



Investigation Report into the flooding in North Walsham from 2016 – 2018

Report Reference: FIR018

Draft Report prepared by Abygail Hadley on 22 March 2019



Executive Summary

(a) Flooding incidents and causes

Flooding in North Walsham occurred on 23 June 2016, 9 August 2017 and 2 June 2018. These rainfall events generated 44 reports of flooding that led to the identification of 19 properties that had suffered internal flooding. The properties affected were concentrated in 4 separate catchments¹.

Verified flood reports covered within this report:

Lyngate Catchment

- Folgate Road: 2 properties
- Hazel Road: 1 property
- Lynfield Road: 5 properties
- Gaymers Way: 1 property
- Bacton Road: 1 property
- Corbett Road: 1 property
- Cornish Way: 2 properties
- Hipperson Close: 1 property
- Aylsham Road: 1 property

Skeyton Beck Catchment

- Cromer Road: 1 property

Marshgate Catchment

- Rye Close: 1 property
- Birch Close: 1 property

River Ant Catchment

- White Horse Common: 1 property

(b) Flooding causes

Our initial conclusion is that the flooding was caused by:

Run-off from significant rainfall across the catchment was directed along flow paths towards the surface water drainage network and the watercourse. These flows could not be accommodated by the receiving watercourse which led to the overloading of connecting drainage. Flows that could not be accommodated by the watercourse and drainage system found their way into the affected properties.

This was exacerbated by:

- Obstruction of surface run-off flow paths by structures;

¹ What are catchments? - To aid the investigation process and, for ease of presentation, the incidents of flooding within this report 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.

- Entry of flood water into property through the unprotected structure of the building, such as low thresholds at entrances, unprotected air bricks and services conduits;
- Surface run-off from roads;
- Surcharging of the drainage system.
- Unmaintained or obstructed watercourses;
- Loss of pre-existing drainage features;
- Surface water washed off public highway by vehicles.

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.

23 June 2016 – 43.6mm rainfall was recorded as falling in 2 hours 30 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 33 rainfall event.

9 August 2017 - 21mm rainfall was recorded as falling in 8 hours 45 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 13 rainfall event.

2 June 2018 - 30mm rainfall was recorded as falling in 1 hours 45 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 14 rainfall event.

(b) Key recommendations

Following flooding to people, property and infrastructure;

Risk Management Authorities should

communicate with affected residents and property owners 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;

- 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 resilience 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. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait for measures to be approved through national funding schemes.
- 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 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
- 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
- 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.

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.

North Norfolk District Council should:

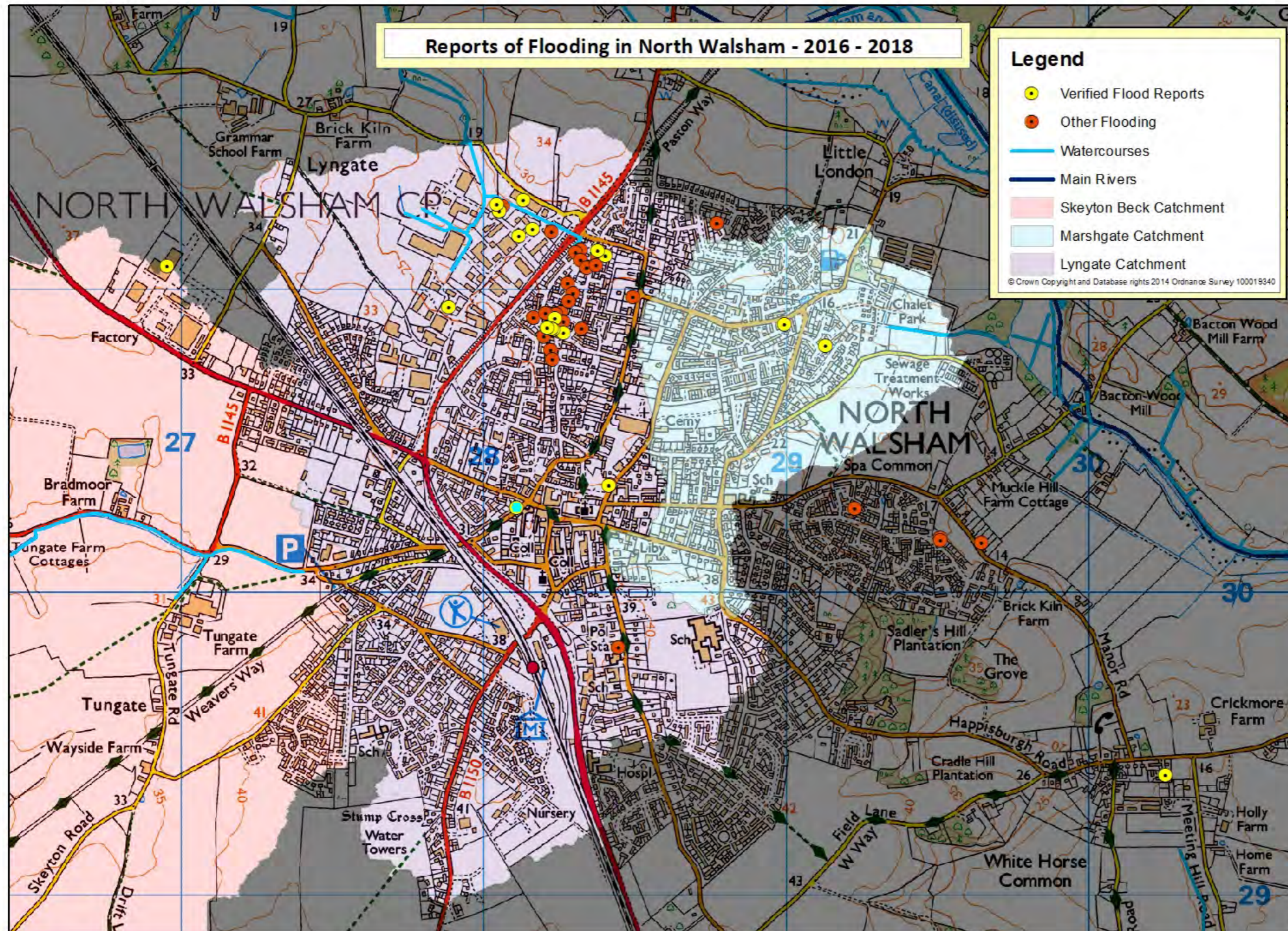
- assess if there is a need to the use their permissive powers to maintain the ordinary watercourse under the Land Drainage Act 1991.

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Overview of catchments and reports of flooding in North Walsham.

The map below (C1) shows the three main catchments in which flood reports have been received: Skeyton Beck, Lyngate, and Marshgate. One report of internal flooding sits outside of the se catchments. The local catchment this property sits within has not been mapped, however the wider catchment that the property sits within can be seen on Page 27.



C1 - Catchment Map: Overview of catchments and flood reports

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 North Walsham in 2016 - 18 as:

- multiple residential properties were internally flooded.
- multiple commercial 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:

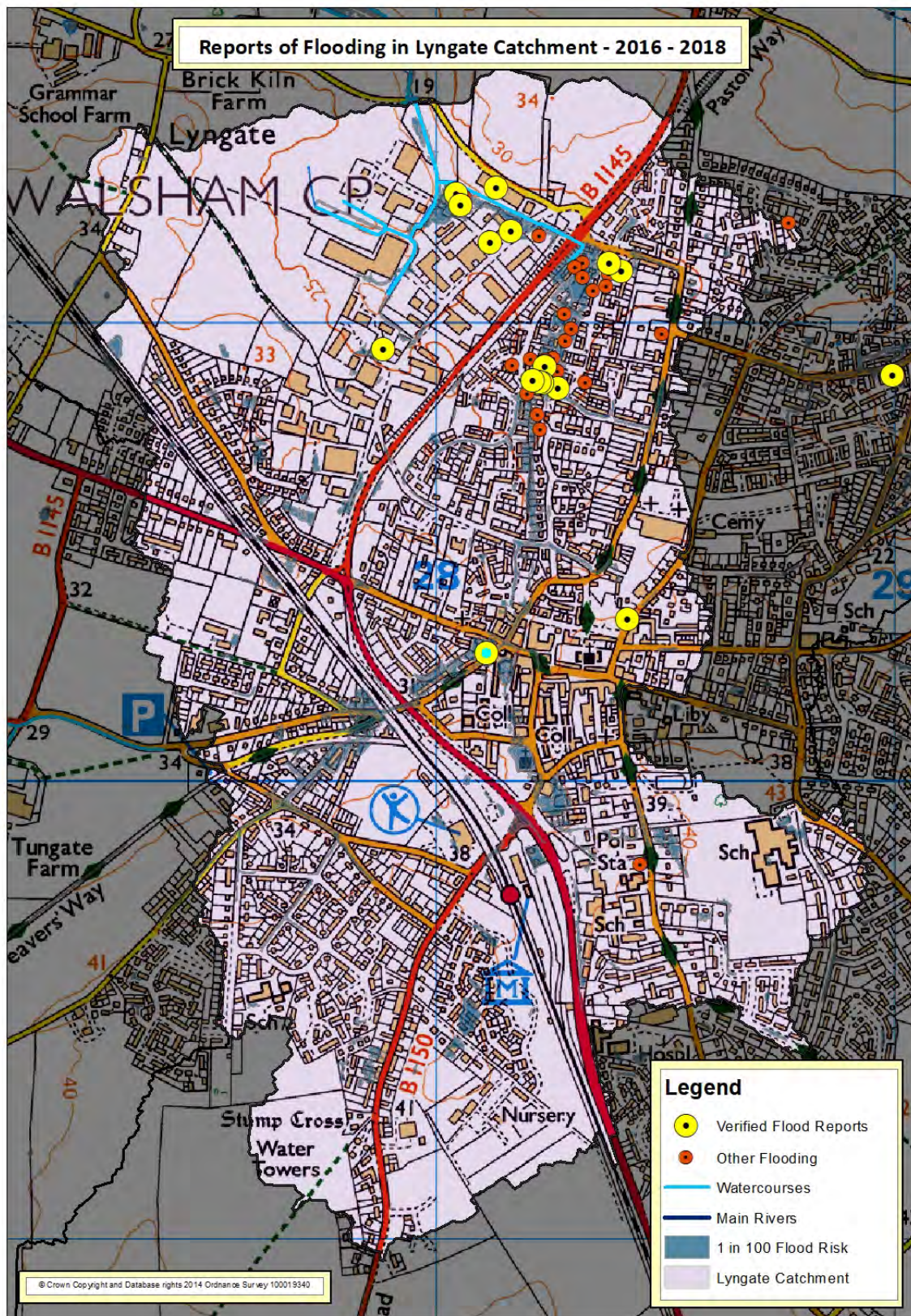
- provide a transparent and consistent review of recent flooding.
- identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- identify what their response has been or will be to the flooding.
- make recommendations as to how the flood risk could be mitigated 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.

Flooding and flood risk within the Lyngate Catchment



C2 - Catchment Map: Lyngate Catchment

Description of catchment

Partly urban catchment containing both residential and business estates. It flows north joining a ditch system and then discharges to the North Walsham and Dilham Canal. This watercourse has been culverted in much of the catchment. Flooding effected the lower reaches of the catchment in the urban area.

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 event and the 1 in 100 event. This assessment does not take into account 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 event:	4	164	39
[b] No. of properties subject to surface water flood risk at 1 in 100 event:	6	309	58
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 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 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 event:	0	0	0

Flood incidents within this catchment

Within this catchment 16 incidents of internal flooding have been assessed as part of this investigation. These incidents are detailed in the table below.

Incident as reported	What was the response to the flood incident
On the 23/06/2016 - 2 properties were internally flooded on Folgate Road (Map D1) , North Walsham. These incidents were reported by a member of the public via: <ul style="list-style-type: none">• an online flood report form on the 2 November 2017, (FWF/16/1/5615)• personal communication on the 22 August 2016, (FWF/16/1/3845)	A member of the public carried out measures to minimise the impact of flooding after the incident. Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
On the 23/06/2016 - 1 property was internally flooded on Hazell Road (Map D2) , North Walsham. This incident was reported by a resident via personal communication on the 22 August 2016, (FWF/16/1/3826)	Residents carried out measures to minimise the impact of flooding after the incident.

<p>On the 23/06/2016 - 5 properties were internally flooded on Lynfield Road (Map D3), North Walsham. These incidents were reported by:</p> <ul style="list-style-type: none"> • a resident via personal communication on the 22 August 2016, (FWF/16/1/3833), (FWF/16/1/3839), (FWF/16/1/3837), (FWF/16/1/3838 • the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/1/3406) 	<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 visited affected residents to offer advice and to gather information during the incident.</p>
<p>On the 23/06/2016 - 1 property was internally flooded on Gymers Way (Map D4), North Walsham. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 27 June 2016, (FWF/16/1/3929)</p>	<p>The landowner carried out measures to minimise the impact of flooding during the incident.</p>
<p>On the 23/06/2016 - 1 property was internally flooded on Bacton Road (Map D5), North Walsham. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 4 July 2016, (FWF/16/1/3945)</p>	<p>The landowner carried out measures to minimise the impact of flooding during the incident.</p>
<p>On the 23/06/2016 - 1 property was internally flooded on Corbett Road (Map D3), North Walsham. This incident was reported by the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/1/3409)</p>	<p>The Fire and Rescue Service responded and pumped out during the incident.</p>
<p>On the 23/06/2016 - 1 property was internally flooded on Cornish Way (Map D1), North Walsham. This incident was reported by a resident via email correspondence on the 20 October 2016, (FWF/16/1/3637)</p>	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p>
<p>On the 23/06/2016 - 1 property was internally flooded on Hipperson Close (Map D2), North Walsham. This incident was reported by a resident via email correspondence on the 11 July 2016, (FWF/16/1/3028)</p>	<p>The landowner carried out measures to minimise the impact of flooding during the incident.</p>
<p>On the 09/08/2017 - 1 property was internally flooded on Cornish Way (Map D6), North Walsham. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 15 August 2017, (FWF/17/1/5280)</p>	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.</p> <p>Norfolk County Council (Highways) assessed the capacity of their drainage system after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p>

On the 02/06/2018 - 1 property was internally flooded on Cornish Way (Map D6) , North Walsham. This incident was reported by a resident via an online flood report form on the 21 June 2018, (FWF/18/1/6725)	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident. Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.
On the 02/06/2018 - 1 property was internally flooded on Alysham Road (Map D6) , North Walsham. This incident was reported by Norfolk County Council (Highways) via an electronic report on the 4 July 2018, (FWF/18/1/6772)	Norfolk County Council (Lead Local Flood Authority) Norfolk County Council assessed validity and impact of the flood report 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.

16 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;

23 June 2016 - 43mm rainfall was recorded as falling in 2 hours 30 minutes at the North Walsham STW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 33 rainfall event.

9 August 2017 - 21mm rainfall was recorded as falling in 8 hours 45 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 13 rainfall event.

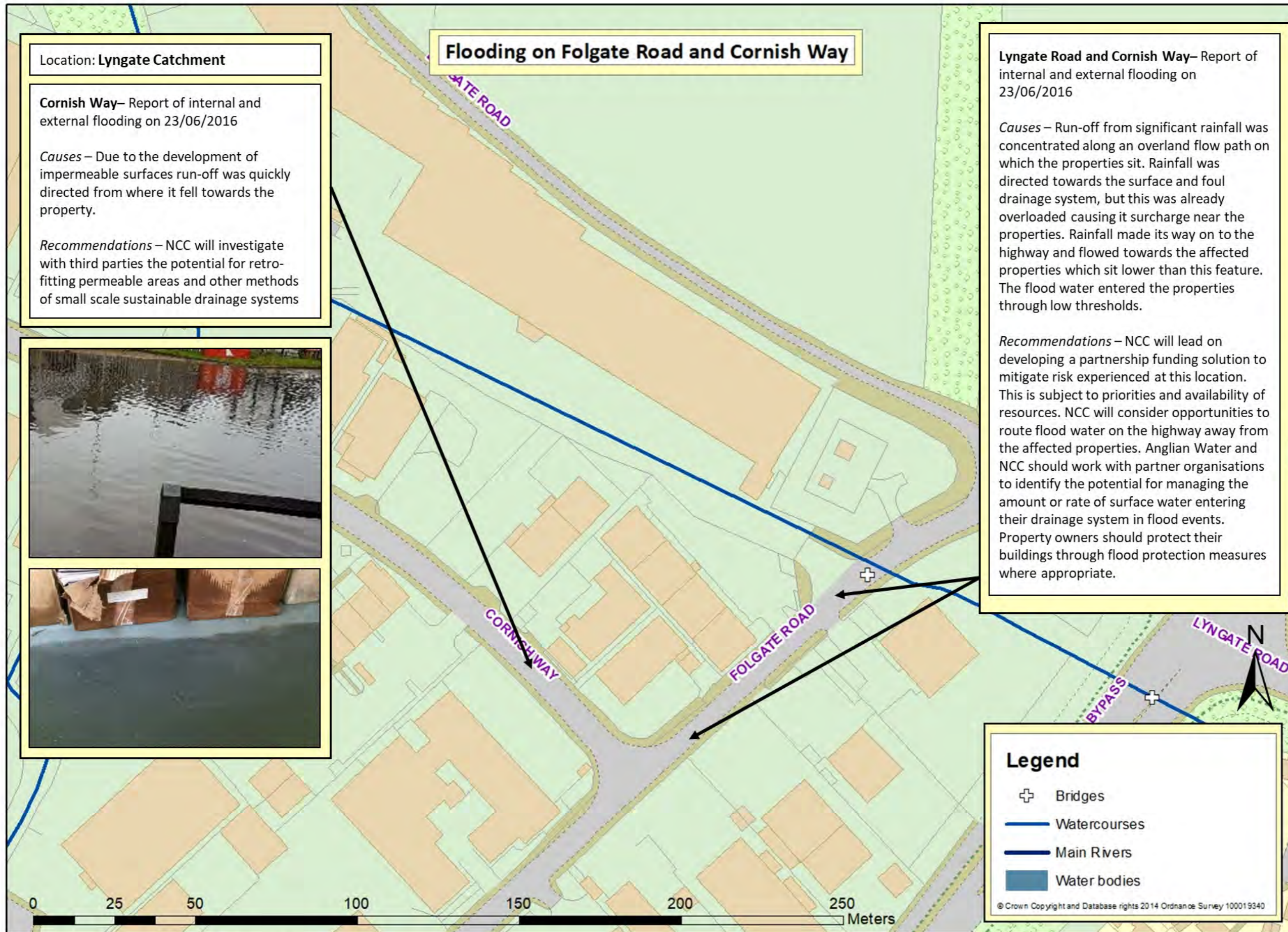
2 June 2018 - 30mm rainfall was recorded as falling in 1 hours 45 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 14 rainfall event.

Historic flooding incidents within the catchment

The only reports of internal flooding that have been recorded within the catchment have been covered throughout the report. The following table lists external flooding incidents within the catchment that have been recorded in the catchment:

Date of incident	Impact	Rainfall intensity
23/06/2016	Three reports of external flooding in the North of the catchment and one report on Bacton Road	1 in 33 rainfall event

10/07/2016	One report of external flooding on Yarmouth Road	Unknown
22/08/2016	Four reports of external flooding in the North of the catchment	Unknown
January 2017	Four reports of external flooding in the North of the catchment	Unknown
09/08/2017	One report of external flooding in the North of the Catchment	22mm of rainfall 1 in 13 event
September 2017	Two reports of external flooding in the North of the catchment	08/09 – 6.2mm of rainfall 29/09 – 2.6mm of rainfall
17/10/2018	One report of external flooding on Norwich Road	Unknown



Flooding on Hipperson Close and Hazell Road

Location: Lyngate Catchment

Hipperson Close and Hazell Road – Report of internal and external flooding on 23/06/2016

The Fire and Rescue Service provided advice and guidance to residents during the incident.

Causes – Run-off from significant rainfall was concentrated along an overland flow path on which the properties sit. Rainfall made its way on to the highway and flowed towards the affected properties which sit lower than this feature. Rainfall was directed towards the drainage system, but this was already overloaded causing it to surcharge near the properties. Flood water entered the properties through low thresholds. The loss of pre-existing drainage features (such as ditches) within the catchment exacerbated the flooding.

Recommendations – NCC will lead on developing a partnership funding solution to mitigate risk experienced at this location. This is subject to priorities and availability of resources. 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 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. Property owners should consider flood protection measures for their property where appropriate. The property owner should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times.



Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

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Location: Lyngate Catchment

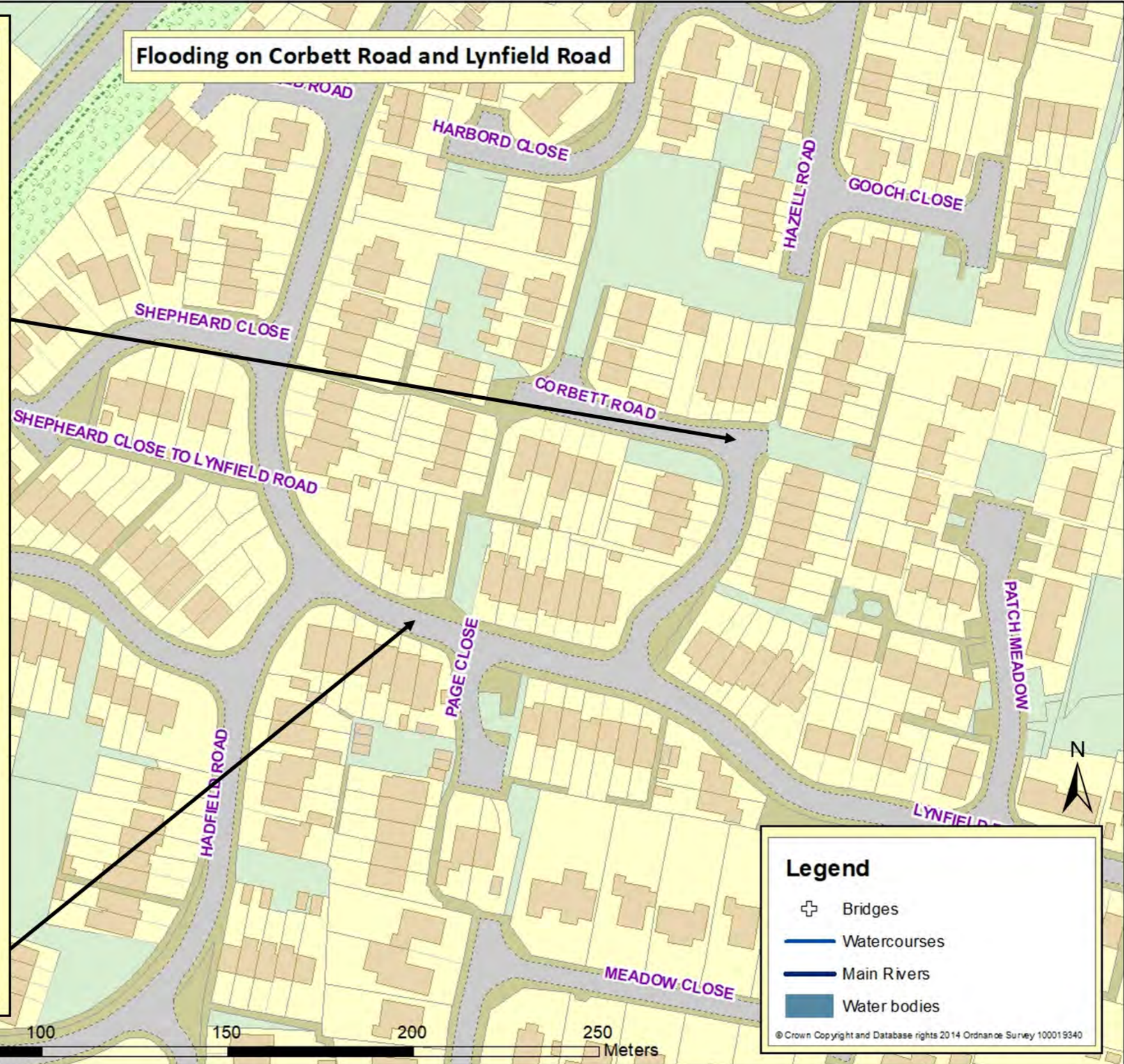
Corbett Road and Lynfield Road– Report of internal and external flooding on 23/06/2016

The fire and rescue service responded and pumped water out during the incidents and residents took measures to reduce the impact of flooding. NCC, Anglian Water, and local bodies met with the residents following the flooding to discuss the incident.

Causes – Run-off from significant rainfall was concentrated along an overland flow path on which the properties sit. Rainfall made its way on to the highway and flowed towards the affected properties which sit lower than this feature. Rainfall was directed towards the foul and surface drainage system, but this was already overloaded causing it surcharge near the properties. Flood water entered the properties through low thresholds. The loss of pre-existing drainage features (such as ditches) within the catchment exacerbated the flooding.

Recommendations – NCC will lead on developing a partnership funding solution to mitigate risk experienced at this location. This is subject to priorities and availability of resources. 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 and Anglian should work with partner organisations to identify the potential for managing the amount or rate of surface water entering their drainage system in flood. Property owners should consider flood protection measures for their property where appropriate. The property owners in the area should instigate a regular regime of maintenance to ensure the system is free from obstruction (i.e. tree leaves / roots) at all times.

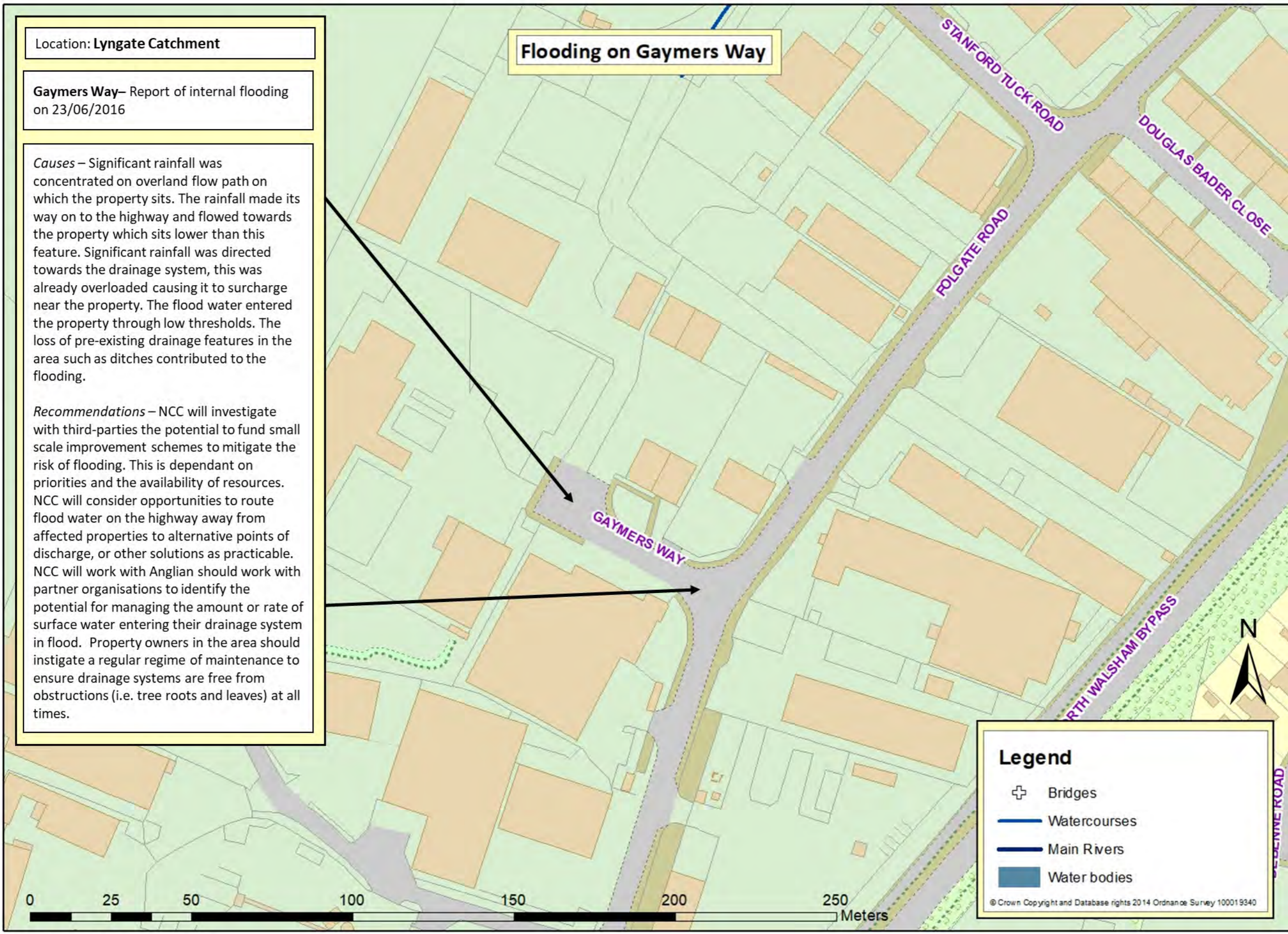
Flooding on Corbett Road and Lynfield Road

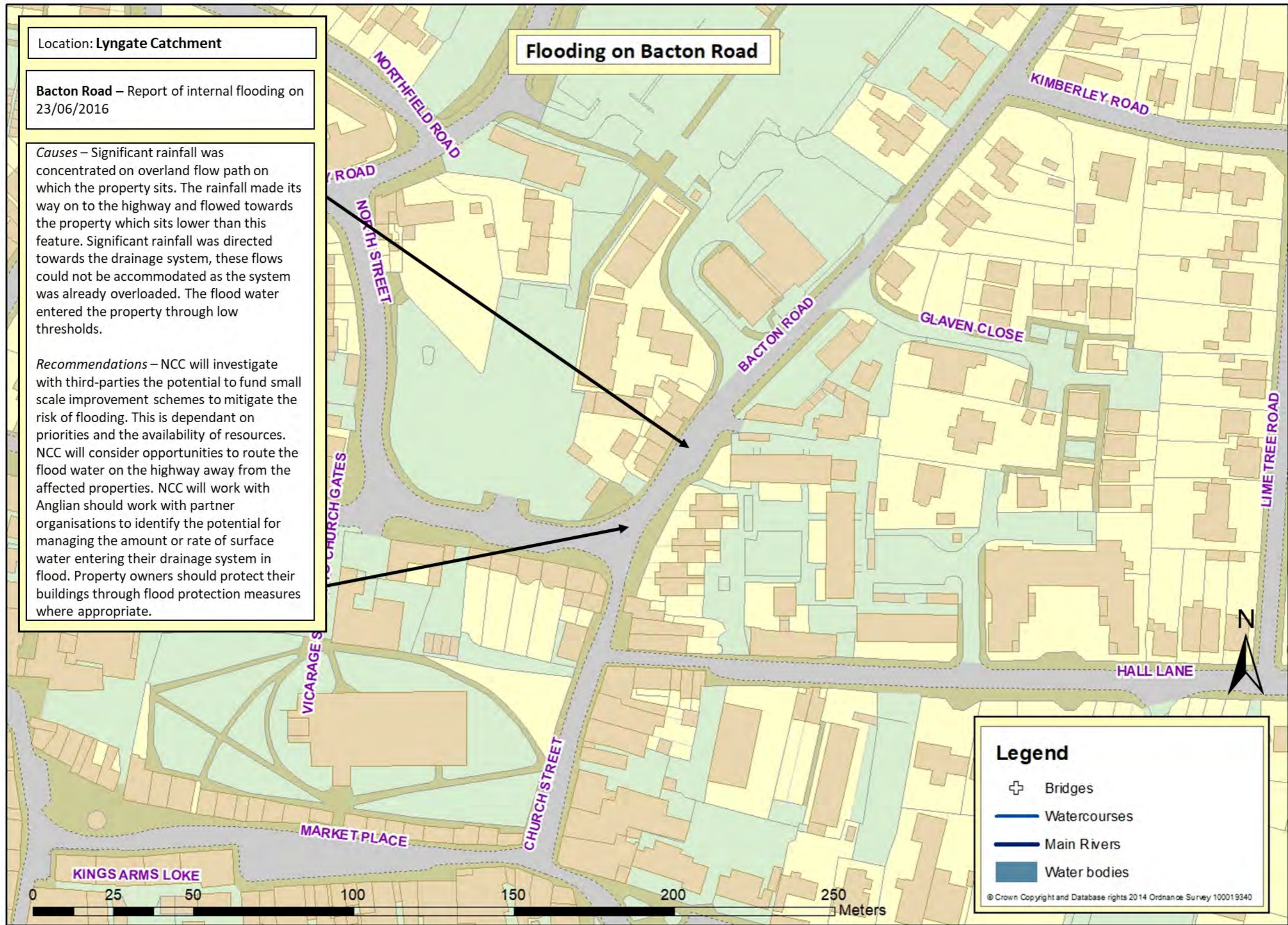


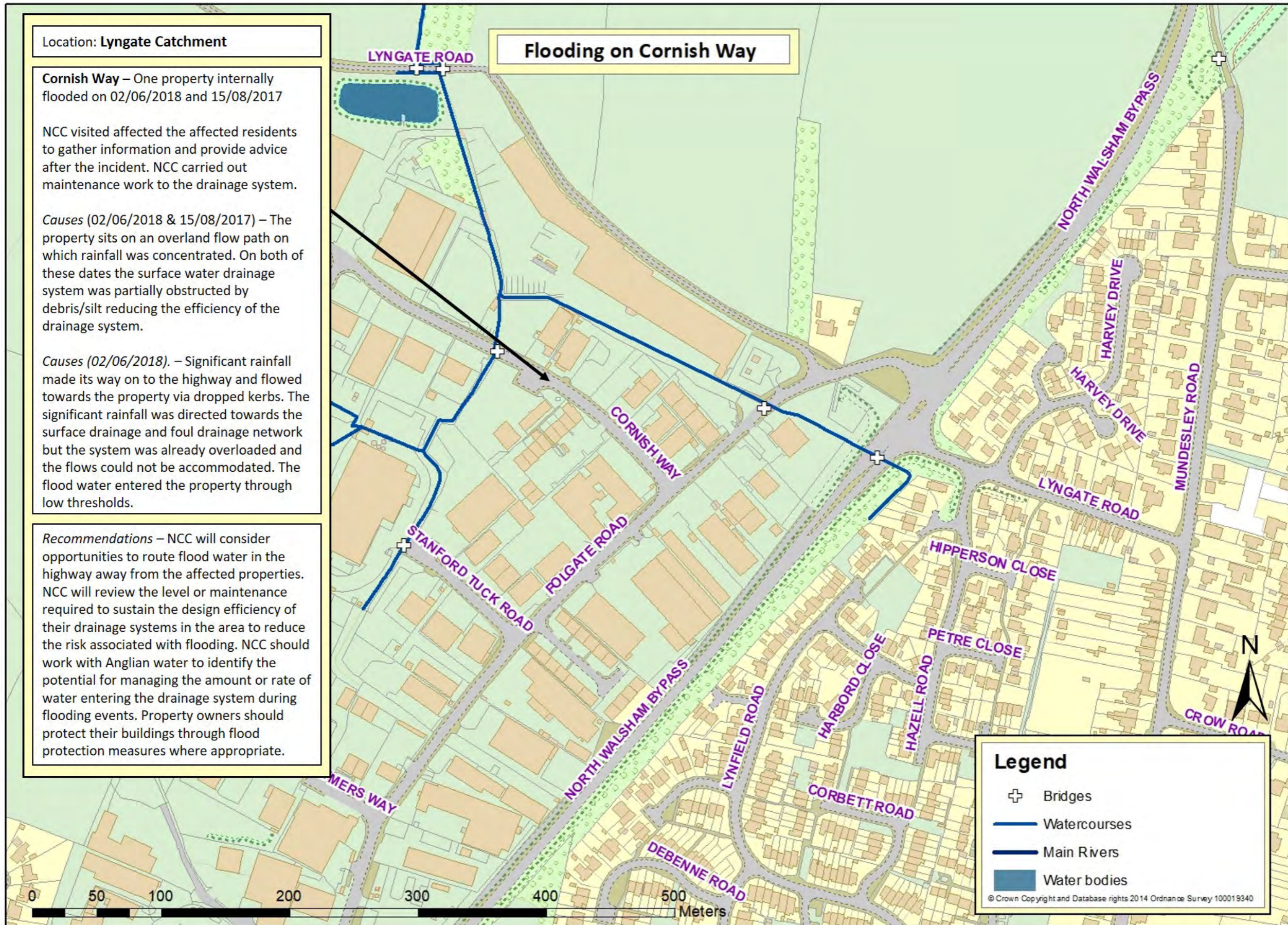
Legend

- ⊕ Bridges
- Watercourses
- Main Rivers
- Water bodies

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Location: **Lyngate Catchment**

Cornish Way – One property internally flooded on 02/06/2018 and 15/08/2017

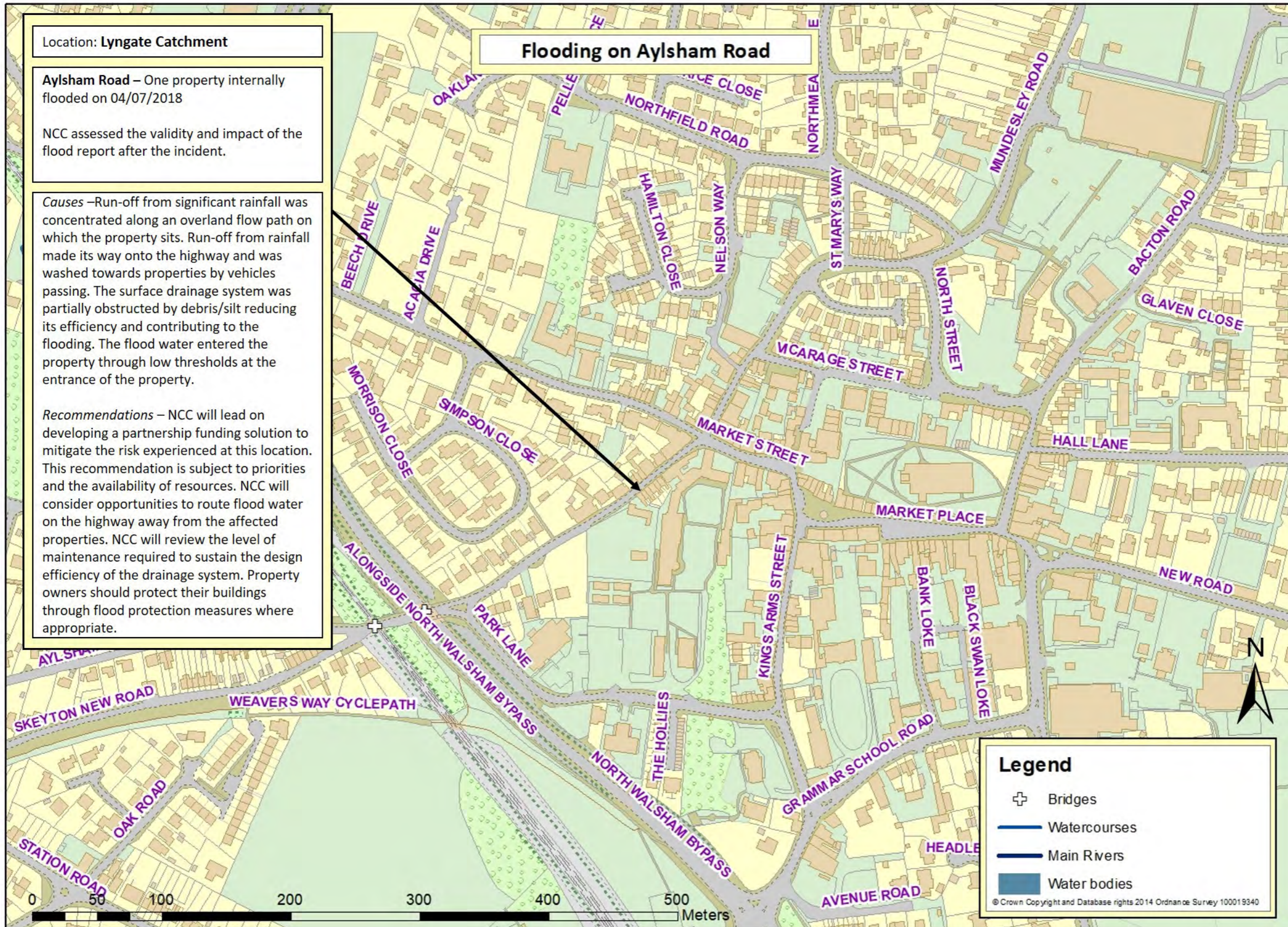
NCC visited affected the affected residents to gather information and provide advice after the incident. NCC carried out maintenance work to the drainage system.

Causes (02/06/2018 & 15/08/2017) – The property sits on an overland flow path on which rainfall was concentrated. On both of these dates the surface water drainage system was partially obstructed by debris/silt reducing the efficiency of the drainage system.

Causes (02/06/2018) – Significant rainfall made its way on to the highway and flowed towards the property via dropped kerbs. The significant rainfall was directed towards the surface drainage and foul drainage network but the system was already overloaded and the flows could not be accommodated. The flood water entered the property through low thresholds.

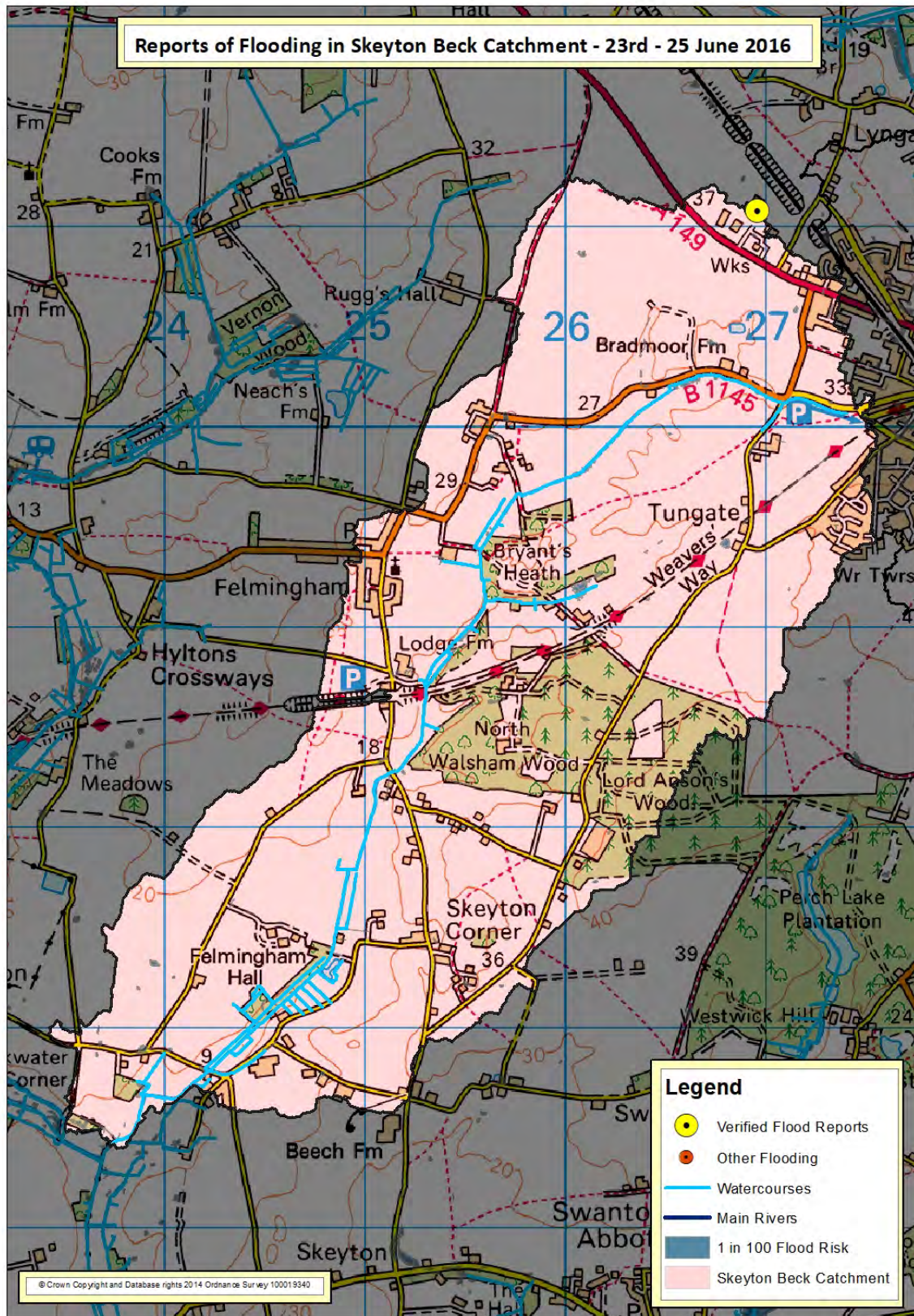
Recommendations – NCC will consider opportunities to route flood water in the highway away from the affected properties. NCC will review the level or maintenance required to sustain the design efficiency of their drainage systems in the area to reduce the risk associated with flooding. NCC should work with Anglian water to identify the potential for managing the amount or rate of water entering the drainage system during flooding events. Property owners should protect their buildings through flood protection measures where appropriate.

D6 – Detailed Map: Cornish Way



D7 – Detailed Map: Aylsham Road

Flooding and flood risk within the Skeyton Beck catchment



C3 - Catchment Map: Skeyton Beck Catchment

Description of catchment

Rural catchment containing Skeyton Beck which flows southwest into Kings Beck and then the River Bure. The areas effected by flooding are in the very upper parts 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 event and the 1 in 100 event. This assessment does not take into account 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 event:	0	1	0
[b] No. of properties subject to surface water flood risk at 1 in 100 event:	0	1	1
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 event:	1	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 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 event:	0	0	0

Flood incidents within this catchment

Within this catchment 1 incident of internal flooding has been assessed as part of this investigation. This incident is detailed in the table below.

Date of Incident	Incident as reported	What was the response to the flood incident
23/06/2016	On the 23/06/2016 - 1 property was internally flooded on Cromer Road (Map D8) , North Walsham. This incident was reported by a member of the public via personal communication on the 22 August 2016, (FWF/16/1/3842)	The Environment Agency 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.

Historic flooding incidents within the catchment

There are no recorded incidents of internal or external flooding within this catchment.

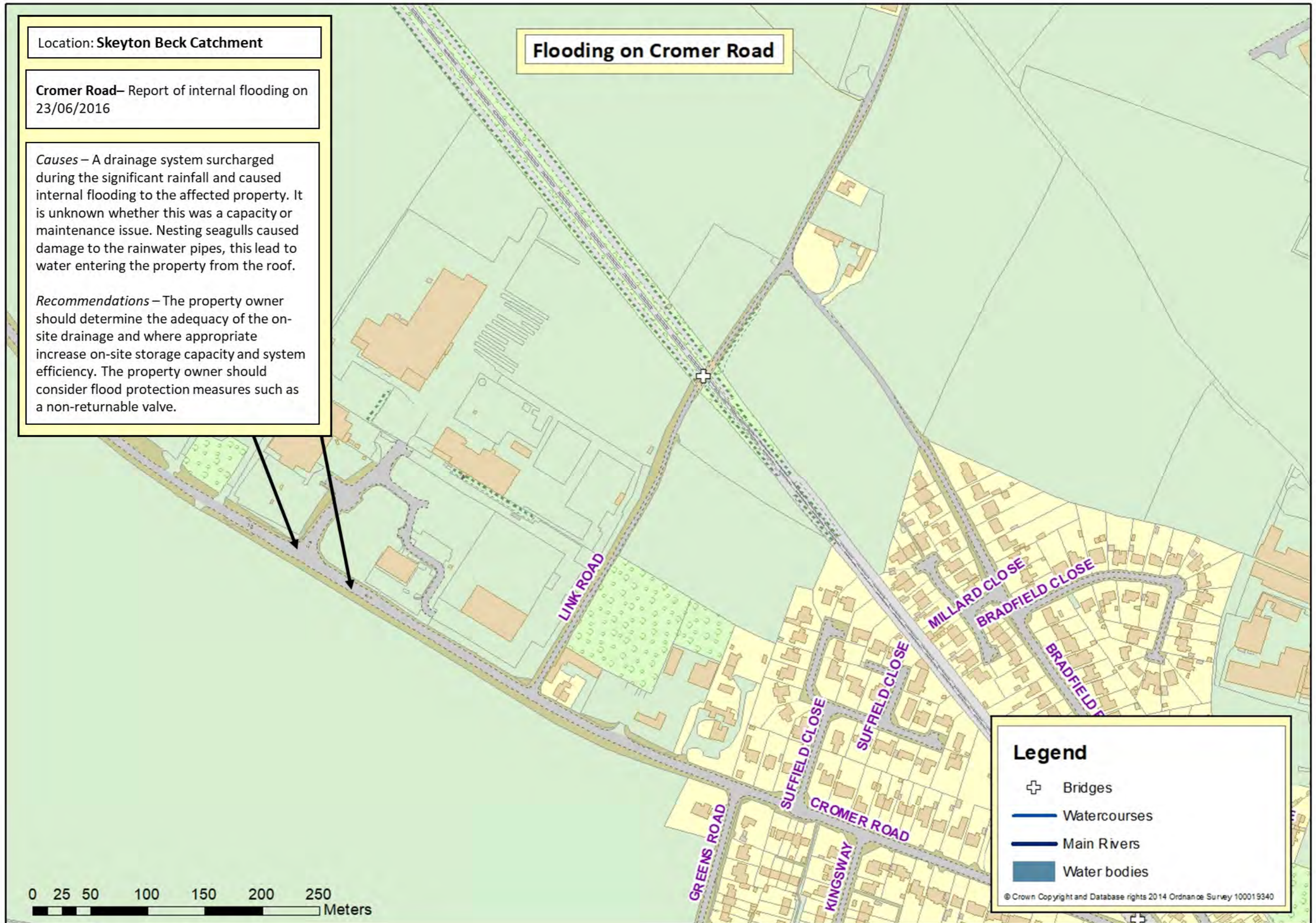
Location: **Skeyton Beck Catchment**

Cromer Road– Report of internal flooding on 23/06/2016

Causes – A drainage system surcharged during the significant rainfall and caused internal flooding to the affected property. It is unknown whether this was a capacity or maintenance issue. Nesting seagulls caused damage to the rainwater pipes, this led to water entering the property from the roof.

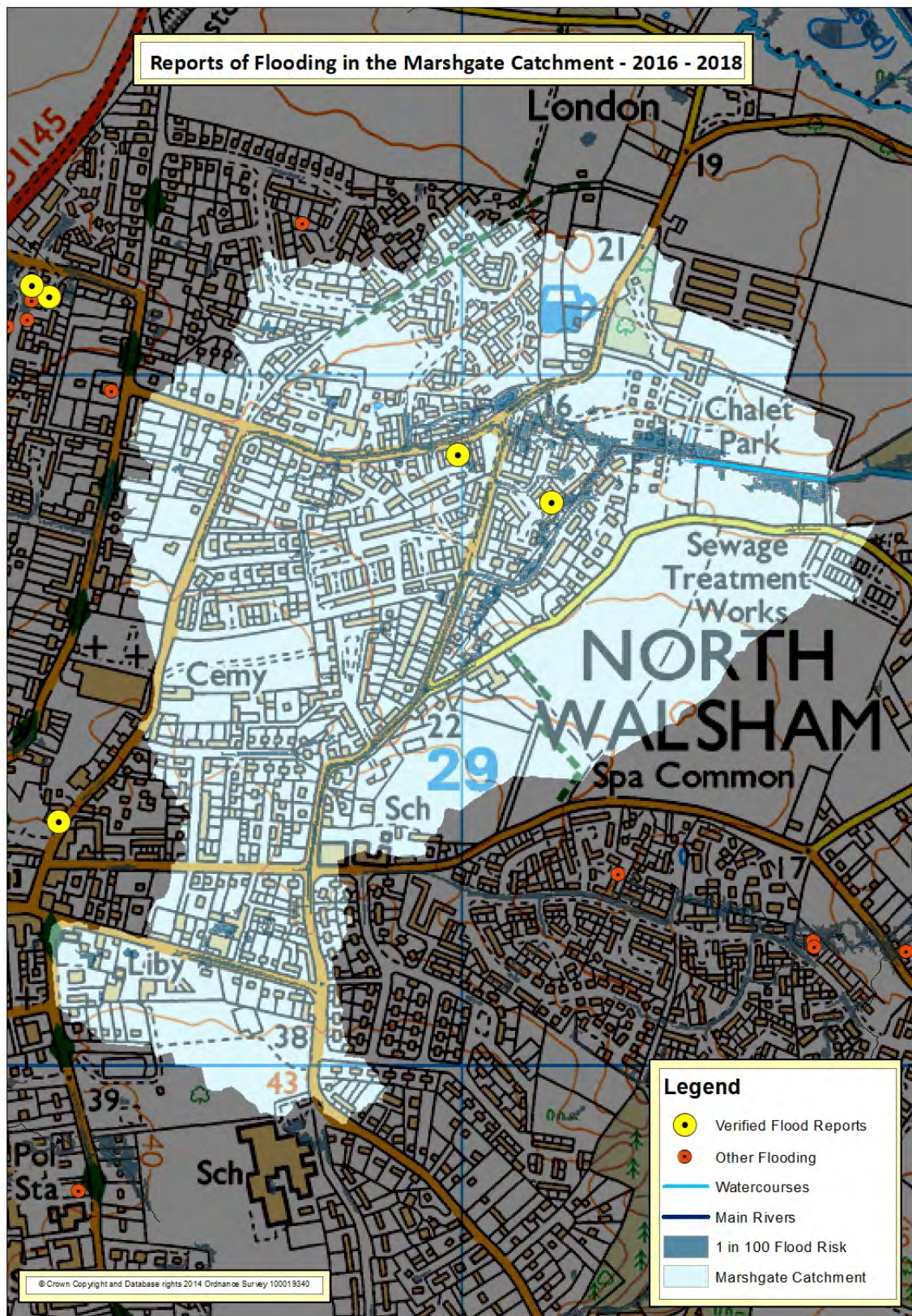
Recommendations – The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency. The property owner should consider flood protection measures such as a non-returnable valve.

Flooding on Cromer Road



D8 – Detailed Map: Cromer Road

Flooding and flood risk within the Marshgate catchment



C4 - Catchment Map: Marshgate

Description of catchment

A small urban catchment which flows east into a ditch system and joins the North Walsham and Dilham Canal.

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 event and the 1 in 100 event. This assessment does not take into account 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 event:	1	39	4
[b] No. of properties subject to surface water flood risk at 1 in 100 event:	1	89	9
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 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 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 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
23/06/2016	On the 23/06/2016 - 1 property was internally flooded on Rye Close (Map D9) , North Walsham. This incident was reported by the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/1/3405)	The Fire and Rescue Service visited affected residents to offer advice and to gather information during the incident.
23/06/2016	On the 23/06/2016 - 1 property was internally flooded on Birch Close (Map D9) , North Walsham. This incident was reported by the Fire and Rescue Service via an electronic report on the 10 July 2016, (FWF/16/1/3354)	The Fire and Rescue Service visited affected residents to offer advice and to gather information during 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;

27 May 2016 - 43mm rainfall was recorded as falling in 2 hours 30 minutes at the North Walsham STW rainfall monitoring station. This intensity of rainfall for the total duration equates to a 33 rainfall event.

Historic flooding incidents within the catchment

The only reports of internal flooding that have been recorded within the catchment have been covered throughout the report. The following table lists external flooding incidents within the catchment that have been recorded in the catchment:

Flooding on Rye Close and Birch Close

Rye Close – Report of internal flooding on 23/06/2016

The fire and Rescue Service attended during the event to offer advice. The resident used sandbags to reduce the impact of flooding.

Causes – Run-off flowed from the highway towards the affected property which sits lower than this feature. Rainfall was directed towards the foul drainage system, this was already overloaded causing it to surcharge at the property.

Recommendations – NCC will consider opportunities to route water on the highway away from the affected property to reduce the risk of flooding. Anglian Water should investigate the potential for providing increased attenuation to reduce the amount of water entering the drainage system.

Location: **Marshgate Catchment**





Birch Close – Report of internal flooding on 23/06/2016

The fire and Rescue Service attended during the event to offer advice. The resident used sandbags to reduce the impact of flooding.

Causes – Rainfall was directed into the surface water system which was already overloaded causing it to surcharge near the property. Flood water entered the property through low thresholds at entrances to the property.

Recommendations – NCC should identify methods of removing excess surface water to alternative points of discharge to reduce risk of flooding. Property owners should protect their properties where appropriate, for example for the use of flood doors.

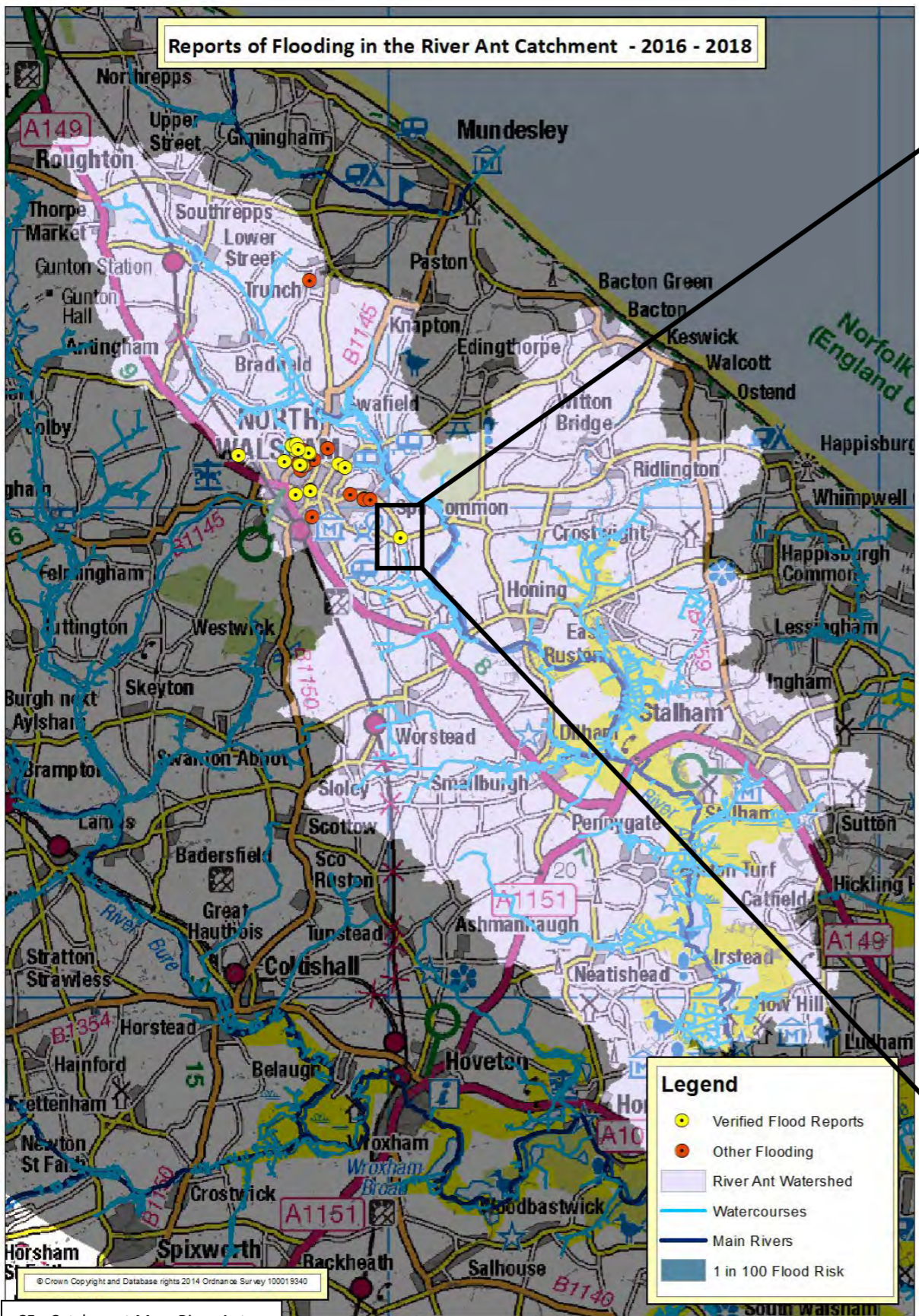
Legend

-  Bridges
-  Watercourses
-  Main Rivers
-  Water bodies

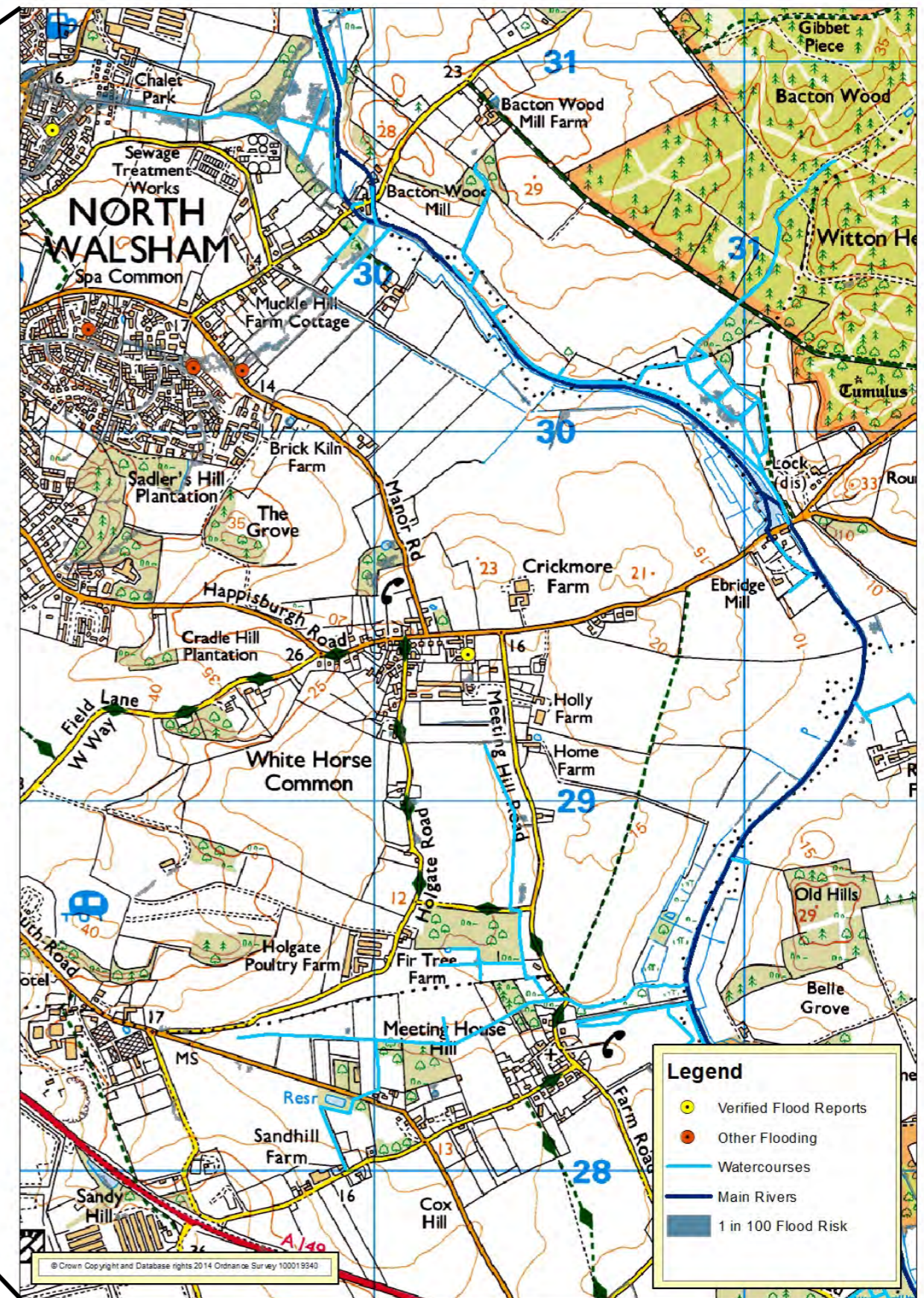
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Reports of Flooding in the River Ant Catchment - 2016 - 2018



C5 - Catchment Map: River Ant



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Description of catchment

As previously stated the local catchment for which one of the property sits has not been mapped. The wider catchment, the River Ant Catchment, is shown above. This is an extensive catchment covering a large area of North Norfolk. For the purpose of this report a localised map of the area surrounding the flooded property at White Horse Common has been shown.

The area around White Horse Common is relatively hilly for the local region. Water flows through the area from the West to East where it outlets into the North Walsham and Dilham Canal which can be seen to the right of the map. The North Walsham and Dilham Canal flows in a southerly direction. The land around White Horse Common is predominately agricultural.

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 event and the 1 in 100 event. This assessment does not take into account 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 event:	12	372	0
[b] No. of properties subject to surface water flood risk at 1 in 100 event:	19	931	191
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 event:	13	314	94
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 event:	19	415	154
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 event:	1	9	3
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 event:	1	35	12

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 White Horse Common (Map D10) , North Walsham. This incident was reported by Norfolk County Council via an electronic report on the 4 July 2018, (FWF/18/1/6771)	Norfolk County Council carried out maintenance work to the highway drainage system after the incident. Norfolk County Council assessed validity and impact of the flood report 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.

1 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 - 30mm rainfall was recorded as falling in 1 hours 45 minutes at the North Walsham rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 14 rainfall event.

Historic flooding incidents within the catchment

The only reports of internal flooding that have been recorded within the catchment have been covered throughout the report.



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.