |
| Attleborough Road, Morley, 02/06/2018 | Norfolk County Council will consider options that would ensure water does not pool on the highway. | Norfolk County Council | 12 months |
| Attleborough Road, Morley, 02/06/2018 | Norfolk County Council will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. | Norfolk County Council Riparian owners Land owners | 12 months |
| Attleborough Road, Morley, 02/06/2018 | Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. | Norfolk County Council | 12 months |
| Attleborough Road, Morley, 02/06/2018 | Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems. | Norfolk County Council Property owners | 12 months |
| Attleborough Road, Morley, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate and/or consider the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems. Norfolk County Council will communicate with residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Norfolk County Council Property owners | 12 months |

Flooding on Attleborough Road

Causes – Run-off from significant rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This was exacerbated by sections of the existing drainage network appearing to be lost i.e. field accesses, and this in turn directed flood water towards the affected properties.

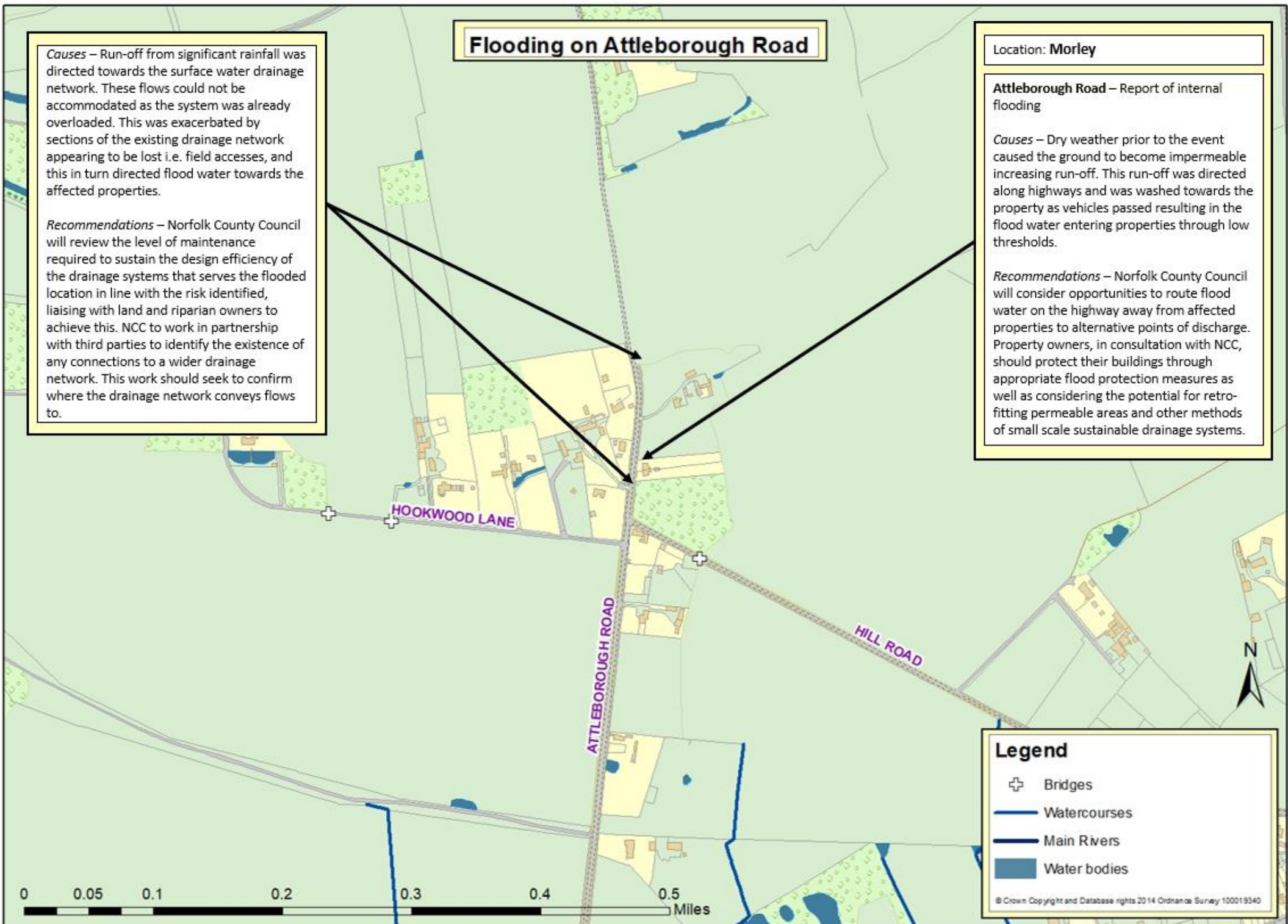
Recommendations – Norfolk County Council will review the level of maintenance required to sustain the design efficiency of the drainage systems that serves the flooded location in line with the risk identified, liaising with land and riparian owners to achieve this. NCC to work in partnership with third parties to identify the existence of any connections to a wider drainage network. This work should seek to confirm where the drainage network conveys flows to.

Location: **Morley**

Attleborough Road – Report of internal flooding

Causes – Dry weather prior to the event caused the ground to become impermeable increasing run-off. This run-off was directed along highways and was washed towards the property as vehicles passed resulting in the flood water entering properties through low thresholds.

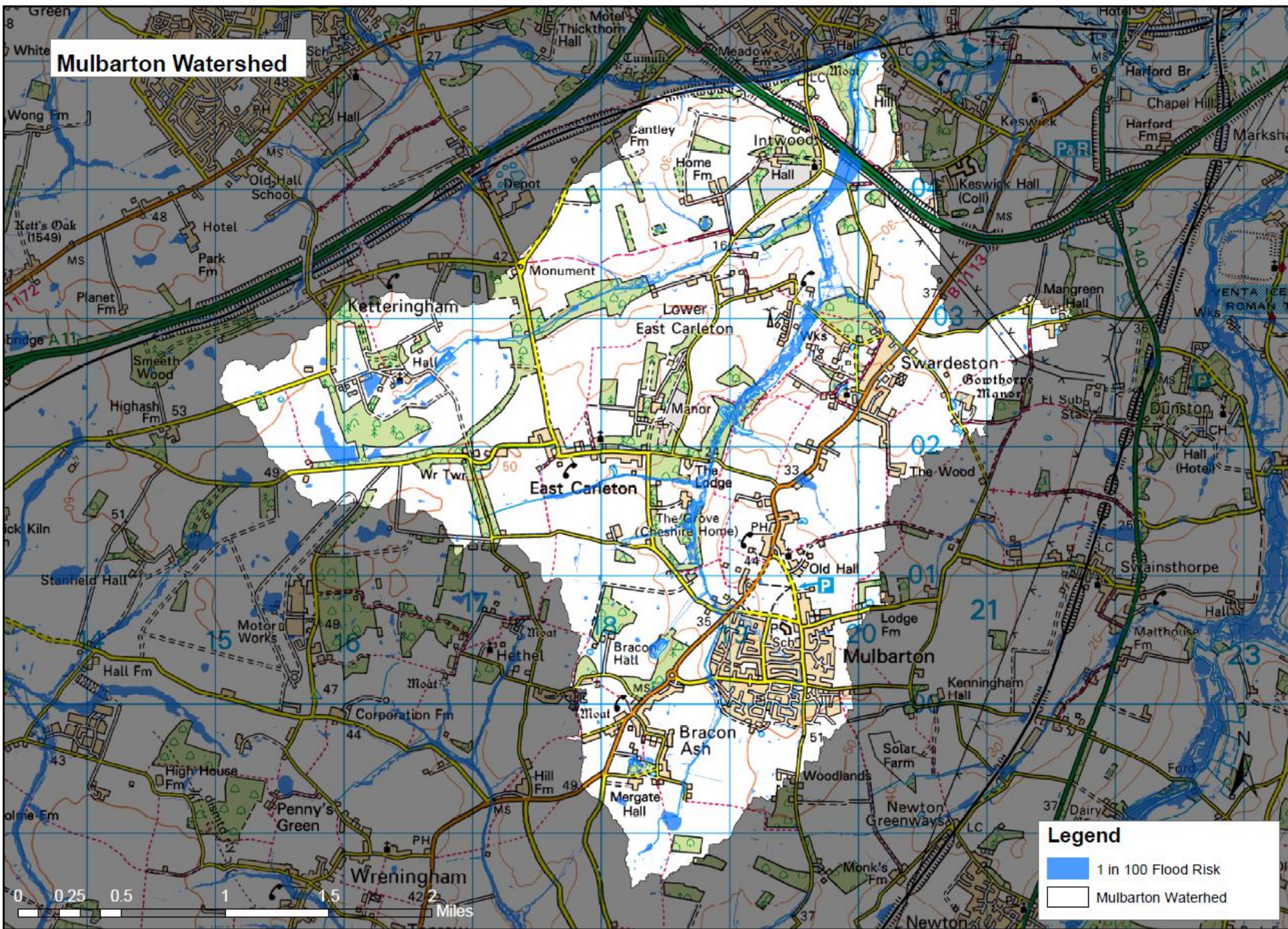
Recommendations – Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge. Property owners, in consultation with NCC, should protect their buildings through appropriate flood protection measures as well as considering the potential for retrofitting permeable areas and other methods of small scale sustainable drainage systems.



Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

Mulbarton Watershed



Legend

- 1 in 100 Flood Risk
- Mulbarton Watershed

Flooding and flood risk within the Mulbarton Catchment:

Description of catchment

A large catchment stretching from the villages of Ketteringham to the West, Keswick to the North and Mulbarton in the South East. Flood reports have historically spread across the catchment. A largely rural catchment, water flows to the North East towards the outfall at the River Yare.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|--------------------------|--------------------|------------------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 0 | 30 | 13 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 1 | 89 | 20 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 0 | 0 |

Flood incidents within this catchment

Within this catchment 1 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|-------------------------|---|--|
| 02/06/2018 | On the 02/06/2018 - 1 property was internally flooded on Rectory Lane, Mulbarton. This incident was reported by a resident via email correspondence on the 5 June 2018, (FWF/18/7/6608) | Norfolk County Council assessed validity and impact of the flood report. |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of

British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|-------------------------------------|--|--|
| Rectory Lane, Mulbarton, 02/06/2018 | Run-off from significant rainfall was concentrated along overland flow paths on which the affected properties are positioned adjacent to. | Property owner |
| Rectory Lane, Mulbarton, 02/06/2018 | Surface run-off from significant rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Rectory Lane, Mulbarton, 02/06/2018 | Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property. | Norfolk County Council |
| Rectory Lane, Mulbarton, 02/06/2018 | The surface water & foul drainage system network was fully obstructed by high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. | Norfolk County Council Anglian water |
| Rectory Lane, Mulbarton, 02/06/2018 | Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded. This directed flood water towards the affected property. This was due to the infiltration of surface water into existing drainage networks. | Norfolk County Council Highways |
| Rectory Lane, Mulbarton, 02/06/2018 | Rainfall was directed into the surface water & foul systems causing it to surcharge elsewhere. This surcharging contributed to the flooding at the affected property. | Norfolk County Council Anglian water |
| Rectory Lane, Mulbarton, 02/06/2018 | Due to periods of dry weather localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowner |
| Rectory Lane, Mulbarton, 02/06/2018 | The flood water entered the property through low thresholds at entrances and the air bricks. | Property owner |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|-------------------------------------|--|--|------------------|
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council will consider options that would ensure water does not pool on the highway. | Norfolk County Council | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council & Anglian Water will review the level of maintenance required to sustain the design efficiency of their drainage systems that serve the flooding location in line with the risk identified. | Norfolk County Council, Anglian water | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. | Norfolk County Council | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood events. | Norfolk County Council, Anglian Water | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems | Norfolk County Council, Property owners | 12 Months |
| Rectory Lane, Mulbarton, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Norfolk County Council, Property owners | 12 Months |

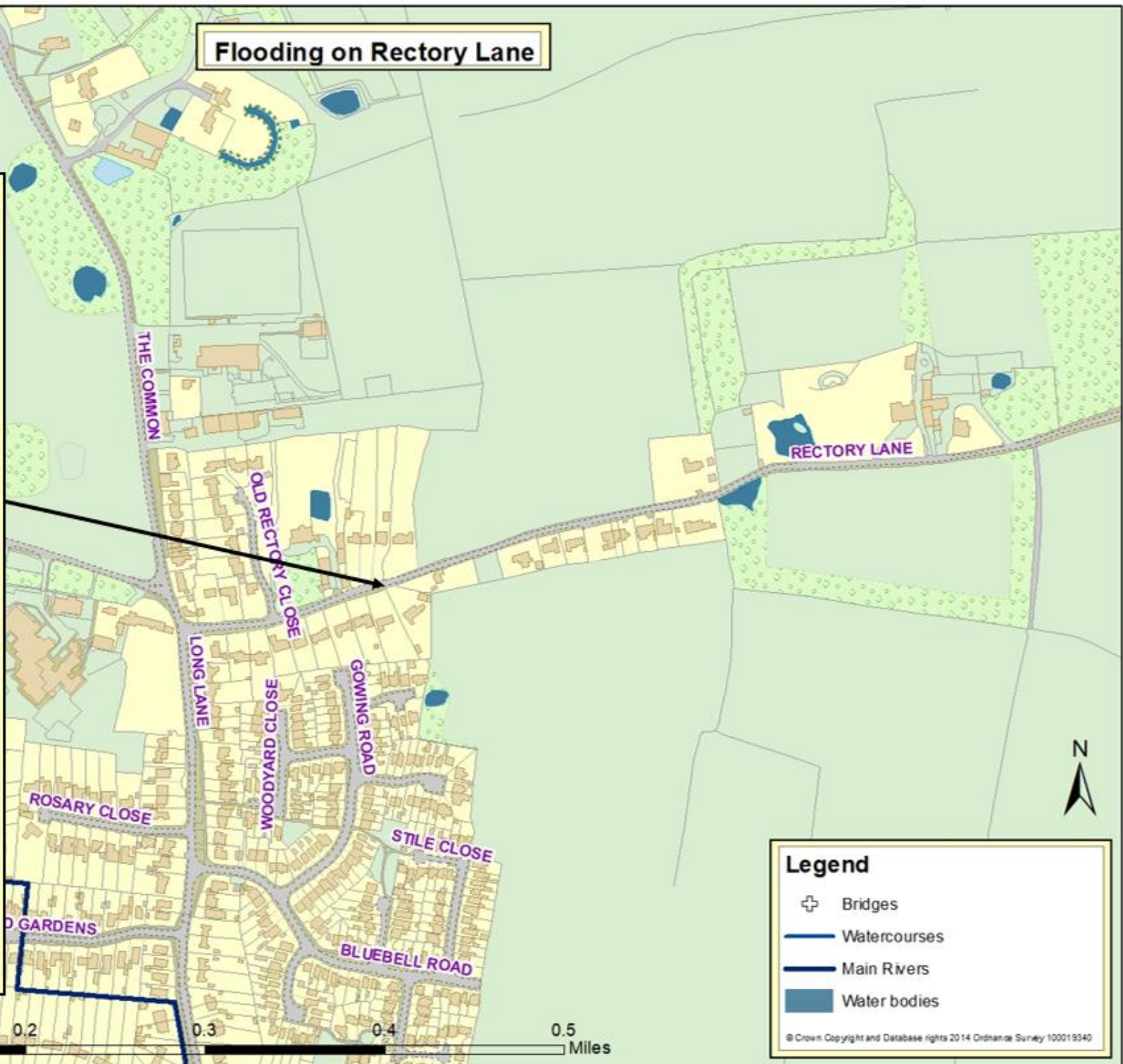
Flooding on Rectory Lane

Location: **Mulbarton**

Rectory Lane – Report of internal flooding

Causes – Dry weather prior to the rainfall made ground surfaces impermeable. Surface run-off was concentrated on the highways and was washed towards the affected property by passing vehicles. The drainage system was obstructed by high levels downstream, reducing its efficiency and causing the drains to surcharge near the property. Water entered the property through low thresholds and air bricks.

Recommendations – NCC will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge. NCC and Anglian Water to review maintenance level required to keep drainage system efficient. Homeowner to install flood protection measures where appropriate and consider the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems .

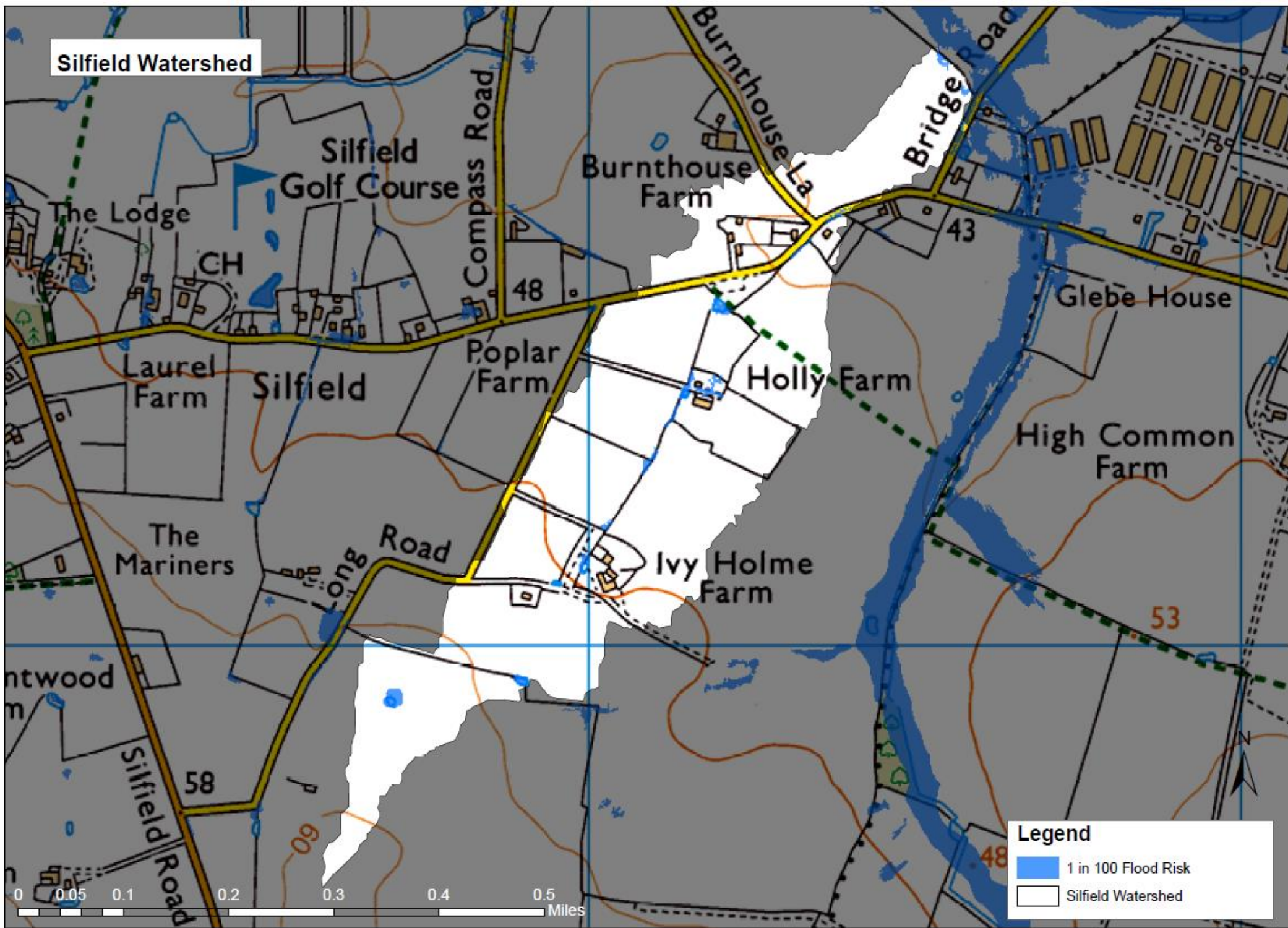


Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

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Silfield Watershed



Flooding and flood risk within the Silfield catchment

Description of catchment

A very small, rural catchment to the South East of Silfield. Water flows South West to North East and catchment forms part of the large Tiffey Catchment. One recorded incidence of internal flooding to property.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface run-off) and strategic sources (fluvial above 3 square km and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not consider flood risk from groundwater or reservoir failure.

| Flood Risk Data Source | Critical Services | Residential | Non-residential |
|---|--------------------------|--------------------|------------------------|
| [a] No. of properties subject to surface water flood risk at 1 in 30 year event: | 0 | 0 | 0 |
| [b] No. of properties subject to surface water flood risk at 1 in 100 year event: | 0 | 1 | 0 |
| [c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event: | 0 | 0 | 0 |
| [d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event: | 0 | 0 | 0 |
| [e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event: | 0 | 0 | 0 |
| [f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event: | 0 | 0 | 0 |

Flood incidents within this catchment

Within this catchment 2 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

| Date of Incident | Incident as reported | What was the response to the flood incident |
|-------------------------|--|--|
| 02/04/2018 | On the 02/04/2018 - 1 property was internally flooded on Silfield Street, Silfield. This incident was reported by a resident via email correspondence on the 18 June 2018, (FWF/18/7/6724) | Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. |

Recent rainfall within the catchment

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the catchment that led to the flooding. This analysis is useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas was exceeded.

Norfolk County Council has sought to use data from rain gauges where incidents of flooding are located within a 2.5 km radius of the instrumentation. This distance meets the requirements of British Standards and aims to capture localised rainfall patterns. Where there is no available data within this radius this will be stated.

There were no rain gauges within 2.5km of the incidents of flooding within this catchment.

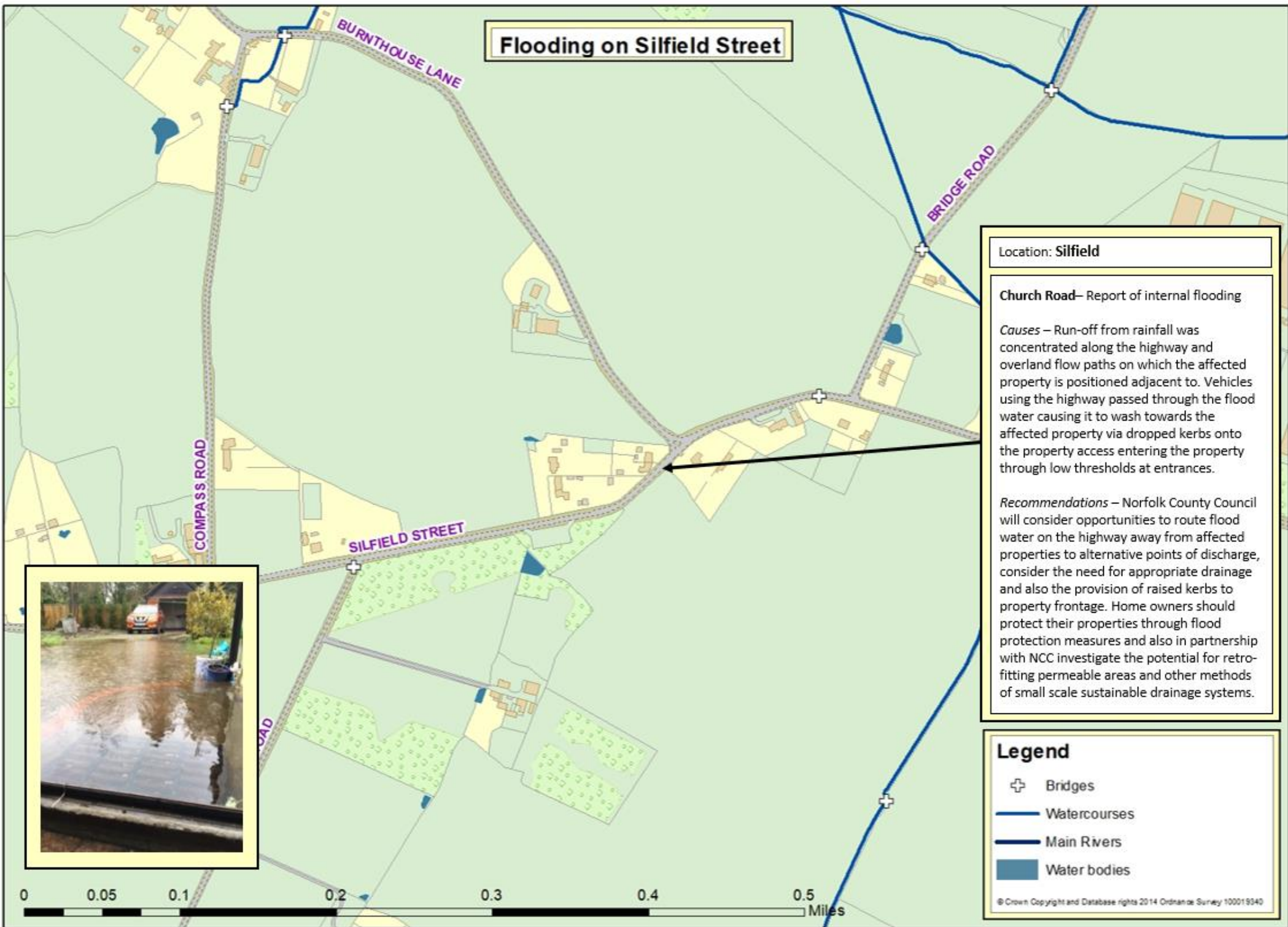
Causes of flooding within the catchment and recommendations

The findings of the investigation are detailed on the following pages. The first table details the causes that led to flooding within the catchment as well as when and where they were experienced. It also sets out which Risk Management Authorities have responsibility to help manage the causes of the flooding. The second table sets out recommendations to mitigate the causes and impacts of the flooding experienced within this catchment.

| Flooding experienced at / on | Causes of flooding | Who has responsibilities to manage the cause(s) of the flood? |
|---------------------------------------|---|---|
| Silfield Street, Silfield, 02/06/2018 | Run-off from rainfall was concentrated along overland flow paths on which the affected property is positioned adjacent to. | Property owner |
| Silfield Street, Silfield, 02/06/2018 | Surface run-off from rainfall that had made its way onto the highway flowed along the road network and onto the accesses of affected properties that were situated lower than these features. | Norfolk County Council |
| Silfield Street, Silfield, 02/06/2018 | Rainfall was concentrated on the highway. Vehicles using the highway passed through the flood water causing it to wash towards the affected property. | Norfolk County Council |
| Silfield Street, Silfield, 02/06/2018 | Due to periods of dry weather localised ground conditions caused run-off to be directed quickly from where it fell as rain to the areas of flooding. | Landowners |
| Silfield Street, Silfield, 02/06/2018 | The flood water entered the property through low thresholds at entrances. | Property owner |

| Flooding experienced at / on | Recommendation | Who has responsibility to follow up the recommendation? | Timescale |
|---------------------------------------|---|---|-----------|
| Silfield Street, Silfield, 02/06/2018 | Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. | Norfolk County Council | 12 Months |
| Silfield Street, Silfield, 02/06/2018 | Norfolk County Council will consider options that would ensure water does not pool on the highway. | Norfolk County Council | 12 Months |
| Silfield Street, Silfield, 02/06/2018 | Norfolk County Council will investigate with third parties the potential for retro-fitting permeable areas and other methods of small scale sustainable drainage systems | Norfolk County Council Property owner | 12 Months |
| Silfield Street, Silfield, 02/06/2018 | Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council will communicate with resident to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders. | Norfolk County Council Property owner | 12 Months |

Flooding on Silfield Street



Location: **Silfield**

Church Road— Report of internal flooding

Causes – Run-off from rainfall was concentrated along the highway and overland flow paths on which the affected property is positioned adjacent to. Vehicles using the highway passed through the flood water causing it to wash towards the affected property via dropped kerbs onto the property access entering the property through low thresholds at entrances.

Recommendations – Norfolk County Council will consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, consider the need for appropriate drainage and also the provision of raised kerbs to property frontage. Home owners should protect their properties through flood protection measures and also in partnership with NCC investigate the potential for retrofitting permeable areas and other methods of small scale sustainable drainage systems.

Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

Disclaimer

Although every effort has been taken to ensure the accuracy of the information contained within the pages of the report, we cannot guarantee that the contents will always be current, accurate or complete.

This report has been prepared as part of Norfolk County Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide context and information to support the delivery of the local flood risk management strategy and should not be used for any other purpose.

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

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

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

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

The implications for producing Flood Investigation Reports and any consequences of blight have been considered. The process of gaining insurance for a property and/or purchasing/selling a property and any flooding issues identified are considered a separate and legally binding process placed upon property owners and this is independent of and does not relate to the County Council highlighting flooding to properties at a street level.

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Appendix A - Key definitions and responsibilities

What is flooding?

Section 1 of the Flood and Water Management Act 2010 states that: "Flood" includes any case where land not normally covered by water becomes covered by water. In addition, this section adds the caveat: "But "flood" does not include – (a) a flood from any part of the sewerage system, unless wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitation) entering or otherwise affecting the system, or (b) a flood caused by a burst water main (within the meaning given by Section 219 of the Water Industry Act 1991)."

What is internal and external flooding?

For the purposes of this report, properties that have internally flooded are those where it is considered that water has entered the fabric of the building;

- Basements and below ground level floors are included.
- Garages are included if in the fabric of the building. Garages adjacent or separate from the main building are not included.
- Occupied caravans are included but not tents.

External flooding included those properties where water has entered gardens or surrounding areas which restricts access, affects the highway or where flooding has disrupted essential services to the property such as sewerage. For businesses this includes those where the flood waters are directly preventing them trading as usual.

What is Local Flood Risk?

Local Flood Risk is defined by the Flood and Water Management Act 2010 as being flood risk from surface runoff, groundwater and ordinary watercourses.

- 'Surface runoff' means rainwater (including snow and other precipitation) which is on the surface of the ground (whether or not it is moving) and, has not entered a watercourse, drainage system or public sewer.
- 'Groundwater' means all water which is below the surface of the ground and in direct contact with the ground or subsoil.
- 'Ordinary Watercourse' means a watercourse that does not form part of a main river and includes a reference to a lake, pond or other area of water which flows into an ordinary watercourse.

Roles and Responsibilities of Risk Management Authorities

Below is a short summary of those groups and Risk Management Authorities ("RMAs") that have a role in managing flooding within Norfolk. The listing of responsibilities includes those duties or powers that directly relate to managing the flood incidents or consequence. All RMAs have a duty to cooperate with other RMAs.

1. Norfolk County Council (as Lead Local Flood Authority)

- Duty to investigate significant flooding from any source.
- Duty to maintain a register of structures or features which affect flood risk from all sources.
- Power to undertake works to manage flood risk from surface run-off and groundwater.
- Powers to regulate activities on ordinary watercourses outside of Internal Drainage Board areas.
- Duties as a Category 1 Responder for Emergency Planning and the Fire & Rescue Service.

2. District Councils

- Powers to undertake works on ordinary watercourses outside of IDB areas.

- The Local Planning Authority for their District area and determine the appropriateness of developments and their exposure and effect on flood risk.
- Duties as a Category 1 Responder for Emergency Planning.

3. Internal Drainage Boards (“IDBs”)

- A duty to act in a manner consistent with the national and local strategies and guidance when exercising FCERM functions.
- Duty to act in a manner consistent with Local Flood Risk Management Strategies when exercising other functions that may affect flood risk.
- Powers to regulate activities on ordinary watercourses within IDB areas.
- Exercise a general power of supervision over all matters relating to the drainage of land within their district.
- Powers to undertake works on ordinary watercourses within IDB areas.

4. Highway Authorities (Norfolk County Council / Highways England)

- Powers to undertake works to manage water on the highway and to move water off the highway.
- Enforcement powers to unauthorised alterations, obstructions and interferences with highway drainage.
- Have responsibilities for culverts vested in the highway. Currently NCC discharges its responsibilities associated with bridges and culverts (whether as owner or highway authority) through the inspection of condition (undertaken by the Bridges team) and through maintenance activity (delivered on a as needs basis by the relevant Highways area team).

5. Water Companies

- Undertake cost beneficial capital schemes to alleviate or eliminate flooding where the flood event is associated with a failure of their assets.
- Duty to provide, improve, maintain and operate systems of public sewers and works for the purpose of effectually draining an area.
- Are responsible for flooding from their foul, combined and surface water sewers, and from burst water mains.
- Maintain ‘At Risk Registers’ for Ofwat that record properties that have flooded from public foul, combined and surface water sewers and that are at risk of flooding again.
- Water companies respond to reports from the public of flooding associated with their assets and determine an appropriate response in line with their standards or customer service.
- Duties as a Category 2 Responder for Emergency Planning.

6. Riparian Owners

- Duty of care towards neighbours upstream and downstream, avoiding any action likely to cause flooding.
- Entitled to protect their properties from flooding.
- May be required to maintain the condition of their watercourse to ensure that the proper flow of water is unimpeded.