Section 19 Flood and Water Management Act 2010

Crowfield Flood Investigation –

Storm Babet 2023

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Executive Summary

Storm Babet caused significant disruption to communities across Suffolk between 18th-21st October 2023. Crowfield was a community that was significantly impacted, with 5 properties suffering internal flooding as well as disruption to infrastructure and services. Suffolk County Council, as Lead Local Flood Authority, have therefore undertaken a Section 19 Flood Investigation. The resulting report will:

- highlight the probable causes of flooding
- identify options to reduce future flood risk and increase property resilience
- make recommendations for actions by relevant responsible organisations, landowners or homeowners.

Crowfield is in an area containing several isolated sites predicted to be at risk of pluvial (surface water) flooding, and the local topography and geology further contribute to the community's susceptibility. Crowfield is situated on higher ground, with the village centre being predominantly flat. The local geology and soils are characterised as having low permeability and high run off, making a number of properties in Crowfield vulnerable to flooding due to intense rainfall events.

Storm Babet delivered significant rainfall to the catchment, following an extended period of above average rainfall. Impacts within Crowfield were widespread and for the purposes of this report, the affected areas have been categorised into one zone. The description of the flood events detailed in the report have been compiled using data submitted to Suffolk County Council, as well as information from Risk Management Authorities (e.g. Suffolk County Council Highways and Anglian Water) and the community.

A comprehensive summary of the location of internal flooding is provided within the report, outlining the context of the event and the impact. Key findings are that Crowfield was severely impacted by flooding due to the intensity of rainfall, that overwhelmed the natural flow routes and the capacity of watercourses and drainage infrastructure. This situation was compounded when overland flow paths converged and saw the resultant internal flooding of property.

Short, medium and longer term recommendations have been published and each have a potential role to improve resilience and reduce the risk of flooding to Crowfield. For short term measures, key highlights include the implementation of community flood plans, maximising Property Flood Resilience (PFR) grants, removal of blockages within watercourses, as well as investigations into local drainage infrastructure. For medium to longer term recommendations, there is emphasis on the management of water from rural land and the creation of new natural flood management features, to reduce flood risk within the catchment.

Justification for Investigation

Suffolk County Council, Lead Local Flood Authority (LLFA) has determined that in accordance with our criteria, it is considered necessary and appropriate to carry out an investigation into this flood event.

This is in accordance with Section 19 (1) of the Flood and Water Management Act 2010, and in accordance with Section 19 (2) of the Flood and Water Management Act 2010, to publish the results and notify the relevant risk management authorities (RMAs).

Section 19 Local authorities: investigations

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate -

> *(a) which risk management authorities have relevant flood risk management functions, and*
>
> *(b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.*

(2) Where an authority carries out an investigation under subsection (1) it must -

> *(a) publish the results of its investigation, and*
>
> *(b) notify any relevant risk management authorities*

Criteria for an investigation (as per Appendix D of the Suffolk Flood Risk Management Strategy):	
There was a risk to life because of flooding?	
Internal flooding of one property (domestic or business) has been experienced on more than one occasion?	
Internal flooding of five properties has been experienced during one single flood incident	✓
Where a major transport route was closed for more than 10 hours because of flooding	
Critical infrastructure was affected by flooding	
There is ambiguity surrounding the source or responsibility of a flood incident	

Understanding the flood context

1. What happened during Storm Babet

A succession of weather fronts between the 11th and 13th of October 2023 brought significant rainfall to the region. Readings indicate that between 30mm and 50mm of rain fell across Suffolk compared with an average of just less than 65mm across the whole month of October according to Met Office weather data (Met Office, 1991-2020). This significant rainfall occurred in a short space of time and resulted in saturated land and rivers reaching their capacity. Shortly after this, Storm Babet followed on the 18th to 21st of October 2023. The storm brought between 50 mm and 80 mm of rain to much of central and northern East Anglia, with some Suffolk weather stations recording the wettest October day on record.

The Environment Agency river level measuring stations indicated many flows close to or exceeding their highest on record, and the weather remained wetter than average for the rest of the month. October 2023 was the joint wettest on record in the east of England since 1871. During Storm Babet, Suffolk saw the heaviest rainfall across East Anglia causing significant flooding of roads and properties. The river systems rose rapidly across whole catchments due to the existing conditions, which was unusual as storms will often impact a small area and result in a steady progression of flood water downstream. A major incident was declared by the Suffolk Resilience Forum (SRF) in the afternoon of the 20th of October due to significant impacts on communities and disruption to the road and rail networks.

The following maps illustrate the extent to which the rainfall in the months preceding Storm Babet exceeded the average monthly rainfall for July to October in recent years in Suffolk.

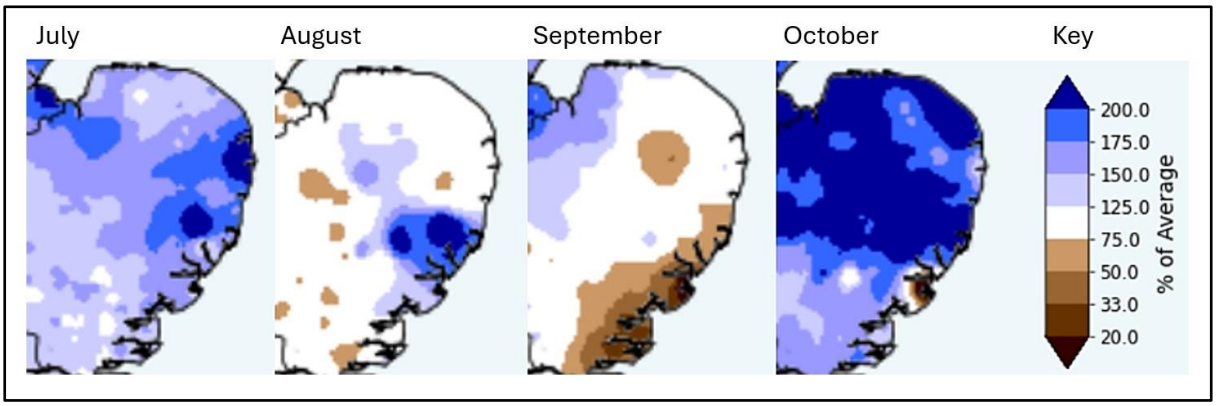

Figure 1. Average rainfall in East Anglia between July and October 2023 as a percentage of the historical average monthly rainfall

The following report acknowledges that October 2023, and in particular Storm Babet, was an extreme event and will assess the likely causes and impacts. The report will recommend measures to reduce the risk of flooding within the location, in line with best practice, ranging from large to small scale interventions and be targeted at a range of stakeholders. It should be noted that Storm Babet was a significant event, with a low probability of recurrence. The recommendations will provide advice about reducing flood risk; however, they should not be relied upon as a guaranteed failsafe to mitigate against all future flooding.

2. Location of flooding

Crowfield is a village situated approximately 9 miles Northwest of Ipswich. It is in the local authority district of Mid Suffolk.

Figure 2. Investigation area map

The Environment Agency has permissive powers to carry out maintenance, improvement or construction work on main rivers to manage flood risk. The Internal Drainage Boards (IDBs) have similar permissive powers but instead relate to ordinary watercourses within their board area.

Lead Local Flood Authorities (LLFAs) and Internal Drainage Boards (IDBs) manage the flood risk from ordinary watercourses but responsibility for maintaining watercourses rests with the Riparian landowner, defined as those who have a river, stream or ditch which runs next to or through their land or property.

Fig. 3 shows the location of the nearest statutory main rivers near Crowfield. However, in this case, main rivers did not contribute to flooding experienced in Crowfield, during Storm Babet.

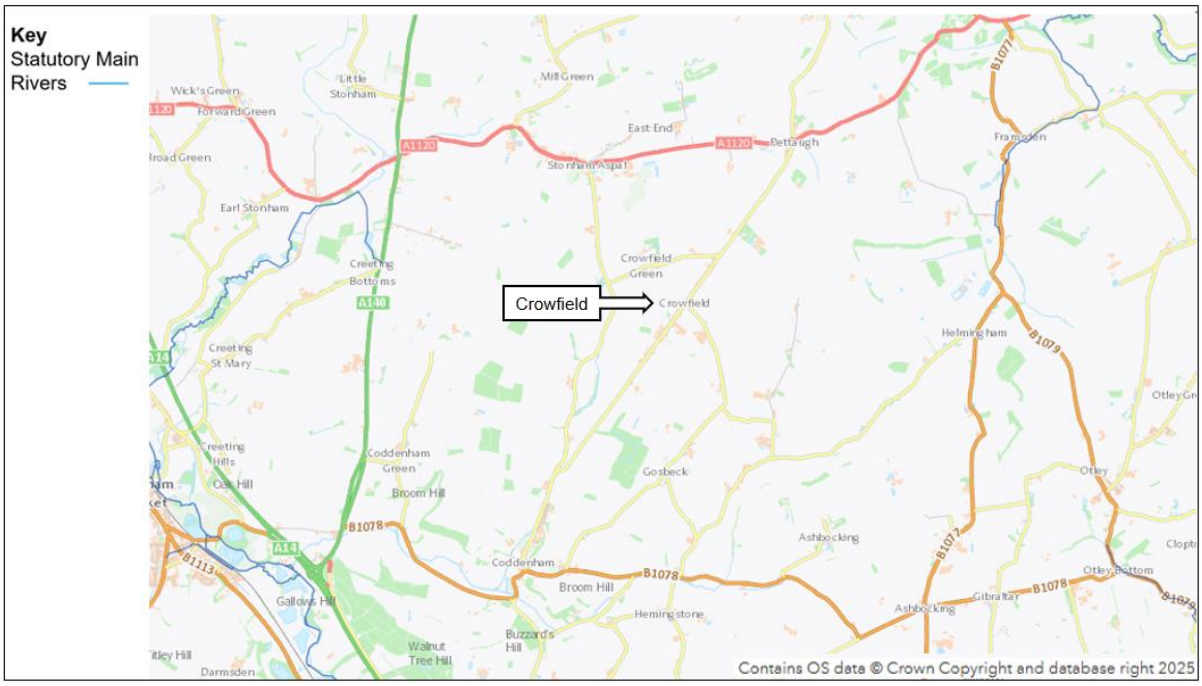

Figure 3. Location of statutory main river and ordinary watercourses

On the 20th of October 2023, Storm Babet resulted in significant rainfall in Suffolk on top of an already wetter than average October. This caused internal flooding to properties, residential and commercial, across the county from various flooding sources. Crowfield was impacted with 5 properties reporting internal flooding. Flood water was reported to have originated from surface water runoff from surrounding fields and highways (pluvial).

For the purposes of this investigation the areas affected by flooding have been grouped into two distinct areas (see Figure 4). The locations in these areas as follows:

1. Debenham Road, Gosbeck Road, Stone Street
2. Church Road

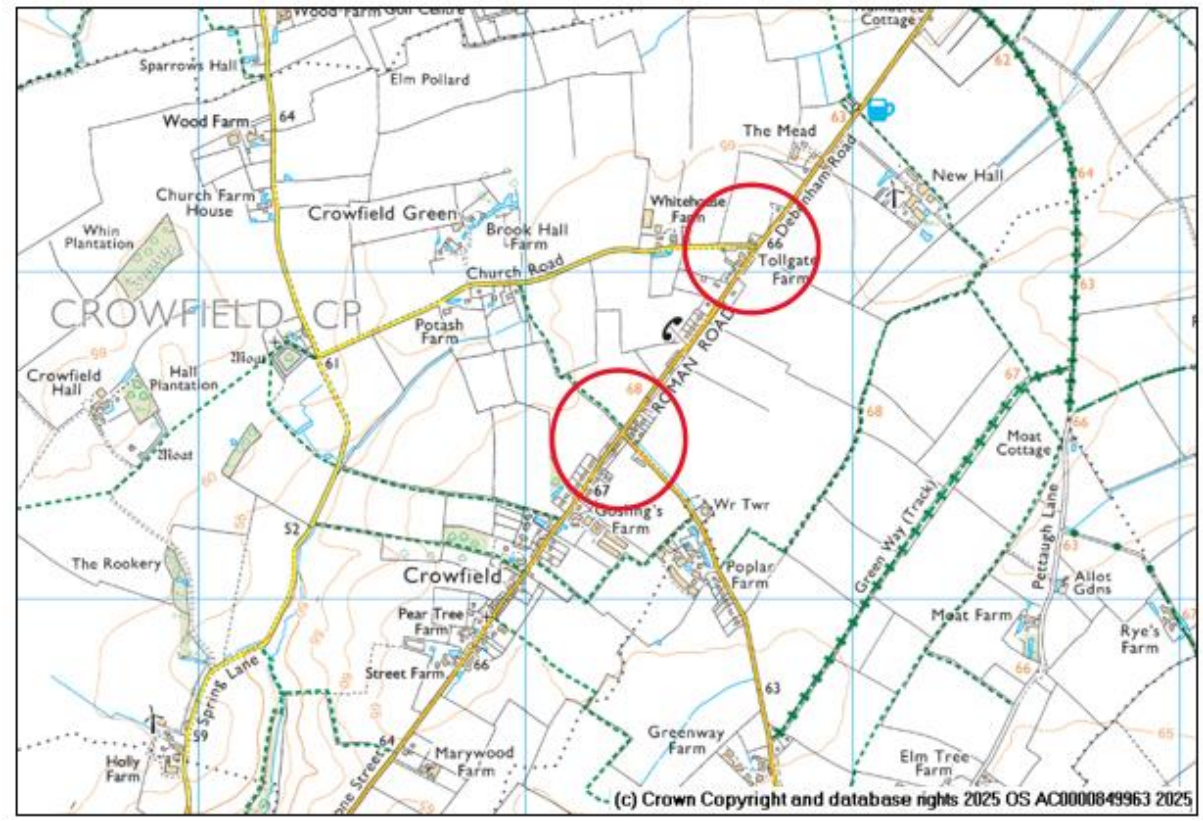

Figure 4. Crowfield investigation area map with locations

3. Records of any historical flooding

The Environment Agency do not hold any historical records of flooding in Crowfield.

No significant flood history is recorded by Anglian Water in Crowfield.

Between 2015 and October 2023, Suffolk Highways received a total of 15 customer reports regarding drainage issues in Crowfield. The majority of these reports concerned blocked ditches, with a smaller number relating to gullies—primarily located on Church Lane and Debenham Road. In response, Suffolk County Council's enforcement team became involved, and remedial works were subsequently carried out by landowners around 2021.

4. Predicted Flood Risk

Several areas of Crowfield are at risk of flooding from pluvial sources.

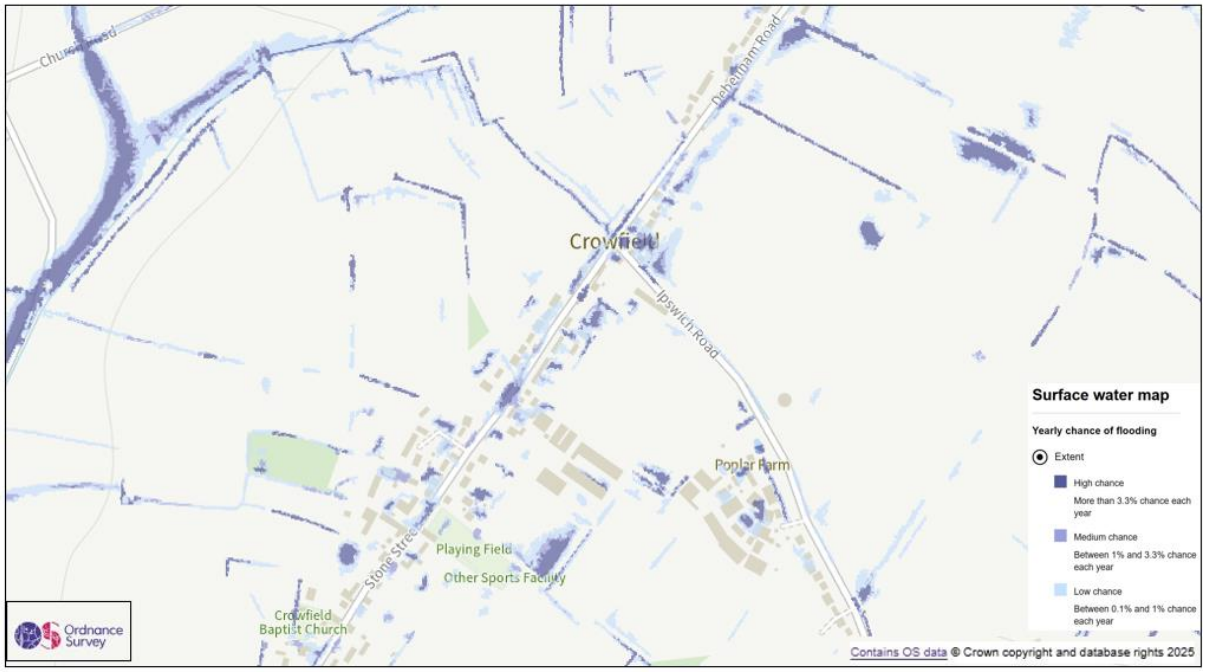

Figure 5. Surface water flood risk

Figure 5 highlights the predicted pluvial (surface water run-off from surrounding land) flood risk in Crowfield, with several isolated locations predicted to be at risk.

Pluvial flood risk varies across this location, ranging from low to high risk. Impacted locations including Debenham Road, Gosbeck Road and Stone Street, closely align with predicted flood risk for this area.

Figure 6. Flood risk from rivers and sea

Figure 6 shows the predicted fluvial (from designated main river and ordinary watercourses) flood risk in Crowfield. There is a minor watercourse that runs adjacent to Spring Lane to the west, and no further designated main river or significant watercourses within Crowfield. Fluvial flood risk is therefore low in this location.

5. Catchment characteristics

Figure 7 shows the topography surrounding Crowfield, with gradient changes across the wider region. The village of Crowfield is situated on higher ground, with a gradual gradient change to the southwest of the village. The village centre is predominantly flat. (see Figure 7).

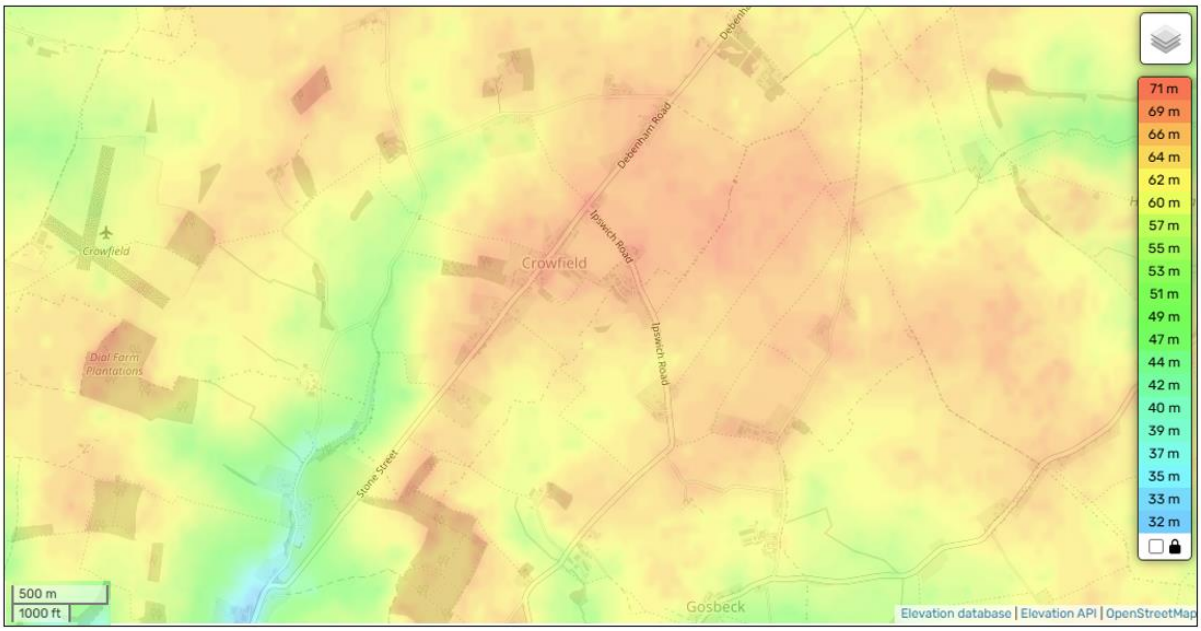

Figure 7. Crowfield and surrounding topography (TessaDEM as cited in topographic-map.com)

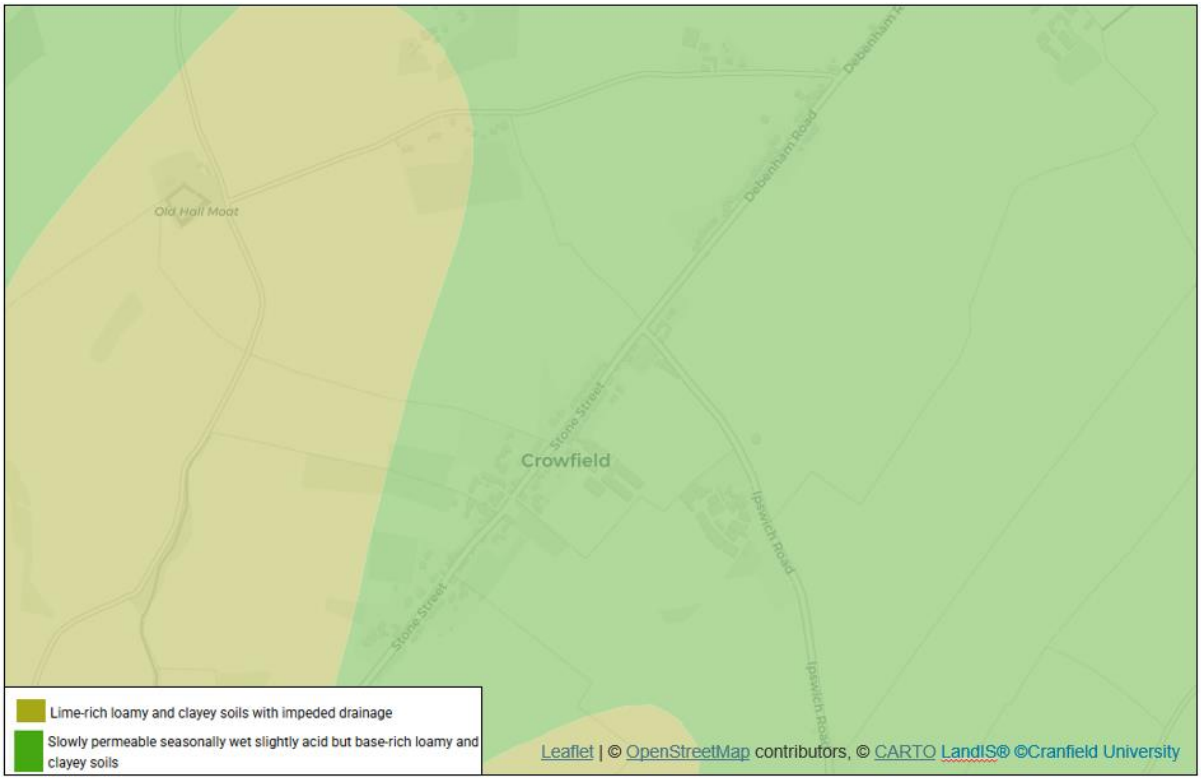

Figure 8. Soil map (LandIS Soilscapes)

The soils in and around Crowfield are loamy and clayey with impeded drainage, meaning that water permeates more slowly and surface water runoff is greater.

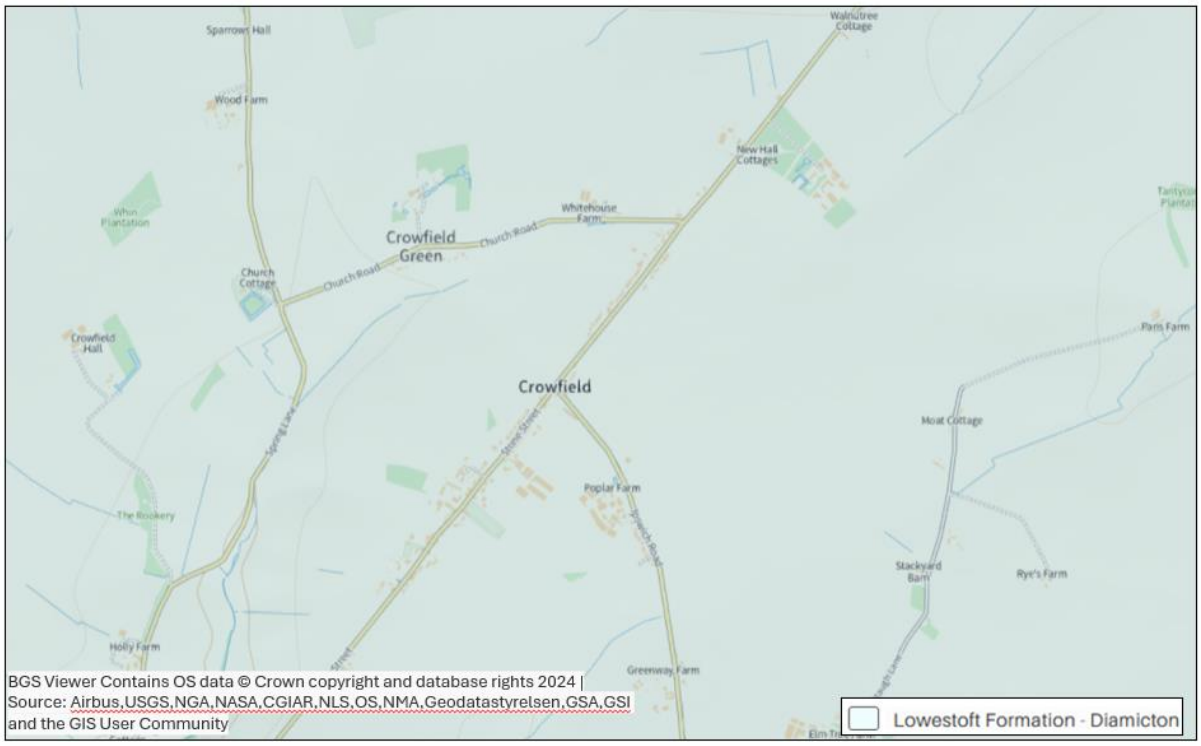

Figure 9. Superficial Geology (BGS Viewer)

Lowestoft Formation ‘Diamicton’ surrounds Crowfield which is described by the British geological survey as a diverse mixture of clay, sand, gravel, and boulders varying widely in size and shape. This generally has a low permeability, meaning water will tend to flow off it before it can be infiltrated. Saturated ground and high rainfall, like that of Storm Babet, will further emphasise the vulnerability of the parish and localised flooding could be experienced.

Flooding Source(s), Pathway(s) & Receptor(s)

Storm Babet was an extreme event which came at a time when Suffolk had experienced a significant amount of rainfall in the preceding week.

Storm Babet delivered significant rainfall in the catchment between 19 and 20 October. The nearest rainfall gauge to Crowfield is at Needham Market. It recorded 50.77mm of rainfall on 20th October, with 15-minute peaks of 5.43mm at 00:30 GMT and 5.21mm at 07:00 GMT.

The Environment Agency issue two types of warning when flooding is possible from a main river. These are:

1. Flood Alert – Flooding is possible. Be prepared. - usually issued between 2 and 12 hours before flooding.
2. Flood Warning - Flooding is expected. Immediate action required – usually issued 30 minutes to 2 hours before flooding.

Crowfield is not covered by the Environment Agency Flood Warning Service.

The description of the flood events described below will discuss the probable sources of flooding, the observed flow paths through the community and the receptors which have been affected. The term ‘floodwater’ may be used to describe both fluvial (water from a watercourse) and pluvial (surface water run-off) flooding. This section has been prepared using reports submitted to Suffolk County Council via the online Highways Reporting Tool and information gathered by Risk Management Authorities (RMAs) and the community.

Detailed descriptions of each investigation area can be found in the following two sections.

1. Gosbeck Road, Debenham Road and Stone Street
2. Church Road

1. Gosbeck Road, Debenham Road and Stone Street

On the morning of 20 October, following a period of heavy rainfall, it was reported that surface water began to accumulate on fields (approximately 9am) close to the junction. Property was impacted by a combination of surface water runoff from neighbouring fields, highway as well as overtopping of watercourses.

Flood water began to pool on fields located to the east of the junction at the rear of properties and opposite, across the road. The flood water flowed overland into the adjacent watercourse, however due to the volume of water and reports of unmaintained channels (both open and piped) the feature quickly exceeded capacity. Flood water flowed across rear gardens, before breaching thresholds and entering

properties. Water also overtopped directly onto the highway and consequently flooding into properties.

A further source of flooding was reported from a small watercourse slightly south of the junction. It has been reported to have been unmaintained, causing water to discharge directly onto the highway. The over-topping of watercourses within this area caused flood water to merge at the junction of Debenham Road, Gosbeck Road and Stone Street. Additional flows were seen coming off fields north of the road junction. Water flowed across a public right of way directly onto the highway as well as overtopping the watercourse. This surface water further contributed to the flooding.

By approximately midday, the accumulation of surface water had resulted in internal flooding to multiple properties along Debenham Road and Stone Street. One resident reported flood water levels reaching 8 inches within their affected property.

Residents reported that the local drainage system was unable to cope with the volume of water during the storm. They also noted that several highway gullies were blocked at the time. Both surface water and foul water were observed surcharging from drains and manholes. Reports indicated that ditches were overflowing and unmaintained, which restricted flows and contributed to overtopping. Residents have since made efforts to reduce the impacts of flooding, including the removal of blockages from ditches where possible.

The floodwater flow paths observed on Debenham Road, Gosbeck Road and Stone Street during Storm Babet closely align the national pluvial flood risk mapping (see Figure 5). Pluvial flood risk varies across this location, ranging from low to high risk. Impacted locations including Debenham Road, Gosbeck Road and Stone Street, closely align with predicted flood risk for this area.

In Summary:

- Following heavy rainfall, high water levels flowed across fields. Flood water exceeded the capacity of watercourses in multiple locations, causing water to flow across land and onto the highway.
- Unmaintained and/or culverted watercourses restricted the flow of water and caused flood water to travel overland.
- Surface water from the highway added to the extent of the flooding as highway drainage was overwhelmed by the amount of floodwater. There were reports of some assets being blocked.
- Property was impacted by a combination of surface water runoff from neighbouring fields, highway as well as overtopping of watercourses.

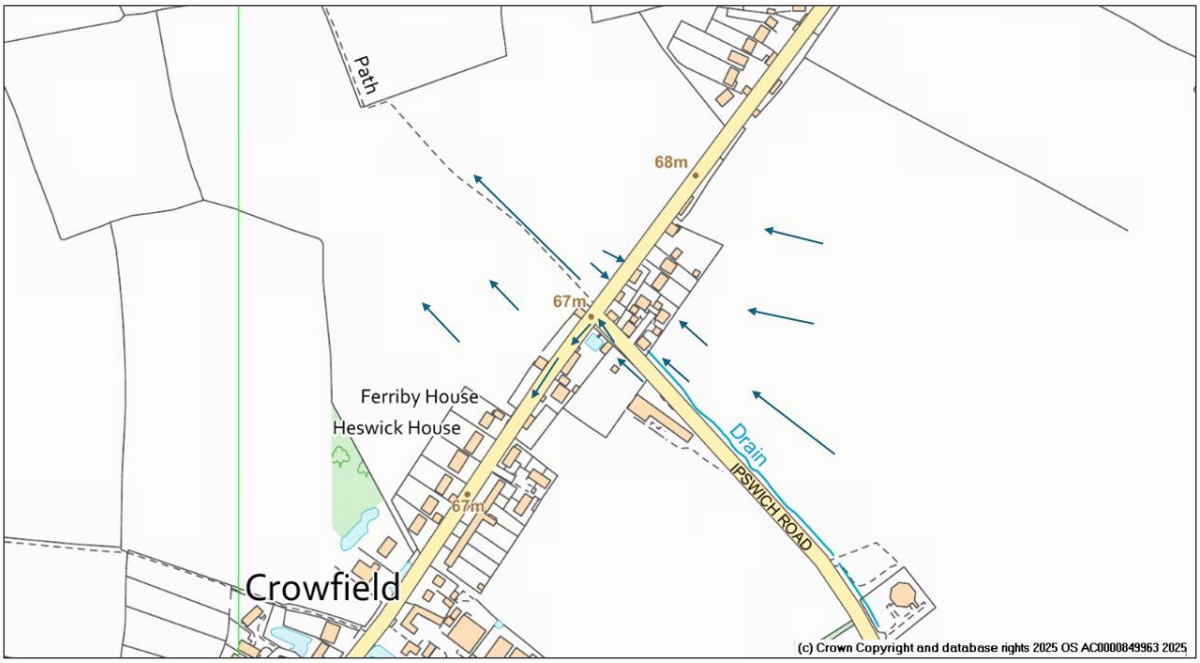

Figure 10. Approximate flood water flow routes along Debenham Road, Gosbeck Road and Stone Street

Figure 11. Pluvial flood risk on Debenham Road, Gosbeck Road and Stone Street

LLFA recommended action(s):

- Residents to install Property Flood Resilience (PFR).
- Riparian landowners to carry out appropriate watercourse maintenance (both open and piped) to reduce flood risk as necessary as per their riparian responsibilities.

- Explore potential NFM projects to ‘slow the flow’ and attenuate water on overland flow paths east of Debenham Road, e.g. storage ponds, wetland areas, field bunds.
- Suffolk Highways to investigate potential blocked assets in the affected areas of Debenham Road, Gosbeck Road and Stone Street
- Suffolk Highways to ensure the completion of highway drainage asset cyclic maintenance (with the inclusion of grips) on Debenham Road, Gosbeck Road and Stone Street.
- Landowner to ensure that the piped ditch is installed and maintained in accordance with the required consents from the LLFA and SCC Rights of Way.

2. Church Road

On 20 October, following a period of intense rainfall, the capacity of both the highway drainage system and Anglian Water infrastructure was exceeded. Hydraulic overload of these assets resulted in the highway flooding, loss of serviceability of utilities within adjacent properties, and surcharging of local drainage networks caused discharge into residential gardens.

This condition has recurred in this locality since 2021 during moderate to heavy rainfall events. Initial investigations by Anglian Water suggested that probable cause of flooding at this location is misconnections into the sewer system. Further investigation is required to determine the root cause of the flooding at this location.

Summary

- Heavy rainfall overwhelmed highway and drainage assets causing utilities to back up in a property.

LLFA recommended action(s):

- Suffolk Highways to ensure the completion of highway drainage asset cyclic maintenance (with the inclusion of grips) on Church Road.
- Suffolk Highways to investigate the surface water drainage infrastructure at Church Road to outfall.
- Anglian Water to investigate the sewer system at Church Road.
- Following investigations Suffolk Highways and Anglian Water to coordinate efforts to resolve flooding at this location.

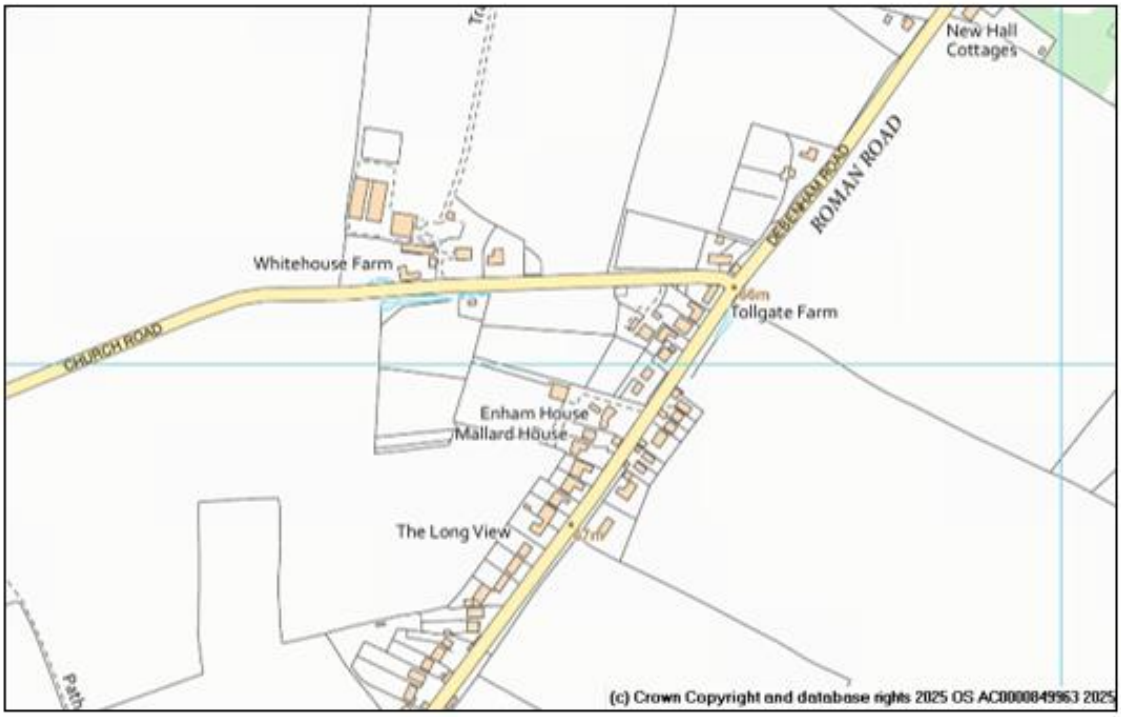

Figure 12 Church Road which was affected by surface water flooding

Risk Management Authorities, Non Risk Management Authority and flood risk function(s)

The following section acknowledges both RMA's and Non-RMA's relevant to the location and provide an overview of their flood risk functions. The table has been compiled from information collated as part of the investigation. It is not exhaustive and it should be acknowledged additional organisations and groups may be active within the community.

Risk Management Authority	**Relevant Flood Risk Function(s)**
Suffolk County Council	Lead local Flood Authority (LLFA), Highways Authority & Asset Owner
The Environment Agency (EA)	Lead organisation for providing flood risk management under its permissive powers and issuing warnings of flooding from main river
Anglian Water	Asset owner supplying water and water recycling services
Mid Suffolk District Council	Local Planning Authority (LPA) & Asset Owner
Non-Risk Management Authority	**Relevant Flood Risk Function(s)**
Private Landowners	Riparian responsibilities and management of water from land or watercourses
Private Homeowners	Improving flood resilience to property and some riparian responsibilities if adjacent to watercourses.
Crowfield Parish Council	Manage flood risk at a community level, prepare and produce flood action plans and maintain watercourses where present on land they own

Action(s) completed to date:

The following section acknowledges actions that RMA's and Non-RMAs have implemented or are currently in progress since Storm Babet and prior to publishing of this report.

Action	Risk Management Authority	Progress
Offer of Property Flood Resilience (PFR) measures to the properties that flooded during Storms Babet.	Suffolk County Council Lead Local Flood Authority	Application window now closed. Installation of PFR measures on approved applications has been extended to December 2025.
Ensure riparian landowner responsibilities are understood with regard to watercourse management.	Suffolk County Council Lead Local Flood Authority	SCC published "Flood Smart Living" online and hard copy guide to increasing flood resilience for residents, landowners and communities, December 2024.
Understand the annual event probability of the rainfall & river flow across the region.	The Environment Agency (EA)	Complete. Details of the report can be found on the SCC website or at the following https://www.suffolk.gov.uk/roads-and-transport/flooding-and-drainage/storm-babet
Remedial works to upscale a culverted access has been completed.	Resident/Landowner	SCC LLFA to investigate and provide relevant advice and guidance.
Anglian Water have investigated the blocked assets in Church Road	Anglian Water	The issue needs discussion with Suffolk Highways.

LLFA Recommended Action(s):

The following section provides a range of flood mitigation measures that could be implemented to reduce the risk of flooding in Crowfield. They have been derived from data and evidence collated as part of the report and have been included having been considered realistic in their implementation. The implementation of actions falls to the responsible party. Progress on the action will be monitored by Suffolk County Council, but it should be acknowledged that the council has limited powers to enforce the implementation of recommended actions.

Action	Responsible Party	Timescale for response	Latest Progress Update for Actions
Short Term Actions (e.g. standard maintenance activity and initial investigation of options that can be undertaken with limited need for forward planning)			
Establish a Community Emergency Plan that includes plans to manage future flood events – Liaison with Suffolk Joint Emergency Planning Unit.	Crowfield Parish Council	6 months	
Residents to consider installing Property Flood Resilience (PFR) measures to property to reduce damage caused by flooding.	SCC LLFA / Residents	N/A	DEFRA PFR Grant has now closed for new applications. Installation of PFR measures on approved applications has been extended to December 2025. Further information on PFR measures can be found within SCC published "Flood Smart Living" handbook. There is currently no active PFR schemes being managed by the LLFA in Suffolk.
Riparian landowners to carry out appropriate watercourse maintenance (open and piped) to reduce	Riparian landowners	N/A	Further information on Riparian Ownership can be found within SCC published "Flood Smart Living" handbook.

flood risk as necessary as per their riparian responsibilities (See Appendix A).			
Investigate utilising the Community Self Help scheme to help manage localised flooding.	Crowfield Parish Council / Suffolk Highways	6 -12 months	Further information can be found at the following https://www.suffolk.gov.uk/roads-and-transport/highway-maintenance/community-self-help-scheme
Suffolk Highways to investigate potential blocked highway drainage assets in the affected areas of Debenham Road, Gosbeck Road and Stone Street	Suffolk Highways	6-12 months	
Suffolk Highways to ensure the completion of highway drainage asset cyclic maintenance on Debenham Road, Gosbeck Road and Stone Street	Suffolk Highways	Annually	Ongoing. Routine cleansing of the gullies will be completed in line with the set cycles (annual or biennial).
Suffolk Highways to investigate the surface water drainage infrastructure at Church Road to outfall.	Suffolk Highways	6-12 months	
Anglian Water to investigate the sewer system at Church Road.	Anglian Water	6-12 months	

Medium Term Actions (e.g. longer planning timescales and potential need to source funding but potential for greater impact)			
Deliver improvements to drainage and sewer assets at Church Road, if investigation works suggest it is beneficial and viable.	Suffolk Highways and Anglian Water	12 - 24 months	
Explore potential NFM measures which aim to attenuate water and 'slow the flow' on overland flow paths in the catchments east of Debenham Road e.g. storage ponds, wetland areas, field bunds.	Landowners, supported by relevant authority, resource dependant (SCC LLFA, EA)	12 - 24 months	
Long Term actions (significantly longer timescale and budget required with potentially greater positive impact)			
Deliver any capital interventions that are economically, technically and environmentally feasible and acceptable to improve flood resilience of the village e.g NFM, PFR.	Landowners, supported by relevant authority, resource dependant (SCC LLFA, EA)	TBC	

Approval

This report will be reviewed and updated every 6 months until actions are marked as complete.

Reviewer	Date of Review

Disclaimer

This report has been prepared and published as part of Suffolk County Council's responsibilities under Section 19 of 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 while all reasonable efforts have been made to gather and verify such information 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. Should there be additional information available to develop the report, please email to floodinvestigations@suffolk.gov.uk

The opinions, conclusions and recommendations in this Report are based on assumptions made by Suffolk 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.

Suffolk County Council expressly disclaims responsibility for any error in, or omission from, this report arising from or in connection with any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the time of preparation and Suffolk County Council expressly disclaims responsibility for any error in, or omission from this report arising from or in connection with those opinions, conclusions, and any recommendations.

The implications for producing Flood Investigation Reports and any consequences of blight have been considered. The process of gaining insurance for a property and/or purchasing/selling a property and any flooding issues identified are considered a separate and legally binding process placed upon property owners and this is independent of and does not relate to Suffolk County Council highlighting flooding to properties at a street level. Property owners and prospective purchasers or occupiers of property are advised to seek and rely on their own surveys and reports regarding any specific risk to any identified area of land.

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Appendix A – Indicative locations for NFM and watercourse maintenance