

Flood Investigation Report

Flooding in Cringleford on 23 June 2016



* OS 25k mapping has been used within this report which are not current

Report Reference: FIR025

Final, prepared by Robert Webster on 27 November 2018



Norfolk County Council

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Executive Summary

(a) Flooding incidents

Flooding in Cringleford occurred on 23 June 2016. The rainfall event on this date generated 19 reports of flooding that led to the identification of 8 properties that had suffered internal flooding. The properties affected were concentrated within an overall catchment of the River Yare. For ease of presentation we have set out the report based on the sub-catchments within which the incidents were located. A summary of the 8 properties affected in each sub-catchment are set out below;

- Cringleford - Intwood Catchment – Cantley Lane, Langley Close and Brettingham Avenue – 6 properties
- Cringleford - Willowcroft Catchment – Willowcroft Way – 1 property
- Cringleford - Bridge Catchment – St Peters Close – 1 property

The incidents of internal flooding in Cringleford and its environs occurred in the following parishes and at the approximate locations listed below;

- Cringleford Parish:
Cantley Lane, Langley Close, Brettingham Avenue, Willowcroft Way and St Peters Close

One resident of Cantley Lane whose property flooded in June 2016 reported that flash flooding occurs on the highway once every five years and is a major risk to property. They also report that highway flooding could occur once a year if it wasn't for the resident proactively cleaning the gullies so that they can function during flash floods.

(b) Flooding causes

The flooding that occurred in Cringleford in 2016 was concentrated in the Cringleford - Intwood catchment but was also spread over two other separate catchments. More detail on the causes that occurred at the individual catchment level can be found in each section of this report however some of the key trends identified in the flooding of 2016 have been summarised on below;

- The rainfall experienced on 23 June 2016 was recorded at the Hethersett Water Tower rainfall monitoring station as being a 1 in 5 year event. However, it is likely that localised areas of the catchment saw a greater rainfall event as a number of the properties that were internally flooded only correlated between the 1 in 30 year and the 1 in 100 year flood extent mapping. This judgement is supported by the extensive evidence of flooding submitted to the LLFA.
- All of the properties impacted are situated on overland surface water flow paths and/or are below the level of the nearest highway. It is also believed that several greenfield areas adjacent to affected properties did not have sufficient drainage measures to capture/attenuate surface water runoff.
- The flooding in several locations was exacerbated by the loss of drainage features within the catchment (such as ditches) due to their lack of maintenance. Culverting and infilling may also be a factor but this is unconfirmed.
- The capacity of surface water drainage including land drains, highway drainage and private property drainage was exceeded due to the significant levels of rainfall that fell during the event.
- Features such as kerbs, drop-kerbs, garden fences and footpath links had the effect of containing or channelling flood water near to properties.
- Flood water entered properties through the unprotected structure of the building; external doors.

- The capacity of the foul network was also exceeded due to the ingress of surface water into the foul network. This caused the foul network to surcharge in a number of locations during the event with several residents reporting foul water entering their property.

(c) Key recommendations

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

Risk Management Authorities should;

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

Property owners of affected properties should;

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

Norfolk County Council should;

- Work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce run-off and increase the attenuation of flood water to reduce the impacts of flooding.
- Seek to remind riparian owners of their responsibility to undertake appropriate levels of maintenance to sustain the efficiency of the drainage systems.
- Communicate with local residents to advise them of the appropriate measures they could take to protect their property without prejudicing the rights and responsibilities of adjoining property holders.
- Determine if works are needed to remove the risk posed by structures that form obstructions to watercourse flows and communicate with affected parties and riparian owners.
- Review and monitor the delivery of recommendations within this and other relevant flood investigation reports.
- Undertake investigations to determine the full extent of watercourses, culverts, highway drainage and any other drainage infrastructure within the area to assess their condition and capacity.
- Liaise with affected property owners to confirm several points that are raised within their flood incident reports and then action from them appropriately.
- Liaise with landowners and discuss appropriate land management techniques to reduce runoff.
- Consider opportunities to protect affected properties from greenfield runoff – such as land drains, filter drains and attenuation.

- Consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable.
- Investigate further into reports that relatively new developments within the surrounding area of affected properties have increased flood risk.
- Ensure that any future development, within the areas this report, does not increase local flood risk.

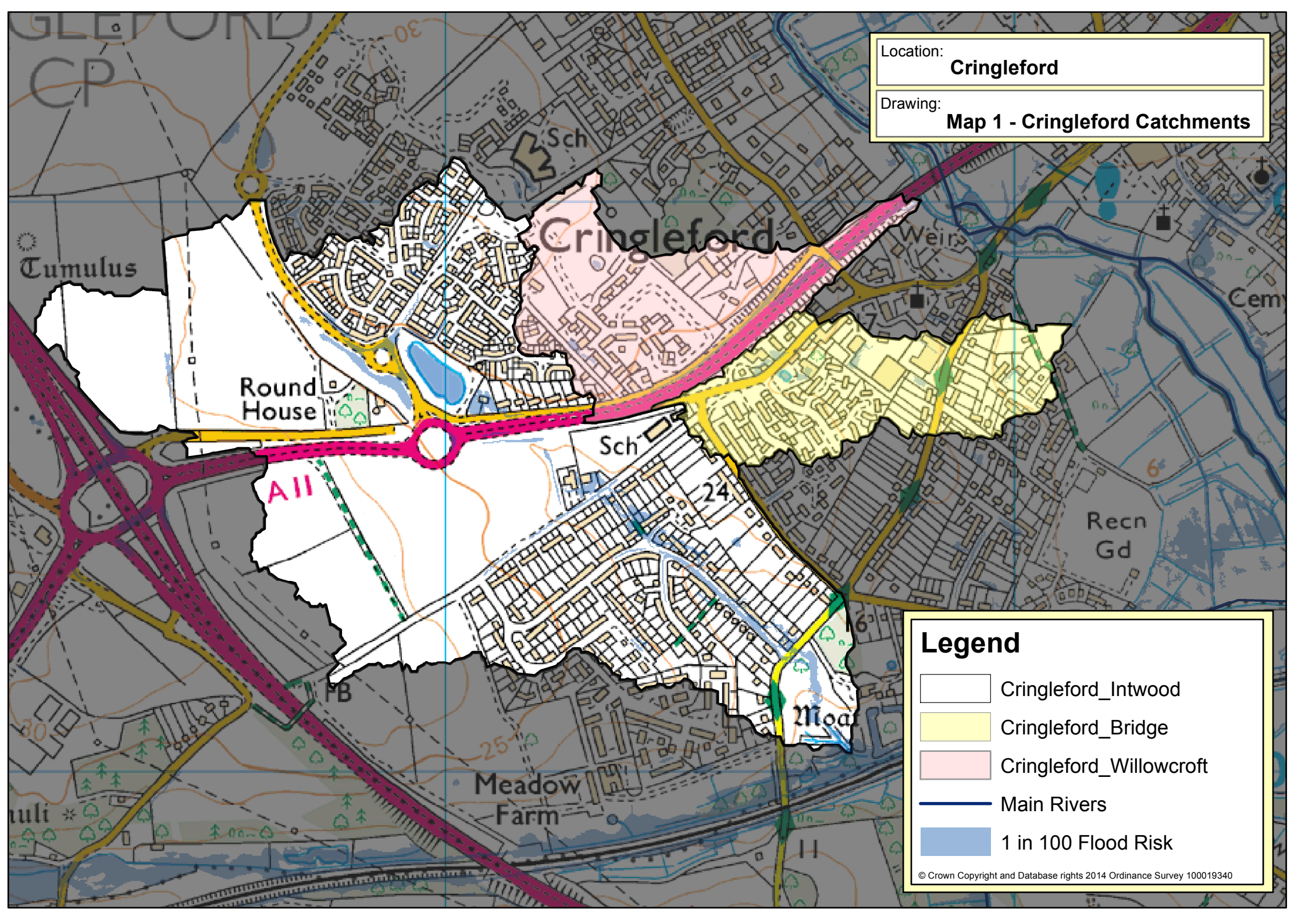
Anglian Water should;

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

South Norfolk District Council should;

- Review their approach to the use of their permissive powers to maintain watercourses under the Land Drainage Act 1991.
- Ensure that any future development, within the areas of this report, does not increase local flood risk.

Location: **Cringleford**
Drawing: **Map 1 - Cringleford Catchments**



Legend

- Cringleford_Intwood
- Cringleford_Bridge
- Cringleford_Willowcroft
- Main Rivers
- 1 in 100 Flood Risk

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Justification for Flood Investigation

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

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

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

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

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

It was deemed necessary to complete a formal Investigation Report into the flooding in Cringleford in 23 June 2016 as:

- multiple residential properties were internally flooded
- one commercial property was internally flooded.

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

The flood investigation report aims to:

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

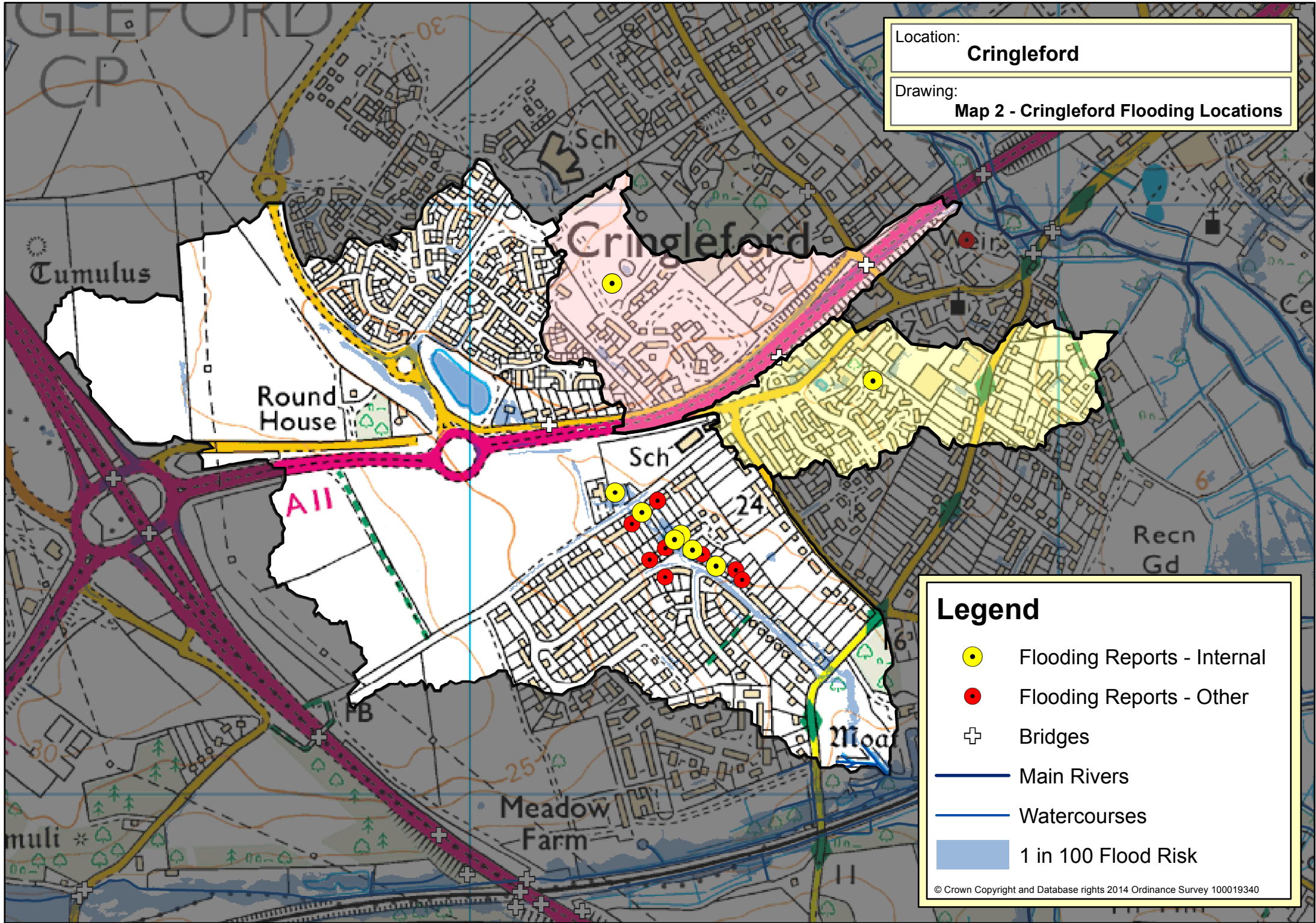
Mitigation measures include property level protection: reinstating lost drainage features: reviewing or increasing maintenance regimes and increasing the capacity of the drainage network.

The flood investigation report cannot:

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

Location: **Cringleford**

Drawing: **Map 2 - Cringleford Flooding Locations**



Legend

- Yellow dot: Flooding Reports - Internal
- Red dot: Flooding Reports - Other
- White cross: Bridges
- Thick blue line: Main Rivers
- Thin blue line: Watercourses
- Light blue shaded area: 1 in 100 Flood Risk

Flooding and flood risk within the Cringleford – Intwood catchment

Description of catchment

The catchment is roughly half and half split between rural and urban area. The land within the catchment falls generally to the south-east and discharges into one of the many tributaries of the River Yare.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface runoff) and strategic sources (Main Rivers and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	0	9	1
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	0	36	3
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

Within this catchment 14 reports of external and internal flooding have been received. Out of these 14 reports 6 incidents of internal flooding have been confirmed and assessed as part of this investigation. These incidents are detailed in the table below.

Incident as reported	What was the response to the flood incident
On the 23/06/2016 - 2 properties were internally flooded on Cantley Lane , Cringleford. These incidents were reported by: <ul style="list-style-type: none"> • email from South Norfolk District Council on the 24 June 2016, (FWF/16/7/2795) • email from South Norfolk District Council on the 27 June 2016, (FWF/16/7/2926) 	<ul style="list-style-type: none"> • A resident carried out measures to minimise the impact of flooding during the incident. • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.
On the 23/06/2016 - 2 properties were internally flooded on Langley Close , Cringleford. These incidents were reported by: <ul style="list-style-type: none"> • Two emails from South Norfolk District Council on the 01 July 2016, (FWF/16/7/2975) & (FWF/16/7/2974) 	<ul style="list-style-type: none"> • A resident carried out measures to minimise the impact of flooding during the incident. • Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

On the 23/06/2016 - 2 properties were internally flooded on **Brettingham Avenue**, Cringleford. These incidents were reported by:

- Two emails from South Norfolk District Council on the 01 July 2016, (FWF/16/7/2977) & (FWF/16/7/2978)

- A resident carried out measures to minimise the impact of flooding during the incident.
- Norfolk County Council (Lead Local Flood Authority) visited affected residents to offer advice and to gather information after the incident.

* it has been stated that an additional property on Cantley Lane suffered flooding within the same rainfall event. This was not reported to the relevant authorities and is therefore not included within the number of properties listed above.

Recent rainfall within the catchment

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

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

There were no incidents within 2.5km of a rain gauge, the nearest gauge is Hethersett Water Tower which is approximately 4.5km away. The rainfall events recorded by gauges for this catchment are:

23 June 2016 - 28mm rainfall was recorded as falling in 3 hours at the Hethersett Water Tower rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 5 rainfall event.

Historic flooding incidents within the catchment

The following table lists flooding incidents within the catchment that have been recorded:

Date of incident	Impact	Rainfall intensity
Unknown	One resident of Cantley Lane reported that flash flooding occurs on the highway once every five years and is a major risk to property. They also report that highway flooding could occur once a year if it wasn't for the proactive cleaning of gullies.	Unknown

Causes of flooding within the catchment and recommendations

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

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Cantley Lane, Cringleford, 23/06/2016	<p>Adjacent field runoff entered a commercial property during a significant rainfall event. It was reported that the field was planted with sweetcorn and ploughed parallel to the slope rather than perpendicular.</p> <p>Runoff from the field flowed across the footpath linking Cantley Lane to the A11 and then into gardens and properties to the north of Cantley Lane. The flood water then came out of the commercial property, crossing Cantley Lane and flowed into the electricity substation.</p> <p>Surface water from the field and from the flooded commercial property ran along Cantley Lane towards the low spot within the highway and affected properties and the electricity substation to the south of the road which are lower than the carriageway. It is reported that the drainage system did not have sufficient capacity to prevent this from occurring.</p>	Property owner, landowner, NCC Highways
Langley Close, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Runoff from highway – believed to be channelled down the footpath linking Cantley Lane and Langley Close during a significant rainfall event • Runoff from the electricity substation continued through adjoining gardens and then into the footpath linking Cantley Lane and Langley Close during a significant rainfall event • Surcharging within surface water system • Surcharging within foul sewer system 	Property owner, landowner, NCC Highways, Anglian Water
Brettingham Avenue, Cringleford, 23/06/2016	The field and highway runoff that occurred on Cantley Lane during a significant rainfall event flowed through the electricity substation and adjacent gardens and was channelled down the footpath linking Cantley Lane and Langley Close and affected the properties on Brettingham Avenue.	Property owner, landowner, NCC Highways, Anglian Water

Flooding experienced at / on	Recommendations	Who has responsibility to follow up the recommendations?	Timescale
All locations, Cringeford, 23/06/2016	Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait for measures to be approved through national funding schemes.	Property owners, Land owners, Norfolk County Council	12 months
Cantley Lane, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Property owners could install property level protection to mitigate against runoff. • Undertake investigations to determine the full extent of watercourses, culverts, highway drainage and any other drainage infrastructure within the area to assess their condition and capacity. • Liaise with field landowners and discuss appropriate land management techniques to reduce runoff. • Consider opportunities to protect affected properties from greenfield runoff – such as land drains, filter drains and attenuation. • Consider opportunities to route flood water on the highway away from affected properties to alternative points of discharge, or other solutions as practicable. • Liaise closely with any developer applicant to ensure that flood risk within the area isn't increased. 	Property owners, land owners, Norfolk County Council, South Norfolk District Council	12 months
Langley Close, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Since flooding to properties on Langley Close is believed to be caused from flooding on Cantley Lane, any recommendations listed above will mitigate flooding on Langley Close. • Property owners could install property level protection to mitigate against runoff. • Further investigation should be carried out into the reports of flooding due to surcharging of foul sewer. If this is occurring, Anglian Water will need to be contacted. 	Property owners, land owners, drainage asset owner, Norfolk County Council, Anglian Water	12 months

	<ul style="list-style-type: none"> • Further investigation should be carried out into the reports of flood water entering a property from a bath/shower and from a toilet. If this is occurring, appropriate mitigation is required. • Liaise with the affected property owner to identify the surface water drain which was reported to have surcharged during the significant rainfall event. Determine the body responsible for this asset and identify the cause of this surcharging. 		
Brettingham Avenue, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Since flooding to properties on Brettingham Avenue is caused from flooding on Cantley Lane, any recommendations listed above will mitigate flooding on Brettingham Avenue. • Property owners could install property level protection to mitigate against runoff. • Anglian Water to confirm the layout of the system at the Roundhouse roundabout development and investigate into its effectiveness. 	Property owners, land owners, Norfolk County Council, Anglian Water	12 months

Location:
Cringleford_Intwood

Drawing:
Map 3 - Flood and Drainage Details

Cantley Lane – Internal and external flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields and the highway affected properties on Cantley Lane.

Recommendations – Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce runoff and increase the attenuation of flood water to reduce the impacts of flooding. NCC will also liaise with local landowners to discuss riparian responsibilities and runoff prevention methods.



Langley Close and Brettingham Avenue – Internal and external flooding experienced on 23 June 2016

Causes – The field and highway runoff that occurred on Cantley Lane during a significant rainfall event was channelled down the footpath linking Cantley Lane and Langley Close and affected the properties on Langley Close and Brettingham Avenue.

Recommendations – Since flooding to properties on Langley Close and Brettingham Avenue is caused from flooding on Cantley Lane, any recommendations undertaken on Cantley Lane will mitigate flooding to properties downstream. Norfolk County Council will also work with partner organisations to identify funding for property level protection flood mitigation.

Legend

- Bridges
- Main Rivers
- Watercourses

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Flooding and flood risk within the Cringleford – Willowcroft catchment

Description of catchment

The catchment is mostly urban with a small number of green areas situated throughout. The land within the catchment falls generally to the north-east and discharges directly into the River Yare.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface runoff) and strategic sources (Main Rivers and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

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

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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

Incident as reported	What was the response to the flood incident
On the 23/06/2016 - 1 property was internally flooded on Willowcroft Way , Cringleford. This incident was reported by Media report from EDP 23.06.16, (FWF/16/7/2822)	No authority visited the affected property however Norfolk County Council (Lead Local Flood Authority) contacted resident to offer advice and to gather information after the incident.

Recent rainfall within the catchment

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

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

There were no incidents within 2.5km of a rain gauge, the nearest gauge is Hethersett Water Tower which is approximately 4.5km away. The rainfall events recorded by gauges for this catchment are:

23 June 2016 - 28mm rainfall was recorded as falling in 3 hours at the Hethersett Water Tower rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 5 rainfall event.

Historic flooding incidents within the catchment

There were no reports of historic flooding within this catchment.

Causes of flooding within the catchment and recommendations

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

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
Willowcroft Way, Cringleford, 23/06/2016	Field/green-space runoff entered the property through external doors during a significant rainfall event. It has been reported that this was due in part to an incorrectly built silt trap within an adjacent playing field.	Property owner, private developer

Flooding experienced at / on	Recommendations	Who has responsibility to follow up the recommendations?	Timescale
All locations, Cringleford, 23/06/2016	Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures and other flood mitigation measures. Property owners could also carry out their own measures where funding is not forthcoming or residents are unwilling to wait for measures to be approved through national funding schemes.	Property owners, Land owners, Riparian owners, Norfolk County Council	12 months
Willowcroft Way, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Property owner could install property level protection to mitigate against runoff. • Identify the owner of the adjacent field/green space and determine what drainage infrastructure (if any) captures the runoff. If present, investigate into its ineffectiveness. It has been reported that since the flooding event, the incorrectly built silt trap has since been modified.. 	Property owners, land owners, private developer, Norfolk County Council	6 months

Location:
Cringleford_Willowcroft

Drawing:
Map 4 - Flood and Drainage Details

Willowcroft Way – Internal flooding experienced on 23 June 2016

Causes – Significant runoff from adjacent fields affected a commercial property on Willowcroft Way. Surcharging from a surface water drain also contributed towards the flooding.

Recommendations – Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce runoff and increase the attenuation of flood water to reduce the impacts of flooding. Investigation into the surcharging water drain should also be carried out so that recommendations can be presented.



Legend

- ⊕ Bridges
- Main Rivers
- Watercourses

Flooding and flood risk within the Cringleford – Bridge catchment

Description of catchment

The catchment is vastly urban with small areas of green situated throughout. The land within the catchment falls generally to the east and discharges into one of the many tributaries of the River Yare.

Flood Risk within the catchment

The flood risk from local sources (ordinary watercourses and surface runoff) and strategic sources (Main Rivers and the sea) of flooding within this catchment has been assessed. The number of properties at risk are set out in the table below for two different risk bandings, the 1 in 30 year event and the 1 in 100 year event. This assessment does not take into account flood risk from groundwater or reservoir failure.

Flood Risk Data Source	Critical Services	Residential	Non-residential
[a] No. of properties subject to surface water flood risk at 1 in 30 year event:	0	3	0
[b] No. of properties subject to surface water flood risk at 1 in 100 year event:	0	9	17
[c] No. of properties subject to flood risk from rivers and the sea at 1 in 30 year event:	0	0	0
[d] No. of properties subject to flood risk from rivers and the sea at 1 in 100 year event:	0	0	0
[e] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 30 year event:	0	0	0
[f] No. of properties only subject to both flood risk from surface water and rivers and the sea (combined risk) at 1 in 100 year event:	0	0	0

* The number of affected critical services/properties listed above has been obtained through using the Environment Agency's (EA) Risk of Flooding from Surface Water (RoFSW) maps.

Flood incidents within this catchment

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

Incident as reported	What was the response to the flood incident
On the 23/06/2016 - 1 property was internally flooded on St Peters Close , Cringleford. This incident was reported by email from South Norfolk District Council on the 01 July 2016, (FWF/16/7/2984)	<ul style="list-style-type: none"> A resident carried out measures to minimise the impact of flooding during the incident.

Recent rainfall within the catchment

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

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

There were no incidents within 2.5km of a rain gauge, the nearest gauge is Hethersett Water Tower which is approximately 4.5km away. The rainfall events recorded by gauges for this catchment are:

23 June 2016 - 28mm rainfall was recorded as falling in 3 hours at the Hethersett Water Tower rainfall monitoring station. This intensity of rainfall for the total duration equates to a 1 in 5 rainfall event.

Historic flooding incidents within the catchment

There were no reports of any historic flooding within this catchment.

Causes of flooding within the catchment and recommendations

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

Flooding experienced at / on	Causes of flooding	Who has responsibilities to manage the cause(s) of the flood?
St Peters Close, Cringleford, 23/06/2016	During a significant rainfall event runoff from the highway was channelled through an access lower than the carriageway, then through garages and gardens and into the affected property.	Property owners, NCC Highways

Flooding experienced at / on	Recommendations	Who has responsibility to follow up the recommendations?	Timescale
St Peters Close, Cringleford, 23/06/2016	<ul style="list-style-type: none"> • Property owner could install property level protection to mitigate against runoff. • Work with property owners to assess the road structure to identify if it could be amended to route flood water away from the affected properties to alternative points of discharge, or other solutions as practicable. 	Property owners, land owners, riparian owners, Norfolk County Council	12 months

Location:
Cringleford_Bridge

Drawing:
Map 5 - Flood and Drainage Details

St Peters Close – Internal flooding experienced on 23 June 2016

Causes – During a significant rainfall event highway runoff from Newmarket Road channelled through the external of a property which has an access lower than the carriageway, through garages and gardens and into the affected property.

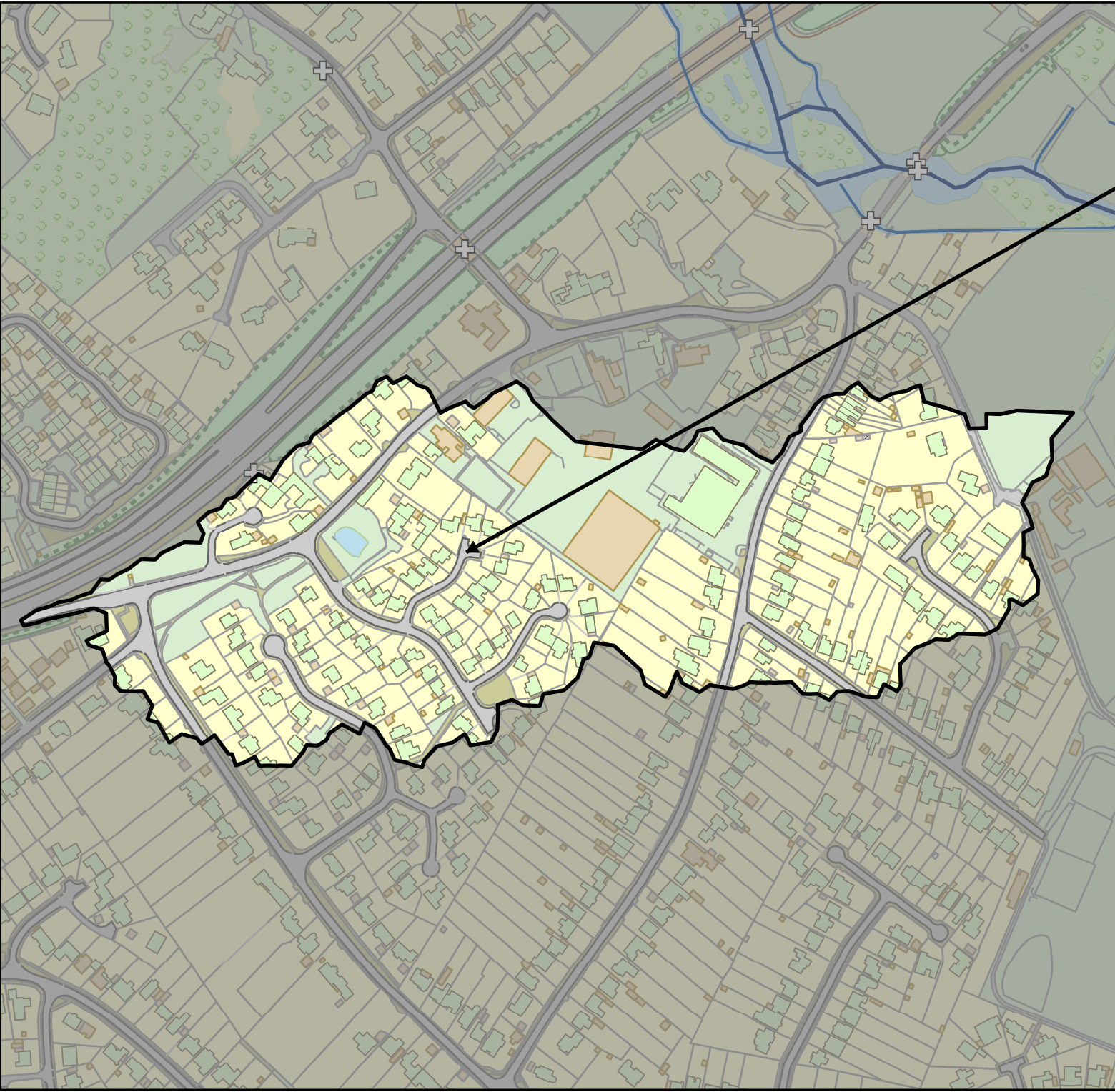
Recommendations – Norfolk County Council will work with partner organisations to identify funding for flood mitigation. This would include assessing the potential to install property level protection measures, reduce runoff and increase the attenuation of flood water to reduce the impacts of flooding.



Legend

- ⊕ Bridges
- Main River
- Watercourses

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

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

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

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

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

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Appendix A - Key definitions and responsibilities

What is flooding?

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

What is internal and external flooding?

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

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

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

What is Local Flood Risk?

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

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

Roles and Responsibilities of Risk Management Authorities

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

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

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

2. District Councils

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

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

3. Internal Drainage Boards (“IDBs”)

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

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

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

5. Water Companies

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

6. Riparian Owners

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