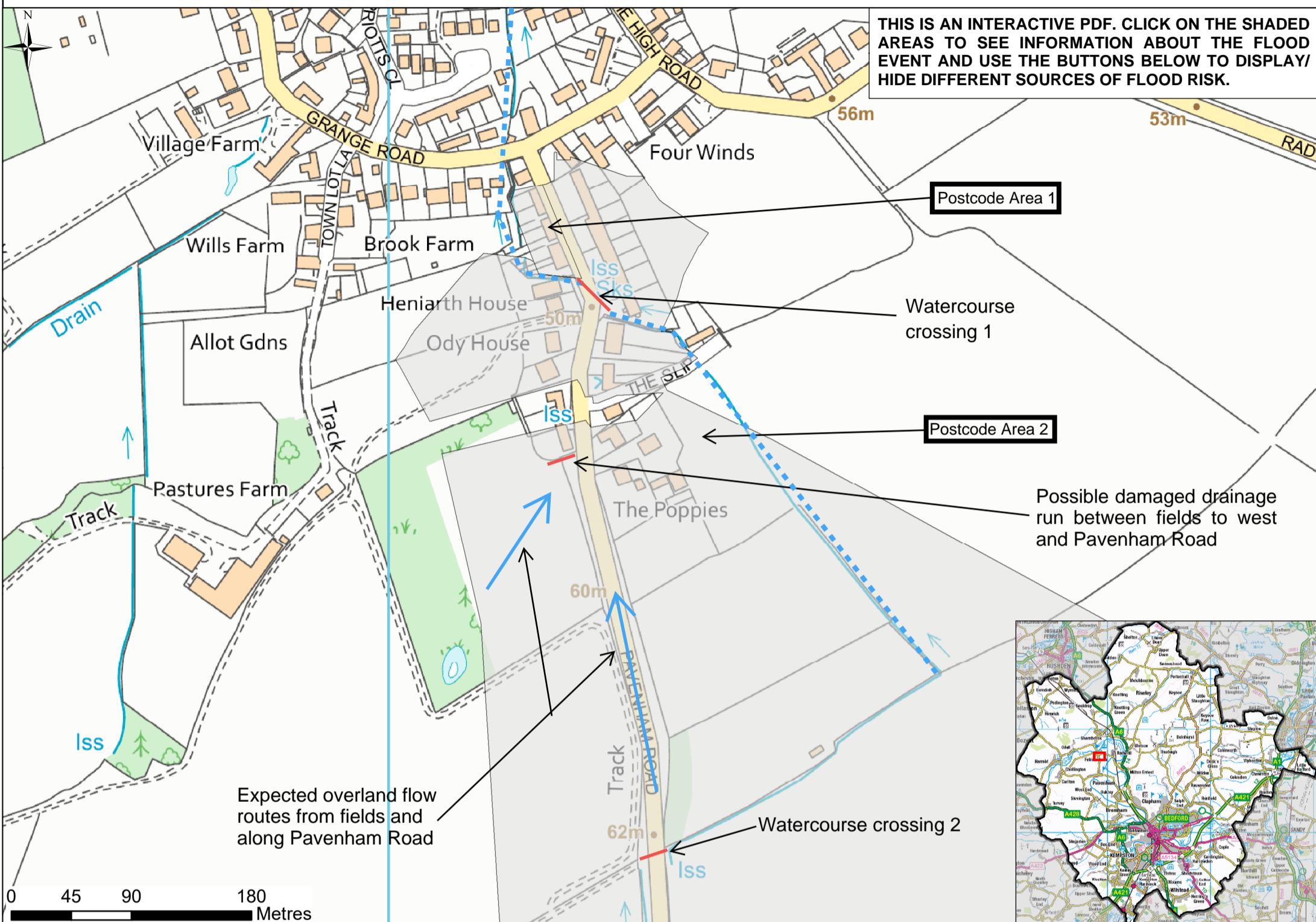


Section 19 Flood Investigation Report: Felmersham

The village of Felmersham 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.



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Legend

Postcode Boundary	Flood Map for Planning
EA Flood Warning Areas	Flood Zone 3
Flood Warning Areas	Flood Zone 2
Areas benefitting from flood defences	

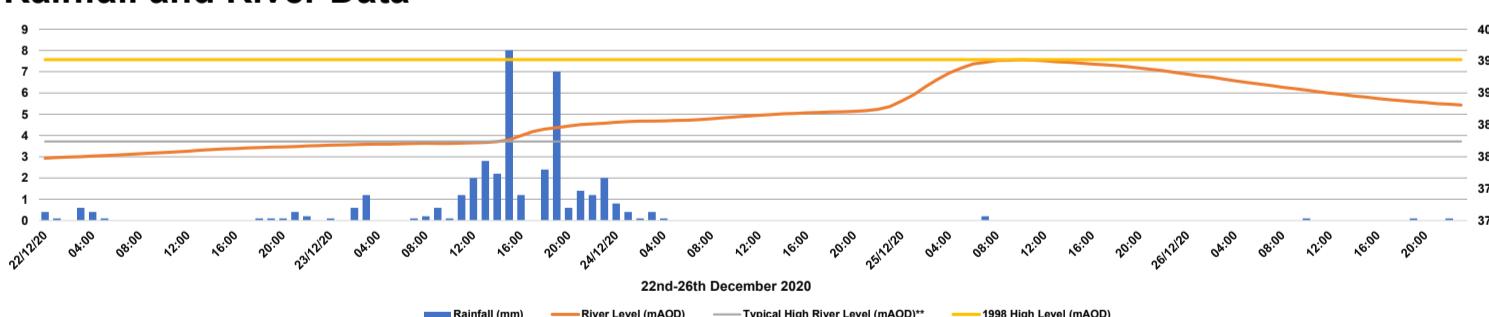
Risk of Flooding from Surface Water

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 *



*Rainfall and River data was obtained from the Environment Agency (May 2021)

**River levels below this level 90% of the time.

Rainfall and River Data Interpretation

The graph identifies that the main rainfall event at the nearest rainfall gauge to Felmersham 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.

The River Great Ouse is located approximately 270m to the north of Pavenham Road. The graph shows that the river levels in the Great Ouse were elevated above the 'typical high river level' from 15:00 on December 23rd and stayed above this level until beyond December 26th. The 'typical high river level' at the nearest gauge station is identified as 38.2m Above Ordnance Datum (AOD). River levels above this are only expected to be recorded 5% of the time. For context, the 1998 peak flood level is included, which was recorded as 39.5m AOD. The graph shows that the December 2020 river levels reached the 1998 level at 07:00 on December 25th.

SOURCE OF FLOODING: Watercourse

FLOOD EVENT & CAUSE

Four properties reported internal flooding on December 23rd with flood depths between 25mm and 200mm across the ground floor, damaging carpets. The residents of three of the affected properties used sandbags and aquasacs to try to minimise water ingress. The bridge over the River Great Ouse in Felmersham was reported to be impassable due to the floodwater.

There is a watercourse which flows through Felmersham and discharges into the River Great Ouse approximately 300mm further north. The watercourse conveys flows from a catchment area of approximately 50ha¹ and it is thought that these flows are closely related and responsive to rainfall. The watercourse flows towards Felmersham from the fields to the east until it crosses beneath Pavenham Road (watercourse crossing 1 on the map annotation) and flows towards Grange Road along the back of residential gardens. Three of the affected properties are located adjacent to the watercourse, where it is reported the banks were overtapped and water entered the properties from the rear. The same properties are reported to have experienced water entering from the road which is consistent with the Environment Agency Flood Risk from Surface Water mapping², which identifies a flow route from where the watercourse crosses Pavenham Road.

One of the affected properties is located approximately 90m away from the watercourse to the west of Pavenham Road. It is thought that the heavy rainfall resulted in overland flow routes on the fields to the west. The watercourse crosses Pavenham Road at another point further south (watercourse crossing 2 on the map annotation) and it is thought likely that the heavy rainfall caused water to back up at this constriction point and form a flood flow route within Pavenham Road, which could have contributed to the flooding. Initial investigations suggest that an informal drainage run between the western fields and Pavenham Road may have been damaged, further exacerbating the flooding experienced. A blocked highway drain on Pavenham Road was reported to Bedford Highways in January 2021. However, it is thought that heavy rainfall would have overwhelmed the capacity of the highway drainage and watercourse crossings, regardless of their state of maintenance. In addition, the high levels in the River Great Ouse would have prevented the watercourse from discharging freely.

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 watercourses and form overland flood flow routes. In conclusion, it is thought that a combination of heavy rainfall, overland flow routes, and high river levels in the River Great Ouse contributed to the flooding experienced.

FLOOD WARNINGS & INITIAL RESPONSE

- **23/12/2020:** Lead Local Flood Authority (LLFA) officers monitored/assessed locations based on the conditions and forecast predicted.
- **23/12/2020:** LLFA, Bedford Highways, and Bedfordshire Local Emergency Volunteers Executive Committee⁴ (BLEVEC) assist on the ground.
- **23/12/2020 15:05 – 16:25:** Fire service provided flooding advice to residents and passed on a request for cones to close the road to Bedford Highways.
- **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	Investigate the condition of the highway drainage on Pavenham Road as well as the piped watercourse crossing to clear any blockages. This was completed in March 2021.	Bedford Highways
Medium term (6-12 months)	Investigate who is responsible for the informal drainage run between the western fields and Pavenham Road. Discuss the findings with the landowner and investigate the benefits of re-instating it to full functionality.	Bedford Highways / Lead Local Flood Authority
Medium term (6-12 months)	Undertake a capacity assessment of the watercourse crossings beneath Pavenham Road and Grange Road to identify opportunities for improvement.	Bedford Highways
Medium term (6-12 months)	Liaison with the landowner to ensure the watercourse throughout Felmersham is maintained, setting a suitable inspection and maintenance regime as necessary.	Lead Local Flood Authority / Riparian Owner
Medium term (6-12 months)	Investigate the potential benefits and local appetite for a 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
Long term (2-4 years)	Investigate the potential benefits of a flood warning system in the watercourse upstream of Felmersham.	Lead Local Flood Authority
Long term (2-4 years)	Investigate the potential for Natural Flood Management (NFM) in the form of a flood storage area in the upstream reaches of the watercourse to hold back floodwater.	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 Flood Estimation Handbook (FEH) web service, <https://fehweb.ceh.ac.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.