



Norfolk County Council

Investigation Report into the Countywide Flooding of Summer/Autumn 2022

Report Reference: FIR072

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Executive Summary

This report summarises the causes and recommendations in relation to flooding for seven rainfall events occurring between August and October 2022. The source of flooding was predominately surface water entering properties either via overland flow paths or from drainage systems.

Flooding Incidents and Causes

The flooding that occurred in the locations listed below led to the reported internal flooding of 19 properties. Key causes of flooding vary between the locations and are summarised throughout this report. Common causes between properties include surface water flow from highways entering properties through low thresholds and overloading surface water drainage systems causing flooding. In some instances, vehicles using the highway passed through the flood water causing it to wash towards the affected properties.

Road Name	Area	District	Properties Flooded
Extons Place	King's Lynn	Borough Council of King's Lynn and West Norfolk	2
Low Road	Grimston	Borough Council of King's Lynn and West Norfolk	2
Diamond Street	South Lynn	Borough Council of King's Lynn and West Norfolk	1
Brandon Court	Brundall	Broadland District Council	1
Hemblington Road	Strumpshaw	Broadland District Council	1
Reedham Road	Acle	Broadland District Council	1
Kittens Lane	Loddon North	South Norfolk Council	5
Hall Lane and Row Hill	West Winch:	Borough Council of King's Lynn and West Norfolk	6

Key Recommendations

A common cause of flooding to the properties in this report is the pooling of water at a low spot on the highway. This is caused by surface water flowing along the highway or by the surcharging of surface water systems. Common recommendations include:

1. Routing flood water away from the properties.
2. Reviewing maintenance regimes.
3. Property level flood protection methods.

Following flooding to people, property, and infrastructure the following recommendations are made in three areas:

1. Risk Management Authorities should:
 - a) Communicate with affected residents where their assets have given rise to the flooding of properties.
 - b) Review the appropriateness of their response to flooding.
 - c) 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.
2. Property owners of affected properties should seek their own legal advice.
3. Norfolk County Council (LLFA) should:
 - a) Incorporate all relevant information of actual flooding into the review of the Norfolk Preliminary Flood Risk Assessment (PFRA).
 - b) Review and monitor the delivery of recommendations within this and other relevant flood investigation 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 that an investigation will be undertaken where it is determined that:

1. There is ambiguity surrounding the source or responsibility for a flood incident, and/or
2. 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:

- a) Any risk to loss of life or serious injury.
- b) One or more residential or business property flooded internally.
- c) 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.
- d) 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.
- e) Flooding adversely impacting a rail link by making it impassable.

In this instance it was deemed necessary to complete a formal investigation as multiple residential and business properties flooded internally.

This impact met the County Council's threshold for undertaking a formal flood investigation and the flood investigation report aims to:

- i) Provide a transparent and consistent review of recent flooding.
- ii) Identify those organisations and individuals who have responsibility to manage the causes of the flooding.
- iii) Identify what their response has been or will be to the flooding.
- iv) Make recommendations as to how the flood risk could be mitigated or reduced.
- v) 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.

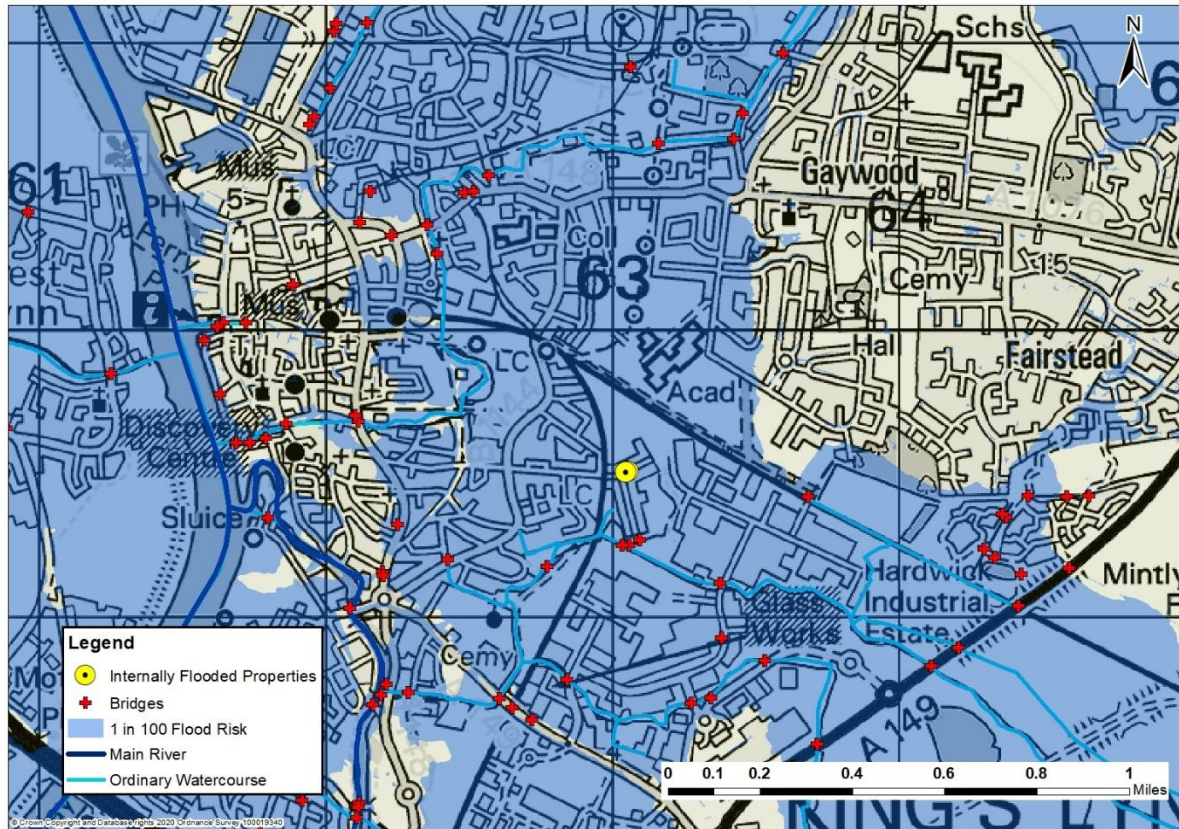
Mitigation measures include property level protection, reinstating lost drainage features, reviewing, or increasing maintenance regimes and increasing the capacity of the drainage network.

The flood investigation report cannot:

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

Borough Council of King's Lynn and West Norfolk

Flooding and Flood Risk Within Extons Place, King's Lynn Area



Map Showing Location of Flooded Properties in Extons Place, King's Lynn.

Description of Area

King's Lynn is an urbanised low-lying area adjacent to the River Ouse. Catchments and flow paths are not clearly defined. Extons Place is in a low spot, at approximately three metres above ordnance datum within the King's Lynn Internal Drainage Board area. This area is served by a surface water drain which is maintained by Norfolk County Council (Highways), this outfalls to an open watercourse at the east end of the Extons Place. There is also an Anglian Water foul sewer serving the properties.

Flood Incidents Within the Area

Within the area two 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	Response to the Flood Incident
18 August 2022	<p>On the 18 August 2022 - two properties were internally flooded on Extons Place, King's Lynn. These incidents were reported by:</p> <ul style="list-style-type: none">• A resident via an online flood report form on the 18 August 2022 (FWF/22/6447)• A resident via a flood questionnaire on the 22 November 2022 (FWF/22/6522).	<p>Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p>

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 incident of flooding within the area.

Historic Flooding Incidents Within the Area

No historic flood incidents have been reported to the LLFA.

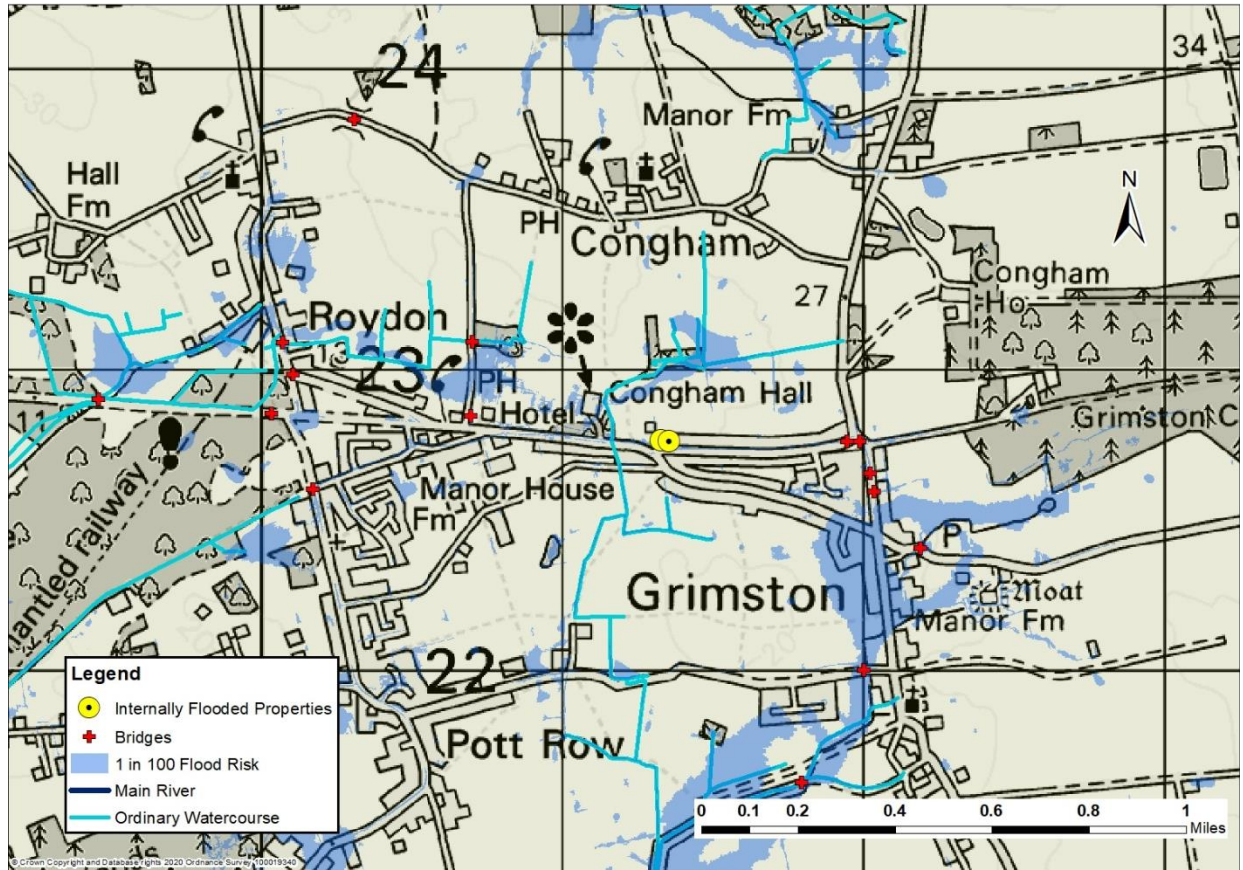
Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Extons Place, King's Lynn, 18 August 2022</p>	<p>Surface run-off from significant rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. The surface water drainage system and outfall and watercourse downstream were obstructed by debris or silt/high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p>	<p>Norfolk County Council (Highways) and Kings Lynn Internal Drainage Board should 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. This should include consideration of all assets contributing to the flooding.</p> <p>Anglian Water should investigate the foul sewer to the rear of the properties and establish whether system is in fact a combined system, is blocked or has insufficient capacity.</p>	<p>Norfolk County Council (Highways)</p> <p>Kings Lynn Internal Drainage Board</p> <p>Anglian Water</p>

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Extons Place, King's Lynn, 18 August 2022</p>	<p>The flood water entered the properties through low thresholds at entrances and air bricks.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.</p>	<p>Property Owners Norfolk County Council (LLFA)</p>

Borough Council of King's Lynn and West Norfolk

Flooding and Flood Risk Within Low Road, Grimston Area



Map Showing Location of Flooded Properties in Low Road, Grimston

Description of Area

The flooded properties are located at a low spot on the edge of a village of Grimston within the large Gaywood River Catchment. The flow paths flow westerly into a main drain within the King's Lynn Internal Drainage Board area and then on to the River Ouse. Low Road is served by a surface water drain maintained by Norfolk County Council (Highways). This drain outfalls into a ditch north of Lynn Road

Flood Incidents Within the Area

Within the area two 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	Response to the Flood Incident
25 August 2022	<p>On the 25 August 2022 - one property was internally flooded on Low Road, Grimston. This incident was reported by:</p> <ul style="list-style-type: none">• A resident via personal communication on the 6 December 2022 (FWF/22/6677)	<p>Norfolk County Council as Lead Local Flood Authority (LLFA) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the open water course of the incident (within 2 hour response time). Further downstream ditch clearance took place in October 2022. Gulley maintenance is on an annual cycle.</p>
16 August 2022	<p>On the 16 August 2022 - one property was internally flooded on Low Road, Grimston. This incident was reported by:</p> <ul style="list-style-type: none">• Norfolk County Council (Highways) via an electronic report on the 31 August 2022 (FWF/22/6468)	<p>Norfolk County Council as Lead Local Flood Authority (LLFA) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.</p> <p>Norfolk County Council (Highways) carried out maintenance work to the open water course on 25 August 2023. Further downstream ditch clearance took place in October 2022. Gulley maintenance is on an annual cycle.</p>

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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.

Two of the incidents (100%) of internal flooding in the area are within 2.5km of a rain gauge. The calculated return period for the flood event on 25 August 2022 is 1 in 3 to 4 years. The calculated return period for the flood event on 16 August 2022 is 1 in 50 years.

Historic Flooding Incidents Within the Area

The following table lists flooding incidents within the area that have been recorded.

Date of Incident	Impact	Return Period
14 September 2021	One property flooded internally (Further information can be found in FIR068).	1 in 5 to 6 years.

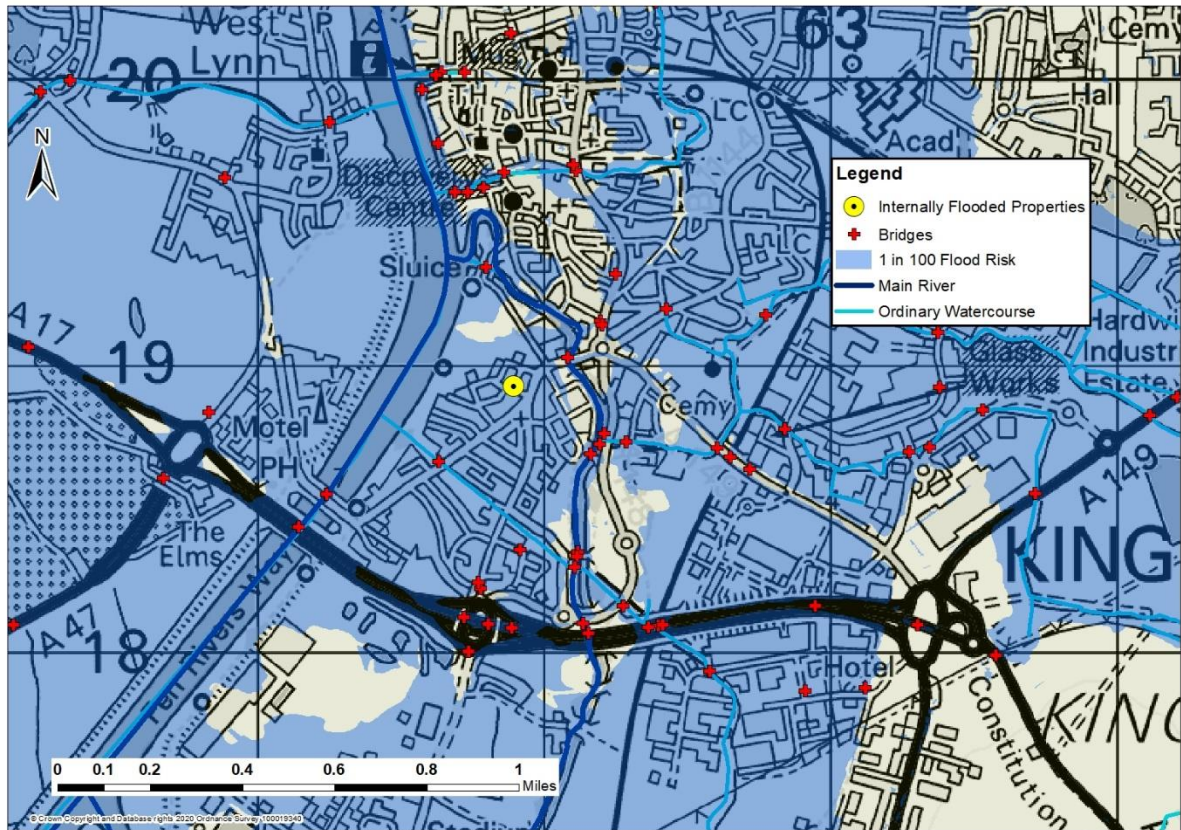
Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Low Road, Grimston, 25 August 2022</p> <p>Low Road, Grimston, 16 August 2022</p>	<p>Significant rainfall was concentrated on the highway and pooled at a low point within the area.</p> <p>The surface water drainage system outfalls to a watercourse. The watercourse was partially obstructed by debris and silt downstream, both within the watercourse and where screens have been installed on structures. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties.</p>	<p>Norfolk County Council (Highways) and riparian owners should instigate a regular regime of maintenance to ensure the system is free from obstruction at all times.</p> <p>Riparian owners to consider whether screens are required to prevent the blockage of the structures and remove these where they are not required.</p> <p>Norfolk County Council (Highways) should undertake survey of the existing drainage system.</p>	<p>Riparian owners</p> <p>Norfolk County Council (Highways)</p>

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Low Road, Congham 25 August 2022</p> <p>Low Road, Congham 16 August 2022</p>	<p>The flood water entered the properties through thresholds at entrances</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.</p>	<p>Property Owners</p> <p>Norfolk County Council (LLFA)</p>

Borough Council of King's Lynn and West Norfolk

Flooding and Flood Risk Within Diamond Street, South Lynn Area



Map Showing Location of Flooded Properties in Diamond Street, South Lynn.

Description of Area

King's Lynn is an urbanised low-lying area adjacent to the river Ouse. Catchments and flow paths are not clearly defined in this area due to the flat topography. Diamond Street is in a low spot, at approximately three metres above ordnance datum. This area is served by a surface water drain maintained by Norfolk County Council (Highways), this drains to an Anglian Water combined sewer. Roof water discharges to the road and enters the gullies on the highway. There is also an Anglian Water foul sewer in the road.

Flood Incidents Within the Area

Within the area one 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	Response to the Flood Incident
17 August 2022	On the 17 August 2022 - one property was internally flooded on Diamond Street, King's Lynn. This incident was reported by: <ul style="list-style-type: none">A Norfolk County Councillor via email correspondence on the 13 October 2022 (FWF/22/6566).	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and gather information after the incident.
18 June 2023	On the 18 June 2023 - one property was internally flooded on Diamond Street, King's Lynn. This incident was reported by: A Norfolk County Councillor via email correspondence on the 18 June 2023 (FWF/23/6999).	Norfolk County Council (Lead Local Flood Authority) contacted affected residents to gather information after the incident. Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 incident of flooding within the area.

Historic Flooding Incidents Within the Area

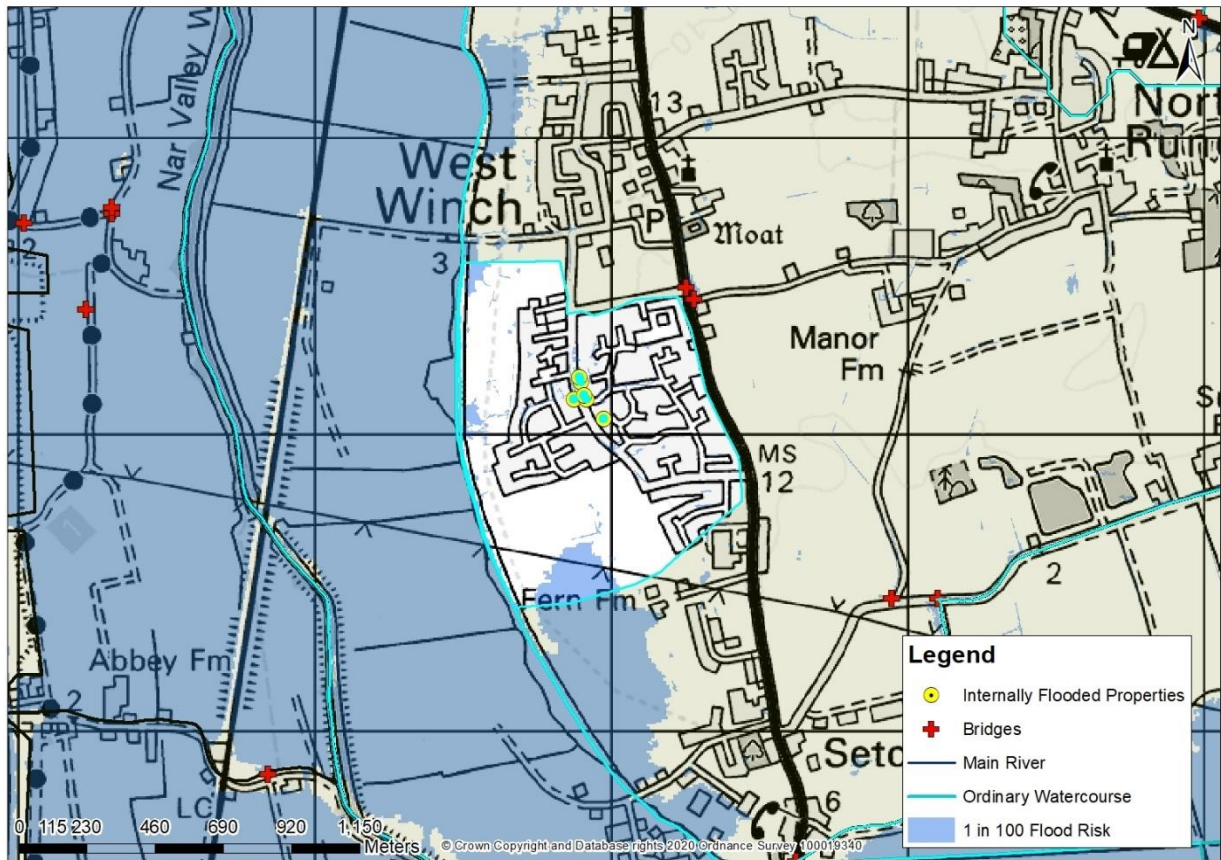
No historic flood incidents have been reported to the LLFA.

Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
Diamond Street, King's Lynn, 17 August 2022, 18 June 2023	<p>Surface run-off from significant rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.</p> <p>The surface water drainage system and outfall were obstructed by debris or silt/high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.</p>	<p>Norfolk County Council (Highways) should consider developing a solution to mitigate the risk experienced at this location. This may include the following:</p> <ul style="list-style-type: none">• An assessment of the capacity of the current system to ascertain if it is able to provide protection that aligns with British Standards.• Routing of flood water away from the affected properties.• Survey of the existing system.• A 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 (Highways)

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Diamond Street, King's Lynn, 17 August 2022, 18 June 2023</p>	<p>The flood water entered the properties through low thresholds at entrances and the air bricks.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.</p>	<p>Property Owners Norfolk County Council (LLFA)</p>

Borough Council of King's Lynn and West Norfolk
Flooding and Flood Risk Within West Winch Area



Map Showing Puny Drain Catchment and the Location of Flooded Properties in Hall Lane and Row Hill, West Winch.

Description of the Area

The flooded properties are in West Winch in the centre of the Puny Drain Catchment, a large catchment covering rural and urban areas. West Winch is adjacent to the Downham Market Group of Internal Drainage Boards which includes the Puny Drain and the river Nar. The catchment drains to the north and drains into the River Ouse at King's Lynn. Row Hill is served by an Anglian Water surface water sewer, Hall Lane is served by a surface water drain maintained by Norfolk County Council (Highways) which drains to an Anglian Water sewer which flows west on Fir Tree Drive and outfalls to Puny Drain. The gullies on both Hall Lane and Row Hill are maintained by Norfolk County Council (Highways).

Flood Risk Within the Area

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 using the Environment Agency national flood risk mapping. 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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	5	0
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	1	30	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] Number 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] Number 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 the Area

Within the area six 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	Response to the Flood Incident
17 August 2022	<p>On the 17 August 2022 - five properties were internally flooded on Hall Lane, West Winch. These incidents were reported by:</p> <ul style="list-style-type: none"> • The Borough Council of King's Lynn and West Norfolk via email correspondence on the 22 August 2022 (FWF/22/6454) • The Borough Council of King's Lynn and West Norfolk via email correspondence on the 22 August 2022 (FWF/22/6565) • A resident via a flood questionnaire on the 13 September 2022 (FWF/22/6535) • The Borough Council of King's Lynn and West Norfolk via email correspondence on the 22 August 2022 (FWF/22/6507) • The Borough Council of King's Lynn and West Norfolk via email correspondence on the 22 August 2022 (FWF/22/6506) 	<p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system 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>
17 August 2022	<p>On the 17 August 2022 - one property was internally flooded on Row Hill, West Winch. This incident was reported by:</p> <ul style="list-style-type: none"> • The Borough Council of King's Lynn and West Norfolk via email correspondence on the 21 September 2022 (FWF/22/6527) 	<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 Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 the area.

Historic Flooding Incidents Within the Area

No historic flood incidents have been reported to the LLFA, however, external flooding is known to have affected neighbouring properties.

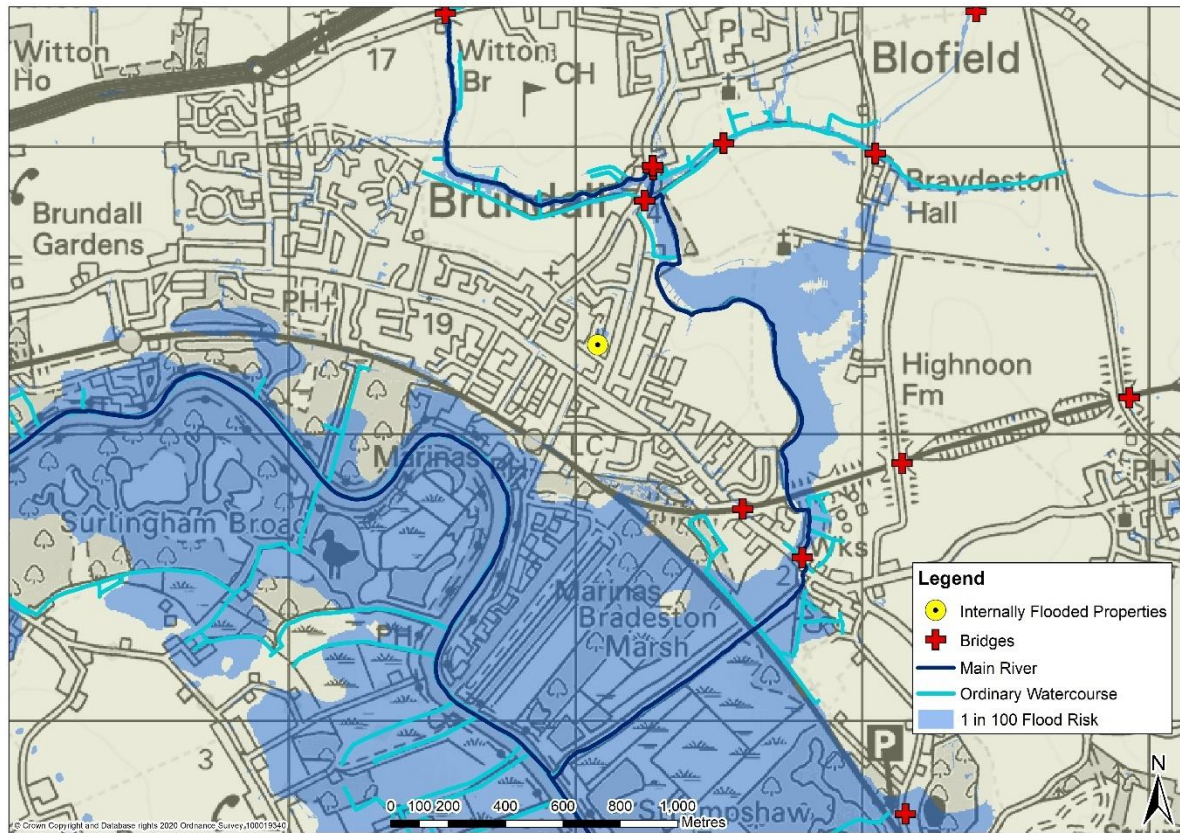
Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Hall Lane, West Winch, 17 August 2022</p> <p>Row Hill, West Winch, 17 August 2022</p>	<p>Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features. Vehicles using the highway passed through the flood water causing it to wash towards the affected properties. Water was then 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.</p>	<p>Norfolk County Council (Highways) to keep a regular maintenance regime to prevent drainage system becoming blocked.</p> <p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forth coming, or residents are unwilling to wait.</p>	<p>Norfolk County Council (Highways)</p>

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
Row Hill, West Winch 17 August 2022	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.	Anglian Water 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.	Anglian Water

Broadland District Council

Flooding and Flood Risk Within Brandon Court, Brundall



Map Showing Location of Flooded Properties in Brandon Court, Brundall.

Description of Area

The flooded property is in an urbanised area within the large Lackford Run catchment. The catchment is drained by the Witton Run, a main drain within the Broads Internal Drainage Board and it flows into the river Yare. This area is served by a surface water drain and gullies maintained by Norfolk County Council (Highways). There is also an Anglian Water foul sewer.

Flood Incidents Within the Area

Within the area one 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	Response to the Flood Incident
16 August 2022	<p>On the 16 August 2022 - one property was internally flooded on Brandon Court, Brundall. This incident was reported by:</p> <ul style="list-style-type: none">• A resident via a flood questionnaire on the 28 September 2022 (FWF/22/6530).	<p>Norfolk County Council (Highways) assessed the capacity of their drainage system after the incident and carried out improvement work to the highway drainage system.</p> <p>Norfolk County Council as Lead Local Flood Authority (LLFA) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.</p>

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 incident of flooding within the area.

Historic Flooding Incidents Within the Area

No historic flood incidents have been reported to the LLFA.

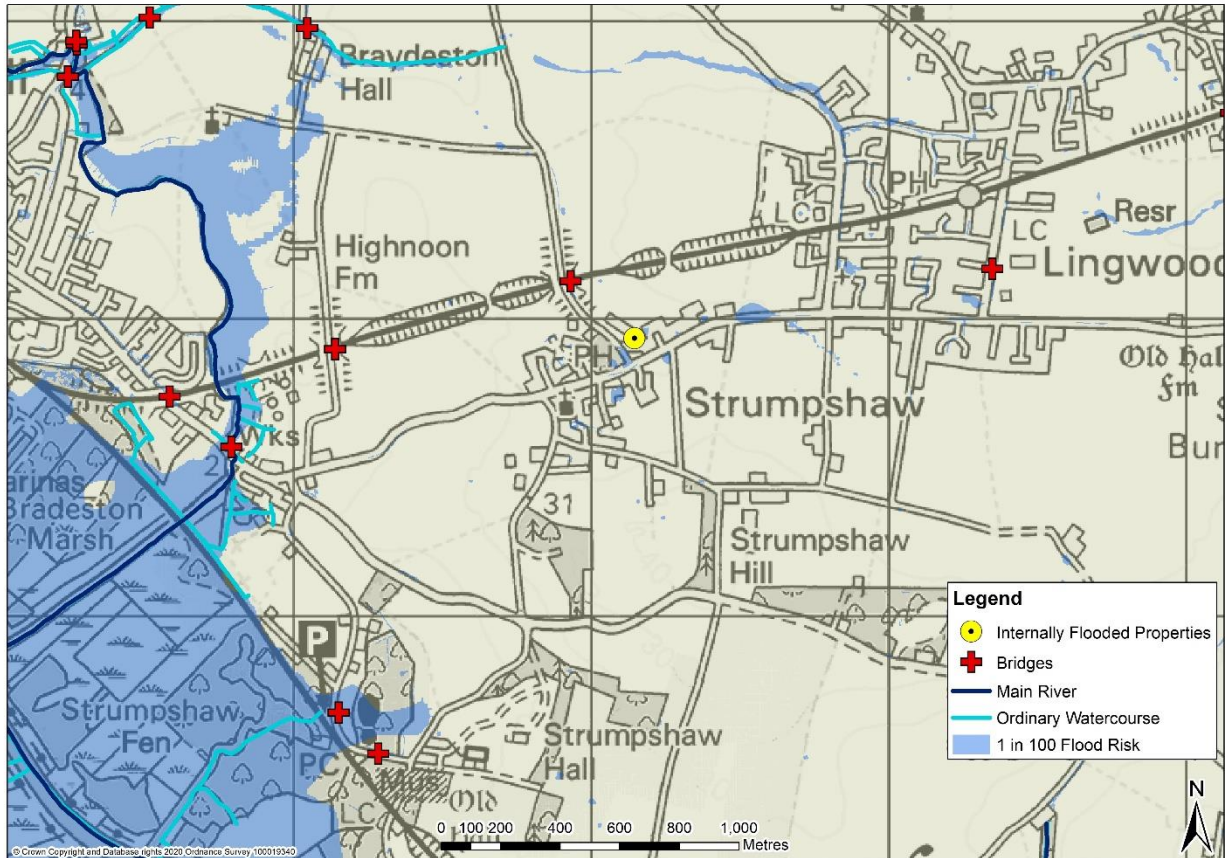
Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
Brandon Court, Brundall, 16 August 2022	Surface run-off from rainfall made its way onto the highway and flowed along the road network and onto the accesses of affected properties that were situated lower than these features.	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forth coming, or residents are unwilling to wait.</p>	Property owners
Brandon Court, Brundall, 16/08/2022	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 properties. This was due to the infiltration of surface water into existing drainage networks.	<p>Norfolk County Council (Highways) should 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. This should include consideration of all Highways' assets contributing to the flooding.</p> <p>Norfolk County Council (Highways) should consider opportunities to route flood water away from affected properties.</p>	<p>Norfolk County Council (Highways)</p> <p>Property owners</p>

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
		Property owners to maintain their drainage systems to ensure they are operating effectively	

Broadland District Council

Flooding and Flood Risk Within Hemblington Road, Strumpshaw Area



Map Showing Location of Flooded Properties in Hemblington Road, Strumpshaw

Description of Area

The flooded property is located at a low spot off the main thoroughfare on the edge of Strumpshaw within the large Lackford Run catchment. The catchment is drained by the Witton Run, a main drain within the Broads Internal Drainage Board and it flows into the river Yare. The gullies on Hemblington Road drain via a short pipe to the wooded area on the west side of the road.

Flood Incidents Within the Area

Within the area one 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	Response to the Flood Incident
16 August 2022	<p>On the 16 August 2022 - one property was internally flooded on Hemblington Road, Strumpshaw. This incident was reported by:</p> <ul style="list-style-type: none">• A resident via email correspondence on the 25 August 2022 (FWF/22/6466).	Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 incident of flooding within the area.

Historic Flooding Incidents Within the Area

The following table lists flooding incidents within the area that have been recorded.

Date of Incident	Impact	Return Period
06 April 2012	External flooding to one property on Hemblington Road, Strumpshaw.	Not known.
20 February 2013	External flooding to one property on Hemblington Road, Strumpshaw.	Not known.
13 July 2014	External flooding to one property on Hemblington Road, Strumpshaw.	Not known.
08 October 2014	Internal flooding to one property on Hemblington Road, Strumpshaw.	Not known.
19 October 2014	External flooding to one property on Hemblington Road, Strumpshaw.	Not known.
23 November 2014	External flooding to two properties on Hemblington Road, Strumpshaw.	Not known.
12 July 2016	External flooding to one property on Brickfields, Strumpshaw.	Not known.
13 July 2016	External flooding to one property on Beech Drive and one property on Hemblington Road, Strumpshaw.	Not known.

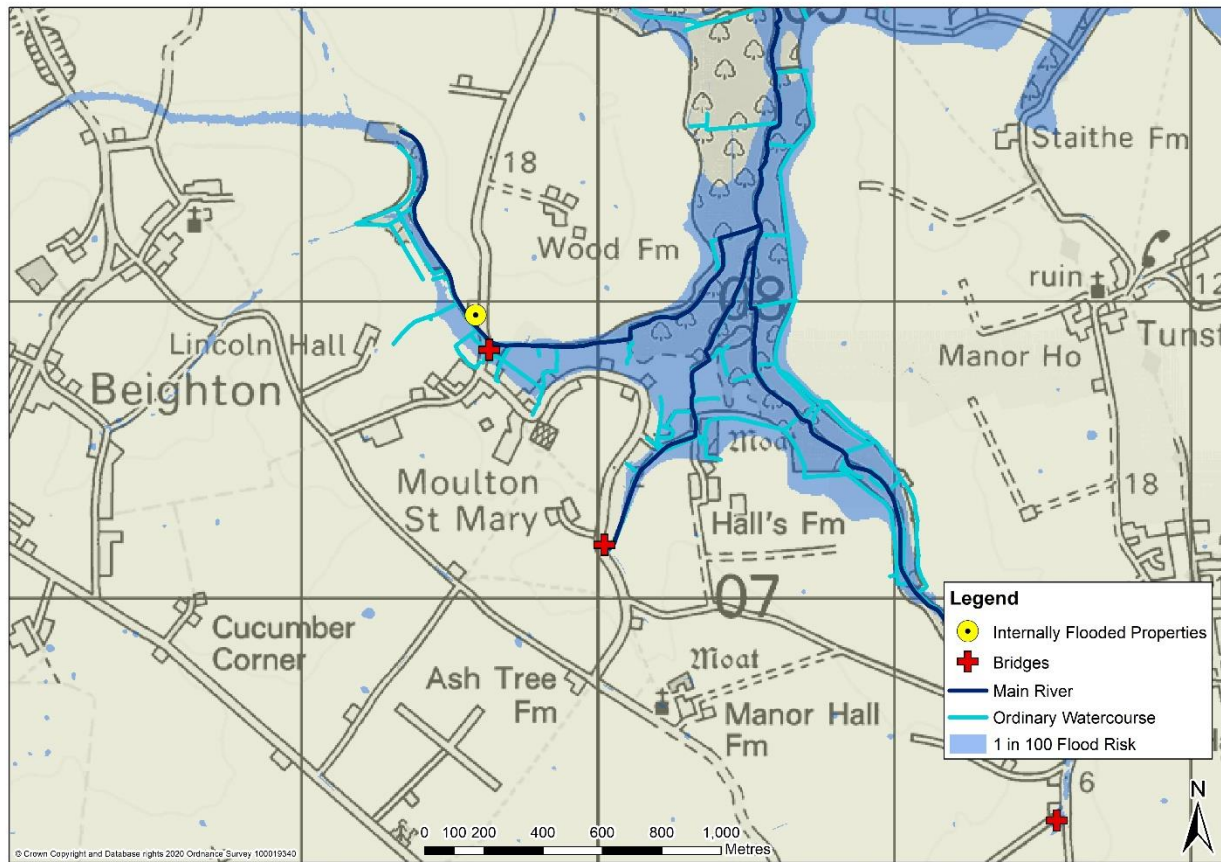
Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Hemblington Road, Strumpshaw, 16 August 2022</p>	<p>Run-off from rainfall was concentrated along overland flowpaths on which the affected property is positioned on.</p>	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forth coming, or residents are unwilling to wait.</p>	<p>Property owners</p> <p>Norfolk County Council (LLFA)</p>

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
<p>Hemblington Road, Strumpshaw, 16 August 2022</p>	<p>Run-off from rainfall was directed towards the surface water drainage network. These flows could not be accommodated as the system was already overloaded and obstructed by debris or silt</p>	<p>Norfolk County Council (Highways) should 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. This should include consideration of all Highways' assets contributing to the flooding.</p> <p>Norfolk County Council (Highways) should undertake CCTV of the network to ensure all gully connections are in good condition.</p> <p>Landowners should ensure that the drainage features that the system outfalls to are maintained to allow flow to exit the highway.</p>	<p>Norfolk County Council (Highways)</p> <p>Landowners</p>

Broadland District Council

Flooding and Flood Risk Within Reedham Road, Acle Area



Map Showing Location of Flooded Properties in Reedham Road, Acle Area

Description of Area

The flooded property is in open countryside adjacent to a bend in the highway. The upper catchment forms a small part of the Acle Dyke Catchment. The small catchment at this location comprises of surface run off from fields and the highway. The highway falls towards an open main drain within the Broads Internal Drainage Board area. There is no existing formal drainage on this road. The Acle Dyke Catchment flows into the river Yare east of Acle.

Flood Incidents Within the Area

Within the area one 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	Response to the Flood Incident
15 October 2022	<p>On the 15 October 2022 - one property was internally flooded on Reedham Road, Acle. This incident was reported by:</p> <ul style="list-style-type: none">• A resident via an online flood report form on the 28 October 2022 (FWF/22/6594).	Norfolk County Council as (Lead Local Flood Authority) visited affected residents to offer advice and gather information as well as assessed the impact of the flood after the incident.

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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.

One of the incidents (100%) of internal flooding in the area is within 2.5km of a rain gauge. The rain gauge data however did not show significant rainfall at the time of the flooding, suggesting the rainfall was localised at the flooding location.

Historic Flooding Incidents Within the Area

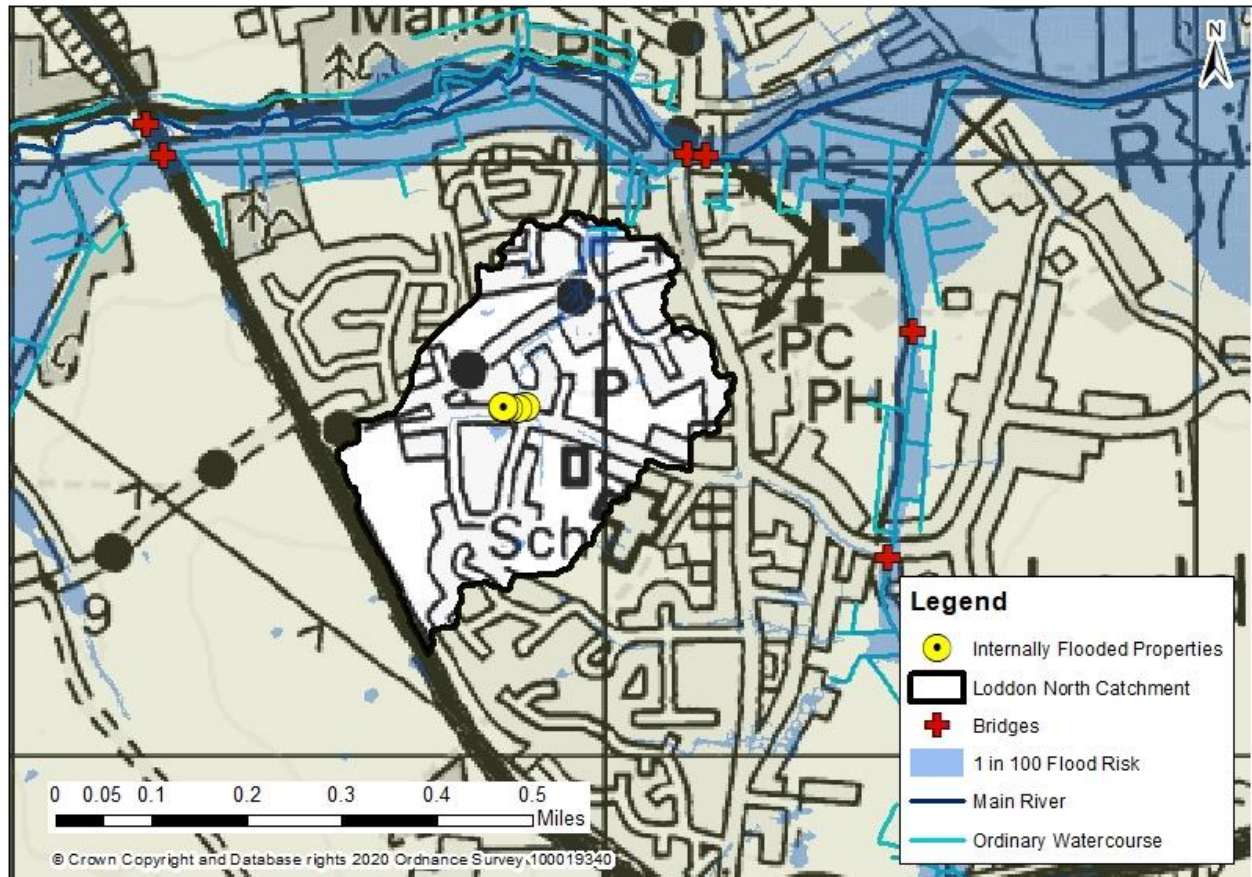
No historic flood incidents have been reported to the LLFA, however, external flooding is known to have affected neighbouring properties.

Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
Reedham Road, Acle, 15 October 2022	Run-off from rainfall was concentrated along overland flowpaths on which the affected property is positioned on.	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.</p>	Norfolk County Council (LLFA)

South Norfolk Council

Flooding and Flood Risk Within the Loddon North Area



Map Showing Location of Flooded Properties in Kittens Lane, Loddon.

Description of the Area

The Loddon North Area catchment is partially urbanised with areas of open green space maintained as playing fields. The catchment drains to the north-east where it joins the River Chet. Kittens Lane is served by a surface water drain which is maintained by Norfolk County Council (Highways) this discharges north into a privately owned drain which is maintained by Saffron Housing.

Flood Risk Within the Area

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 using the Environment Agency national flood risk mapping. 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] Number of properties subject to surface water flood risk at 1 in 30 year event:	0	12	1
[b] Number of properties subject to surface water flood risk at 1 in 100 year event:	0	19	0
[c] Number of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] Number of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] Number 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] Number 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 the Area

Within the area five 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	Response to the Flood Incident
8 September 2022	<p>On 8 September 2022 - four properties were internally flooded on Kittens Lane, Loddon. These incidents were reported by:</p> <ul style="list-style-type: none">• Norfolk County Council (Highways) via an electronic report on:<ul style="list-style-type: none">○ 09 September 2022 (FWF/22/6477, FWF/22/6478)○ 12 September 2022 (FWF/22/6509)○ 13 September 2022 (FWF/22/6499)	<p>Norfolk County Council (Highways) carried out maintenance work to the highway drainage system after the incident.</p> <p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident and visited affected residents to offer advice and to gather information after the incident.</p>
17 August 2022	<p>On 17 August 2022 - one property was internally flooded on Kittens Lane, Loddon. This incident was reported by:</p> <ul style="list-style-type: none">• A resident via email correspondence on 4 December 2022 (FWF/22/6673)	<p>Norfolk County Council (Lead Local Flood Authority) assessed validity and impact of the flood report after the incident.</p>

Recent Rainfall Within the Area

This report seeks to draw on rainfall data to ascertain the intensity of the rainfall events experienced in the area 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 (LLFA) has sought to use data from rain gauges where incidents of flooding are located within a 2.5km 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 the area.

Historic Flooding Incidents Within the Area

The following table lists flooding incidents within the area that have been recorded.

Date of incident	Impact	Return Period
08 August 2017	Two properties flooded internally (Further information can be found in Flood investigation Report into the flooding in South Norfolk District in 2014-2018: FIR/029)	Not known
10 September 2021	One property flooded internally (Further information can be found in Investigation report into the Countywide Flooding of Summer 2021: FIR067)	Not known

Causes of Flooding Within the Area and Recommendations

Location and Date of Flooding	Causes of Flooding	Recommendation	Risk Management Authority/Individual with Relevant Flood Risk Roles
Kittens Lane, Loddon, 08 September 2022 and 17 August 2022	The surface water drainage system was obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to flooding at the affected properties.	Private drainage owners should undertake maintenance of the system, including both gullies and the network draining these gullies. Norfolk County Council (Highways) should continue to maintain the system on the highway.	Norfolk County Council (Highways) Saffron Housing
Kittens Lane, Loddon, 08 September 2022 and 17 August 2022	The flood water entered the properties through thresholds at entrances	<p>Property owners should protect their buildings through flood protection measures where appropriate. Norfolk County Council (LLFA) should communicate with local residents if grants are available to help fund these measures. These grants are subject to an external funding application.</p> <p>Property owners could also carry out their own measures where funding is not forthcoming, or residents are unwilling to wait.</p> <p>Saffron Housing and other property owners should consider the potential to retrofit small scale sustainable drainage systems and storage.</p>	Property Owners Saffron Housing Norfolk County Council (LLFA)

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, where:

- a) Basements and below ground level floors are included.
- b) Garages are included if in the fabric of the building. Garages adjacent or separate from the main building are not included.
- c) 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; where,

- a) '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.
- b) 'Groundwater' means all water which is below the surface of the ground and in direct contact with the ground or subsoil.
- c) '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.

What is a Catchment?

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.

What is a Return Period

A return period is the average length of time in years between events such as a particular amount of rainfall. Where rainfall data is available, we have calculated the return period to help us understand how frequently that event is likely to occur. For example, a 1 in 100 year event would happen on average once every 100 years. This does not mean if an event occurs it will not happen for another 100 years. simply that this is the average interval between events.

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)

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

2. District, City and Bough Councils

- a) Powers to undertake works on ordinary watercourses outside of IDB areas.
- b) The Local Planning Authority for their District area and determine the appropriateness of developments and their exposure and effect on flood risk.
- c) Duties as a Category 1 Responder for Emergency Planning.

3. Internal Drainage Boards (IDBs)

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

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

- a) Powers to undertake works to manage water on the highway and to move water off the highway.
- b) Enforcement powers to unauthorised alterations, obstructions, and interferences with highway drainage.
- c) Have responsibilities for culverts vested in the highway. Currently Norfolk County Council 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

- a) Undertake cost beneficial capital schemes to alleviate or eliminate flooding where the flood event is associated with a failure of their assets.
- b) Duty to provide, improve, maintain, and operate systems of public sewers and works for the purpose of effectually draining an area.
- c) Are responsible for flooding from their foul, combined and surface water sewers, and from burst water mains.
- d) 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.
- e) 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.
- f) Duties as a Category 2 Responder for Emergency Planning.

6. Riparian Owners

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

7. Environment Agency

- a) Powers to regulate activities on main rivers.
- b) Permissive powers to undertake maintenance, however responsibility rests with riparian owners, any maintenance done under Environment Agency permissive powers is done on a risk based approach within the funding available.
- c) Power to undertake works to manage flood risk from main rivers.
- d) Required to have a strategic overview of all forms of flooding.
- e) Enforcement powers for reservoirs greater than 25,000m³ and a duty to maintain a register of these reservoirs.
- f) Duties as a Category 1 Responder for Emergency Planning (including issuing flood warnings).

Abbreviations

Abbreviation	Description
LLFA	Lead Local Flood Authority
FIR	Flood Investigation Report
IDB	Internal Drainage Board
FCERM	Flood and Coastal Erosion Risk Management