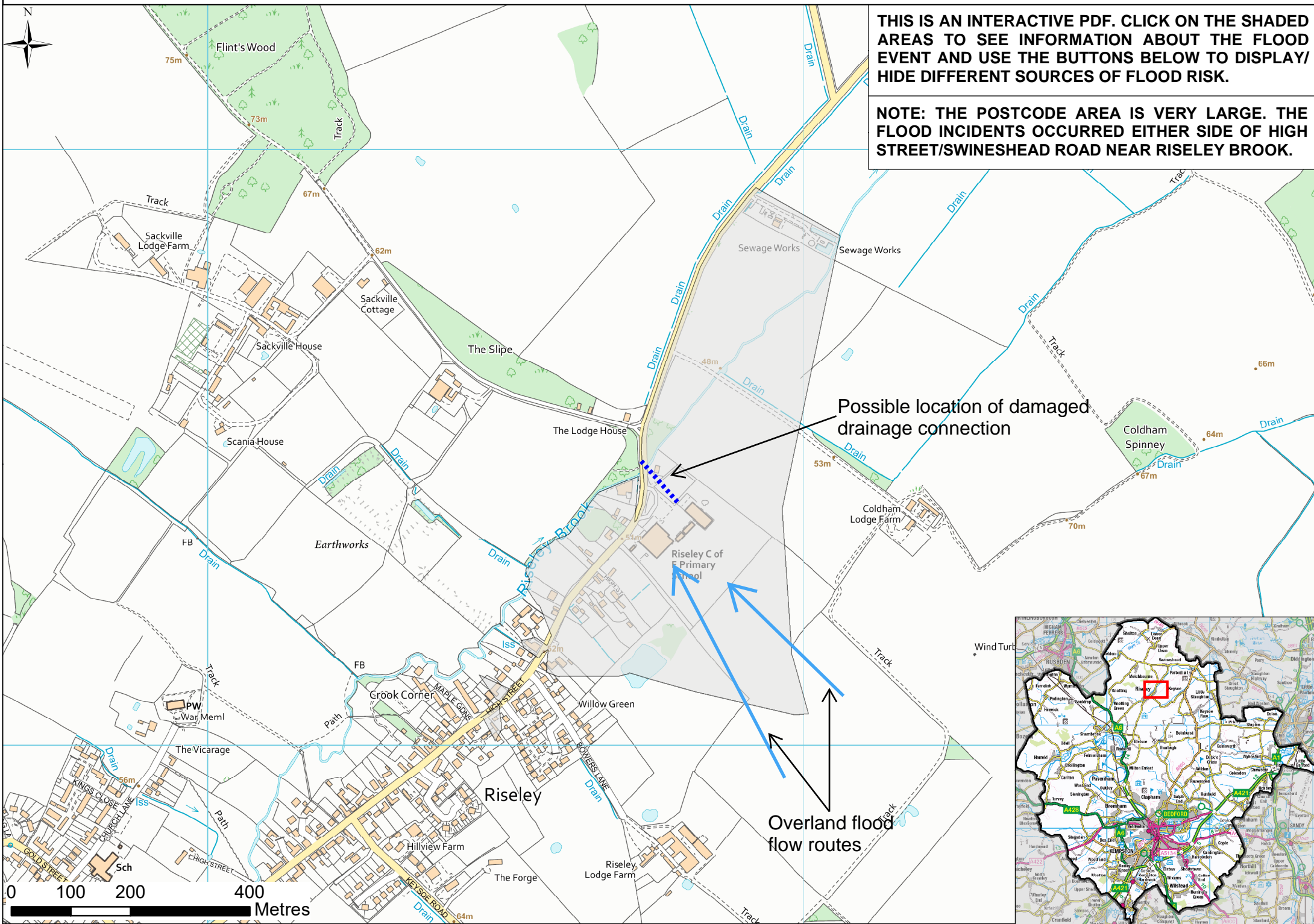


Section 19 Flood Investigation Report: Riseley

The village of Riseley suffered flooding in December 2020. Under the Flood and Water Management Act 2010, Bedford Borough Council as the Lead Local Flood Authority (LLFA) has the duty to investigate the flood event. The scope of this flood investigation is to identify the source, cause and impact of flooding from available information, identify actions completed by relevant Risk Management Authorities (RMAs) in response to the flood event, and consider actions to better understand and manage the risk of flooding in the affected area.



Reproduced from Ordnance Survey digital map data © Crown copyright 2021. All rights reserved. Licence number 100049028. Contains Environment Agency information © Environment Agency copyright and/or database right 2021.

Legend

Postcode Boundary

EA Flood Warning Areas

Flood Warning Areas

Flood Map for Planning

Flood Zone 3

Flood Zone 2

Areas benefitting from flood defences

Risk of Flooding from Surface Water

High risk of flooding (3.3% AEP)

Medium risk of flooding (1% AEP)

Low risk of flooding (0.1% AEP)

CLICK ON THESE BUTTONS

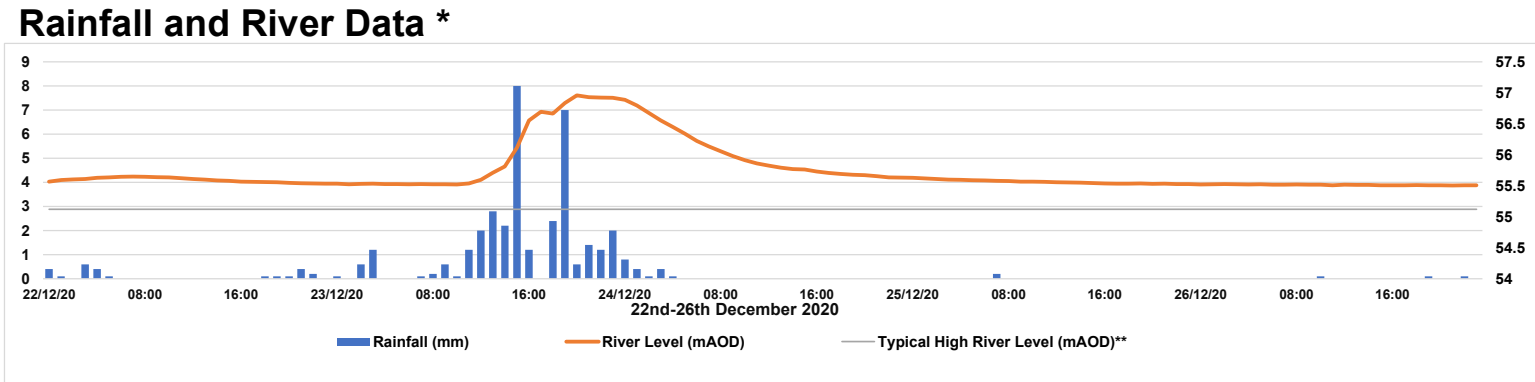
FLOOD MAP FOR PLANNING

RISK OF FLOODING FROM SURFACE WATER

FLOOD WARNING AREAS

BACKGROUND MAP

Rainfall and River Data *



Graph showing Rainfall (mm) as blue bars and River Level (mAOD) as an orange line. The x-axis represents time from 08:00 on 22/12/20 to 16:00 on 26/12/20. The y-axis for rainfall ranges from 0 to 9 mm, and for river level from 54 to 57.5 mAOD. A grey line indicates the Typical High River Level (mAOD)** at approximately 55.1 mAOD.

*Rainfall and River data was obtained from the Environment Agency (May 2021)
**River levels below this level 90% of the time.

Rainfall and River Gauges

Nearest Rain Gauge	Thurleigh
Distance to Gauge	3.47 km
Nearest River Gauge	Riseley
Distance to Gauge	1.48 km

Rainfall and River Data Interpretation

The graph identifies that the main rainfall event at the nearest rainfall gauge to Riseley occurred between 08:00 on December 23rd and 04:00 on December 24th. The total rainfall volume is recorded as 34.7mm with a peak rainfall intensity of 8mm/hour. This single event saw more than half of the 55mm of rainfall which is expected for the whole month of December on average.

Riseley Brook (a Main River) runs through Riseley. The graphs shows that the peak of the river levels occurred between 13:00 on December 23rd and 14:00 on December 24th. However, the graph also shows that the river levels were above the 'typical high river level' from before December 22nd and remained elevated beyond December 26th. The 'typical high river level' at the nearest gauge station is identified as 55.1m Above Ordnance Datum (AOD), and river levels above this are only expected to be recorded 5% of the time.

This document should be viewed in PDF format. Information may be lost when printed

ORIGINATED	BG	14/07/2021	CHECKED	NB	15/07/2021	VERIFIED	MT	16/07/2021
------------	----	------------	---------	----	------------	----------	----	------------

AECOM

SOURCE OF FLOODING: Main River / Surface Water

FLOOD EVENT & CAUSE

One commercial and one educational property reported internal flooding on December 23rd. The commercial property reported water overtopping from Riseley Brook, with standing water up to 500mm deep on the ground floor despite having utilised fourteen sandbags and ten aqua sacs. It is reported that the banks of the Riseley Brook partially collapsed and that High Street in Riseley was impassable due to the floodwater. This flood mechanism is consistent with the Environment Agency Flood Map for Planning¹, which shows that the commercial property is located partly in Environment Agency Flood Zone 2, which means that the chance of river flooding is between 0.1% and 1% in any given year. The Environment Agency flood warning was issued only after flooding was first reported to the Fire Service.

The educational building is located to the south of High Street, outside of the river flood zones. The Environment Agency Flood Risk from Surface Water mapping² shows that overland surface water flow routes are expected to form in the fields to the south, encroaching within the property and surrounding areas. There are a number of ditches originating in the fields to the south of Riseley which discharge into Riseley Brook to the southwest of the affected properties. Some of the ditches are piped beneath the road, but some of the overland flow routes overtop onto High Street and follow the topography towards Riseley Brook. In addition, the high river levels in the Riseley Brook would have prevented the ditches from discharging freely, pushing water upstream. Initial investigations also suggest that the construction of new buildings around the affected properties may have damaged the connection of an existing ditch, further preventing water from effectively discharging into the Riseley Brook.

In conclusion, December 2020 was a very wet month with an average rainfall of 108mm across East Anglia, which is 95% higher than the December average³. The three months leading up to December also saw higher than average rainfall such that by December 23rd the ground was already saturated. This, combined with the rainfall recorded during the dates in question, meant that surface water was less able to infiltrate into the ground and more likely to run off into ditches and form overland flood flow routes. It is thought that a combination of heavy rainfall, saturated ground conditions, the Riseley Brook overtopping its banks, and a possible damaged drainage connection into the Riseley Brook contributed to the flooding experienced.

FLOOD WARNINGS & IMMEDIATE RESPONSE

- **23/12/2020:** Lead Local Flood Authority (LLFA) monitored/assessed locations based on conditions and forecast predicted.
- **23/12/2020 14:48:** Environment Agency Flood Alert River Kym (known as the River Til in its upper reaches) in Cambridgeshire and Riseley Brook in Bedford Borough issued.
- **23/12/2020 15:40:** Fire service visited affected property and provided flooding advice.
- **23/12/2020:** Community flood group closed off High Street.
- **23/12/2020 19:04:** Environment Agency Flood Warning Riseley Brook at Riseley and Pertenhall issued.
- **23/12/2020:** LLFA, Bedford Highways, and Bedfordshire Local Emergency Volunteers Executive Committee⁴ (BLEVEC) assist on the ground.
- **24/12/2020 daytime:** LLFA visited those who flooded on December 23rd to gain information on the damage caused by the flooding and offer assistance.
- **25/12/2020 14:30:** Flooding experienced in the wider area declared a major incident by Bedford Borough Council.
- **28/12/2020:** LLFA, Bedford Flood Response Team, and volunteers from the Council visited properties to carry out impact assessment to help with recovery and clean up.

ACTIONS

Timescale	Action	Responsible Party
Complete	Undertake a flooding debrief/community visit with the flood group to identify improvements to the community flood plan, identify measures that need action following the flood event with other RMAs and/or riparian owners.	Lead Local Flood Authority
Ongoing	Continued engagement with and support of the community flood group. The flood group should enable access to flood kits, flood action plans, and information about flood warnings/alerts and Property Flood Resilience (PFR).	Lead Local Flood Authority
Inspections short term (1-6 months); Remedial works as required	Inspect Main River assets (sluices, weirs, gates, locks and river banks) and identify the requirement for remedial works. Over 5,000 checks are already complete across East Anglia (95% of relevant assets), with 22 assets identified as being in need of remedial works in the wider area ⁵ .	Environment Agency
Medium term (6-12 months)	Investigate the suitability of flood protection measures for the affected properties (e.g. flood barriers, waterproof wall sealant, non-return valves, etc.), develop a flood action plan, and investigate the condition of drainage features. Specialist advice should be sought from a Property Flood Resilience (PFR) surveyor.	Property owner
Medium term (6-12 months)	Investigate improvements to the Flood Warning system. This warning is already included as medium priority in the Flood Warning Improvement Plan.	Environment Agency
Medium term (6-12 months)	Investigate the potential benefits of installing non-return valves to highway drainage outfalls to prevent water backing up from Riseley Brook during high-flow situations.	Bedford Highways
Medium term (6-12 months)	Investigate the feasibility of grants for improvements to educational buildings in flood risk areas.	Lead Local Flood Authority
Medium term (6-12 months)	Investigate the drainage ditch which may have been disconnected through the construction of new buildings to provide continuity of flow into the Riseley Brook.	Lead Local Flood Authority

ORIGINATED: Nora Balboni CEng C.WEM MCIWEM, Senior Engineer, 21/07/2021

CHECKED/VERIFIED: Matt Tandy C.WEM MCIWEM MInstLM, Principal Engineer, 23/07/2021



¹ Environment Agency Flood Map for Planning, <https://flood-map-for-planning.service.gov.uk/>, [accessed June 2021].

² Environment Agency Flood Risk from Surface Water Map, <https://flood-warning-information.service.gov.uk/>, [accessed June 2021].

³ Environment Agency, December 2020 Flooding Great Ouse Catchment Summary.

⁴ BLEVEC is the voluntary sector of the Bedfordshire Local Resilience Forum, consisting of the Bedfordshire Community Emergency Response Team (CERT) and other organisations such as Midshires Search and Rescue, the British Red Cross, Beds and Cambs 4x4 Recovery, and the Royal Voluntary Service.

⁵ Environment Agency, May 2021. Harrold Winter Flooding Briefing.