

Flood Investigation Report

Newport Pagnell – 27th May 2018 Flood Event

Milton Keynes Council

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Quality information

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Foreword

One of the roles of Milton Keynes Council as the Lead Local Flood Authority is to undertake investigations into flooding incidents if they consider it necessary or appropriate.

The investigation will:

- Identify and explain the likely cause(s) of flooding;
- Identify which authorities, communities and individuals have relevant flood risk management powers and responsibilities;
- Provide recommendations for each of those authorities, communities and individuals; and
- Outline whether those authorities, communities or individuals have or will exercise their powers or responsibilities in response to the flooding incident.

The investigation cannot:

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

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Executive Summary

This Flood Investigation Report (FIR) has been completed by AECOM on behalf of Milton Keynes Council (MKC) under its duties as the Lead Local Flood Authority (LLFA) in accordance with Section 19 of the Flood and Water Management Act 2010 (F&WMA).

Statutory Context

Section 19 of the F&WMA states that on becoming aware of a flood in its area, the LLFA must, to the extent that it considers it necessary or appropriate, undertake an investigation in order to identify the relevant flood risk management authorities and which flood risk management functions have been, or should be taken in response to the flood. Where an authority carries out an investigation it must publish the results and notify the relevant risk management authorities.

MKC are currently drafting a Flood Investigation policy which will identify the criteria to be applied to future flooding incidents to determine if the need for a Section 19 flood investigation is required.

Flooding Incident

MKC determined that it was necessary to complete a formal investigation into the flood incident at Newport Pagnell that occurred on Sunday 27th May 2018 which resulted in reports to MKC of internal flooding to 15 properties.

Cause of Flooding

The flooding that occurred in several areas of Newport Pagnell was caused by heavy rainfall over a short period of time. Based on available evidence, it is considered that flooding likely occurred as a result of the capacity of the drainage systems being exceeded during this rainfall event, resulting in flow overland following natural contours to low points around multiple properties.

Main Findings

This Flood Investigation Report concludes that the capacity of the drainage network in the areas affected in Newport Pagnell was unable to accommodate the surface water runoff experienced during the heavy rainfall event on the 27th May 2018. The intensity of the rainfall that fell is likely to have meant that flooding in both locations would have been experienced regardless of the condition of gullies and sewers. Surface water will naturally flow towards low points around properties.

The foul flooding experienced in Westbury Lane would have been caused by surface water getting into the foul sewers and reducing their capacity, as has been known to happen during intense rainstorms.

Culvert collapse and intentional blockage of the sewers around Wolverton Road will result in reduced the ability of surface water to flow through the system and contributed to increased surface water runoff. Anglian Water, with support from MKC, has responded to this with investigation leading to works starting in February 2019. All significant works will be complete before autumn 2019; this should enable the area's drainage network to flow at optimum levels. Recognising the level of risk in his location, Anglian Water has committed to annual CCTV inspections on the surface water sewer system Wolverton Road, Marsh End Road and Westbury Lane. The risk of the more intense storms overcoming surface water and/or foul network capacity can never be completely removed.

Multiple Risk Management Authorities (RMA's) have been identified as having roles and responsibilities in relation to flood risk management.

1. Introduction

Lead Local Flood Authority Investigation

Section 19 of the Flood and Water Management Act (F&WMA) states:

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 (RMA) have relevant flood risk management functions, and
 - b. Whether each of those RMA's 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.

Milton Keynes Council (MKC), as Lead Local Flood Authority (LLFA) for the Borough of Milton Keynes, are currently developing a draft flood investigations policy to define the thresholds for triggering the need for a Section 19 investigation to be undertaken for a reported flood incident within the Borough.

Flooding Incident – 27th May 2018

MKC determined that it was necessary to complete a formal investigation into the flood incidents at Newport Pagnell that occurred on Sunday 27th May 2018 which resulted in reports to MKC of internal flooding¹ to 15 properties within the area. Three additional properties were reported to have experienced flooding within their curtilage (external areas), including gardens, driveways and garages.

AECOM undertook a joint site visit with MKC on 27th June 2018; as part of this visit some residents in the affected areas provided anecdotal information regarding this flooding incident, as well as previous flooding incidents.

Site Location

Newport Pagnell is a town in Buckinghamshire, in the Borough of Milton Keynes. It is separated from Milton Keynes itself by the M1 motorway which is to the south west of Newport Pagnell, as seen in Figure 1-1. The town is bordered to the north and to the east by the River Great Ouse.

There are two areas of affected properties within Newport Pagnell the postcode area MK16 8JQ on Wolverton Road and the postcode area MK16 8JA on Westbury Lane. Both locations are within areas identified at high risk of surface water flooding, equivalent to greater than a 3.33% chance of flooding each year, based on the Environment Agency Risk of Flooding from Surface Water mapping, but less than a 0.1% chance of fluvial flooding each year, based on the Environment Agency Risk of Flooding from Rivers and the Sea mapping (see maps in Appendix A & B).

¹ **Definition of internal flooding:** A situation in which a building (commercial or residential) has been flooded internally, i.e. water has crossed the threshold and entered the building. This includes:

- Basements and ground level floors of the building;
- Garages/outbuildings if they are integral to the main occupied building. Garages adjacent or separate from the main occupied building are not included;
- Occupied static caravans and park homes. Tents are not included.

(Definition given in Milton Keynes Council Draft Flood Investigations Policy, May 2018)

The town is located within a relatively flat area with elevations declining from approximately 70mAOD in the west to approximately 60mAOD in the south and east. There are several side roads which slope down towards Wolverton Road.

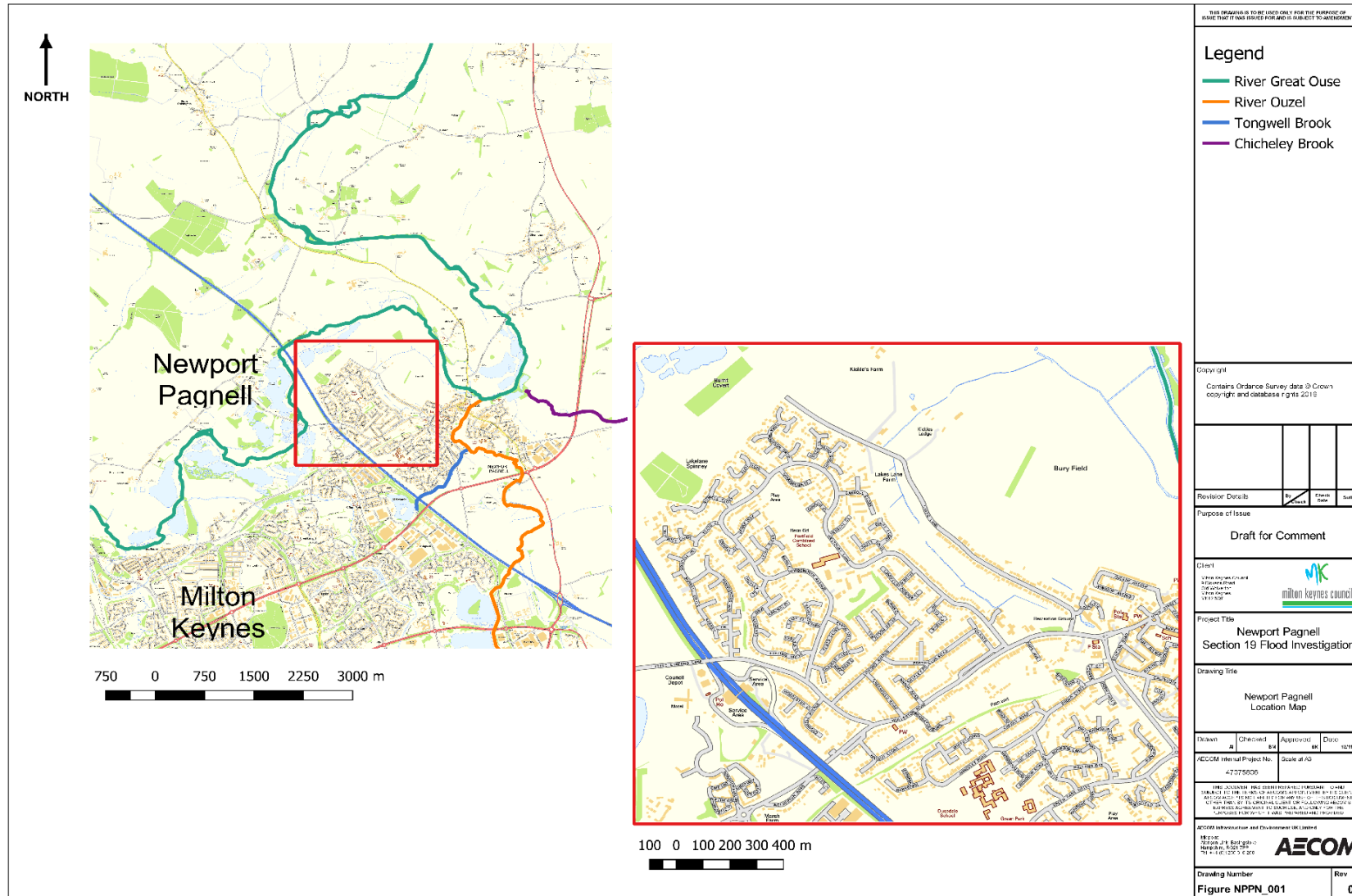


Figure 1-1: Location of Newport Pagnell

Drainage Systems

The River Great Ouse is a Main River which flows to the north and to the east of the town.

Newport Pagnell acts as a confluence for multiple watercourses, including the River Great Ouse, Tongwell Brook, Chicheley Brook and the River Ouzel, as shown on Figure 1-1. These are a combination of open channels, such as one alongside Wolverton Road to the west of the M1 (see Figure 1-2), and also culverted watercourses.



Figure 1-2: Private ditch alongside Wolverton Road, west of M1

There is a raised embankment on the river bank of the River Great Ouse at Kickles Bank (SP86624469), to the east of Lakes Lane, which has a Standard of Protection (SOP) of 1 in 50 years. The Environment Agency data identifying areas that benefit from defences show that the area behind Kickles Bank, including most of Lakes Lane, is currently benefitting from defences as the 1 in 100 year water levels in the Great Ouse are 60cm lower than Kickles Bank².

Surface water runoff from the public road network and private areas, such as roofs and driveways, are believed to discharge into the public surface water sewer network adopted by Anglian Water. The roads in the vicinity of the two flooding incidents are drained by local highway authority road gullies which drain into the surface water network.

² Milton Keynes Level 1 Strategic Flood Risk Assessment, URS, 2015

2. Flooding History

Previous Flood Incidents in Newport Pagnell

Prior to the development of Milton Keynes there was regular flooding of the Great Ouse, River Ouzel and Loughton Brook. Newport Pagnell was affected during the floods of 1947, 1968 and 1992. The development of the town has led to significant changes to the catchment characteristics, with increased runoff from urban areas mitigated by a system of public storm sewers, reengineered watercourses and balancing lakes. The most significant flooding prior to the May 2018 event occurred in April 1998 and July 2007, both after heavy rainfall fell on already saturated ground^{2,3}.

Some areas of Newport Pagnell are identified to be susceptible to surface water flooding, with some areas also having reported historic groundwater flooding incidents³.

The Milton Keynes Strategic Flood Risk Assessment² found that water levels for a 1 in 100 year return period (1% Annual Exceedance Probability (AEP)) storm at Newport Pagnell would be lower than they were prior to the development of Milton Keynes, due to storage provided by the balancing lakes on the River Ouzel and by their role in reducing flood peak water levels.

³ Milton Keynes Local Flood Risk Management Strategy Summary, AECOM, 2016

3. 27th May 2018 Flood Event

Rainfall Analysis

The Met Office gives an average monthly rainfall of 54.3mm in May, and 53.2mm in June at Woburn, the nearest climate station to Newport Pagnell, located approximately 10 miles to the south east⁴.

A rainfall gauge at Shenley Lodge, on the south west side of Milton Keynes recorded the rainfall rates outlined in Table 3-1⁵, totally approximately 23mm depth between 8.40pm and 10.10pm on 27th May 2018.

Table 3-1: Shenley Lodge rainfall gauge recordings 27th May 2018

Date/Time	Rainfall rate (mm/hr)
27/5/18 21:00	8.1
27/5/18 21:10	12.7
27/5/18 21:20	16.3
27/5/18 21:30	18.5
27/5/18 21:40	19.1
27/5/18 21:50	18.5
27/5/18 22:00	14.7
27/5/18 22:10	11.7
27/5/18 22:20	9.4

Rainfall gauges at Olney, to the north east of Newport Pagnell, showed approximately 24mm depth of rainfall between 8.20pm and 9.20pm on the 27th May 2018^{6,7}.

Analysis of the recorded rainfall totals against the Depth-Duration-Frequency 2013 (FEH13) rainfall model indicate the rainfall experienced at Shenley Lodge was approximately a 1 in 5 year return period (20% AEP) and the rainfall experienced at Olney was approximately a 1 in 9 year return period (11% AEP). The rainfall radar for the evening of 27th May 2018 indicates that the intensity of the rainfall across the Borough of Milton Keynes was variable so the recorded rainfall depths for Shenley Lodge and Olney cannot be assumed to be representative of the rainfall experienced at Newport Pagnell. For example, Central Milton Keynes was reported to have experienced 62mm of rainfall within one hour on the evening of 27th May 2018, which was quantified by Meniscus using FEH99 calculations, as being a 1 in 237 year return period (0.42% AEP).

⁴ Data from climate station, <https://www.metoffice.gov.uk/public/weather/climate/gcr2r3dhr> Accessed July 2018

⁵ Data from rainfall gauge, <https://www.metoffice.gov.uk/observations/details/20180527merbz9ub7he6txmqyyb96sp15e> Accessed July 2018

⁶ Rainfall gauge, <http://www.gaugemap.co.uk/#!/Map/Summary/12572/7980/2018-05-27/2018-05-28> Accessed July 2018

⁷ Rainfall gauge, <https://www.metoffice.gov.uk/observations/details/20180527xc6rxe5b7ye6txmpyyb96sk6ze> Accessed July 2018

Areas of Flooding and Impacts

There were two areas of Newport Pagnell reported to have experienced internal flooding to properties during the rainfall event of the 27th May 2018; the postcode area of MK16 8JQ on Wolverton Road and the postcode area of MK16 8JA on Westbury Lane.

To inform the review of the 27th May 2018 flood event, AECOM undertook a joint site visit with MKC on 27th June 2018. As part of this visit some residents in the affected areas provided anecdotal information regarding the flooding incident, as well as previous flooding incidents.

Wolverton Road

Ten properties within the postcode area of MK16 8JQ on Wolverton Road reported to MKC that they experienced internal flooding following the rainfall event of the 27th May 2018. It was reported by residents that some of these properties have also previously experienced internal flooding during more frequent rainfall events. Three additional properties were reported to have experienced flooding within their curtilage (external areas), including gardens, driveways and garages.

The flooding to these properties began between 8.30pm and 9pm on the 27th May 2018 during the heavy rainfall. Some of the properties experienced ingress of water from multiple directions.

The roads within this area were inspected during the site visit on 27th June 2018 and it was observed that the topography would enable overland flow to be channelled towards the flooded area. Given the poor condition of some of the gullies (see Figure 3-1 & Figure 3-5) within the nearby roads, it is possible that during heavy rainfall, road gullies would only collect a small proportion of the surface water runoff from the roads, resulting in surface water flowing overland to the lower points. However, it is possible that the siltation observed within the gullies could have resulted from or been exacerbated during the rainfall event on 27th May 2018 when silt and debris was washed off the road and surrounding areas. There is also evidence of additional drainage being retrofitted into some of the roads, such as on the south side of Little Linford Lane, where a concrete channel runs along the back of the footpath. This was observed to be in poor condition and overgrown in places (see Figure 3-2 & Figure 3-3), although properties in this location were not reported to have been flooded during the 27th May 2018 rainfall event.

Runoff from private areas, such as driveways, could contribute to the volume of surface water on the roads. The addition of dropped kerbs in this area will have modified the flow paths and enabled water to more easily move between the highway and private properties (see Figure 3-4).

Drainage investigations carried out by MKC Highways and Anglian Water Services (AWS) following the flood event led to the following:

- MKC identified that the road gullies were becoming blocked more often in a number of locations due both to a greater build-up of street debris and to silt building up more than normal in the surface water sewers. The latter was identified from CCTV and the information was passed to AWS.
- AWS identified that there was a bottleneck in the surface water sewer system somewhere from Lakes Lane through to Marsh End Road and Caldecotte Street and this was restricting the flow and capacity of the system. Further investigation identified a manhole next to the car park on Marsh End Road where concrete had been fly-tipped into the sewer, resulting in a dam effect which was causing siltation build-up behind and flows to back up in the system. AWS have since undertaken a three week program to clear in excess of 30 tonnes of silt and concrete from the system between Caldecotte Street and the roundabout at the junction of Marsh End Road and Wolverton Road.

- AWS undertook further cleansing work along Wolverton Road towards Lakes Lane. A 300mm pipe from Little Linford Lane joins Wolverton Road at the junction. The sewer on Wolverton Road increases diameter from 300mm to 375mm to accommodate for the incoming flow. As flows move east along Wolverton Road, pipe sizes increase to 450mm and then 600mm, to accommodate further connections. At the junction with Lakes Lane, towards Marsh End Road, the 600mm sewer splits into two 375mm sewers.
- It was identified that one of these 375mm pipes had been damaged over time by previous road works and had partially collapsed. Remedial work is needed to re-lay the sewer.
- The works to relay the sewer have been planned in and at the time of publication of this report are due to start on 19th August 2019. Anglian Water have been working with MKC Highways and are looking to minimise the disruption to road traffic on Wolverton Road as much as they can while the sewer is re-laid across the road.

Once these remedial works are completed another highway gully cleanse will be carried out. AWS have also committed to carrying out inspections by means of CCTV on an annual basis on the surface water system on Wolverton Road, Marsh End Road and Westbury Lane. These will assist in identifying if any further works are required in future.

Intense rainfall of the order that was seen in parts of Milton Keynes on 27th May 2018 would have caused flooding regardless of the condition of the network. This can be determined because it is known that the average sewer was designed to manage a rainfall event of annual probability of 1 in 30 and the average gully designed to 1 in 2. However given the reliance on the surface water drainage system to manage rainfall within this area, the condition that it was found to be in this will have had an impact. The condition of the sewer system during earlier experienced flood events is unknown but it is hoped that once the works are complete the sewer system and highway gullies will be able to better cope with the more regular, lower intensity rainfall events.



Figure 3-1: Heavily vegetated gully



Figure 3-2: Concrete drainage channel along back of pavement



Figure 3-3: Vegetation in concrete channel



Figure 3-4: Dropped kerb adjacent to roundabout



Figure 3-5: Blocked road gully on Wolverton Road

Westbury Lane

Five properties within the postcode area of MK16 8JA on Westbury Lane reported internal flooding following the rainfall event of the 27th May 2018. It was reported by residents that some of these properties have also previously experienced external flooding during more frequent less intense rainfall events.

The flooding to these properties was reported as a combination of surface water and foul water surcharge from manholes both in the road, and on a nearby public footpath. This resulted in a number of properties experiencing either surface water flooding, foul water flooding or in some cases a combination.

The catchment contributing to the surface water drainage network which drains to this location includes an urban area comprising residential areas within approximately 0.24km². According to the Anglian Water public sewer records a 300mm diameter, 600mm diameter and 375mm diameter sewer converge at the junction outside the affected properties, with a single outlet of 600mm diameter. This 600mm diameter sewer then has a 90 degree bend before it increases in size to a 975mm diameter sewer. The surface water network flows north, behind Westbury Lane, where it eventually outfalls to a watercourse north of Lakes Lane, adjacent to Lakes Lane Horse Riding School. If levels in the watercourse are high, the outfall is submerged and therefore water can back up. However, this is not reported to have been an issue for the 27th May 2018 event, due to the short intensity of the rainfall and the difference in the time of peaks seen within the surface water and the fluvial network. The areas of Westbury Lane that flooded are not linked to the surface water drainage system in Wolverton Road so there is no link between the flooding here and the works being carried out on the Wolverton Rd system.

The foul water network does flow south along Westbury Lane, where it joins the foul network in Wolverton Road. The foul network then flows towards a pumping station on the edge of the recreation ground at the south east end of Newport Pagnell. There are many connections into the foul network including a sewer around the 90 degree bend on the public footpath, in the main area of flooding. In some parts of the upper catchment it is thought that the foul system is combined, with surface water draining into the foul network. Excessive surface water runoff is likely to have contributed to the surcharging of several of the foul manholes in the affected area. Due to the occurrence of foul sewage flooding in this area

AWS were contacted by residents during the flood event and were in attendance to follow up on the reports of foul sewage flooding.

A number of the road gullies in this area were observed to be silted up during the site visit on 27th June 2018. Even in optimum condition during very heavy rainfall, these gullies would only collect a small proportion of the surface water runoff from the roads, resulting in surface water flowing to lower points along the road. It is possible that the siltation observed within the gullies could have resulted from or been exacerbated during the rainfall event on 27th May 2018 when silt and debris were washed off from the road and surrounding areas. Due to the surcharging of the surface water and foul sewer network in this area, any siltation within the road gullies is unlikely to have exacerbated the flooding on 27th May 2018.

The areas of Westbry Lane that flooded are not linked to the surface water drainage system in Wolverton Road so there is no link between the flooding here and the works being carried out on the sewers.

Given the reliance on the piped drainage system to manage rainfall within this area, it is likely that the exceedance of the surface water drainage network (i.e. intensities being experienced above that which a sewer system is designed for) contributed to the surface water and foul flooding in the area on the 27th May 2018.

Summary of Impacts and Findings

The flooding that occurred in Newport Pagnell was caused by an intense rainfall event in Milton Keynes on the evening of Sunday 27th May 2018. It is known that the UK sewer network has limited capacity to manage intense rainfall so it would be expected that drainage systems would be exceeded during a rainfall event of this type. For Wolverton Road, the collapse of one of the sewers and the fly-tipping of concrete into the sewer system on Marsh End Road will have further reduced sewer capacity. In total the drainage systems will therefore have been unable to collect and convey rainwater effectively into the larger watercourses downstream which led to surface water flowing overland, which followed localised topography, directing it towards multiple low points around private properties.

4. Rights and Responsibilities

This section considers the rights and responsibilities of the various RMA's in relation to flood risk management.

Communities and Residents

It is the responsibility of householders and businesses to:

- Protect their property (through property level resilience and resistance measures).
- Maintain a proper flow of water in any watercourse running through their land.

Milton Keynes Council

MKC are responsible for:

- investigating flood incidents under Section 19 of the F&WMA (as Lead Local Flood Authority)
- Co-ordinating the management of flood risk from ordinary watercourses that are not within an Internal Drainage Board (IDB) district (as LLFAs)
- Consenting any works to ordinary watercourses (i.e. streams, ditches) which may affect the flow or storage of water outside the Bedford Group of Internal Drainage Boards (BGIDB) Drainage District (at this time this responsibility has been delegated by MKC to the BGIDBs to provide consistency across Milton Keynes).
- Statutory consultee for major planning applications with surface water drainage implications. (as the LLFA)
- Ensuring drainage of surface water from local highways and residential streets excluding private roads (as Highways Authority).
- Maintaining the road drains on minor roads, including kerbs, road gullies, ditches and the pipe network which connects to the Anglian Water Services sewers (as Highways Authority)
- Developing and implementing an emergency plan, contingency plan and business continuity plan (as a Category One Emergency Responder).
- Ensuring flood risk is considered in the Local Plan (as Local Planning Authority).
- Ensuring that planning decisions do not increase flooding (as Local Planning Authority).
- Maintaining Council owned assets such as, drainage ditches, gullies, trash screens and culverts, which have a role in flood risk management (under estates and highways functions).

Highway Authority (MKC and Highways Agency)

As a Highway Authority, MKC is required by the Highways Act 1980⁸ to ensure that all local highways are drained of surface water and where necessary maintain highway drainage systems.

⁸ Communities and Local Government (2012) National Planning Policy Framework
<http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950>

The Highways Agency is responsible for managing highway drainage from the motorways and major trunk road network, including the slip roads to and from trunk roads. Within Milton Keynes, this includes the M1, A5, A421 and A509.

Water Authority (Anglian Water Services)

AWS is responsible for:

- The drainage of surface water from development via sewers adopted by Anglian Water.
- Maintaining public sewers owned by AWS into which much of the highway drainage connects.
- Maintaining a number of the balancing lakes within Milton Keynes.
- Maintaining and improving its water mains and other pipes to reduce the risk of leaking or burst pipes.
- Reporting its performance each year to OFWAT, including in respect of internal sewer flooding of properties.

Environment Agency (EA)

The EA are responsible for:

- Managing flood risk from main rivers (e.g. River Great Ouse and River Ouzel), reservoirs, estuaries and the sea.
- Providing a strategic overview for all sources of flooding and coastal erosion.
- Regulation of third party works on main rivers.
- Regulation of works in, over, under and within 8m of the top bank of main rivers.

Bedford Group of Drainage Boards (BGDB)

The BGDB is a consortium comprising the Buckingham & River Ouzel Internal Drainage Board (IDB) which operates within the Milton Keynes borough, as well as the Bedfordshire & River Ivel IDB and the Alconbury & Ellington IDB.

The BGDB is responsible for:

- Managing water levels in the watercourses designated to each IDB and work in partnership with other authorities to actively manage and reduce the risk of flooding within the board's district.
- Supervise all matters relating to the drainage of land within their districts and manage water levels in the watercourses designated to each IDB.
- Manage and reduce the risk of flooding within the IDB's districts.
- Permissive powers to undertake maintenance on ordinary watercourses within their districts.

Buckingham & River Ouzel IDB cover the area containing Newport Pagnell.

Milton Keynes Parks Trust (MKPT)

MKPT is a charitable trust that owns and maintains most of the parkland in Milton Keynes. The MKPT is responsible for:

- Riparian ownership of the watercourses through the linear parks in Milton Keynes.
- Maintaining the linear parkland in the river valleys to allow them to effectively function as floodplains.
- Managing the land around the large balancing lakes within the linear parks and recreational use of the lakes.
- Managing a number of Sustainable Drainage Systems (SuDS) in some residential and commercial estates.

Landowners and Developers

Riparian owners are responsible for:

- Maintaining the banks and beds of the watercourses, including trees and shrubs growing on the banks, and any flood defences that exist on it.
- Clearing litter from the watercourses and banks, even if it did not come from their land.
- Maintaining and clearing watercourses and any structures on their stretch of watercourses, including culverts, weirs and mill gates, from obstructions (natural or otherwise) so the normal flow of water is not impeded.
- Accepting the natural flow from the upstream neighbour and transferring it downstream without obstruction, pollution or diversion.
- Applying to MKC for formal consent to carry out any works within any ordinary watercourses, or to notify MKC of any works adjacent to any ordinary watercourses outside BGDB Drainage District.
- Applying to the Environment Agency for formal consent to carry out any works in, over, under or within 9 metres of a main river.
- Applying to Buckingham and River Ouzel Internal Drainage Board for formal consent to carry out any works within 9 metres of any watercourse in the Drainage District.

5. Recommendations

Overview

Listed below are a number of recommended actions resulting from this formal Flood Investigation. As outlined in Section 3, MKC Highways and AWS have already undertaken investigations in Newport Pagnell following the flood event on 27th May 2018 with a number of maintenance activities identified.

It is important to note that it is for the relevant responsible body or persons to assess each recommendation in terms of the legal obligation, resource implications, priority and cost/benefit analysis of undertaking such action.

The recommendations may be included within the Action Plan linked to the Local Flood Risk Management Strategy or in the relevant risk management authority's future work programmes, as appropriate.

There are no specific recommendations for the EA, BGDB, MKPT with respect to this flood event, beyond undertaking their risk management duties identified in Section 4.

Communities and Residents

The following recommendations are for the Town/Parish Council, any Community Groups and affected residents.

Form a Community Flood Group to help coordinate the following:

- Produce an overall plan of the catchment area, with the cooperation of all drainage system owners of surrounding properties. This can form the basis of a Community Flood Plan, which should include as a minimum:
 - Identification of any historic routes of drainage from the various catchment areas of the village, which could be reinstated or improved.
 - Identification of riparian ownership and responsibilities for drainage systems, including ditches, culverted watercourses and open watercourse sections.
 - Identify any land uses within the catchment that may unduly affect the normal flow of surface water.
- Prepare Household Emergency Plans for any vulnerable properties in the area.
- Regularly inspect accessible ditches and culverts in the area of flood risk. Request that landowners inspect and maintain or clear flood related assets in order to reduce the risk of flooding in the community Report blockages or other issues to the landowner and the LLFA, as well as any incidents of materials being fly-tipped into watercourses and sewers.
- Report highways issues via the council's website and check online for information about routine cleans.
- .

Residents and contractors must refrain from fly-tipping or pouring substances into road gullies, surface water sewers or watercourses – these are only designed to carry rainwater! For foul systems refrain from putting fats, oils, greases and unflushables, such as nappies and baby wipes, down the toilet or sink as these will also cause blockage.

Communities should continue to report flood incidents to the LLFA Endeavour to obtain as much evidence of flood events as possible, such as photographic and video evidence. Flood issues directly related to the sewers should also be directly reported to Anglian Water as it assists them to receive details first-hand.

Explore options for property level resistance and resilience, seeking advice from experienced professionals, and, where possible, implement any recommendations.

Lead Local Flood Authority (LLFA)

It is recommended that MKC:

- Work with the Emergency Planning Team and the Environment Agency to support the Community Flood Warden.
- Work with the Emergency Planning Team, the Environment Agency and other flood management authorities to support the community in the production and implementation of a Community Flood Plan and provide advice to residents as to how to explore options for property level protection.
- Inform those affected, and any owners of drainage systems and watercourses within the overall surface water catchment area, once this investigation report has been published reminding them of their legal responsibilities.

Highway Authority (Milton Keynes Council and Highways Agency)

MKC have undertaken drainage investigations following the flood event on 27th May 2018 and identified a number of reactive maintenance activities required on the highway drainage network within the Wolverton Road and Westbury Lane.

It is recommended that the Highway Authorities:

- Complete identified reactive maintenance activities within Wolverton Road and Westbury Lane. This is in progress at the time of publication and is being co-ordinated with Anglian Water's works to ensure an effective cleanse.
- Undertake regular highway drainage cleansing throughout Newport Pagnell.
- Assess the capacity of their assets and identify any areas with insufficient capacity for draining runoff from the highway. Where this leads to flood risk to properties, improvement works should be considered.
- Work with the community and LLFA to clarify ownership and maintenance responsibilities for drainage systems and watercourses, particularly where they are located within or near to the highway, or effective highway drainage is dependent on them being operational.

Water Authority (Anglian Water Services)

Anglian Water Services (AWS) has undertaken drainage investigations following the flood event on 27th May 2018 and identified a number of reactive maintenance activities required on the public sewer network within the Wolverton Road and Westbury Lane.

It is recommended that AWS:

- Complete identified reactive maintenance activities within Wolverton Road and Westbury Lane. These activities as detailed on pages 7-8 were in progress at the time of publication.
- Assess the sources of water entering the surface water and foul water sewerage system.
- Assess the capacity of their assets and identify any areas of insufficient capacity. Where this leads to flood risk to properties, improvement work should be considered and communities engaged in the process.
- Work with other parties to clarify ownership and maintain responsibilities for culverted watercourses, particularly where these are recorded as public sewers.

Landowners and Developers

It is recommended that landowners:

- Undertake regular inspection and maintenance of their drainage systems in accordance with a defined maintenance regime.
- Identify and develop a detailed plan of their assets to share with the LLFA, other flood risk management authorities and their community.
- Assess the capacity of their drainage systems and identify any areas with insufficient capacity for the collection, conveyance, storage and disposal of surface water. Where this could lead to runoff to the public highway or to private properties, improvement works should be considered.

It is recommended that developers:

- Work with MKC to ensure all development is completed in accordance with approved plans and documents, and planning policy. Suitable mitigation will need to be identified to manage the risk of flooding to the development itself and it needs to be demonstrated that proposals will not increase flood risk to third parties and, where possible, developments should contribute to reducing offsite flooding.

6. Disclaimer

This report has been prepared as part of Milton Keynes Council's responsibilities under the Flood and Water Management Act 2010. It is intended to provide context and information 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.

Any recommended actions outlined in this Flood Investigation Report will be for the relevant responsible body or persons to assess in terms of resource implications, priority and cost/benefit analysis of the proposal. Moving forward, these may be included in the Action Plan linked to the Local Flood Risk Management Strategy or in the relevant risk management authority's future work programme as appropriate.

The opinions, conclusions and any recommendations in this report are based on assumptions made by AECOM and Milton Keynes Council when preparing this report, including reliance on information provided by others.

AECOM and Milton Keynes Council expressly disclaim responsibility for any error in, or omissions 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 AECOM and Milton Keynes Council expressly disclaim responsibility for any error in, or omission from, this report arising from or in connections 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 the Council highlighting flooding to properties at a street level.

AECOM and Milton Keynes Council do not accept any liability for the use of this report or its contents by any third party.

7. Acronyms

AWS	Anglian Water Services
BGDB	Bedford Group of Drainage Boards
EA	Environment Agency
F&WMA	Flood and Water Management Act 2010
FIR	Flood Investigation Report
IDB	Internal Drainage Board
LLFA	Lead Local Flood Authority
MKC	Milton Keynes Council
MKPT	Milton Keynes Parks Trust
RMA	Risk Management Authorities
SOP	Standard of Protection

Appendix A – Risk of Flooding from Surface Water

Appendix B – Risk of Flooding from Rivers and Sea

