



Norfolk County Council

Addendum to the
Investigation Report into the flooding
within the Norwich Urban Area
during the summer of 2014
Ref: FIR008/A

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1. Introduction

- 1.1 A [Flood Investigation Report](#) was published in January 2015 (as amended in October 2019; '*Norwich and Broadland 2014 – FIR008_Amended October 2019*'), by Norfolk County Council as part of its responsibilities under the Flood and Water Management Act 2010 in response to the flooding events that occurred across the Norwich urban area between May and October 2014.
- 1.2 The aim of the report was to determine the causes of the flooding and identify the roles and responsibilities of organisations to incidents of flooding. The report also recommended actions to reduce the impact or frequency of flooding in the future.
- 1.3 The intention of Norfolk County Council (as Lead Local Flood Authority) was to publish an addendum to outline the actions undertaken by Risk Management Authorities to better protect residents and properties in Norwich.
- 1.4 The flood investigation report grouped the incidents of flooding based on hydrological catchments. Therefore, the findings and recommendations were reported using this grouping. The original findings of the report have been reproduced and updated as part of this addendum and include actions taken by organisations and individuals since this date.
- 1.5 The following addendum has been produced in consultation with Norwich City Council: Broadland District Council: Anglian Water.

2. Additional Flood events

2.1 Since the publication of the flood investigation report into the flooding in 2014 in the Norwich urban area an amended report has since been published '[Norwich Urban Area 2014 – FIR008 Amended October 2019](#)'. This amended report includes properties that were flooded during the summer of 2014 but were only subsequently identified as being flooded internally. In addition, some of the properties included in the report in 2014 experienced repeat flooding in 2015 & 2016. Those affected in 2014 but not included in the original report were flooded on the 20 July 2014 and are as follows:

- ^{1,2}Two properties on The Denes, Thorpe St Andrew. In addition, one of the properties on The ³ Denes undertook preventative measures to protect their property in relation to an event on the 18th September 2015.
- One property in Marion Road⁴

2.2 Since the publication of the report more rainfall events occurred in 2015 that flooded properties in Norwich internally. A number of these properties had previously been flooded in the 2014 rainfall events. These are described below:

2.4 Three properties in the Prince of Wales Road were again flooded internally in 2015. One property was flooded on the ⁵29 March and again on the ⁶ 26 August and two additional properties were also flooded in ^{7,8} 26 August 2015.

2.5 To assess whether the drainage systems could have been reasonably expected to cope an assessment of the return period for the rainfall event was undertaken and is as follows:

The 29 March rainfall event – 13.2mm was recorded as falling in 9 hrs by Heigham rainfall monitoring station. This intensity of rainfall equates to less than a 1 in 1 year rainfall event.

The 26 August rainfall event – 24.6mm was recorded as falling in 4hrs by Heigham rainfall monitoring station. This intensity of rainfall equates to a 1 in 3.7 year rainfall event. Please note that a number

¹ Reported via NCC Highways on the 6/08/2014 (FWF/14/5/2044)

² Reported via NCC Highways on the 6/08/2014 (FWF/14/5/2043)

³ Reported via NCC Highways on the 6/08/2014 (FWF/14/5/2044)

⁴ Reported via Norwich City Council on the 16/07/2015 (FWF/14/4/1789)

⁵ Reported via the Fire and Rescue Service on the 28/09/2015 (FWF/15/4/2032)

⁶ Reported via the Fire and Rescue Service on the 28/09/2015 (FWF/15/4/1941)

⁷ Reported via a resident on the 02/04/2015 (FWF/15/4/1940)

⁸ Reported via Norwich City Council on the 16/09/2015 (FWF/15/4/2037)

of properties in Norfolk were affected by flooding on this date and the rain gauge information may not accurately reflect the localised significance of the event.

The causes of the flooding to these properties in 2015 have been identified as being the same as those that caused flooding in 2014. These are repeated in the table as detailed on page 10 for the properties in Prince of Wales Road.

A property within Clarence Harbour Court experienced repeat flooding on the ⁹26 August 2015. In assessing the rainfall return it was noted that there is no rain gauge present. Further details of action taken since this repeat flooding are included on page 14.

- 2.6 Within Oak Lane, ^{10,11,12,13} four properties that were flooded in the 2014 event, were again flooded on the 23 June 2016.

To assess whether the drainage systems could have been reasonably expected to cope an assessment of the return period for the rainfall event was undertaken and is as follows:

23rd June 2016- 29mm rainfall was recorded as falling in 30 minutes at the Norwich Heigham STW rainfall monitoring stations. The intensity of rainfall for the total duration equates to a 36 year rainfall event. It should be noted that several other properties across the Norwich urban area and significantly more properties were internally flooded across Norfolk on the same date. Please note that a significant number of properties in Norfolk were affected by flooding on this date and the rain gauge information may not accurately reflect the localised significance of the event.

- 2.7 On the 23rd June 2016 one property was again flooded in ¹⁴Reepham Road. This property was affected by the same causes as those in 2014. Further details of action taken since this repeat flooding are included on page 12. In assessing the rainfall return it was noted that there is no longer a rain gauge present at Norwich Airport and therefore there is no rainfall data to assess the significance of the rainfall event.

- 2.8 One property on Laundry Close, Thorpe St Andrew was again flooded on the 31st May 2016¹⁵. Further details of action taken since this repeat flooding are included on page 15. In assessing the rainfall return it was noted that there is no longer a rain gauge present at

⁹ Report via the Fire and Rescue Service (FWF/15/4/1939)

¹⁰ Report via the Environment Agency on the 27/06/2016 (FWF/16/5/2889)

¹¹ Report via the Environment Agency on the 27/06/2016 (FWF/16/5/2892)

¹² Report via the Environment Agency on the 27/06/2016 (FWF/16/5/2888)

¹³ Report via the Environment Agency on the 27/06/2016 (FWF/16/5/2891)

¹⁴ Reported by resident via flood report on the 05/09/2015 (FWF/16/5/3913)

¹⁵ Reported by resident via flood report on the 27/06/2016 (FWF/16/5/2820)

therefore there is no rainfall data to assess the significance of the rainfall event.

3. Update in response to Key Recommendations

- 3.1 A number of projects have subsequently been initiated by Risk Management Authorities in response to the key recommendations, as detailed in section 2.8, 2.9, 2.10 & 2.11 of the [Flood Investigation Report](#) (Ref 'Norwich and Broadland 2014 – FIR008_Amended October 2019'. The key recommendations have been repeated below along with actions in italics immediately following the key recommendations:

2.8 Maintenance of drainage systems

- a) There is a need for better coordination between Norwich City Council Highways and Anglian Water in relation to routine maintenance/works on the drainage systems in Norwich.

Anglian Water and Norwich City Council are intending to trial the alignment of maintenance programmes to ensure that they are better coordinated.

- b) Norwich City Council Highways, Anglian Water and Norfolk County Council should prioritise the maintenance of drainage systems where there are known flooding issues.

Anglian Water continuously review their Planned Preventative Maintenance (PPM) programme with regards to high risk repeat incident locations. These locations will be monitored for future incidents before additional funding can be sought to add this location onto the PPM commitments.

Norfolk County Council Highways have carried out a review of gully maintenance based on a range of factors including flood risk.

- c) More detailed record keeping of maintenance activities by Norwich City Council could be undertaken to ensure that any drainage systems not initially cleaned are recorded and revisited or included on the deep cleansing schedule (see section 4.37 for further explanation of the deep cleansing schedule)

Highway gully cleaning in the city is carried out by the county's contractor and work recorded on a central system which will allow further analysis as data is collected.

2.9 Funding

- a) Risk Management Authorities could work together to apply for funding to mitigate flood risk associated with their areas of responsibility. This could include large or small scale Sustainable Drainage Systems, provision of alternative points of discharge and provision of property level protection.

Norfolk County Council as Lead Local Flood Authority have been successful in securing funding to better protect properties in the Norwich urban area, these include:

In April 2015 Norfolk County Council was successful in its bid for Department for Transport Challenge funding and were awarded £9.1 million to fund a Greater Norwich Area Surface Water Drainage Scheme to improve the highway drainage systems through the replacement of individual systems with limited capacities with effective, piped surface water system connected to SUDS features and existing outfalls. See section 3.2 for details of the [Greater Norwich Area Surface Water Drainage Scheme](#).

A scheme to provide the opportunity for all the affected properties within the Norwich urban area to access subsidised funding towards property protection measures e.g. flood doors. A maximum grant of £3,500 was made available to successful applicants. To date six properties affected by the flooding have benefitted from the grant and are included within this report. Further funding will be sought to provide subsidised funding to protect additional properties that have not benefitted to date.

The [CATCH](#) project which has received funding from the EU and Anglian Water and is being project managed by Norfolk County Council.

- b) Additional funding may be required to provide an increase in the level of maintenance of the drainage systems in priority areas as budget constraints currently limit levels of maintenance.

Norfolk County Council Highways have carried out a review of gully maintenance based on a range of factors including flood risk.

2.10 Improved understanding of drainage capacity and surface water flows

- a) Increase the number of rainfall gauges across Norwich to ensure all areas of high risk have access to rainfall event data.

The EA is leading on a project to provide more extensive rain gauge coverage across Norfolk which will include areas within Norwich.

- b) Share information (including mapping) between Risk Management Authorities to ensure that the responsibilities and capacity of surface water, foul and combined systems are identified.

Ongoing area of work.

- c) Utilise evidence from the Anglian Water Sustainable Drainage System pilot project to identify the preferred locations for the infiltration of excess surface water.

Anglian Water completed a 3-year study to determine the long-term strategy for Surface Water removal from Anglian Water systems and the benefits this may have to deal with growth, catchment creep e.g. increased run off from additional impermeable areas and climate change. Anglian Water are now looking at opportunities identified through this study to inform their future business planning. Any communication strategies will be developed as part of the Surface Water removal strategy project as described above.

- d) Utilise updated surface water and catchment mapping across organisations to inform plans and projects.

This is continuously undertaken. A recent example of this is the use of these maps as part of the [CATCH](#) project utilising Critical Drainage Catchments to identify the most appropriate locations for SuDS features including slow release water butts.

2.11 Planning

- a) Local Planning authorities should work closely with the Lead Local Flood Authority and Environment Agency to fully consider and incorporate lessons learnt from flood investigations in relation to proposed development.

Norfolk County Council as Lead Local Flood Authority became a statutory consultee to the planning process for local flood risk in April 2015. The authority is required to provide comments on major planning applications within Norfolk. The LLFA also prioritise those applications identified within critical Drainage Catchments, of which there are two DCD;s within the Norwich urban area as detailed within the [Norwich Urban Area Surface Water Management Plan](#).

- b) Local Planning Authorities should note that there is an automatic right to connect to the public sewer. As such, Anglian Water's ability to reduce the risk of flooding within current systems is limited if new development is approved in a manner which does not provide appropriate mitigation. Despite Anglian Water not being a statutory consultee to the planning process, Local Planning Authorities should include Anglian Water as a consultee for significant developments.

Ongoing.

4. Update in response to Specific Recommendations

The specific recommendations relating to the individual properties affected in 2014 and subsequently those again affected in 2015 (since the publication of the report into the flooding events in 2014) are detailed within the appropriate tables on the following pages:

A. Central City Catchments

Update to the recommendations of the Flood Investigation report	
<p>Dallingfleet Catchment</p> <p>¹⁶Prince of Wales Road</p> <p>St Faiths Lane</p> <p>Eastbourne Place</p> <p>Upper King Street</p>	<ul style="list-style-type: none"> • Anglian Water carried out further investigations and found that the property drainage internal stack pipes/downpipes were unable to cope with amount of rain during the event and additional flooding occurred from the private systems. • Anglian Water have installed additional monitoring equipment within Prince of Wales and St Faiths Lane area to monitor system performance and highlight emerging issues. • Property owners have carried out a range of actions including the installation fat traps to reduce the potential for blockage, installation of Non-Return Valves, investigation of the private surface water system put in place a programme of regular maintenance.
<p>Great Cockey Catchment</p> <p>Bedford Street</p> <p>Westlegate</p> <p>Surrey Street</p> <p>Orford Place</p>	<p>Anglian Water completed remedial works of clearing a blockage found downstream and diverting the localised flows from Orford Place onto an Adjacent drainage system.</p> <ul style="list-style-type: none"> • Flooding within Bedford St and Westlegate was due to low threshold properties and general overland flood routing towards the property during high intensity storms. • As part of the Norfolk County Council traffic improvement scheme in Westlegate drainage improvements were incorporated into the design of the proposed scheme which included amending the pavement to direct water away from the southern shop entrances • Norwich City Council replaced a gully on Surrey Street to improve maintenance access, and kerb works. • Anglian Water will await the success of runoff redirection measures undertaken within Surrey Street by Norwich City Highways to determine the residual flood risk.

¹⁶ See page 4 for details of flooding to properties on the Prince of Wales Road that occurred after the publication of the flood investigation report in January 2015.

B. Dalimond Catchment

Update to the recommendations of the Flood Investigation report	
North Walsham Road	<ul style="list-style-type: none"> This was not included within the Greater Norwich Area Surface Water Drainage Scheme
Oak Lane Orchard Close	<ul style="list-style-type: none"> Anglian Water completed a capital scheme to provide protection from foul water flooding at the rear of the affected properties in Oak Lane. Norfolk County Council have installed additional surface water attenuation within Old Catton Park to reduce the surface water flows to properties in Oak Lane as part of the Greater Norwich Area Surface Water Drainage Scheme. In addition additional storage was installed by Norfolk County Council in Swinbourne Close to reduce flood risk to the rear of the properties in Oak Lane An Anglian Water capital scheme has been delivered to provide increased capacity at this location. This included work on Orchard Close and Plumstead Road East. The Greater Norwich Area Surface Water Drainage Scheme led to the following: <ul style="list-style-type: none"> the installation of attenuation features at known flooding locations within Plumstead Road East to increase the capacity of the surface water system. a new carrier drain was installed within Furze Road and linked to the ring road to reduce external flooding to the highway
Allen's Lane	<ul style="list-style-type: none"> Whilst the causes of the flooding related primarily to private drainage systems it is worth noting that Allen's Lane is within the remit of the Greater Norwich Area Surface Water Drainage Scheme. However, no works were carried out at this location as part of this scheme.

C. Dobb's Beck Catchment

Update to the recommendations of the Flood Investigation report	
Dobb's Beck Catchment Cannerby Lane (including Russell Avenue) Merlin Mews Martin Close	<ul style="list-style-type: none"> As part of the Greater Norwich Area Surface Water Drainage Scheme Cannerby Lane benefited from the installation of two large attenuation features within the open space to increase the capacity of the surface water system serving the highway. Norfolk County Council Highways will monitor the impact of the Greater Norwich Area Surface Water Drainage Scheme upstream of

Wroxham Road	<p>the location before reviewing any further measures in Merlin Mews and Martin Close. No further action is planned at present.</p> <ul style="list-style-type: none"> • A property within Merlin Mews benefitted from a grant towards property level protection from Norfolk County Council.
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D. Hellesdon Catchment

Update to the recommendations of the Flood Investigation report	
Reepham Road Heath Crescent Drayton High Road	<ul style="list-style-type: none"> • Reepham Road is within the remit of the Greater Norwich Area Surface Water Drainage Scheme. The Highway system was silted up. • Heath Crescent was assessed as part of the Greater Norwich Area Surface Water Drainage Scheme. There is the potential to install a positive system in the future although attenuation of any surface would be required to restrict the discharge into the surface water system within the A140 Cromer Road, which is already at capacity.
Woods Close	<ul style="list-style-type: none"> • Woods Close is within the remit of the Greater Norwich Area Surface Water Drainage Scheme. • The drainage from the private road adjacent to Woods Close, which is the responsibility of the nearby supermarket, was cleared at the request of Norwich City Council. • Norfolk County Council as Lead Local Flood Authority became a statutory consultee to the planning process for local flood risk in April 2015. Broadland District Council have approved development within the upstream catchment against the advice of the LLFA who had concerns about the flood risk both on site and elsewhere. • Norwich City Council, Anglian Water and Norfolk County Council have met and agreed to seek opportunities for funding to pay for a feasibility study to identify the opportunities to: <ul style="list-style-type: none"> ○ route flood water away from affected properties to alternative points of discharge, or other solutions as practicable. ○ identify the potential for managing the amount of surface water entering the drainage system in flood events.
St Martins Close	<ul style="list-style-type: none"> • Anglian Water has continuously reviewed the system to undertake a Planned Preventative Maintenance (PPM) programme with regards to high risk repeat incident locations. This location will be monitored for future incidents before additional funding can be sought to add this location onto the PPM commitments.
Hawthorne Avenue	<ul style="list-style-type: none"> • A new surface water system was installed within the highways as part of the Greater Norwich Area Surface Water Drainage Scheme. This included the installation of the road gullies to increase the capture of highway surface water into the surface water system.

Meadow Way	<ul style="list-style-type: none">Norfolk County Council, as part of the Greater Norwich Area Surface Water Drainage Scheme, investigated the potential to install a positive system but this was not feasible as the levels would not allow a gravity system to operate. Other options were also reviewed e.g. thrust boring and these would need to be looked at as part of a future programme of works and would be dependant on funding becoming available.
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E. Riverside Catchments

Update to the recommendations of the Flood Investigation report	
Barrack Street St James Meadow	<ul style="list-style-type: none"> Norwich City Council Highways have constructed a ramp across the access from Barrack Street and gullies have been cleaned.
Telegraph Lane East	<ul style="list-style-type: none"> The flooded property has reviewed its onsite drainage arrangements to provide improved protection against surface water events.
Beatrice Road Ella Road	<ul style="list-style-type: none"> Norwich City Council Highways have installed two additional gullies in Beatrice Road. Norwich City Highways have repaired and cleaned the drainage system within the alleyway adjacent to the affected properties in Ella Road. The damaged highway section of wall repaired was by Norfolk County Council. Other damaged sections of the wall have been reported to building control. Two properties within Ella Road benefitted from a grant towards property level protection from Norfolk County Council. Anglian Water will aid partnership development of potential SuDS components/schemes within the upstream catchment, to look at potential benefits of reducing or re directing overland flows. Funding routes would need to be considered following option and feasibility assessments being completed for properties affected in Beatrice Road and Ella Road.
Thorpe Road	<ul style="list-style-type: none"> Anglian Water have completed a 3-year study to determine the long term strategy for Surface Water removal from Anglian Water systems and the benefits this may have to deal with growth, catchment creep e.g. increased run off from additional impermeable areas and climate change. Anglian Water are now looking at opportunities identified through this study to inform their future business planning.
Carrow Road Clarence Harbour Court Kerrison Road	<ul style="list-style-type: none"> Anglian Water has undertaken major de siltation of the system for this location, potentially from the previous and on-going construction works within the area. Area to be monitored following these works. Clarence Harbour Court - Development location and topography has led to the connection of substandard design criteria of connecting onto the Anglian Water infrastructure leading to location being at risk from flooding. Anglian Water have subsequently installed a Non-Return-Valve to reduce the risk of flooding. A property within Clarence Harbour Court benefitted from a grant towards property level protection from Norfolk County Council.

F. Thorpe St Andrew Catchments

Update to the recommendations of the Flood Investigation report	
Wellesley Avenue South	<ul style="list-style-type: none"> • Wellesley Avenue South was assessed as part of the Greater Norwich Area Surface Water Drainage Scheme. • Norwich City Council Highways have carried out alterations to the kerbs and crossings at the properties affected by internal flooding. • As part of the Greater Norwich Area Surface Water Drainage Scheme Norfolk County Council and Norwich City have also investigated a range of measures to reduce the flood risk within this area which has included installing sustainable drainage measures such as basins and swales as well as footpath restoration works within Lionwood Park and attenuating additional surface water within the surface water system serving this catchment. However, due to physical constraints within the surface water system this has hindered the opportunities to capture additional surface water. In addition installing basins and swales within Lionwood Park requires planning permission and it was not feasible to include any such proposals as part of the Greater Norwich Area Surface Water Drainage Scheme, due to the strict timescales involved in delivering the Greater Norwich Area Surface Water Drainage Scheme. • Norfolk County Council, Environment Agency, Anglian Water & Norwich City Council are seeking additional funding to manage and attenuate surface water runoff in the upper catchment and in particular within Lionwood Park to reduce the surface water flows into Wellesley Avenue South. Further information with regards to this application will be communicated to affected parties.
Laundry Close	<ul style="list-style-type: none"> • Anglian Water identified reduced capacity within the downstream system, which has been rectified. Anglian Water will look at a potential capital solution to address the foul water flood risk. There are no commitments on funding approval at this stage. • Thunder Lane, St Williams Way and the Ring Road were included in highway improvements as part of the Greater Norwich Area Surface Water Drainage Scheme. Specifically the works carried out included: <ul style="list-style-type: none"> ○ A number of gullies were installed in the ring road adjacent to the low point that provided access to Laundry Close. ○ A new carrier drain was installed on Thunder Lane and the ring road. Soakaways are still being utilised but a positive drainage system is used as an overflow to reduce the flood risk at this location. • A property within Laundry Close benefitted from a grant towards property level protection from Norfolk County Council.

G. Other Flooding Locations

Update to the recommendations of the Flood Investigation report	
Heigham Street Long John Hill Hall Road	<ul style="list-style-type: none">• Anglian Water surveyed the surface water system and outfall in Heigham St and found no issues with the system.
Brazen Gate	<ul style="list-style-type: none">• Norwich City Highways cleaned the gullies before and after the event and will consider a feasibility study in due course.