



Norfolk County Council

Investigation Report into the flooding within the Borough of King's Lynn and West Norfolk during the summer of 2014



Report Reference: FWF/14/2/1520

18 June 2015

Report Status: Approved Report

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Investigation Report into the flooding within the Borough of King's Lynn and West Norfolk during the summer of 2014.

Contents

1. Disclaimer	3
2. Executive Summary	4
3. Justification for Flood Investigation	8
4. Rainfall events and data	10
(A) Puny Drain Catchment	12
(B) Downham Catchment	15
(C) Wretton Gravity Catchment	20
(D) Gaywood River Catchment	24
(E) River Nar Catchment	27
(F) Ouse Bridge Farm Catchment	30
(G) Southery Catchment	33
(H) Catsholme Catchment	36
(I) Laddus Drain Catchment	39
(J) Churchfield & Plawfield Catchment	44
(K) Old Croft River Catchment	48
(L) Reeds Drain Catchment	51
(M) Smeeth Lode Catchment	54
(N) Mill Basin Catchment	58
Appendix A - Key definitions and responsibilities	65

1. Disclaimer

- 1.1 Although every effort has been taken to ensure the accuracy of the information contained within this report, we cannot guarantee that the contents will always be current, accurate or complete.
- 1.2 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 Norfolk's Local Flood Risk Management Strategy and should not be used for any other purpose.
- 1.3 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.
- 1.4 The opinions, conclusions and any recommendations in this Report are based on assumptions made by Norfolk County Council when preparing this report, as well as, but not limited to, those key assumptions noted in the Report, including reliance on information provided by third parties.
- 1.5 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.
- 1.6 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.
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2. Executive Summary

- 2.1 Between early June and late November 2014 a series of rainfall events caused 42 properties to flood internally within the King's Lynn and West Norfolk area. Two of these rainfall events caused the greatest impact to people, property and infrastructure and occurred on the 8th and 9th August 2014.
- 2.2 This report has been drafted in response to these flood events. Its purpose is to determine the causes of the flooding and to identify those organisations that have a role in managing the incidents of flooding. It also recommends actions to reduce the impact or frequency of the flooding in the future.
- 2.3 The findings of this document have been produced in consultation with the Borough Council of King's Lynn and West Norfolk, Anglian Water, the Fire and Rescue Service and relevant Internal Drainage Boards ("IDBs") (Needham and Laddus IDB, King's Lynn IDB, Upwell IDB, Churchfield and Plawfield IDB and the Downham Market Group of IDBs). These organisations (except the Fire and Rescue Service) are all classed as Risk Management Authorities ("RMAs") under the Flood and Water Management Act 2010. This status reflects their role in managing the flooding incidents mentioned within this report.
- 2.4 In response to the flood events the organisations mentioned above deployed services to provide assistance to the public. In some locations proactive investigations and remedial work has already been undertaken by Anglian Water, Norfolk County Council (NCC) Highways and a number of Internal Drainage Boards to identify issues, clear and repair surface water systems to ensure that residents are better protected from flooding.
- 2.5 The flooding that occurred between June and November 2014 impacted individual properties across a large area of the Borough of King's Lynn and West Norfolk. To aid the investigation process and, for ease of presentation, the incidents of flooding have been grouped within this document based on hydrological catchments¹. The purpose of viewing flooding incidents based on catchments reflects the reality that flooding does not respect the administrative boundaries of water management organisations.
- 2.6 The key findings and recommendations of this report are summarised overleaf. More detailed site specific recommendations are included later in the document on a catchment and street level basis.

¹ Hydrological catchments catch water (particularly rainfall) 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.

Key Findings

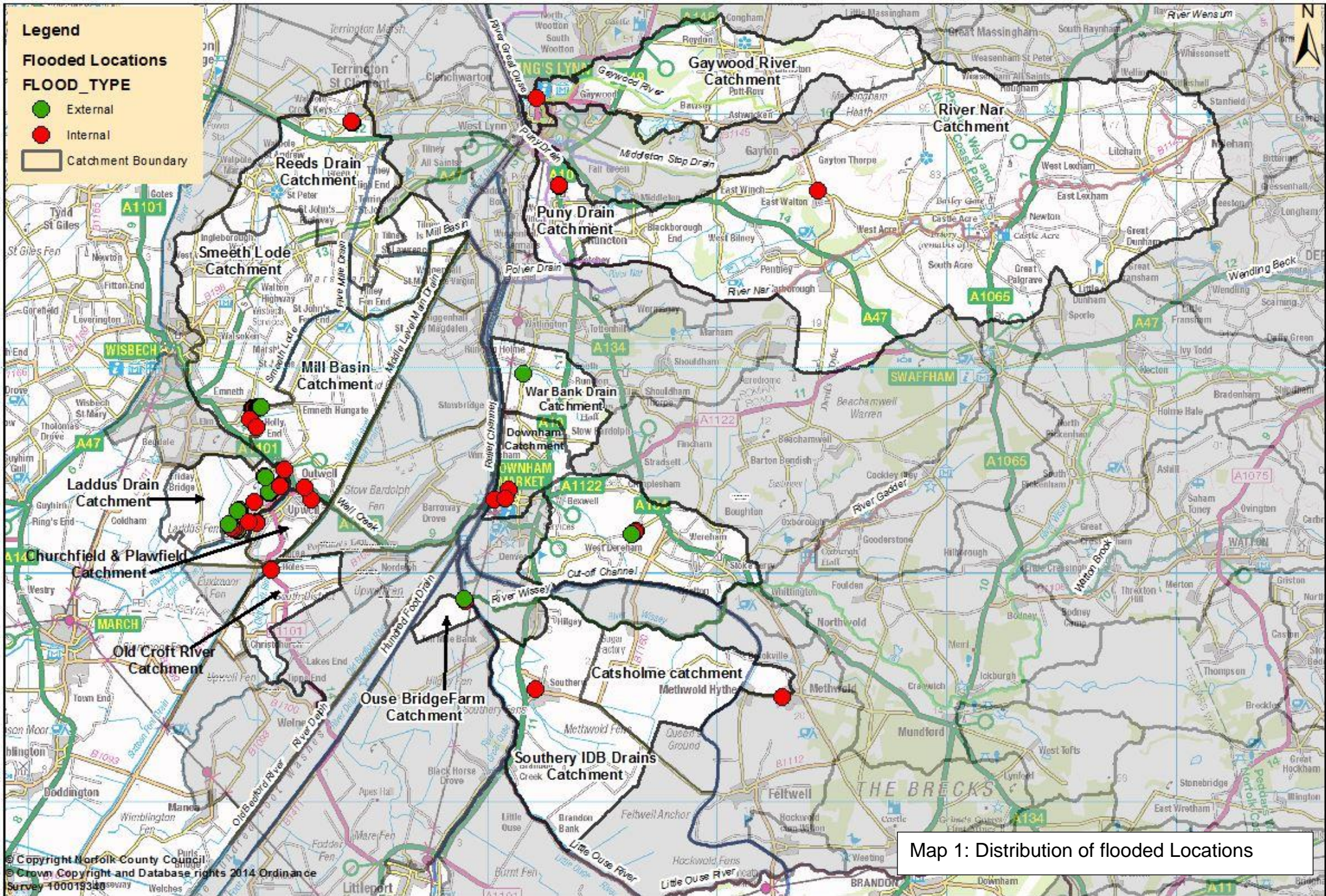
- 2.7 The report has highlighted a number of factors that contributed to the flooding;
- a) A significant number of properties have flooded as they are located where the rainfall naturally collects at low points. This particularly occurs when properties are lower than the roads they are situated by. In a significant number of cases water was found to flow off adjacent roads and into properties.
 - b) In a number of catchments it was found that there are few positive drainage features within the road. Consequently there is a reliance on grips to remove surface water from the highway. In some areas these features were partially or fully obstructed by debris, silt or vegetation. This led to increased run-off being found to flow to low points where the affected properties were positioned. The flows were directed off the road due to a number of factors such as the fall of the road or the use of dropped kerbs.
 - c) In most areas property owners undertook measures to minimise the impact of flood water on their buildings. This included the use of sandbags and/or small water pumps.
 - d) Within some catchments surface water is managed by multiple organisations and individuals. The interaction between these systems and the finite capacity of the infrastructure to deal with extreme rainfall events led to them becoming overloaded. In some circumstances this was exacerbated by;
 - The outfalls to these systems being submerged below the water level of local watercourses.
 - Slow infiltration of water into the soil.
 - e) In some catchments water entered the public foul water sewer network which led to these systems surcharging and flooding properties.
 - f) Some areas experienced localised extreme rainfall. These events could not reasonably be accommodated by the design standard of the local drainage systems.
 - g) In a number of instances lack of maintenance of open dykes had allowed excessive undergrowth and in some cases, trees to grow, restricting the flow of water leading to localised flooding.

Key Recommendations

- 2.8 Maintenance of drainage systems
- a) It is recognised that the Internal Drainage Boards, NCC Highways and Anglian Water have maintenance programmes for their drainage systems and should review these programmes where there are known flooding issues.
 - b) There is a need for better coordination between the relevant Internal Drainage Boards, Norfolk County Council Highways and Anglian Water in relation to routine maintenance/works on the drainage systems in the Borough.

- 2.9 Funding

- a) Where appropriate Risk Management Authorities could work together to seek and where available apply for funding to mitigate flood risk associated with their areas of responsibility. This could include large or small scale Sustainable Drainage Systems, flood routing, provision of alternative points of discharge and provision of property level protection.
- 2.10 Improved understanding of drainage capacity and surface water flows
- a) Increase the number of rainfall gauges/telemetry systems across the Borough Council of King's Lynn & West Norfolk to ensure all areas of high risk have access to rainfall event data.
 - b) Share information (including mapping) between Risk Management Authorities to ensure that the responsibilities and capacity of multi-agency surface water; foul and combined systems are identified.
 - c) Utilise updated surface water and catchment mapping across organisations to inform plans and projects.
- 2.11 Planning
- a) Local Planning authorities should work closely with the Lead Local Flood Authority, the relevant Internal Drainage Boards and Environment Agency to fully consider and incorporate lessons learnt from flood investigations in relation to proposed new development.



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Spatial distribution of flooded locations within the catchments

3. Justification for Flood Investigation

3.1 It was deemed necessary to complete a formal investigation into the flood incidents that occurred across the Borough of King's Lynn and West Norfolk from June to November 2014 as:

- a) Multiple residential properties were internally flooded
- b) Multiple commercial properties were internally flooded
- c) A school (classed by Defra as critical infrastructure) was internally flooded

3.2 This impact met Norfolk County Council's threshold for triggering the undertaking of a formal flood investigation. The criteria below is used by Norfolk County Council as a basis for determining whether the event has, or is likely to, increase flood risk and what the consequences of any increase in risk may be.

- 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 Persons 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.

The purpose of the report

3.3 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.

3.4 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 for the level of risk faced by communities in the King's Lynn and West Norfolk area, which

can be used to seek funding for flood mitigation schemes.

- 3.5 Mitigation measures include property level protection: reinstating lost drainage features: reviewing or increasing maintenance regimes, balancing flows using in system or off line storage and increasing the flow capacity of the drainage network.
- 3.6 It is the intention of the Lead Local Flood Authority to monitor the progress of Risk Management Authorities (including the Lead Local Flood Authority) in meeting the recommendations of this report. As such, we will publish an addendum, a year after publication of this report, which will outline the actions undertaken by the Lead Local Flood Authority and other Risk Management Authorities to better protect residents and properties in the flooding locations identified within this report.

4. Rainfall events and data

Rainfall data

- 4.1 Data from rain gauges located in March, Denver, Marham and Grimston has been analysed to ascertain the intensity of the rainfall events experienced in the Borough. This analysis was useful in assessing (in broad terms) if the design capacity of drainage systems within the affected areas were exceeded. However, to ensure that any analysis reflects the localised nature of these events a 2.5km radius from these instruments has been used.
- 4.2 Whilst this process is in line with British Standards, it means that 5 of the 42 locations of internal flooding are within the operating range of these gauges. This largely covers the Downham, Ouse Bridge Farm and Puny Drain catchments. For areas of flooding outside this coverage it is difficult to assess the return period of the rainfall event and consequently if the drainage system could have reasonably been able to cope. However, the rain gauge information from these stations gives us an approximate understanding of the rainfall events across the Borough.

Rainfall events

- 4.3 A large number of intense rainfall events fell across the Borough Council of King's Lynn and West Norfolk between late May and late November 2014. Reports received from affected residents and businesses highlight the rainfall events on the 27 June, 10 July, 14 July, 8-9 August, 21 and 28 November 2014 as having led to the internal flooding of 42 properties. Of these 42 properties, 36 (86%) were impacted by the 8-9 August 2014 rainfall event.
- 4.4 Some of the rainfall stations in the Borough recorded the rainfall on the 8-9 August 2014 as a single event. Other stations highlighted 2 distinct rainfalls events. These 2 events have been analysed in more detail in the paragraphs below;
- 4.5 **First rainfall event (between 12:45-18:15 on 8th of August)** – 49.4mm rainfall was recorded as falling in 5hrs 45 minutes (between 12:45 to 18:15) at the **Denver** rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1: 32 year rainfall event, and a 1:40 year event for a 3 hour return period².
- 4.6 **Second rainfall event (between 22:00-02:45)** – The second rainfall event that occurred later on the 8th of August started at 22:00 and continued until 02:45 on the 9th of August. Fifteen minutes rainfall intervals from the Denver rainfall monitoring station shows that

² Calculated using the Flood Estimation Handbook DDF event rarity over 1km grid square for the rain gauge location.

29mm of rain fell in 4 hours 45 minutes. This intensity of rainfall equates to a 1 in 5 year rainfall event³.

- 5.7 If taken as a single event the rainfall experienced on the 8-9th August could be seen as a greater event than a 1:40 year return. However, given the large number of properties that flooded outside of the useful range of the recorded rainfall data this is difficult to verify.

³ Calculated using the Flood Estimation Handbook DDF event rarity over 1km grid square for the rain gauge location

(A) Puny Drain Catchment

1. General Description The Puny drain catchment is an East of Ouse IDB maintained drain which runs from King's Lynn to a pumping station at West Winch which pumps water into the Flood Relief Channel This catchment receives flows from King's Lynn to the North, from Setchey to the South and from North Runcton and Middleton. Key settlements within the catchment are Middleton, Setchey and West Winch.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
15 properties	64 properties

3. Incidents as reported The breakdown of flooding incidents with the catchment is listed below; (Please see Map 2 for approximate location of incident within the catchment).

(a) **Main Road**, West Winch - 1 property reported internal flooding on Main Road. The property was flooded on the 27 June 2014 rainfall event. The incident was reported by the Fire & Rescue Service⁴.

4. Desk Study The flooding incident within this catchment is;

- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have low rates of infiltration
- Within EA Flood Zones 2 & 3. The catchment is bordered West by the River Nar and Puny drain cut across the catchment flowing North to South. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
- Not within 2.5km of an Environment Agency rain gauge
- Covered in the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008 and was covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publicly maintainable.
- Served by foul water sewers as shown by Anglian Water records

5. Responsibilities From the desk study it is indicated that the management of local drainage in the catchment is primarily the responsibility of the following Risk Management Authorities; the East of Ouse Polver & Nar IDB (for drainage issues within its district), Anglian Water, NCC Highways and riparian owners.

⁴ Report by Fire and Rescue Service June 2014; Questionnaire response from resident December 2014 (1198).

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ⁵
<p>Puny Drain Catchment</p> <p>Main Road</p>	<p>[C1] Run-off from significant rainfall was concentrated at a low point within the catchment in the vicinity of which the affected property is positioned.</p> <p>[C4] Water was found to flow from the highway by the camber of the road adjacent to the property access which concentrated flood water in the vicinity of the affected properties.</p> <p>The above causes were exacerbated by:</p> <p>[B]: The structure of the affected property was not able to withstand the impacts of flood water. As such flood water entered the property through low thresholds at entrances.</p>	<p>NCC Highways for cause [C4]</p> <p>Property owners for causes [B].</p>	<p>The Fire and Rescue Service responded and pumped out the water from the internally flooded property as well as from the gardens of adjacent properties on the 27th June 2014.</p> <p>NCC Highways carried out maintenance work to the drainage system after the incident.</p> <p>Some property owners on Main Road avoided being internally flooded by undertaking flood protection measures on their property.</p>	<p>(R4) NCC Highways could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events and mitigating flooding as well as identify where the drainage network conveys flows to.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p>

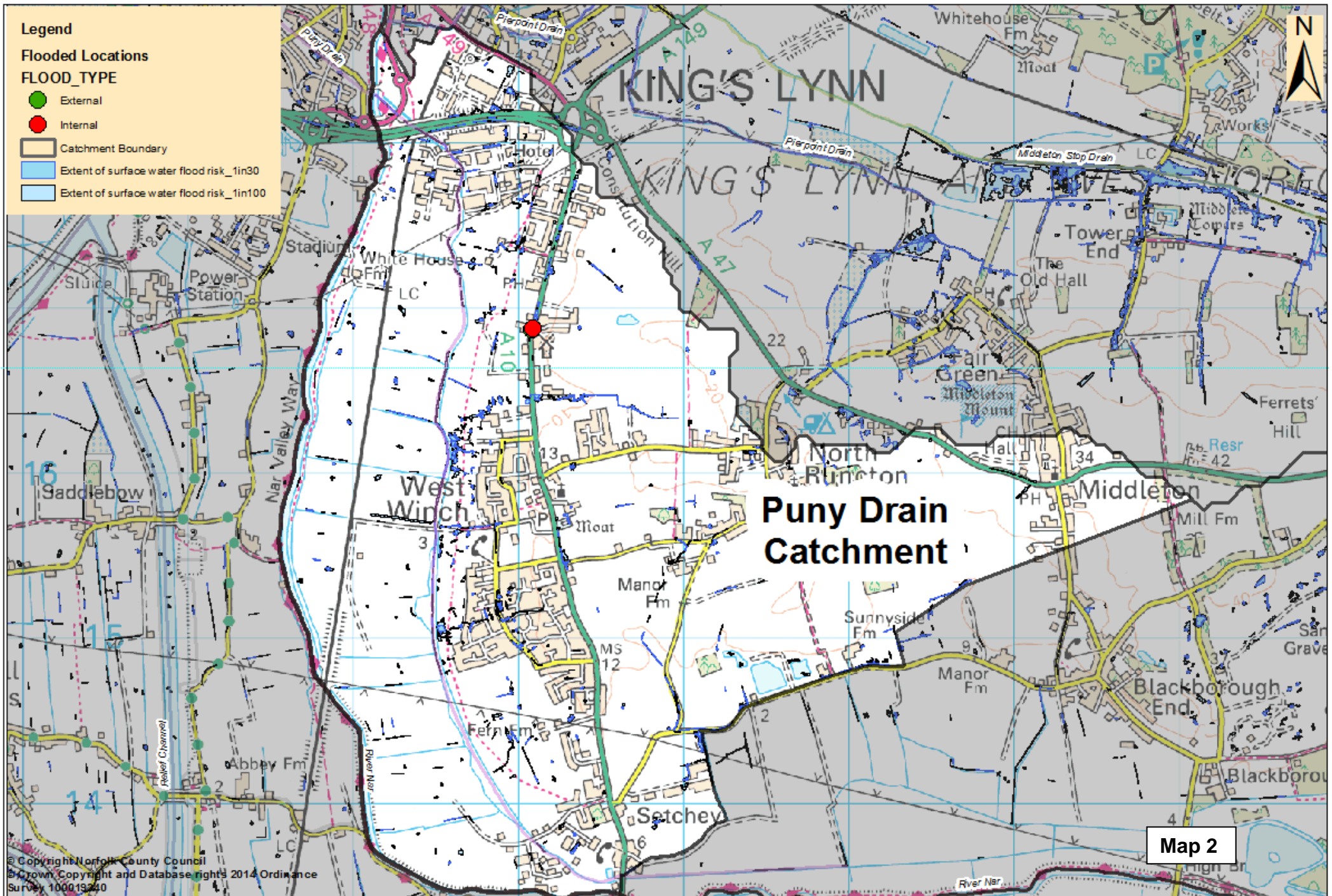
⁵ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

Legend

Flooded Locations

FLOOD_TYPE

- External
- Internal
- Catchment Boundary
- Extent of surface water flood risk_1in30
- Extent of surface water flood risk_1in100



Puny Drain Catchment

Map 2

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Spatial distribution of flooded location within the catchment

(B) Downham Catchment

1. General Description The Downham catchment is bounded by high ground to the East, North and South. It extends outside the settlements of Downham Market, Wimbotsham and Stow Bardolph and falls West towards the Relief Channel. As such there are a number of overland flow paths associated with this topography which aggregate as they fall towards the Relief Channel and its associated watercourses.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
174 properties	478 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 3 for the approximate location of incidents within the catchment).

- (a) **Nursery Road** – 1 property was internally flooded on Nursery Road. This property is classed as critical infrastructure and was flooded on the 8-9 August 2014 rainfall event. This incident was reported by the Fire & Rescue Service⁶
- (b) **Bridge Street** – 1 property was internally flooded on Bridge Street. This property was flooded on the 8-9 August 2014 rainfall event. This incident was reported by the King's Lynn & West Norfolk Borough Council to the LLFA⁷
- (c) **Maltings Lane** – 1 property was internally flooded on Maltings Lane. The property was flooded on 8-9 August 2014 rainfall event. This incident was report by the Borough Council of King's Lynn and West Norfolk to the LLFA⁸.

4. Desk Study The flooding incidents within this catchment are;

- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have good rates of infiltration.
- Within 2.5km of an Environment Agency rain gauge.
- Covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan. The area was taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Near to highway that is publically maintainable and that is drained by highway systems within the carriageway.
- Shown by Anglian Water records to be served by foul and

⁶ Fire & Rescue Service Report August 2014 (1190)

⁷ Email correspondence from King's Lynn and West Norfolk Borough Council to LLFA received on 23rd September, 2014

⁸ Email correspondence from King's Lynn and West Norfolk Borough Council to LLFA received 27th November 2014

combined water sewer systems.

5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of the following Risk Management Authorities; the Stoke Ferry Internal Drainage Board (for drainage issues within its management area), Norfolk County Council Highways and riparian owners.

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ⁹
<p>Downham Catchment</p> <p>Nursery Road</p> <p>Bridge Street</p> <p>Maltings Lane</p>	<p>[C2] Across the catchment run-off from significant rainfall was concentrated along overland flow paths on which the affected properties on Bridge Street and Malting's lane are positioned.</p> <p>[C1] On Nursery road, run-off from significant rainfall was concentrated at a low point within the catchment in the vicinity of which the affected property is positioned.</p> <p>[C4] Water is found to flow from the highway by dropped kerbs on to the property access which concentrates flood water towards the vicinity of the affected property as in Nursery Road On Bridge Street run off from significant rainfall and new development to the rear of property caused flooding via the rear access</p> <p>[C7] On Nursery Road, run-off from significant rainfall was directed into the surface water drainage network. This exceeded the design capacity of the</p>	<p>Norfolk County Council Highways and property owners for cause [C4] & [C7]</p> <p>Property owners at the Maltings for [E]</p>	<p>Fire Service responded and pumped out a number of properties on the 8th & 9th August 2014 at Bridge Street and Malting's Lane.</p> <p>Borough Council of KL& WN Officers carried out a welfare visit to a vulnerable resident and spoke to other affected residents in Downham Market about flood protection and staying safe during flooding.</p> <p>Some property owners carried out measures to minimize the impact of the flooding to their property.</p>	<p>[R4] Norfolk County Council Highways and owners of private roads could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding at Nursery Road, Bridge Street and Malting's Lane.</p> <p>[R5] The property owners could determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency especially at Malting's Lane.</p> <p>[R12] The property owners should aim to protect their buildings through flood protection measures where appropriate.</p>

⁹ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

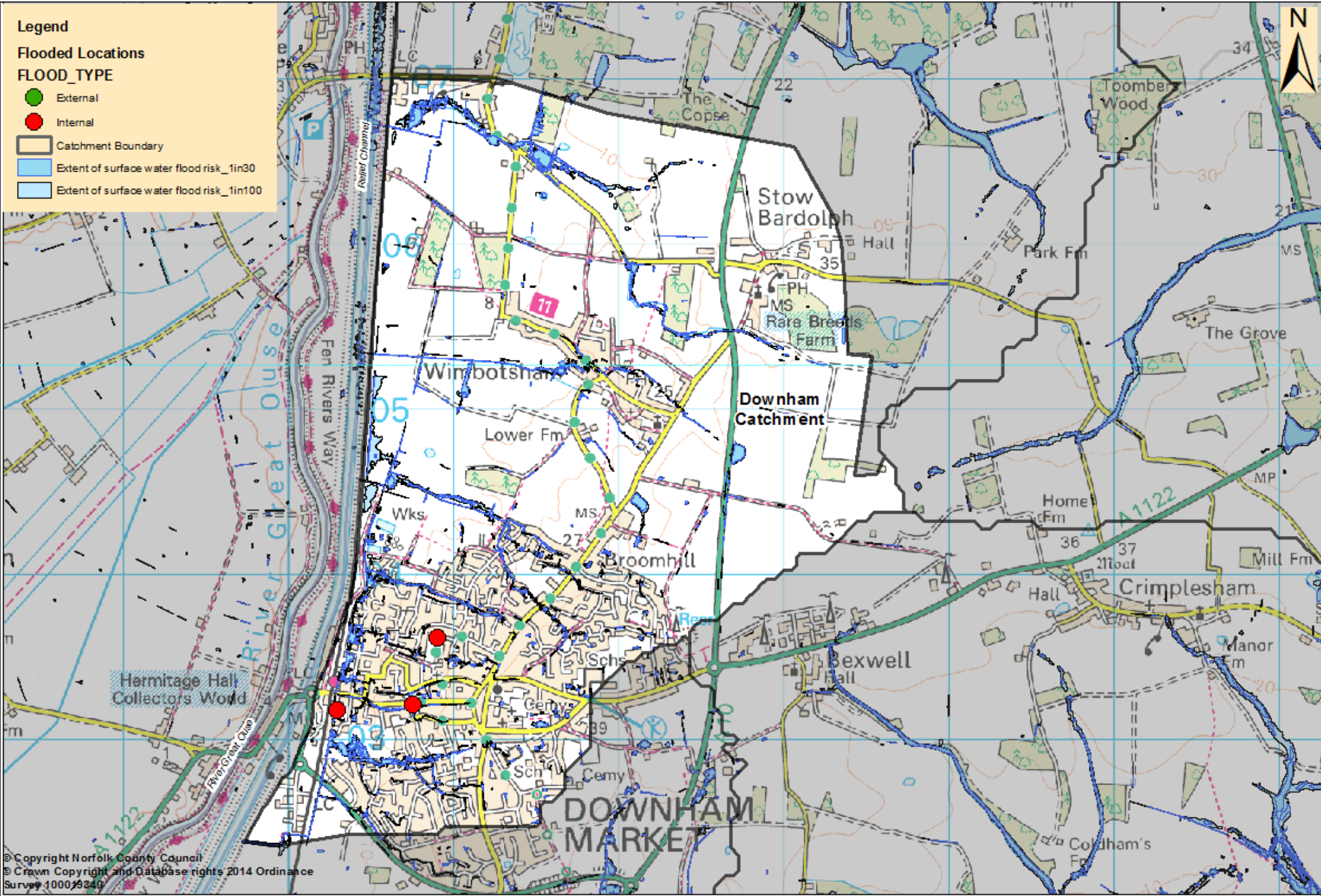
	<p>system. This contributed to the accumulation of flood water at the affected property.</p> <p>The above causes were exacerbated by the factors below:</p> <p>[E] Maltings Lane, drainage features on unadopted roads remain in private ownership and maybe unmaintained/has insufficient capacity and therefore cannot cope with heavy rainfall.</p>			
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Legend

Flooded Locations

FLOOD_TYPE

- External
- Internal
- Catchment Boundary
- Extent of surface water flood risk_1in30
- Extent of surface water flood risk_1in100



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Survey 100049340

Map 3

Spatial distribution of flooded locations within the catchment

(C) Wretton Gravity Catchment

1. General Description The topography within this catchment directs water to the South along flow paths that enter local watercourses that flow towards the Cut-off-Channel. These flow paths emanate from high ground in the North and from the settlements of Crimplasham, Bexwell, Wereham and Boughton.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
53 properties	121 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 4 for approximate location of incident within the catchment).

- (a) **Church Road, West Dereham** - 3 properties flooded internally on Church Road. These properties were flooded on the 8-9 August 2014 rainfall event. These incidents were reported by the Borough Council of King's Lynn and West Norfolk to the LLFA¹⁰. A number of properties close by also reported external flooding.

4. Desk Study The flooding incident within this catchment is;

- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have low rates of infiltration
- Within EA Flood Zones 2 & 3. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
- Not within 2.5km of an Environment Agency rain gauge
- Covered in the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008 but not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publicly maintainable.
- Is shown by Anglian Water records to be served by foul water sewers.

5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of the following Risk Management Authorities; Anglian Water, Highways and riparian owners.

¹⁰ Email correspondence from King's Lynn and West Norfolk Borough Council to LLFA received on 14th August 2014

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ¹¹
<p>Wretton Gravity Catchment</p> <p>Church Road, West Dereham</p>	<p>[C1] Run-off from rainfall was concentrated at a low point within the catchment in the vicinity of which the affected properties are positioned.</p> <p>[C2] Run-off from Significant rainfall was concentrated along overland flow paths adjacent to where the affected properties are positioned.</p> <p>[C3] Run-off from Bath Road, West Dereham may have been partially obstructed by a man-made construction at the Bath Road/Church Road junction. This may have exacerbated the concentration of flood water flood water onto Church Road towards the vicinity of the affected properties</p> <p>[C7] Run-off from significant rainfall was found to flow into the surface water drainage network. This exceeded the capacity of the system and contributed to the accumulation of flood water at the vicinity of the affected properties.</p> <p>[C8] The surface water network (Highways outfalls and adjacent</p>	<p>Norfolk County Council Highways and property owners for cause [C7] and [C8]</p> <p>Riparian owners for cause [C8]</p> <p>Anglian Water and Riparian owners for causes [C3] and [A]</p> <p>Property owners for cause [C1] & [B]</p>	<p>NCC highways have programmed in works to access the capacity of highway grips along Church Road and to have them cleaned out</p> <p>A tactical multi agency group comprising of NCC, BCKLWN, Police, Fire & Ambulance staff established at Downham Market police station to co-ordinate response</p> <p>The Borough Council KL & WN Officers carried out a welfare visit to the affected residents to offer advice, reassurance and to ascertain cause of the flooding.</p> <p>Some residents/riparian owners protected their property using sand bags</p> <p>LLFA investigation revealed poor condition and limited capacity of riparian systems along Church Road. This requires cleaning with a jetting</p>	<p>(R4) Riparian owners along Church Road need to determine private systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R7) Where it is determined that there is insufficient capacity in the public sewer system due to the inappropriate connections of surface water drainage, Anglian Water and the Lead Local Flood Authority could work together with other RMAs, organisations and residents to mitigate this pressure. This work could include feasibility studies that identify possible improvements into existing systems and identify the removal of surface water to alternative points of discharge. This could include a range of mechanisms both within the private property and externally.</p>

¹¹ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

	<p>watercourses) was partially obstructed by debris or silt and high water levels downstream. This reduced the efficiency of the upstream drainage system contributing to the accumulation of surface water/flood water at the affected properties.</p> <p>The above causes were exacerbated by:</p> <p>[A] Additional water was found to flow into the surface water/foul drainage network exceeding its design capacity. This may be due to additional domestic property connections (e.g. connected house extensions) to existing foul or surface water networks.</p> <p>[B] The structure of the affected properties was not able to withstand the impacts of flood water. As such flood water entered the property through low thresholds at entrances.</p>		<p>and root cutting combination system.</p>	<p>(R9) NCC Highways could identify the appropriate level of maintenance required to sustain the design efficiency of their drainage features that serves the flooding location. These works could then be prioritised as part of NCC Highways maintenance programme</p> <p>(R12) The property owners should aim to protect their buildings through flood protection measures where appropriate.</p> <p>[R14] The lead Local Flood Authority could work with other Risk Management Authorities (RMAs) to seek a partnership funding solution to mitigate the risk experienced at this location. This could be either through submission of a bid to secure Partnership funding or through negotiation with RMAs and the local community. It is important to note this recommendation will be subject to the priorities and availability of resources of funders. It may be dependent on those property owners affected contributing towards a solution.</p>
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(D) Gaywood River Catchment

1. General Description The Gaywood River catchment reflects local topography that directs water into the river that drains from East to West eventually discharging into the River Great Ouse. Key settlements within the catchment include; Ashwicken, Bawsey, Congham, Gaywood, Grimston, King's Lynn, Pott Row and Roydon.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
259 properties	767 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (please see Map 5 for approximate location of incident within the catchment).

- (a) **Loke Road** – 1 property was internally flooded on Loke Road, King's Lynn. This property is a commercial property and was flooded on the 10th July 2014 rainfall event¹². This incident was reported by the resident directly to the LLFA. In addition this property reported being affected by flooding on a number of other occasions.

4. Desk Study The flooding incident within this catchment is;

- Located within the Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have low rates of infiltration.
- Within EA Flood Zones 2 & 3.
- Not within 2.5km of an Environmental Agency rain gauge.
- It was covered in the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008 as well as the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan. The area was taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publicly maintainable.
- Shown by Anglian Water records to be served by foul water sewers.

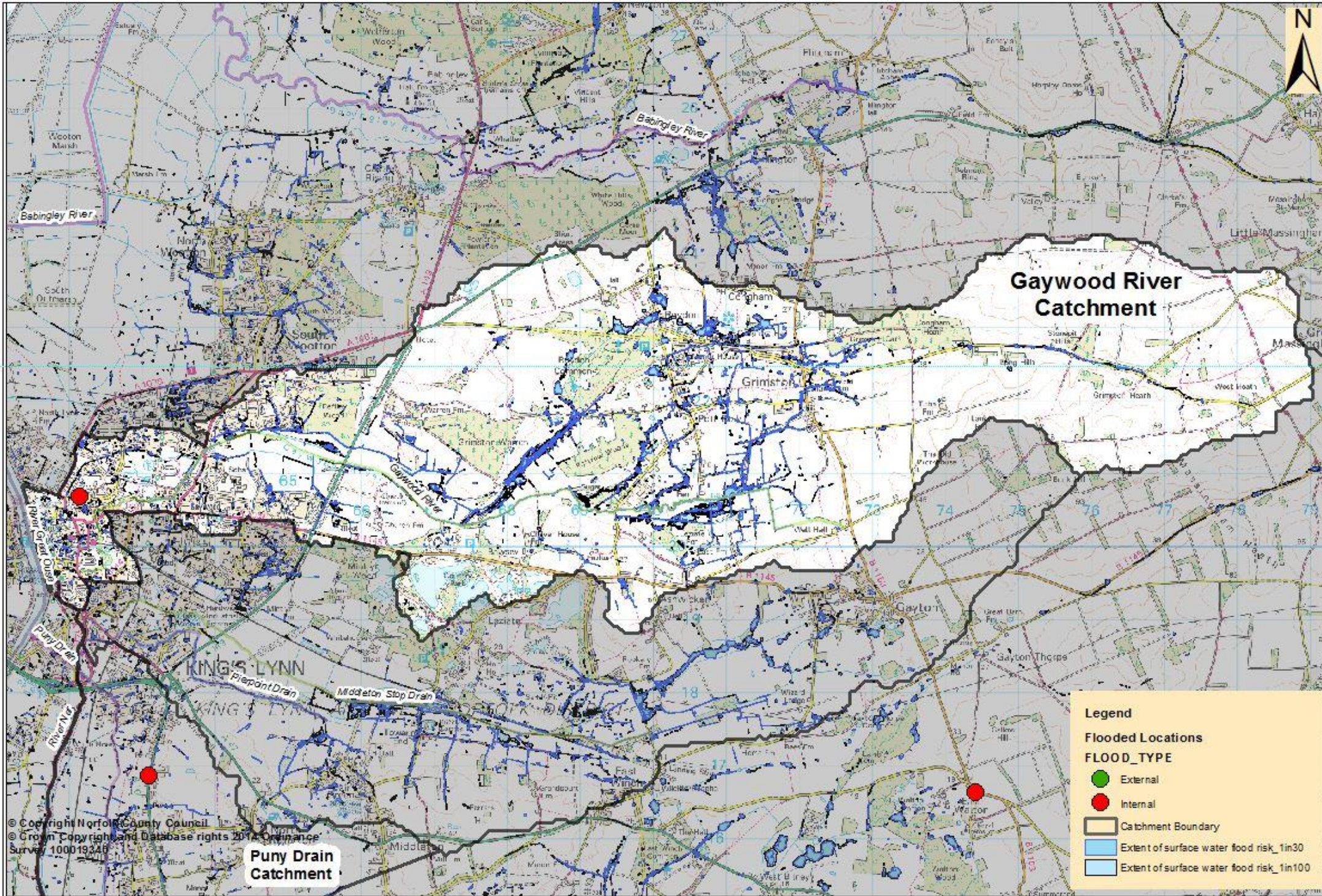
5. Responsibilities From the desk study it is indicated that the management of local drainage in the catchment is primarily the responsibility of the following Risk Management Authorities; Anglian Water, Norfolk County Council Highways, King's Lynn Internal Drainage Board and riparian owners.

¹² LLFA Officer Site visit (661 & 1191).

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ¹³
<p>Gaywood River Catchment</p> <p>Loke Road</p>	<p>[C4] Water was found to flow from the highway by dropped kerb and the camber of the road on to the vicinity of the property which concentrates flood water towards the affected property.</p> <p>[C10] Due to development of impermeable surfaces localised ground conditions caused water run-off to be directed quickly from where it fell as rain to the areas of flooding.</p> <p>The above causes were exacerbated by:</p> <p>[A] Additional water was found to flow into to the combined sewer network exceeding its design capacity.</p>	<p>Norfolk County Council Highways for causes [C4]</p> <p>Anglian Water Services (AWS) Ltd for cause [A]</p> <p>Property owners for causes [C4]</p>	<p>Anglian Water visited the affected property to access the flooding and offer advice.</p> <p>Norfolk County Council Highways has carried out works to clear the gully outside the property and undertook further maintenance to the highway drainage.</p> <p>The property owner used flood protection measures (sand bags) to reduce the impact of flooding to their property.</p>	<p>(R4) Anglian Water could assess the combine system integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R9) Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooding location. These works could then be prioritised as part of Norfolk County Council Highways maintenance programme.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>

¹³ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



Map 5 Spatial distribution of flooded locations within the catchment

(E) River Nar Catchment

1. General Description This catchment is a large river catchment that directs water into the River Nar that falls from East to the West, ultimately discharging into the River Great Ouse. There are a number of key settlements within this catchment such as Narborough and East Walton.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
112 properties	237 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 6 for approximate location of incident within the catchment).

- (a) **Gayton Road** - 1 property was internally flooded on Gayton Road, East Walton Parish. This property was flooded in the 8-9 August 2014 rainfall event. This incident was reported by Borough Council of King's & West Norfolk, Norfolk Fire & Rescue Service¹⁴.

4. Desk Study The flooding incident within this catchment is;

- Located within the Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have high rates of infiltration.
- Not within EA Flood Zones 2 & 3.
- Not within 2.5km of an Environment Agency rain gauge
- Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publicly maintainable.
- Shown by Anglian Water records not to be served by public sewers.

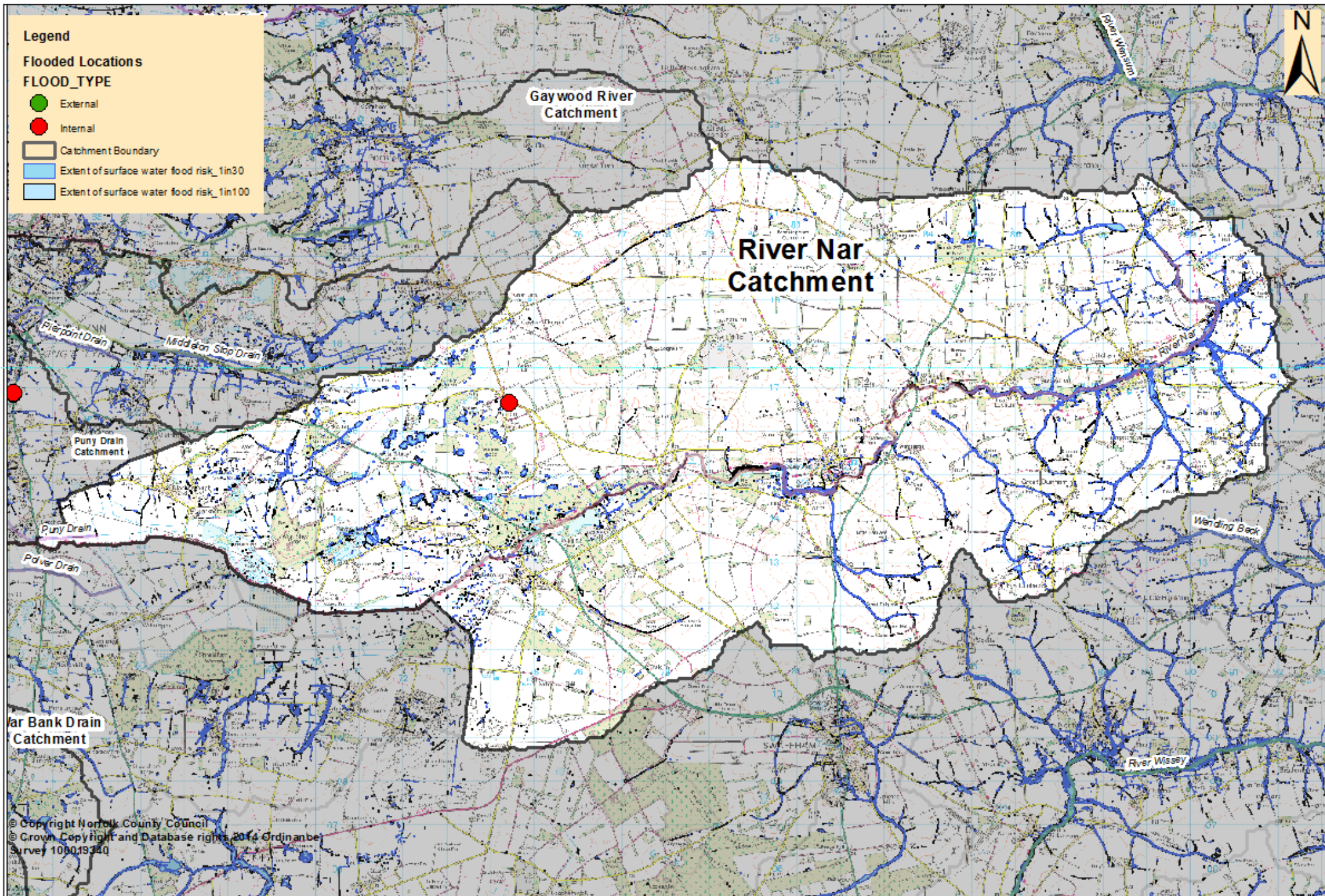
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of NCC Highways and riparian owners.

¹⁴ Fire & Rescue Service report on 16th August 2014 and Email from KL&WN Borough Council on 23 September, 2014 (1208).

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ¹⁵
<p>River Nar Catchment</p> <p>Gayton Road</p>	<p>[C1] Run-off from significant rainfall was concentrated at a low point within the catchment in the vicinity of which the affected property is positioned.</p> <p>[C4] Water was found to flow off the highway by dropped kerbs and the camber of the road on to gravel vehicular access which concentrates flood water towards the affected properties.</p> <p>The above causes were exacerbated by the factors below:</p> <p>[B] The structure of the affected property was not able to withstand the impacts of flood water. As such flood water entered the property through low thresholds at entrances.</p>	<p>Norfolk County Council Highways and for cause [C4]</p> <p>Property owners for causes [C1] and [B]</p>	<p>The Fire & Rescue Service responded and pumped out the property on 8th August 2014</p> <p>Norfolk County Council Highways has carried maintenance to the highway drainage and cleaned some private ditches at the affected property.</p>	<p>(R9) Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooded locations. These works could then be prioritised as part of Norfolk County Council Highways maintenance programme.</p> <p>(R12) The property owners could protect their buildings through improved surface water drainage and property flood protection measures where appropriate</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>

¹⁵ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



Map 6 Spatial distribution of flooded locations within the catchment

(F) Ouse Bridge Farm Catchment

1. General Description This small catchment is very low lying and is located between the Hundred Foot Drain and River Great Ouse. It is bounded to the South by Church Drain, to the West by Middle Leading Drain and to the North by Maylode Drain. This catchment drains into the River Great Ouse via a pumping station.
2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
0 properties	0 properties
3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 7 for approximate location of incident within the catchment).
 - (a) **Sluice Road** - 1 property was internally flooded on Sluice Road, Fordham Parish. This property was flooded on the 8-9th August 2014 rainfall event. An adjacent property also experienced external flooding on this event and reported being affected by a previous undated event. These incidents were reported by King's Lynn & West Norfolk Borough Council and the Norfolk Fire and Rescue Service¹⁶.
4. Desk Study The flooding incident within this catchment is;
 - Located within the Borough Council of King's Lynn and West Norfolk's administrative boundary
 - Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
 - Situated within an area of geology likely to have low rates of infiltration.
 - Within EA Flood Zones 2 & 3. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
 - Within 2.5km of an Environment Agency rain gauge
 - Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
 - Is adjacent to highway that is publically maintainable.
 - Is shown by Anglian Water records to not to be served by foul water sewers.
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of Norfolk County Council Highways and riparian owners.

¹⁶ Email from King's Lynn & West Norfolk Borough Council to the LLFA received on 23rd September 2014, Fire & Rescue Service report on 16th August 2014 (949)

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ¹⁷
<p>Ouse Bridge farm Catchment</p> <p>Sluice Road</p>	<p>[C1] Run-off from rainfall was concentrated at a low point within the catchment in the vicinity of which the affected property is positioned.</p> <p>[C4] Water was found to flow off the highway by fall of the road on to the property access which concentrates flood water towards the vicinity of the affected properties.</p>	<p>NCC Highways for cause [C4]</p> <p>Property owners for [C1]</p>	<p>Fire & Rescue Service responded and pumped out flooded property on 9th August 2014</p> <p>The property owner that experienced external flooding used sandbags to direct water away from property.</p>	<p>(R4) NCC Highways could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R12) The property owners should aim to protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>

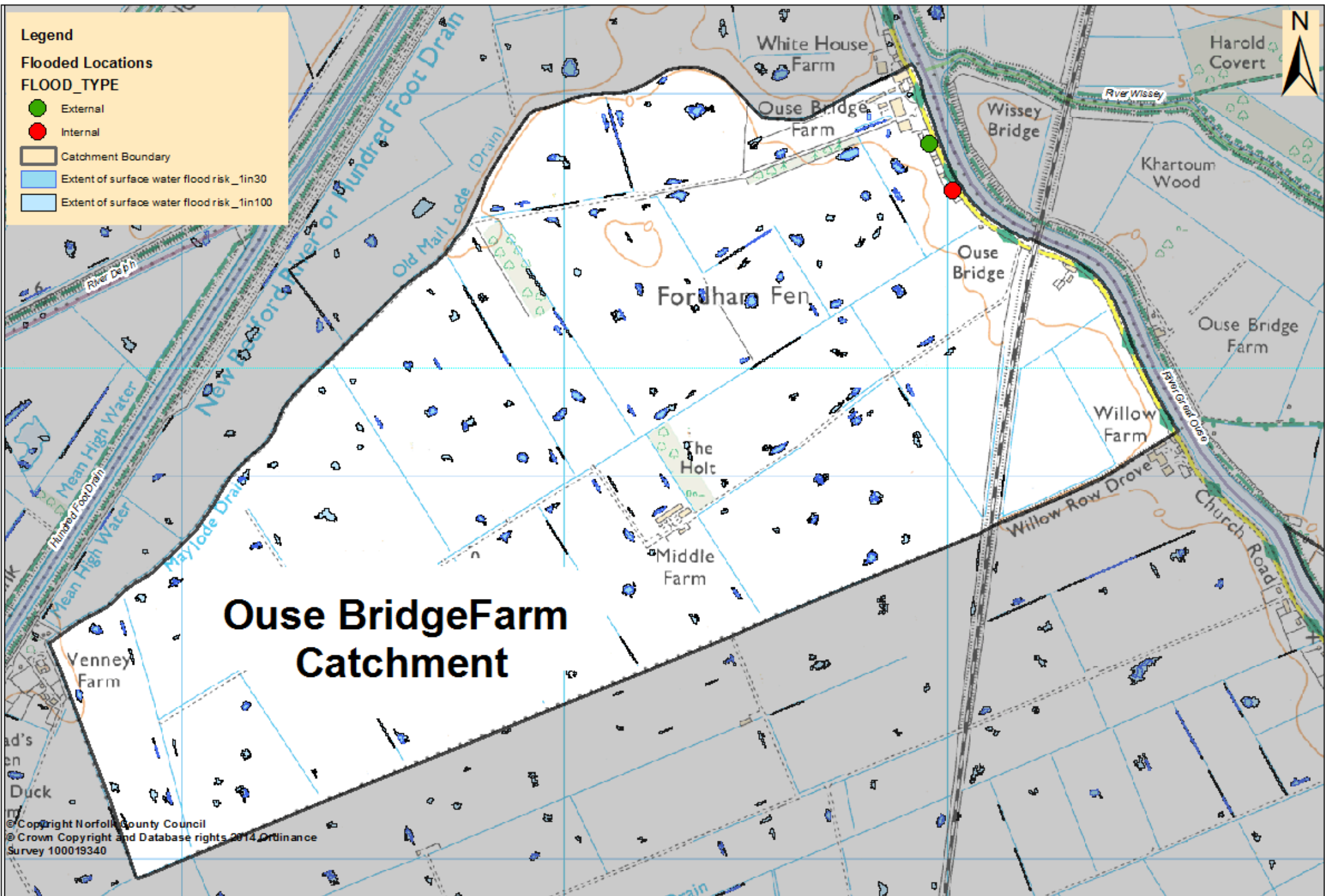
¹⁷ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

Legend

Flooded Locations

FLOOD_TYPE

- External
- Internal
- Catchment Boundary
- Extent of surface water flood risk _1in30
- Extent of surface water flood risk _1in100



Ouse Bridge Farm Catchment

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Map 7 Spatial distribution of flooded locations within the catchment

(G) Southery Catchment

1. General Description The Southery catchment is a large topography that includes significant areas of low lying land within which are extensive drainage networks. This catchment primarily drains through pumps which direct water into the River Great Ouse. A key settlement, located on high ground within the catchment is Southery.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
12 properties	35 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 8 for approximate location of incident within the catchment).

- (a) **Lynn Road** - 1 property was internally flooded on Lynn Road, Southery Parish. This property was flooded on the 8-9th August 2014 rainfall event. The incident was reported by the resident to LLFA¹⁸

4. Desk Study The flooding incident within this catchment is;
- Located within the Borough Council of King's Lynn and West Norfolk's administrative boundary
 - Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas
 - Situated within an area of geology likely to have high rates of infiltration.
 - Not within EA Flood Zones 2 & 3.
 - Not within 2.5km of an Environment Agency rain gauge
 - Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
 - Is adjacent to highway that is publically maintainable.
 - Is shown by Anglian Water records to be served by public foul water sewers.

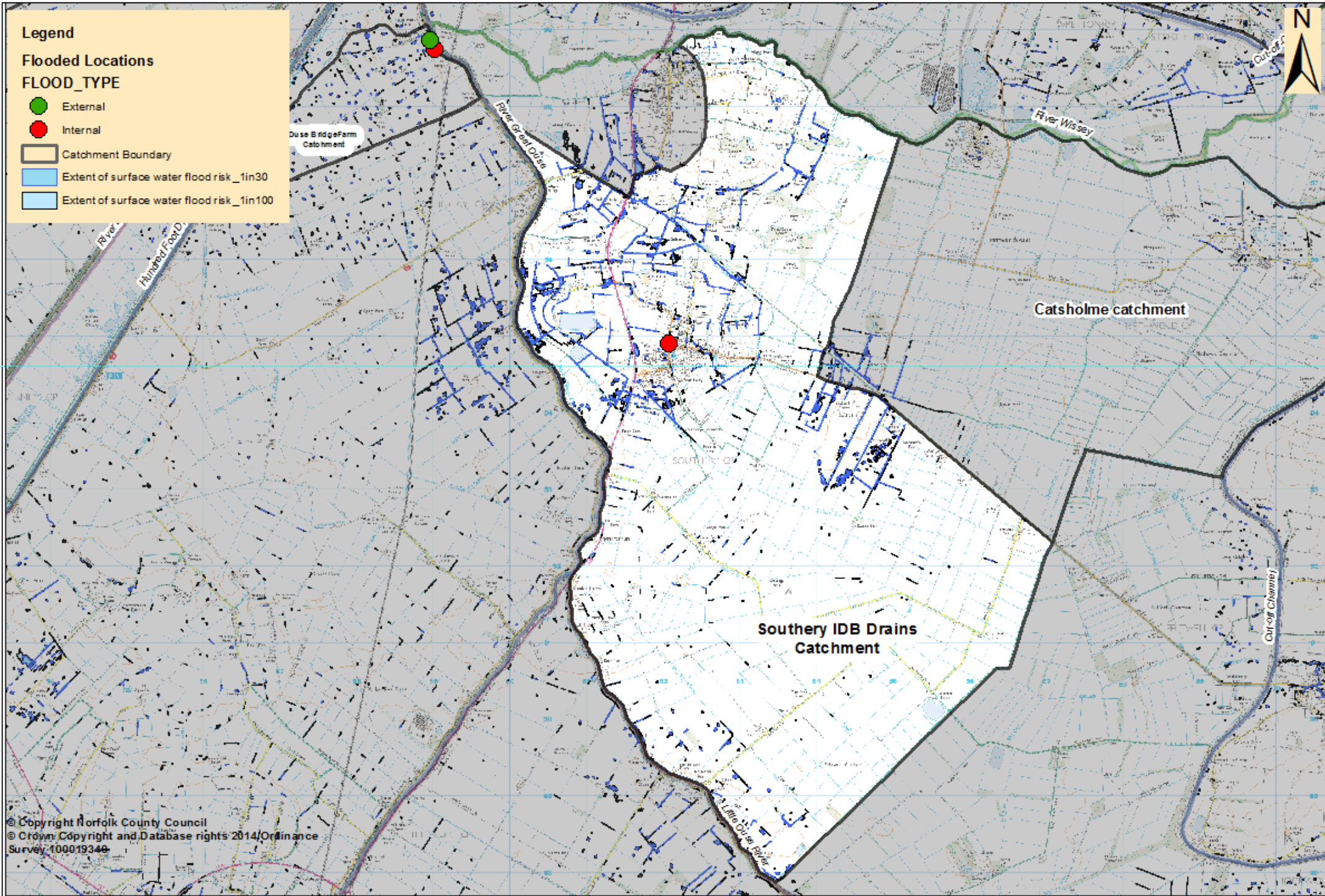
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of Anglian Water, Norfolk County Council Highways and riparian owners.

¹⁸ Flood questionnaire for case 1234

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ¹⁹
<p>Southery Catchment</p> <p>Lynn Road</p>	<p>[C4] Water was found to flow off the highway by the fall of the road on to the property access which concentrates flood water towards the vicinity of the affected properties.</p> <p>[C7] Run-off from significant rainfall was found to flow into the surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected property.</p> <p>The above causes were exacerbated by the factors below:</p> <p>[B] The structure of the affected property was not able to withstand the impacts of flood water. As such flood water entered the property through seepage from the floor.</p>	<p>NCC Highways for cause [C4] and [C7]</p> <p>Property owners for [B]</p>	<p>NCC Highways visited the affected property and carried out maintenance work by raising the kerbing of the road</p>	<p>[R4] The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.</p> <p>[R12] The property owners should aim to protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>

¹⁹ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



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Map 8 Spatial distribution of flooded location within the catchment

(H) Catsholme Catchment

1. General Description This catchment is bounded by high ground to the East and South of Methwold. It extends outside the town area from the high ground in the East and falls towards the Cut-Off-Channel to the West. Water is directed along overland flow paths and under the Cut-Off-Channel into low lying areas of land. Water is then drained through extensive land drainage networks eventually discharging into the River Wissey via pumping stations.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
1 property	12 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map below for approximate location of incident within the catchment).

- (a) **Hythe Road** - 1 property was internally flooded on Hythe Road, Methwold. This property was flooded on the 28 July 2014²⁰ and 12 October 2014²¹ rainfall events. These incidents were reported by the Borough Council of King's Lynn and West Norfolk, the Internal Drainage Board and Media reports.

4. Desk Study The flooding incident within this catchment is;

- Situated within an area of geology likely to have high rates of infiltration.
- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Largely within EA Flood Zones 2 & 3. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
- Not within 2.5km of an Environment Agency rain gauge
- Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publically maintainable.
- Shown by Anglian Water records not to be served by foul water sewers.

5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of the Borough Council of King's Lynn & West Norfolk, NCC Highways and riparian owners.

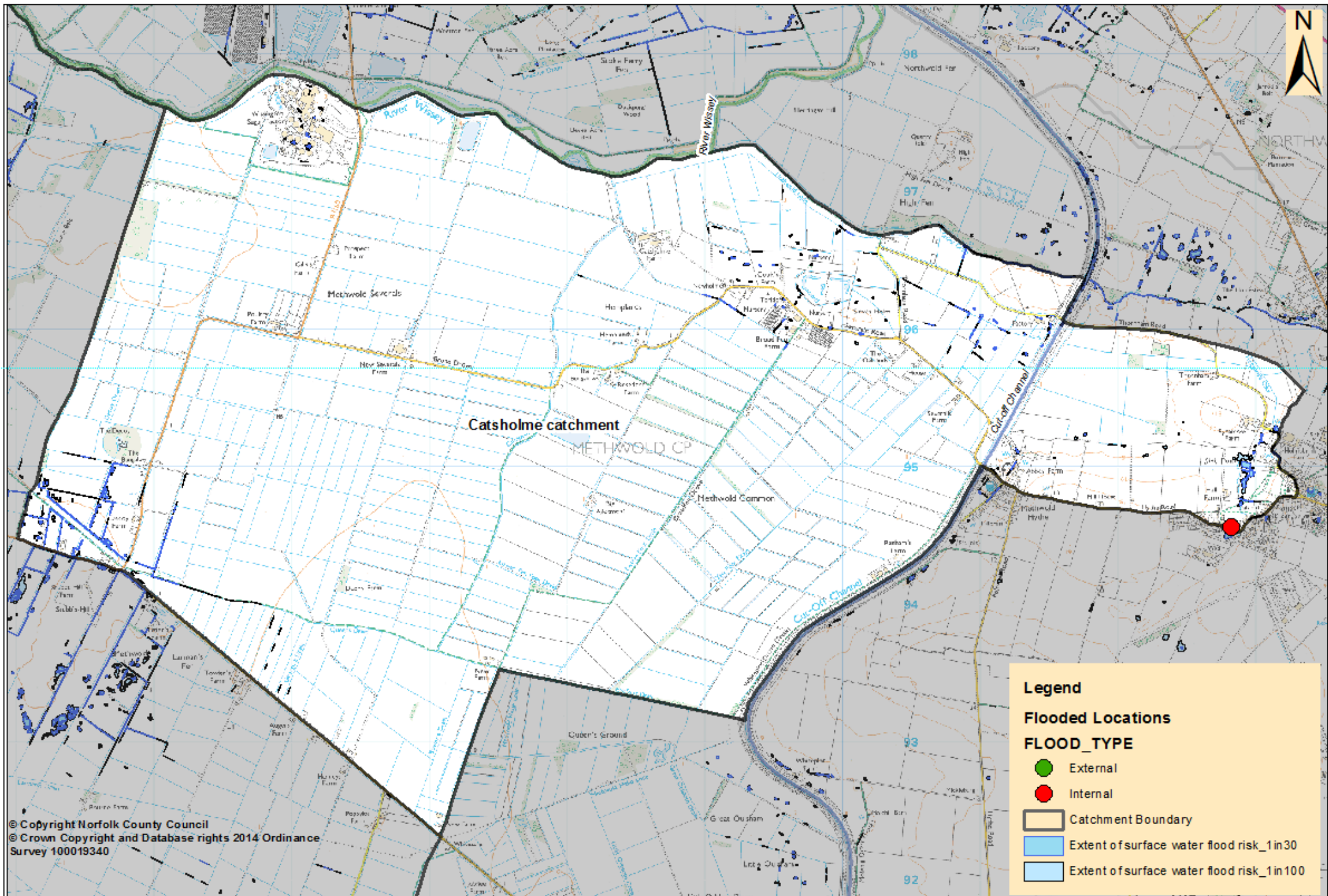
²⁰ Online Flood Report received by LLFA on 01 August, 2014 EDP24 Article July 31, 2014;

²¹ EDP 24 Article October 16 2014 & Public Enquiry Manager October 17, 2014 (791).

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ²²
<p>Catsholme Catchment</p> <p>Hythe Road</p>	<p>[C2] Run-off from significant rainfall was concentrated along overland flow paths on which the affected property is positioned.</p> <p>[C7] Run-off from significant rainfall was found to flow into the surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected property.</p> <p>[C8] The surface water drainage network was partially obstructed by debris or silt. This reduced the efficiency drainage system contributing to the accumulation of surface water/ flood water at the affected property</p> <p>The above causes were exacerbated by:</p> <p>[E] Neighbouring property drainage is unmaintained and therefore cannot cope with heavy rainfall.</p>	<p>Norfolk County Council Highways for causes [C7] and [C8].</p> <p>Property owners for cause [E]</p>	<p>Fire & Rescue Service responded and pumped out the property on 28th July 2014</p> <p>Norfolk County Council Highways have carried out works to improve the highway drainage system.</p> <p>The property owners have carried out works to alleviate surface water flooding within their property.</p>	<p>(R4) NCC Highways could work with adjacent riparian owners to determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R9) Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooded locations. These works could then be prioritised as part of Norfolk County Council Highways maintenance programme.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p>

²² The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



Map 9

Spatial distribution of flooded location within the catchment

(I) Laddus Drain Catchment

1. General Description This catchment directs water into the River Nene (Old Course) via the draining of surface water into the local watercourse network. This network is, in part, made up of Internal Drainage Board drains. The topography of the catchment is low lying includes numerous low points within which water is accumulated. As such there is a reliance on drainage systems to move water through the catchment.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
1 property	5 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see the map below for approximate location of incident within the catchment).

- (a) **Thurlands Drove, Upwell** – 8 properties have confirmed to the LLFA they were internally flooded on Thurlands Drove²³. The majority of these properties were flooded on the 8- 9th August 2014 rainfall events. 3 properties on Thurlands drove reported significant external flooding²⁴. All of these properties experienced external flooding on a number of occasions during August 2014. These incidents were also reported by the Fire & Rescue Service, the residents and the media.
- (b) **Pius Drove, Upwell** - 2 properties have internally flooded on Pius Drove. These properties flooded on the 8-9th August 2014 rainfall event²⁵. These incidents were reported by the Borough Council of King's Lynn & West Norfolk to the LLFA.
- (c) **Isle Bridge Road, Outwell** - 2 properties were internally flooded on Isle Bridge Road. These properties were flooded on the 8-9th August 2014 rainfall event. Over 30 other properties suffered significant external flooding with some residents gardens entirely under water. This incident was reported to the LLFA by the Borough Council of King's Lynn & West Norfolk and affected residents²⁶.
- (d) **Mill Rigg, Upwell**- 1 property was internally flooded on Mill Rigg. The property was flooded in the 8-9th August 2014 rainfall event. The incident was reported by the Fire & Rescue Service²⁷.
- (e) **Cottons Head, Outwell** - 1 property was flooded internally on Cottons Head and another was flooded externally. These properties were flooded during the 9th of August 2014 rainfall event. The incidents were reported by residents directly to LLFA²⁸.

²³ Email received from King's Lynn & West Norfolk Borough Council on 12 August 2014

²⁴ Email received from King's Lynn & West Norfolk Borough Council on 12 August 2014

²⁵ Email received from King's Lynn & West Norfolk Borough Council on 12 August 2014

²⁶ Email received from King's Lynn & West Norfolk Borough Council on 19 September 2014,

²⁷ Fire service report

²⁸ Telephone call from Resident to the LLFA

4. Desk Study

The flooding incident within this catchment is;

- Situated within an area of geology likely to have low rates of infiltration.
- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Located within the Needham & Laddus Internal Drainage Board Internal Drainage District.
- Within EA Flood Zones 2 & 3.
- Not within 2.5 km from an Environment Agency rain gauge. Hence the flooded locations are not covered by any EA rain gauge.
- Not covered by the detailed King's Lynn and West Norfolk Settlements Surface Water Management Plan, 2012. Hence the area is not identified as a Critical Drainage Catchment.
- Are near to highway that is publically maintainable and that is drained by highway systems within the carriageway.
- Some sections of catchment such as Thurlands Drove are shown by Anglian Water records as not served by foul system. However other sections such as Isle Bridge Road are served by Anglian water sewer system.

5. Responsibilities

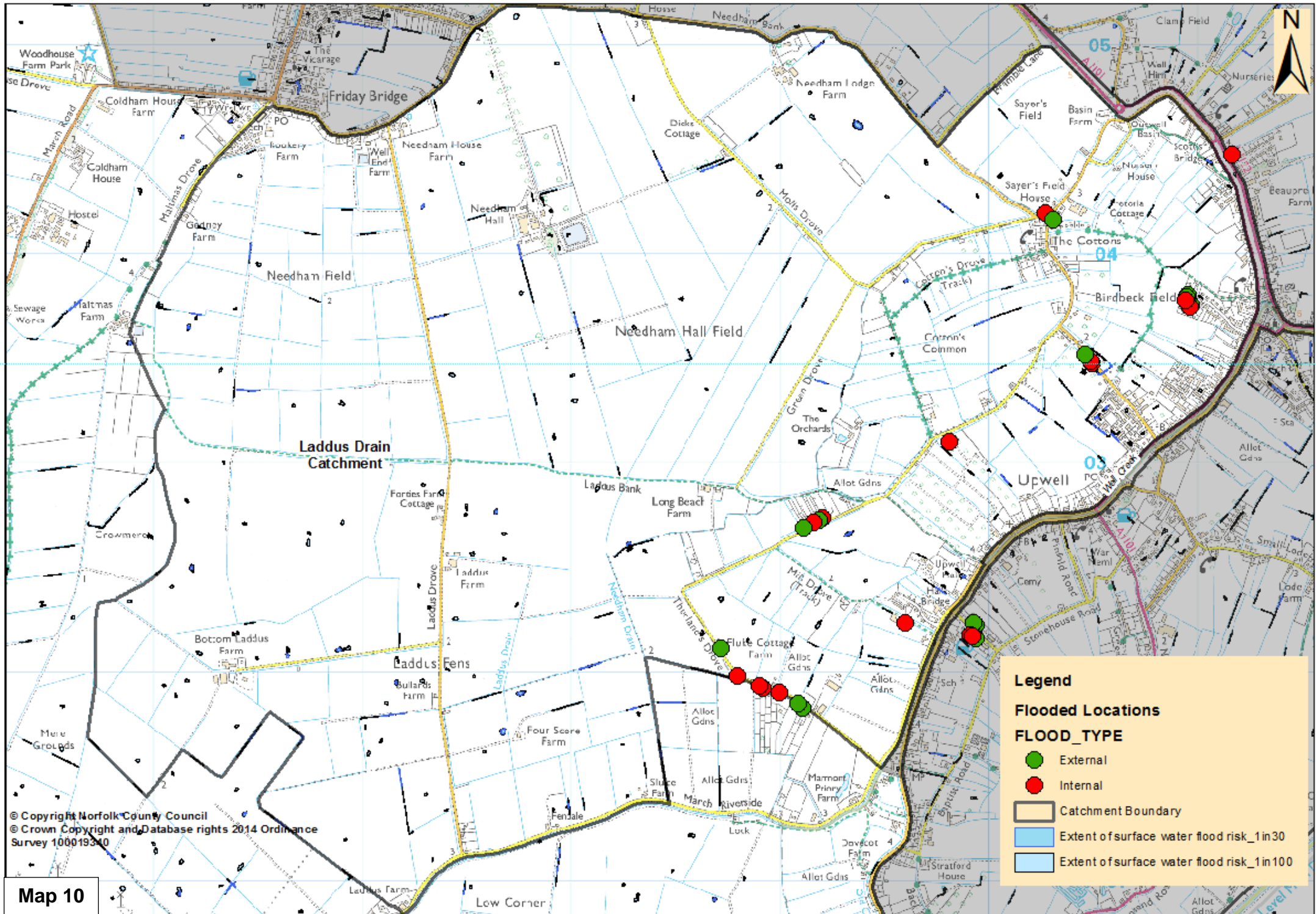
From the desk study it is indicated that the management of local drainage is primarily the responsibility of Needham and Laddus Internal Drainage Board, Anglian Water, Highways and riparian owners.

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ²⁹
<p>Laddus Drain Catchment</p> <p>Thurlands Drove</p> <p>Pius Drove</p> <p>Isle Bridge Road</p> <p>Mill Rigg</p> <p>Cottons Head</p>	<p>[C1] On Thurlands Drove, run-off from the road as a result of significant rainfall was concentrated at low points within the catchment in the vicinity of which the affected properties are positioned.</p> <p>[C7] Run-off from significant rainfall was found to flow into the highway surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected properties on Isle Bridge Road, Pious Drove, Cottons Head & Mill Rigg</p> <p>[C8] On Thurlands Drove and Pius Drove, surface water drainage network was partially obstructed by debris or silt. This reduced the efficiency of the upstream drainage system contributing to the accumulation of surface water/ flood water at the affected properties.</p> <p>[C10] Due to development of impermeable surfaces localised ground conditions in some areas of the catchment caused water run-off to be</p>	<p>Norfolk County Council Highways for cause [C1] and [C7]</p> <p>Adjacent landowners for cause [C8].</p> <p>Property owners for causes [E].</p>	<p>Fire & Rescue Service responded and pumped out a number of properties on the 8th, 9th, 10th & 11th of August 2014</p> <p>Norfolk County Council, Anglian Water, KL&WN Borough Council and IDB officers /engineers visited the affected residents to provide advice and ascertain the cause of the flooding.</p> <p>Anglian Water Services attended Pius Drove to investigate ‘a pollution issue’ which was linked to flooding.</p> <p>Property owners on Thurlands Drove, Isle Bridge Road, Pius Drove undertook measures to protect their properties at the time of the events</p>	<p>(R4) The Lead Local Flood Authority in conjunction with Norfolk County Council Highways, and IDBs could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R9) Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooding location. These works could then be prioritised as part of Norfolk County Council Highways maintenance programme.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p>

²⁹ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

	<p>directed quickly from where it falls as rain to the areas of flooding such as in Isle Bridge Road.</p> <p>The above causes were exacerbated by the factors below:</p> <p>[E] Across the catchment individual property drainage has insufficient capacity to cope with heavy rainfall. Some properties within the catchment are likely to have unmaintained drainage that therefore would not cope with heavy rainfall.</p> <p>[F] The affected properties on Pius Drove, Cottons Head and Thurlands Drove sit on a lower level than the Highway as such excess surface water run-off is directed off the highway on to the driveway and entrances of properties.</p>			<p>(R14) The Lead Local Flood Authority, Needham and Laddus IDB, Freebridge Housing Association and Norfolk County Council Highways could work with the Environment Agency and Regional Flood and Coastal Committee to determine the possibility of securing funding to mitigate flood risk in the Thurlands Drove area. This recommendation will be subject to priorities and availability of resources.</p> <p>(R5) Property owners should determine the adequacy of their on-site drainage and where appropriate increase on-site storage capacity and system efficiency.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>
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Map 10

Spatial distribution of flooded locations within the catchment

(J) Churchfield & Plawfield Catchment

1. General Description This catchment drains to the South-West through a network of watercourses that outfall into the Middle Level Main Drain.
2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
5 properties	8 properties
3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map below for approximate locations of incident within the catchment).
 - (a) **New Bridge Road, Upwell** – 2 properties were internally flooded on New Bridge Road. These properties were flooded on the 8-9th August 2014 rainfall events³⁰. About 30 other properties suffered significant external flooding on New Bridge Road. These incidents were reported by Fire & Rescue Service³¹ and by the property owners to the LLFA³².
 - (b) **Baldwins Drove, Outwell** – 1 property was internally flooded on Baldwins Drove. This property flooded on 8-9th August 2014 rainfall event³³.
4. Desk Study The flooding incident within this catchment is;
 - Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
 - Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
 - Situated within an area of geology likely to have low rates of infiltration due to low permeability clays that can confine underlying aquifers.
 - For some flooding elements within EA Flood Zones 2 & 3.
 - Not within 2.5km of an Environment Agency rain gauge.
 - Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. Hence the area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
 - The flooded locations are near to highway that is publically maintainable and that is drained by highway systems within the carriageway.
 - Shown by Anglian Water records to only be served by foul water sewers.
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of the Churchfield & Plawfield Internal Drainage Board, Anglian Water, Norfolk County Council Highways and riparian owners.

³⁰Flood Questionnaire for cases 1151 &1197

³¹ Fire & Rescue Service report received by LLFA on 16th August 2014

³² Flood Questionnaires for cases 1149, 1150, 1152

³³ NCC Officers site visit, 23rd Oct. 2014

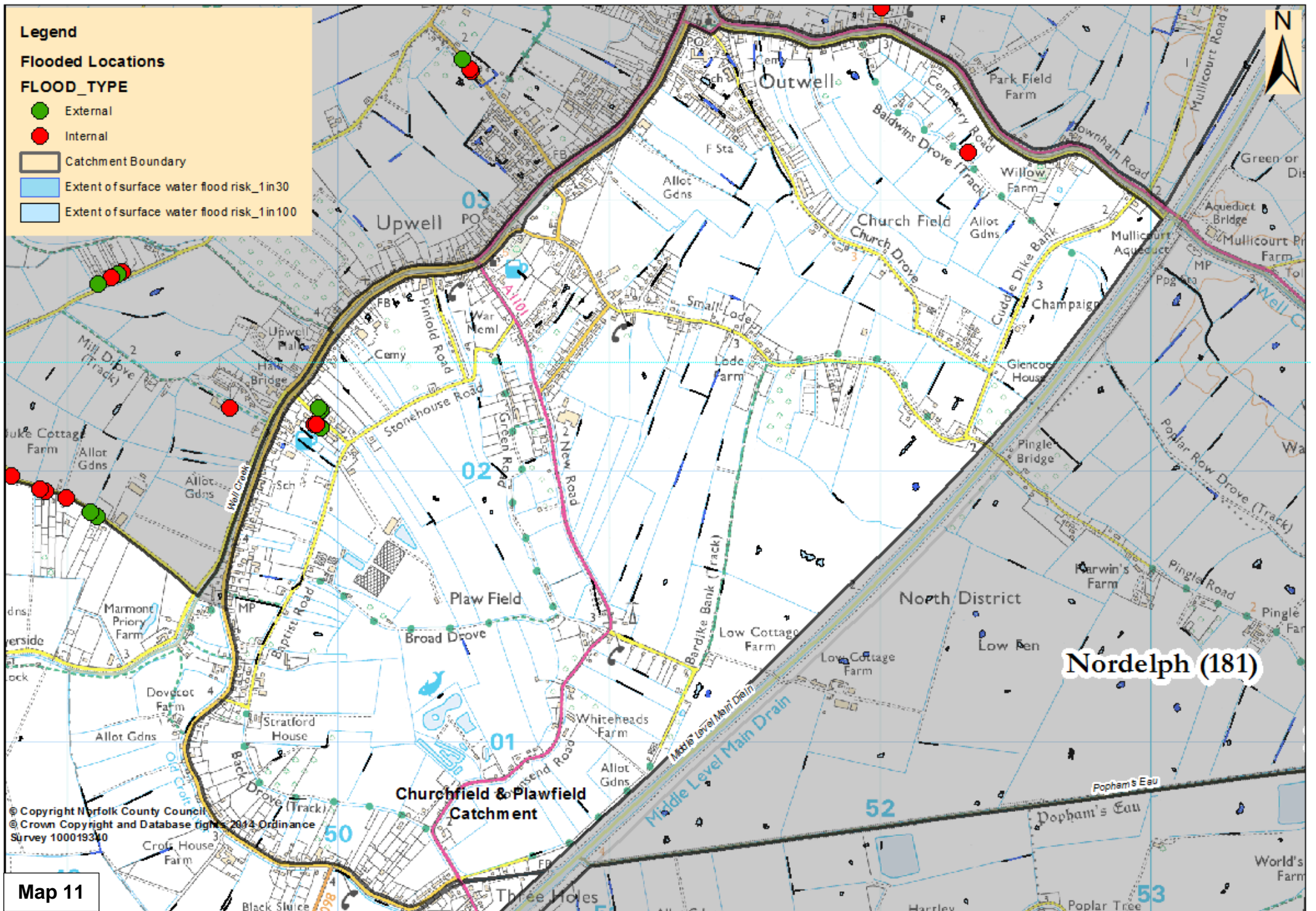
	<p>The above causes were exacerbated by:</p> <p>[A] On New Bridge Road, additional water was directed to the surface water and foul drainage network exceeding its design capacity. This was due to infiltration of surface water into the existing foul system.</p>			<p>the flooded location. These works could then be prioritised as part of the Churchfield & Plawfield IDB's maintenance programme. This work could also be coordinated between organisations like NCC Highways and adjacent riparian owners where there is an interaction between their responsibilities for the drainage systems.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>
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Legend

Flooded Locations

FLOOD_TYPE

- External
- Internal
- Catchment Boundary
- Extent of surface water flood risk_1in30
- Extent of surface water flood risk_1in100



Spatial distribution of flooded locations within the catchment

(K) Old Croft River Catchment

1. General Description The catchment drains to the North-west through a network of watercourses that outfall to the Popham's Eau and Middle Level Main Drain.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
0 properties	0 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 12 below for approximate location of flood incident within the catchment).

(a) **Main Road** Three Holes, Upwell- 1 property was internally flooded on Main Road. This property was flooded 8-9th August 2014 rainfall event. This incident was reported by the Fire and Rescue Service³⁵.

4. Desk Study The flooding incident within this catchment is;

- Is situated within an area of geology likely to have very low rates of infiltration.
- Is within King's Lynn and West Norfolk Borough Council's administrative boundary
- Is located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Some elements of the catchment is within Flood Zones 2 & 3. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
- Is not within 2.5km of an Environment Agency rain gauge
- This area was not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Is adjacent to highway that is publically maintainable.
- Is shown by Anglian Water records not to be served by foul water sewers.

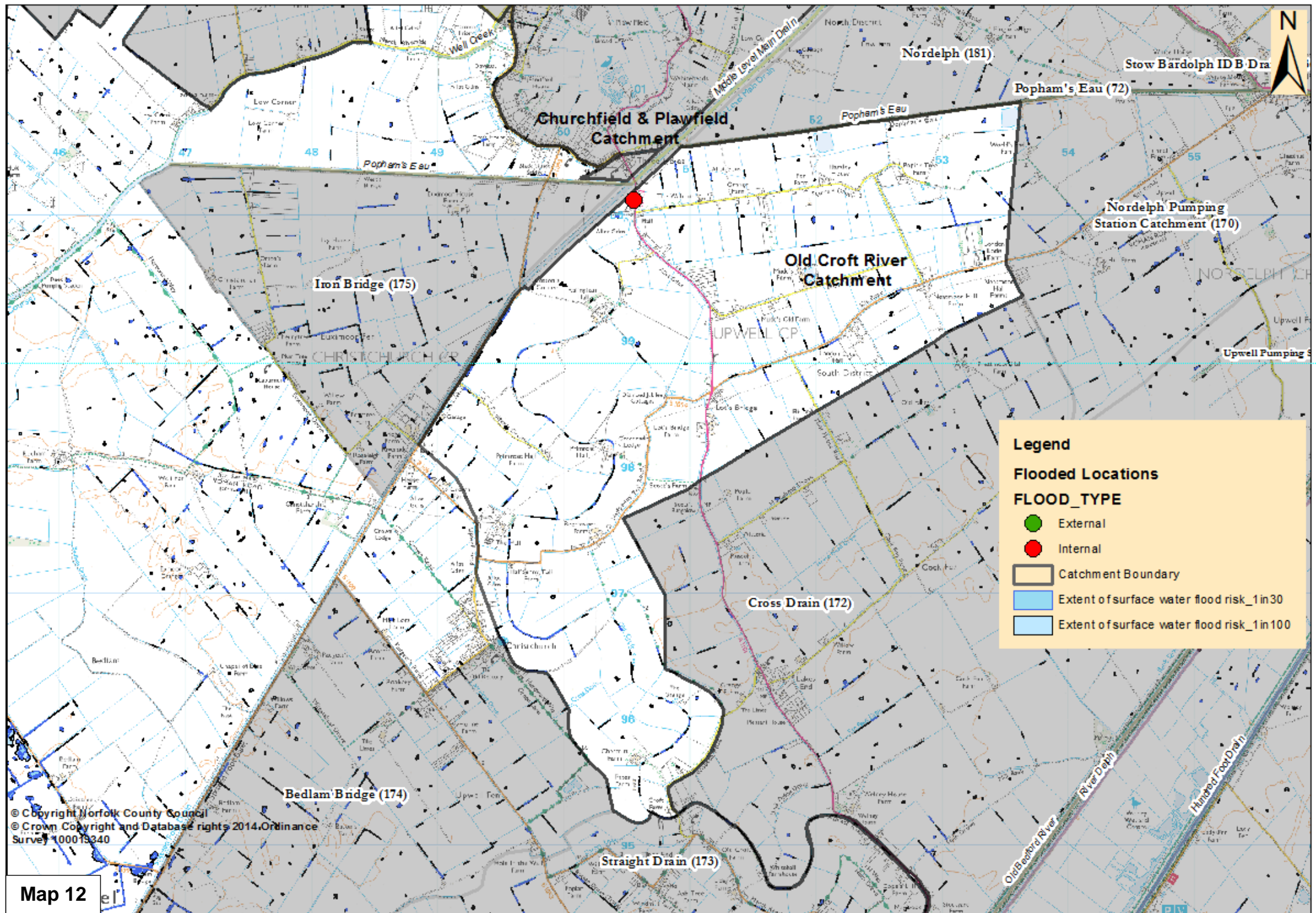
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of Norfolk County Council Highways, Upwell Internal Drainage Board and riparian owners.

³⁵ Fire and Rescue Service Report received by LLFA on 16th August 2014

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ³⁶
<p>Old Croft River Catchment</p> <p>Main Road</p>	<p>[C4] Water was found to flow off the highway by dropped kerbs/ the camber of the road on to the property access which concentrates flood water in the vicinity of the affected property</p> <p>The above causes were exacerbated by:</p> <p>[B] The structure of the affected property was not able to withstand the impacts of flood water. As such flood water entered the property through low thresholds at entrances.</p>	<p>Norfolk County Council Highways for cause [C4]</p> <p>Property owners for cause [B]</p>	<p>The Fire & Rescue Service visited and pumped out affected property 8th August 2014</p>	<p>[R4] Norfolk county Council Highways could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>

³⁶ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



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Map 12

Spatial distribution of flooded location(s) within the catchment

(L) Reeds Drain Catchment

1. General Description This catchment drains generally from North-West to South-East and outfalls into the Reeds Drain, which connects into the Smeeth Lode pumped system.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
7 properties	38 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 13 below for approximate location of incidents within the catchment).

- (a) **South Green, Terrington St Clement** - 2 properties flooded internally on South Green³⁷. These properties were flooded on the 8-9th August 2014 rainfall event. 2 Other properties reported significant external flooding. These incidents were reported by the Fire and Rescue Service³⁸

4. Desk Study The flooding incident within this catchment is;

- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
- Situated within an area of geology likely to have low rates of infiltration.
- Within the Environment Agency Flood Zones 2 & 3.
- Not within 2.5km of an Environment Agency rain gauge.
- Not covered in the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008 as well as the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan. The area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
- Adjacent to highway that is publicly maintainable.
- shown by Anglian Water records to be served by foul water sewers

5. Responsibilities From the desk study it is indicated that the management of local drainage in the catchment is primarily the responsibility of King's Lynn IDB, Anglian Water, Norfolk County Council Highways and riparian owners.

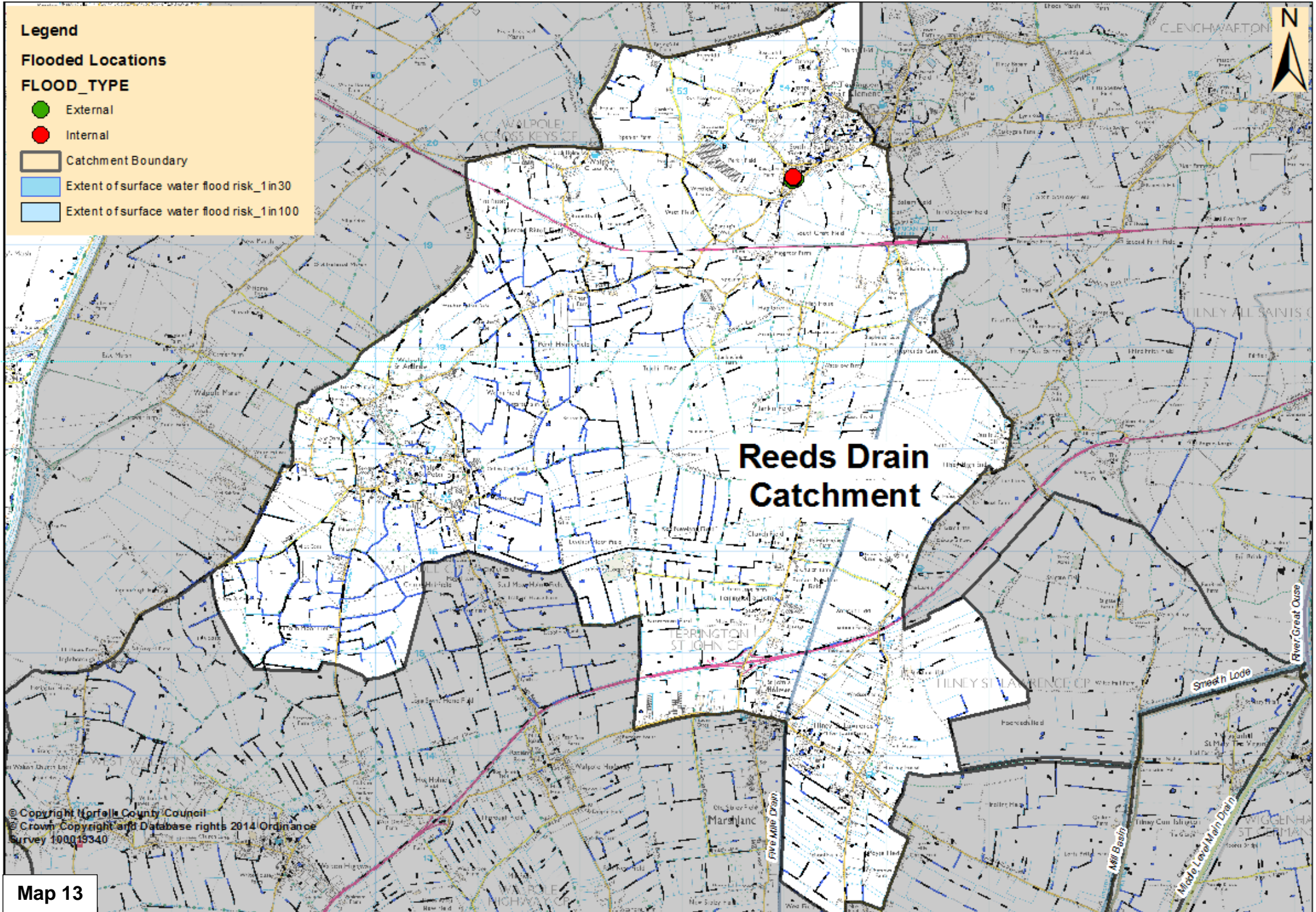
³⁷ Flood Questionnaire for Case for case 1193 & 1194)

³⁸ Fire and Rescue Service Report received by LLFA on 30th November, 2014

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ³⁹
<p>Reeds Drain Catchment</p> <p>South Green</p>	<p>[C1] Run-off from significant rainfall was concentrated at a low point within the catchment in the vicinity of which the affected properties are positioned.</p> <p>[C7] Run-off from significant rainfall was found to flow into the Highway surface water drainage network .This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected properties.</p> <p>[C9] Significant rainfall was found to flow into the foul system. This overloaded the capacity of the system. This caused the connections from private property into the public sewer to back up resulting in flood water at the affected property.</p>	<p>Norfolk County Council Highways for cause [C7]</p> <p>Anglian Water services for cause [C9]</p> <p>Property owners for protecting their property</p>	<p>Fire and Rescue Service responded to South Green flooding and pumped out the flooded properties.</p> <p>Anglian Water attended the property affected by foul sewer flooding</p>	<p>(R4) Norfolk County Council Highways, Anglian Water Services & King’s Lynn IDB could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R12) The property owners could protect their buildings through improved surface water drainage and property flood protection measures where appropriate.</p>

³⁹ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.



Spatial distribution of flooded location(s) within the catchment

(M) Smeeth Lode Catchment

1. General Description This catchment generally drains from south-west to North-East and outfalls into the Straight Mile watercourse at Islington Pumping Station.
2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
8 properties	72 properties
3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 14 below for approximate location of incident within the catchment).
 - (a) **Hungate Road, Emneth** - 1 property was internally flooded on Hungate Road. This property was flooded on the 8-9th August rainfall event⁴⁰. 1 other property experienced severe external flooding. These incidents were reported by Fire & Rescue Service⁴¹.
 - (b) **Elmside** - 1 property was internally flooded on Elmside. This property was flooded on the 8-9th August 2014 rainfall events. This incident was reported by the Fire & Rescue Service⁴².
4. Desk Study The flooding incident within this catchment is;
 - Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
 - Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.
 - Situated within an area of geology likely to have low rates of infiltration.
 - Within EA Flood Zones 2 & 3. This may also indicate that river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect.
 - Over 2.5km away from an Environment Agency rain gauge
 - Not covered by the flood risk modelling in the King's Lynn and West Norfolk Surface Water Management Plan as well as the Kings Lynn & West Norfolk Strategic Flood Risk Assessment of 2008. Hence the area was not taken forward for detailed assessment and no location specific actions exist in the plan to mitigate surface water flood risk.
 - Adjacent to highway that is publically maintainable and there are drainage gullies evident within the carriageway.
 - Are shown by Anglian Water records to only be served by four water sewers.
5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of King's Lynn Internal Drainage Board, Anglian Water, Norfolk County Council Highways and riparian owners.

⁴⁰ Flood questionnaire for case 1182,1183,1185 & Fire Service Report

⁴¹ Fire Service Report received by LLFA on 09 August, 16th August & 30th November, 2014

⁴² Fire & Rescue Service report 16th August (1206)

6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ⁴³
<p>Smeeth Lode Catchment</p> <p>Hungate Road</p> <p>Elmside</p>	<p>[C1] On Hungate Road, run-off from significant rainfall was concentrated at a low point within the catchment where the affected properties are positioned.</p> <p>[C4] Water was found to flow off the highway by the camber of the road on to the property access which concentrates flood water in the vicinity of the affected properties</p> <p>[C6] On Hungate Road, the surface water drainage system outfall (such as Grips) was partially obstructed by debris/vegetation. This reduced the efficiency of the drainage system contributing to the accumulation of surface water at the affected properties.</p> <p>[C6] At Elmside run offs entered a drainage dyke at the rear of the property which was partially blocked by vegetation and tree trimmings. This reduced the capacity of the drain causing external & internal flooding. Following the initial flood secondary flooding of raw sewerage occurred caused by failure of the pumping station in Fendyke Road</p>	<p>Norfolk County Council Highways for causes [C4] and [C6]</p> <p>Anglia Water for cause [C9] and [C6] for Elmside</p> <p>Riparian owners [C1]</p>	<p>Fire and Rescue Service attended and pumped out property on Elmside and Hungate Road on 8th August 2014</p> <p>On Hungate Road, Anglian Water supplied a tanker to the affected property.</p> <p>Anglian water engineer contacted affected resident on Elmside to provide advice and reassurance</p> <p>Officers from the Borough Council of King's Lynn & West Norfolk, Norfolk County council, Anglian Water and King's Lynn IDB visited affected properties to ascertain the cause of the flooding and provide advice.</p>	<p>[R7] Where it is determined that there is insufficient capacity in the public sewer system due to the inappropriate connection of surface water drainage, Anglian Water and the Lead Local Flood Authority could work together with other RMAs, organisations and residents to mitigate this pressure. This work could include feasibility studies that identify possible improvements into existing systems and identify the removal of surface water to alternative points of discharge. This could include a range of mechanisms both within the private property and externally.</p> <p>[R9] Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooded location. These works could then be prioritised as part of</p>

⁴³ The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

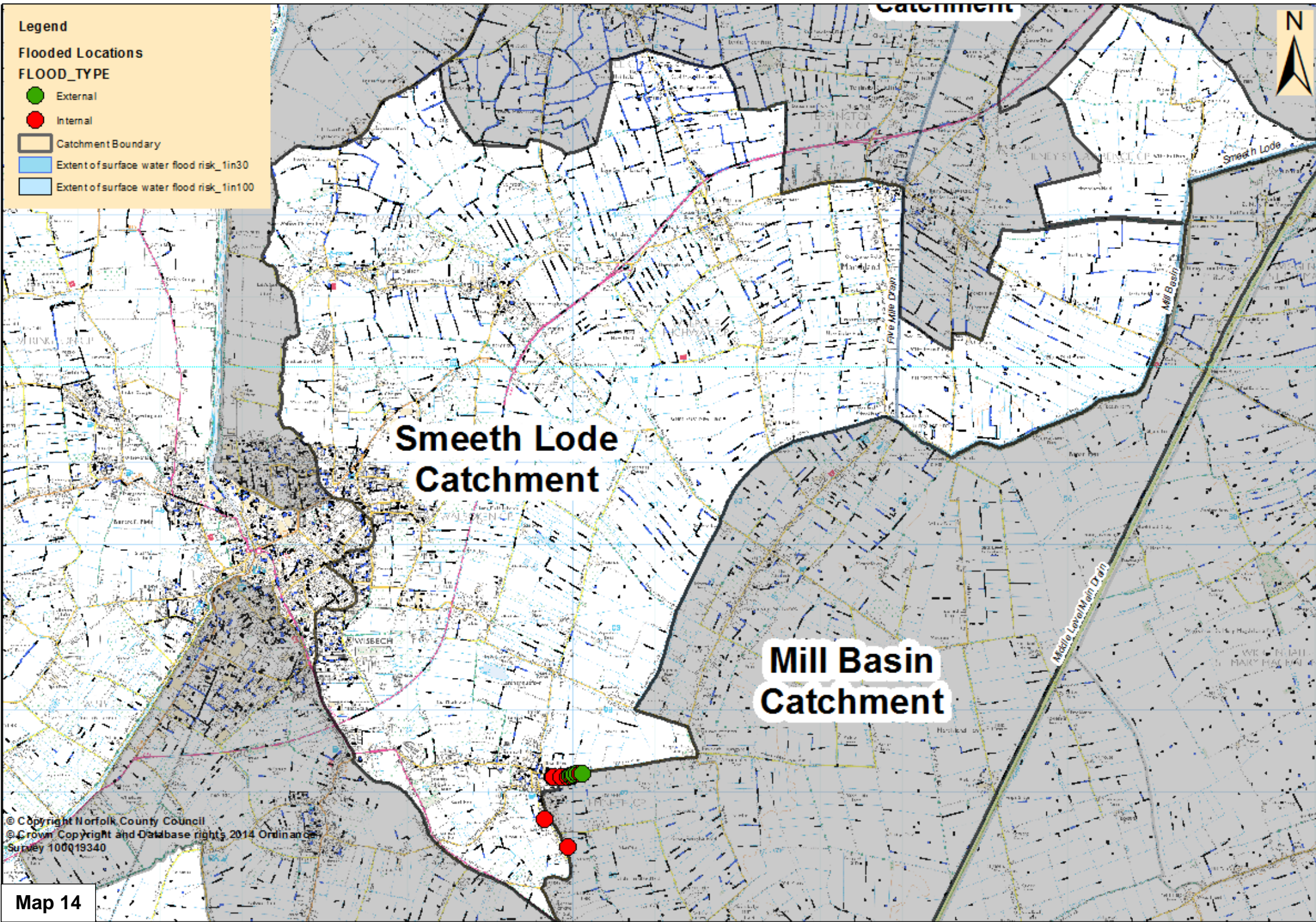
	<p>[C9] On Hungate road and Elmside, significant rainfall was found to flow into the foul system. This overloaded the capacity of the system including the foul pumping station. This caused the connections from private property into the public sewer to back up resulting in flood water at the affected properties.</p>			<p>Norfolk County Council Highways maintenance programme. This work could also be coordinated between organisations including the King's Lynn IDB where there is an interaction between their responsibilities for the drainage systems.</p> <p>[R12] The property owners should aim to protect their buildings through prioritising maintenance of existing drainage systems and use flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>
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Legend

Flooded Locations

FLOOD_TYPE

- External
- Internal
- Catchment Boundary
- Extent of surface water flood risk_1in30
- Extent of surface water flood risk_1in100



**Smeeh Lode
Catchment**

**Mill Basin
Catchment**

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Map 14

Spatial distribution of flooded location(s) within the catchment

(N) Mill Basin Catchment

1. General Description This catchment generally drains from South to North and outfalls into the Mill Basin.

2. Flood Risk The number of properties at flood risk from local sources of flooding within this catchment are set out below for 2 different rainfall events;

1 in 30	1 in 100
0 properties	82 properties

3. Incidents as reported The breakdown of flooding incidents within the catchment is listed below; (Please see Map 15 below for approximate location of incidents within the catchment).

- (a) **Hollycroft Road, Emneth** - 1 property was internally flooded on Hollycroft Road⁴⁴. This property was flooded during the 8-9th August 2014 rainfall event. The incident was reported by Borough Council of King's Lynn & West Norfolk.
- (b) **Langhorns Lane, Outwell** – 1 property was internally flooded on Langhorns Lane. The property was flooded on the 8-9th August and 4th November 2014 rainfall events with potential risk to life to the resident. The incident was reported by Norfolk County Council Highways⁴⁵ and the affected resident⁴⁶.
- (c) **Beaupre Avenue, Outwell**- 1 property was flooded on Beaupre Avenue. The property was flooded on 8-9th August 2014 rainfall event. The incident was report by the Fire & Rescue Service⁴⁷ and confirmed by NCC officers during a site visit⁴⁸.
- (d) **Hungate Road, Emneth** - 4 properties were internally flooded on Hungate Road. The properties were flooded on the 08th & 09th August rainfall events⁴⁹. 4 other properties experienced severe external flooding. These incidents were reported by Fire Service⁵⁰.
- e **Elmside, Emneth**- 1 property was internally flooded on Elmside. The property was flooded on the 8-9th August rainfall event. The incident was reported by Fire and Rescue Service and by the resident⁵¹.

4. Desk Study The flooding incident within this catchment is;

- Located within Borough Council of King's Lynn and West Norfolk's administrative boundary
- Located within the Environment Agency's Cambridgeshire and Bedfordshire admin and water management areas.

⁴⁴ Flood questionnaire for case 684

⁴⁵ Public Enquiry Manager Records for Case (750)

⁴⁶ Flood Questionnaire for Case 750

⁴⁷ Fire & Rescue Service Report received by LLFA on 16th August, 2014.

⁴⁸ NCC Flood and Water team officers visit on 23rd October 2014

⁴⁹ Flood questionnaire for case 1182,1183,1185 & Fire Service Report

⁵⁰ Fire Service Report received by LLFA on 09 August, 16th August & 30th November, 2014

⁵¹ Fire Service Report received by LLFA on 12 December 2014 & Questionnaire response from resident for case no. 1206

- Situated within an area of geology likely to have poor rates of infiltration.
- Within EA Flood Zones 2 & 3. The events being investigated are surface water events and as such being within Flood Zones indicates river levels have an influence on surface water drainage particularly where outfalls are subjected to tidal effect
- Not within 2.5 km from an Environment Agency rain gauge
- Not covered by the 2008 King's Lynn and West Norfolk strategic Flood risk assessment report as well as King's Lynn and West Norfolk Settlements Surface Water Management Plan. Hence the area was not considered as a critical drainage area consequently, no location specific actions exist in the plan to mitigate surface water flood risk.
- Near to highway that is publically maintainable and that is drained by highway systems within the carriageway.
- Shown by Anglian Water records to be served by foul water sewers.

5. Responsibilities From the desk study it is indicated that the management of local drainage is primarily the responsibility of King's Lynn Internal Drainage Board, Anglian Water, Norfolk County Council Highways and riparian owners.

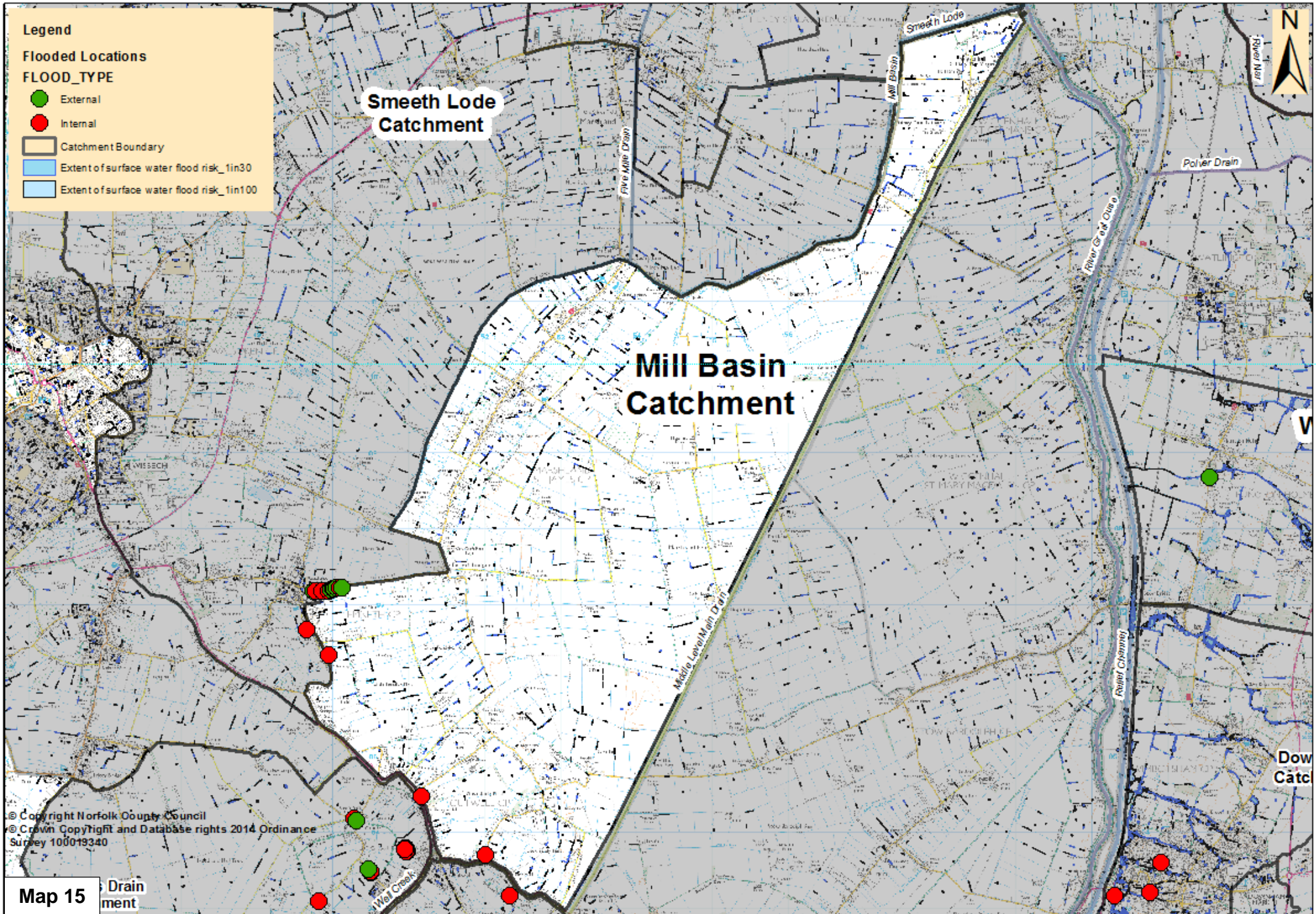
6. Investigation Findings

Location	What caused the flooding?	Who has responsibilities to manage the cause(s) of the flood?	What was their response in relation to the cause of the flood?	Recommendations ⁵²
<p>Mill Basin Catchment</p> <p>Hungate Road</p> <p>Hollycroft Road</p> <p>Elmside</p>	<p>[C1] Run-off from significant rainfall was concentrated low points in the catchment on which the affected properties on Hungate Road are positioned.</p> <p>[C4] On Hungate Road and Hollycroft Road, water was found to flow off the highway by the camber of the road on to the property access, which concentrates flood water towards the affected properties.</p> <p>[C7] On Hungate Road and Hollycroft Road, run-off from significant rainfall was found to flow into the highway surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected properties.</p> <p>[C9] On Elmside, significant rainfall was directed into the foul system. This overloaded the capacity of the system. This caused the connections from private property into the public sewer to back up resulting in flood water at the affected property.</p>	<p>Norfolk County Council Highways for causes [C4] and [C7].</p> <p>Anglian Water for causes [C9]</p> <p>LLFA and Property owners [C2]</p>	<p>Fire & Rescue Service attended and pumped out affected properties on Hungate and Hollycroft on 8th August 2014</p> <p>Norfolk County Council, Anglian Water, KL&WN Borough Council and IDB officers /engineers visited the affected residents on Hollycroft Road, Hungate Road and Elmside to provide advice and ascertain the cause of the flooding.</p> <p>The property owners on Hungate Road and Hollycroft Road did implement some property protection measures to mitigate surface run-off entering onto their property.</p>	<p>(R5) The property owner should determine the adequacy of the on-site drainage and where appropriate increase on-site storage capacity and system efficiency.</p> <p>(R7) Anglian Water, Norfolk County Council Highways and the Lead Local Flood Authority could work with the property owners to identify the potential option for reducing the amount of surface water entering the foul drainage system.</p> <p>(R9) Norfolk County Council Highways could review the existing level of maintenance required to sustain the design efficiency of their drainage systems that serves the flooding location. These works could then be prioritised as part of Norfolk County Council Highways maintenance programme.</p>

⁵² The recommendations highlighted in the table are referenced against the causes detailed above and should not be considered in isolation.

				<p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>
Langhorns Lane	<p>[C1] Run-off from significant rainfall was concentrated at a low point within the catchment in the vicinity of which the affected property is positioned.</p> <p>[C4] Water was found to flow off the highway by the camber of the road on to the property access which concentrates flood water towards the vicinity of the affected property</p> <p>[C6] The surface water drainage system outfall was partially obstructed by reduced pipe outfall. This reduced the efficiency of the upstream drainage system contributing to the accumulation of surface water flood water at the affected property.</p> <p>[C7] Run-off from significant rainfall was directed into the surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected property</p>	<p>Norfolk County Council Highways for Cause [C4], [C6], [C7].</p> <p>Adjacent Riparian owner for cause [C11] and [C8]</p>	<p>Norfolk County Council Highways and King's Lynn IDB have visited the affected residents and to ascertain the cause of the flooding.</p>	<p>(R4) Norfolk County Council highways could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>(R8) Based on investigations into the capacity of the drainage system, the Lead Local Flood Authority, King's Lynn IDB and other relevant RMAs could consider the feasibility for a capital drainage scheme in the medium to long term.</p> <p>(R12) The property owners could protect their buildings through flood protection measures where appropriate.</p> <p>(R17) Where an application for consent for culverting is made within the local catchment,</p>

	<p>[C8] The surface water drainage pipe network is partially obstructed by root ingress. This reduced the efficiency upstream drainage system contributing to the accumulation of surface water at the affected property.</p> <p>[C11] Water is directed from the neighbouring property by their asphalted Car park which concentrates flood water towards the affected property</p>			<p>potential drainage improvements should be sought. The evidence and lessons learnt from past flooding and drainage surveys need to be incorporated into any possible drainage strategy identified for any proposed development.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>
Beaupre Avenue	<p>[C1] Run-off from significant rainfall was concentrated at low points where the affected property is positioned.</p> <p>[C4] Water was found to flow off the highway by dropped kerbs/ the camber of the road on to the property access which concentrates flood water towards the vicinity of the affected property.</p> <p>[C7] Run-off from significant rainfall was found to flow into the surface water drainage network. This exceeded the design capacity of the system. This contributed to the accumulation of flood water at the affected property.</p>	<p>Norfolk County Council Highways for cause [C4]</p> <p>Property owners for [C4]</p>	<p>Fire and Rescue service attended the property and provided flooding advice</p> <p>NCC Flood and Water Management Team Officers visited the property to offer advice to residents and ascertain the cause of the flooding.</p>	<p>[C4] Norfolk County Council Highways could determine the wider systems integrity and/or capacity to understand the systems role in accommodating normal rainfall events as well as mitigating flooding.</p> <p>[R12] The property owner should aim to protect their building through flood protection measures where appropriate.</p> <p>[R25] NCC Highways could amend the road structure to route flood water away from the affected property to alternative points of discharge.</p>



- Legend**
- Flooded Locations**
- FLOOD_TYPE**
- External
 - Internal
 - Catchment Boundary
 - Extent of surface water flood risk_1in30
 - Extent of surface water flood risk_1in100

**Smeeth Lode
Catchment**

**Mill Basin
Catchment**



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Map 15 Drain
ment

Spatial distribution of flooded location(s) within the catchment

Appendix A - Key definitions and responsibilities

What Is Flooding?

- A.1 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?

- A.2 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.
- A.3 **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?

- A.4 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

- A.5 Below is a short summary of those groups and Risk Management Authorities (RMAs) that have a role in managing the flooding within Borough Council of King’s Lynn and West Norfolk area. The listing of responsibilities includes those duties or powers that directly relate to managing the flood incidents or consequence. All RMA’s have a duty to cooperate with other RMAs.

Norfolk County Council (duties under the Flood and Water Management Act 2010 and the Civil Contingencies Act 2004)

- 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

District Councils (Borough Council of King's Lynn & West Norfolk):

- 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

Internal Drainage Boards-"IDBs" (Needham and Laddus IDB, Stoke ferry IDB, King's Lynn IDB, Upwell IDB, Churchfield & Plawfield IDB, East of Ouse, Polver & Nar IDB).

- 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.

Highway Authorities (Norfolk County Council Highways acting agent for the County Council):

- 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
 - Maintenance activity⁵³ - delivered on a as needs basis by the relevant Highways area team.

Water Companies (Anglian Water Services Ltd):

- Undertake cost beneficial capital schemes to alleviate or eliminate

⁵³ It should be noted that Highways Area teams are primarily interested in the ability of highway users to pass and repass not necessarily NCC's riparian responsibilities.

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

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