Medway Council
S19 Flood Investigation Report

Contents **Page number**

Document control:

Version	Status	Issue Date	Prepared by	Approved by
1	Draft	October 2018	D Atkinson Flood Risk Officer	PH
2	Final	January 2019	P Haselhurst Flood Risk Manager	Directorate Management Team

Contact Details:

Flood Risk Management
Major Projects
The Planning Service
Regeneration, Community and Culture Directorate
Gun Wharf
Dock Road
Chatham
Kent
ME4 4TR

Tel: 01634 333333
floodrisk@medway.gov.uk

Executive Summary

Medway Council is a designated Lead Local Flood Authority with powers under Section 19 of the Flood and Water Management Act 2010 to investigate flood incidents within its administrative area.

On 29 May 2018, heavy rainfall was experienced throughout Medway and beyond leading to a number of reported flooding incidents. Those areas most affected are within areas where overland and surface water flow occurs relatively quickly following the onset of rain due to topography.

A number of flood incidents were reported to the council including reports of internal and external property flooding and highway flooding.

Due to the extent and impact of the flooding, this Section 19 investigation was undertaken to identify the mechanism for flooding and summarise the impacts and any remedial action undertaken to address the issues as well as make recommendation for further actions to manage the risk of flooding.

1 Introduction

1.1 Background

Medway Council is a Lead Local Flood Authority (LLFA) responsible for managing local flood risk (defined as flood risk associated with surface water, ground water and ditches/streams) in accordance with the Flood and Water Management Act 2010 (FWMA 2010). The FWMA 2010 places a duty on LLFA's to investigate flood incidents occurring from surface water, groundwater and ditches/streams where it considers it 'necessary and appropriate'.

On 29 May 2018, heavy and prolonged rainfall led to surface water flooding incidents throughout the Medway Council administrative area and beyond. Due to the extent and impact of the event, the LLFA opted to undertake a formal investigation.

The purpose of the investigation is to determine which Risk Management Authorities (RMA's) have relevant flood risk management functions and which functions have been exercised in response to a flood. Having carried out an investigation, Medway Council must publish the results.

Specifically, Section 19 of the FWMA 2010 states:

> *Local authorities: investigations*
>
> *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.*
>
> *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'*

1.2 Risk Management Authorities and functions

The term 'Risk Management Authority' refers to organisation(s) that have legislative powers concerning flood risk management. Medway Council work in partnership with those organisations to investigate and resolve flood problems. Whilst Medway Council has a duty to investigate flood incidents in the area, it may be the responsibility of another RMA, or a land/property owner, to take actions to resolve an issue.

The RMA's relevant to the Medway Council area are:

- Lower Medway Internal Drainage Board (LMIDB)
- North Kent Marshes Internal Drainage Board
- Kent County Council (KCC)
- Highway Authority (Highways Service within Medway Council)
- Environment Agency

Table 1 summarises which RMAs are primarily responsible for managing flood risk dependent on the source of flooding.

Table 1: Responsible Risk Management Authorities

Source of flooding	Environment Agency	LLFA	Water company	Highway Authority
River	✓			
Sea	✓			
Surface water		✓		✓(on or coming from the Highway)
Sewer flooding		✓	✓	
Ditches and streams		✓		
Groundwater		✓		
Reservoirs	✓			

1.3 Roles and responsibilities

Part 1 (4) of the Flood and Water Management Act sets out the meaning of 'flood risk management function' as a function which may be for a purpose connected with flood risk management. The flood risk management functions relevant to Medway RMA's are set out below.

Medway Council

Medway Council is the Lead Local Flood Authority for Medway.

The Flood and Water Management Act 2010 gives Lead Local Flood Authorities powers and duties to manage local flood risk and:

- A duty to investigate flooding
- A duty to develop, maintain, apply and monitor a local flood risk management strategy
- A duty to maintain an asset register of structures and features (which could have a significant impact on flood risk)
- Powers to regulate activities on ditches and streams under the Land Drainage Act 1991
- A duty as a statutory consultee to review surface water management provisions for major development

Medway Council is also the Highways Authority for Medway.

The Highways Act 1980 gives Highways Authorities powers for the purposes of draining or preventing surface water from flowing onto the highway by:

- Constructing or laying drains as considered necessary
- Erecting barriers in the highway or in land adjoining or lying near to the highway, to divert surface water into or through an existing drain
- Cleanse and keep open all drains situated in the highway or land adjoining or lying near to the highway
- Powers to fill in roadside ditches
- Powers to divert non-navigable watercourses and to carry out other works on any watercourse

In addition, Medway Council has an emergency planning role as Category 1 responder under the Civil Contingencies Act 2004 and is a key partner on the Kent Resilience Forum (KRF). This is not a regulatory role, but the partnership has been developed to aid the following:

- Assess the risk of emergencies occurring and use this to inform contingency planning
- Put in place emergency plans
- Put in place business continuity management arrangements
- Put in place arrangements to make information available to the public about civil protection matters and maintain arrangements to warn, inform and advise the public in the event of an emergency
- Share information with other local responders to enhance co-ordination
- Co-operate with other local responders to enhance co-ordination and efficiency
- Provide advice and assistance to businesses and voluntary organisations about business continuity management

Southern Water

Southern Water are responsible for the maintenance and operation of the public sewer network throughout the area including combined sewers (which take foul and surface water), and separate foul and surface water sewers. The Water Resources Act 1991 provides powers to:

- Lay pipes under or over any street
- Inspect, maintain, adjust, repair or alter any relevant pipe which is in, under or over any street

Additionally Southern Water;

- Maintain a register of properties at risk of flooding due to hydraulic overload in the sewerage network
- Undertake capacity improvements to alleviate sewer flooding for properties on that register
- Respond to consultations relating to local planning applications

Environment Agency (EA)

Under the Flood and Water Management Act 2010 the Environment Agency has a number of flood risk management functions including a strategic and operational role. However the flooding which occurred on 29 May 2018 was attributed to surface water runoff and not coastal or tidal flooding and therefore the EA does not have any specific flood risk functions that are directly relevant to this event.

1.4 Background studies

Local Flood Risk Management Strategy

The Medway Local Flood Risk Management Strategy identifies objectives to manage local flood risk to local communities. Local flood risk is that associated with surface water, groundwater, and ordinary watercourses. The strategy contains a number of objectives to:

- Understand the risks
- Prevent inappropriate development
- Manage the likelihood of flooding
- Help people to manage their own risk
- Improve flood prediction

Surface Water Management Plan

Surface Water Management Plans (SWMP's) outline the preferred surface water management strategy in a given location for the long term. A SWMP covering the key urban areas including Gillingham, Chatham, Rochester and Strood was published in 2017.

A further SWMP is currently underway for Rainham, and Hoo due for completion in 2019.

1.5 Reason for investigation

This Flood Investigation Report has been triggered following the rainfall event of May 29 2018 whereby a number of areas throughout Medway were affected by flooding.

Due to sensitivities in publishing property specific flooding information, this report does not contain a comprehensive list of properties flooded but illustrative maps showing areas impacted. It should be noted that not all areas shown are indicative of properties that flooded as many of the reports were of highway flooding incidents.

1.6 Scope

This report has been produced to determine the main causes of flooding and to recommend actions to be considered by the relevant authorities appropriate to their flood risk function to alleviate and/or reduce the risk of flooding where appropriate.

There are various levels of action that could be taken depending on the severity of the situation, available funding and the practical solutions available to reduce the risk of further flooding and will generally fall into one of the following categories:

Delivery of quick win schemes: A solution that can be implemented quickly by the Risk Management Authorities or Local Authority at relatively low cost.

Further investigation/research: Further investigations such as catchment studies and hydrological/hydraulic assessments to understand provide evidence for future capital investment.

Development of future schemes: Where immediate action is not financially viable or a solution not readily available then a larger scale flood alleviation scheme may be required. In such cases national funding would need to be secured together with additional contributions from others, such as local levy, local authorities and other third parties.

Land/property owner action: Common Law permits householder to take reasonable measures to protect their land and property from flooding provided that these measures to not cause harm to others.

Members of the public who own land adjacent to watercourses have riparian responsibilities and therefore have a duty to maintain their section of watercourse to ensure there is no impediment of flow.

2 Flood investigation

2.1 Flood event

On 29 May 2018, areas across the Medway administrative area and beyond experienced widespread surface water flooding. Figure 1 illustrates a map of areas where flooding was reported. It should be noted that this is based on the best available information available and may not be representative of all areas which experienced flooding as it may not have been reported.

The most extensive flooding occurred at Nelson Terrace, Chatham, which caused internal flooding to several properties and resulted in many people being displaced from their homes.

2.2 History of flooding

Medway Council are aware of localised flooding and drainage problems affecting areas during heavy and prolonged rainfall around Medway prior to the event on 29 May 2018. Whilst the focus of this report is on the event of 29 May reference is also made where relevant to historical events affecting those areas illustrated for wider context.

2.3 Rainfall data

On 29 May 2018, an Environment Agency (EA) Tipping Bucket Raingauge (TBR) at Wigmore Reservoir (TQ8014163224) recorded a storm with a duration of 2 hours, 53 minutes and 75.6mm of rainfall.

Rainfall rarity analysis using the Flood Estimation Handbook (FEH) Depth-Duration-Frequency (DDF) equation suggests that the event at the location of the TBR had a 1 in 140 year return period which is equivalent to an annual likelihood (Annual Exceedance Probability) of 0.7%, indicative of a low risk (extreme) event.

There was significant rainfall variation depending on the location and the nature of these thunderstorm events therefore the corresponding return period would also have significant variation.

Radar rainfall estimates provided a robust conservative estimate for the Nelson Terrace area, indicating an event with return period of 1 in 36 probability (i.e. 2.7% AEP), and indicative of a medium risk event.

Recorded flood incidents within Medway are shown at Figure 1 below. These are representative of those incidents reported directly to the council and observed during site inspections, but may not be representative of all areas which flooded as not all flood incidents are reported to the council.

2.4 Flood risk

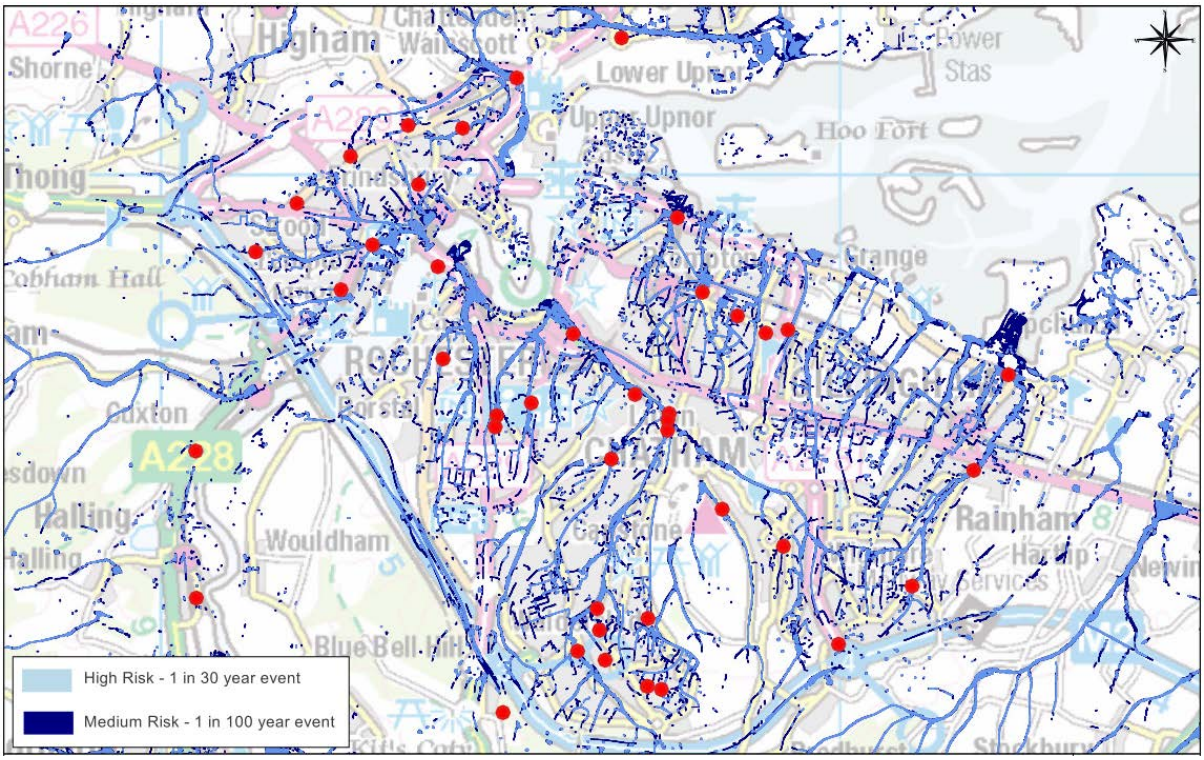
Environment Agency Risk of Flooding from Surface Water (ROFfSW) map indicates that the areas where flooding occurred correlates with areas at risk of surface water flooding. The mapping should be treated with some caution owing to inherent uncertainties and therefore does not contain sufficient information for it to be used to determine flood risk to individual properties, but it can provide an indication about whether an area may be affected.

Risk descriptions are as follows:

- High – each year, the area has a chance of flooding of greater than 1 in 30 (3.3%) AEP
- Medium – each year, the area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%) AEP
- Low – each year, the area has a chance of flooding between 1 in 1000 (0.1% and 1 in 100 (1%) AEP

Many of the areas which flooded and are indicated to be at high risk of flooding have not flooded under high risk events that have been recorded to date, however high risk events include events up to and including the 1 in 30 year storm and generally the events which regularly occur are typically those closer to the 1 in 2 year frequency (0.5% AEP). Figure 2 illustrates the areas affected by flooding against the high and medium flood risk outlines.

Figure 1: Risk of Flooding from Surface Water (ROFfSW) against reported flood incidents



Source: Flood mapping Environment Agency ©

2.5 Existing drainage infrastructure

Most of the areas affected were urban, where there are large areas of impermeable surfaces. The loss of natural, permeable surfaces over the last 50 years within urban areas has increased the rate of surface water runoff during rainfall.

Surface water runoff from these areas drain to either combined sewers which carry surface and foul water or dedicated separate surface water sewers (both maintained by Southern Water), or to private property specific soakaways. The public highway drains via road gullies and pipework to either dedicated highway soakaways owned and maintained by Medway Council or sewers owned by either Medway Council or Southern Water.

Current design standards set out in Sewers for Adoption (SfA) guidance are for surface water sewers on new developments to be designed to carry rainfall events up to and including the 1 in 30 year event (equivalent to 3.3% AEP) plus an allowance for climate change. Legislatively, it is not necessary for sewers to be designed to contain a storm that exceeds this magnitude within existing built developments.

It should be noted that not all areas benefit from a formal surface water system which is owned and maintained by Southern Water. In some areas there are no systems other than highways drainage to collect surface water (which then generally goes into a soakaway) or privately owned and maintained property specific soakaways. These areas may be more prone to surface water flooding depending on the location, capacity and maintenance frequency of soakaways.

The event which occurred had an estimated return period of between 1 in 36 years AEP (i.e. 2.7%) and 1 in 140 years AEP (0.7%) which exceeds the design capacity standard for sewers.

2.6 Flood mechanism

Taking into account the extent and amount of rainfall, location of flooding, and sewer capacity the flood events experienced across Medway on 29 May 2018 are largely attributed to excessive overland flow, and sewer capacity exceedance.

However, reports were received during and after the flooding of blocked gullies in some areas which experienced flooding (including Nelson Terrace). Gullies in Nelson Terrace were inspected 27 February 2018 but cleaning was not possible on all due to vehicles being parked over them. Further cleaning of two out of four gullies was carried out in August 2018.

It is noted that the volume of rainfall far exceeded the capacity of highway and sewer drainage available and therefore the maintenance condition of the highway surface water drainage systems is unlikely to have had a significant impact on the flooding experienced and blockages may also have been a consequence flood debris.

Further, the mechanism of flooding at Nelson Terrace was observed to be overland flow from Capstone Road. The area is situated at the base of a large valley where historical watercourses would have existed to convey water through the valley out into the Medway estuary. Over time the watercourses have become part of an underground sewerage system which have not been designed to store or convey land drainage from the surrounding valley.

During the event due to the hydraulic overloading of the system in the Capstone Road, water pressure was not released through inspection chamber covers but laterally through the highway construction which lifted the road. Further, due to ingress of surface water into the foul water system, the foul system surcharged.

Due to the speed that the flood waters receded, no blockages were suspected to have occurred in any of the sewer systems except where the volume of water prevented discharge of rainfall volume during the event.

2.7 Overview and Scrutiny

Representatives from the Council's Flood Risk and Highways Service, and Southern Water attended Overview and Scrutiny on 16 August 2018 to respond to Councillor enquiries specific to the flooding at Nelson Terrace including;

An investigation into the cause of the flooding, and a request for information on the maintenance of Capstone Road drains by Southern Water

A briefing on the maintenance of Capstone Road drains by Southern Water

A report from the council on the maintenance of gullies for Capstone Road, Nelson Terrace, Queens Road and Beacon Hill

A briefing on improvements to the site undertaken by Southern Water

The link to this paper and responses to these enquiries are summarised in the paper available at https://democracy.medway.gov.uk/mgAi.aspx?ID=19389

3 Flood incident response

3.1 Multi-Agency response

The council's procedures for managing flood events are set out in a Multi-Agency Flood Plan (MAFP)

MAFP's are used by local responders (including the emergency services, local authorities, local NHS, and others) to coordinate their response to flood incidents.

A MAFP procedure is triggered on receipt of an Environment Agency Flood Warning or Met Office Severe Weather Warning and an appropriate response triggered relevant to the risk of flooding. The Council do not have a responsibility to issue flood warnings to the public but will share communications from the Met Office and Environment Agency.

Areas at risk of surface water flooding area summarised in the plan and the procedures also apply in part to surface water flooding. However a key difference is the lead in time from when a warning is given. For example a warning regarding a potential surge event is generally provided at least 1-3 days ahead of a potential flood event for a coastal/tidal flood. This allows more time to prepare and plan a response to a flood incident, in coordination with partner agencies.

The Met Office issues weather warnings relating to surface water flooding, through the National Severe Warning Service. The warnings are colour coded depending on a combination of the impact of the weather and the likelihood of that impact occurring.

On 29 May the Met Office released a yellow warning. Yellow warnings are generally when it is likely that the weather will cause some low level impacts, including some disruption to travel in a few places. However due to difficulties in predicting rain storms it is not always possible to accurately forecast the impacts of a storm.

When a warning for a severe event is triggered, a Severe Weather Advisory Group (SWAG) is convened which is chaired by either the Environment Agency or Local Authority in order to coordinate a multi-agency response to a flood incident. On this occasion, the SWAG was not convened due to the low level impacts predicted.

Therefore the response to the flood was not coordinated between partners and agencies, but rather responded to via individual internal procedures. This meant that there was some delay (up to an hour) before the council were made aware that a major flood incident was occurring at Nelson Terrace.

The below sets out the councils response in the context of its own emergency procedures;

- Council officers on standby following receipt of the Met Office surface water flood risk warning.
- Monitoring of rainfall at key areas using Traffic Operations Room (TOR) / CCTV.
- On receipt of information regarding a major flood incident at Nelson Terrace, a Silver Command Group was set up, as per current procedures in the Multi-Agency Flood Plan and Medway Council Major Emergency Plan) to manage the councils response to flooding.
- Vulnerable communities were identified.
- A rest centre was put on standby.
- Sandbags provided to members of the public on request.
- Council officers visited flooded sites including Nelson Terrace to establish the causes and extent of the flood incident.
- Contact made with Housing Associations to establish what support if any was required from the council.
- A Community Impact Assessment was undertaken at Nelson Terrace in accordance with the council's civil contingency responsibilities as part of the recovery phase.
- Follow up site meetings were undertaken by officers with impacted residents to acquire additional details of flooding and to provide advice on property level protection measures. This did not take place immediately with Nelson Terrace residents as residents were unable to return to the properties for approximately 6 months.
- Prioritised highways cleaning of areas where significant flooding occurred.

3.2 Risk Management Authority actions

Table 2 summarises actions taken by RMA's to date in response to flooding incidents, in the context of the flood risk management functions listed at section 1.3. A full list of location specific actions is included at Appendix 1 and specific actions relating to Nelson Terrace are further detailed at section 4.2.

The table notes a number of actions undertaken by RMA's in response to the flood event, and it is concluded that RMA's satisfactorily discharged their relevant flood risk management functions.

Table 2: Summary of flood risk management functions undertaken

Flood risk function	Evidence	Achieved?
Medway Council LLFA		
Duty to investigate flooding	S19 Flood Investigation	Yes
Medway Council Highways		
Constructing or laying drains as considered necessary	New highways drainage system proposed for Grasmere Grove (refer to Appendix 1)	Yes
Erecting barriers in the highway or in land adjoining to divert surface water into or through an existing drain	N/A	N/A
Cleanse and keep open all drains situated in the highways or land adjoining	N/A – no highway watercourses caused flooding during this incident	N/A
Powers to fill in roadside ditches	N/A	N/A
Powers to divert non navigable watercourses	N/A	N/A
Southern Water		
Lay pipes under or over any street	No further pipework/capacity planned at this stage	N/A
Inspect, maintain, adjust or alter any relevant pipe which is in, under or over any street	Surveys to areas impacted by flooding where structural deficiencies were suspected (Capstone Road/Hopewell Drive)	Yes

3.3 Actions at Nelson Terrace

Medway Council Lead Local Flood Authority

- Flood investigation under S19 FWMA

Medway Council Highways

- Additional gully inspections were carried out following the flooding event of 29 May. No defects were found during these inspections.
- Emergency survey of highways drainage infrastructure at Capstone Road
- Carriageway repair at Capstone Road.

Southern Water

- A CCTV survey of several lengths of sewer at Capstone Road was carried out. The survey identified a need for lining repair at the junction of Capstone Road and Hopewell Drive where another pipe had been constructed too close to the soffit of the pipe, but which was and is not causing obstruction to flow. These works were completed in Oct-November 2018.

- A limited number of less serious defects were found (for example, cracking on the crown of pipework), and these have been recorded into Southern Waters asset database for review and prioritisation which is the normal process for future work allocation in the Asset Management Planning (AMP) period (2020-2025).

3.4 Other actions

Medway Council

- Review of the councils emergency procedures for surface water flooding.

Discussion of the flood event at Overview and Scrutiny during August 2018 recommended a review of the council's emergency procedures for surface water flooding.

The council's initial response in the context of emergency procedures relating to surface water flooding is set out at section 4.1. A key issue with surface water flood events is the difficulty in predicting impacts owing to the uncertainty and spatial variability of events.

As noted at section 4.1, it is not always possible to accurately forecast the impacts of a storm. The response to the flood incident was not a multi-agency coordinated response, but reactive to the incident as it unfolded and in accordance with the councils MAFP and MEP.

Given the scale and speed of the event, the response was considered appropriate however a number of further actions have been identified to provide a better response to surface water flood events summarised at section 4.4 which includes additional procedures which would also be relevant for tidal and coastal flood events.

Medway Council Highways Service

As well as the actions relating to legislative flood risk management functions, a number of actions can take place at a localised level in order to reduce the risk and consequences of flooding including;

- Additional gully and soakaway cleansing to ensure interception of regular rainfall events within the design capacity of the highways drainage
- Placement of additional/enlarged gully grates to increase interception of rainfall
- Installation of additional soakaways to increase drainage capacity

A number of these actions are planned for sites within Medway where there has been regular flooding and drainage issues experienced under high risk events. These actions are summarised for each location where relevant at Appendix 1.

3.5 Recommendations

A number of opportunities have been identified to improve Risk Management Authorities' response to a flood, as well as wider partners and agencies.

A key issue was the lack of communication between partners and agencies which meant that the council were not immediately informed when the flood incident at Nelson Terrace had escalated to emergency status.

Usually communication would take place between partners and agencies (for example, Emergency Services, Environment Agency, Met Office, Local Authorities and NHS) via a Severe Weather Advisory Group (SWAG).

SWAG is a group of partners and agencies that convene on receipt of a significant event warning to establish command and control of response and recovering to a severe weather event. On this occasion the impacts of the rainfall were expected to be low, and SWAG took place after the event and therefore partners and agencies responded as per the own internal procedures rather than as a coordinated response.

Other recommendations are included below to improve communication with the public during and after flood incidents, and to improve the sharing of flood risk information to inform maintenance regimes and collection of flood risk data as an evidence base.

- Clearer lines of communication should be established between emergency partners where a SWAG has not been set up ahead of a flood event. Following a meeting with Kent Fire and Rescue Service (KFRS), there is now a procedure in place for KFRS to notify Medway Council.

- An operational procedure should be added to the councils MAFP to state that upon become aware of a flood event, the council will inform emergency response and resilience partners as appropriate.

- Better prediction of flood events and impacts to help to improve local prediction of flooding impacts under different storm events; the council have purchased 'Hydrocast' a system

which supports the correlation of impacts against different rainfall profiles. This will enable the council to better predict areas which may flood and share that with relevant emergency partners where there is predicted to a significant impact.

- Sharing of Met Office weather alerts using social media to local residents.

- Sharing of council website links to report blocked gullies and report flood incidents during heavy and prolonged rainfall.

- Where there is opportunity to do as part of any ongoing sewer or highway works, consideration should be given to the replacement of inspection chamber covers to that of a hinged cover where there is a history of hydraulic overloading in order to prevent damage to the carriageway.

- Medway Council should sign up to the South West Information Management (SWIM) web based system. SWIMS is a system which allows members of the public, and RMA's to enter details about property flooding in once place. The system can be used to aid multiple agencies in their combined response to flooding both during and event and after.

- Ongoing consultation between Risk Management Authorities as Southern Water progress the development of a framework for all drainage and wastewater management plans which will seek to look at strategic opportunities, including the reduction of flood risk between stakeholders.

- Whilst the sewer network has adequate capacity for foul flows, it was noted that surface water flows entered into the system causing surcharging of the foul system. Medway Council and Southern Water should work together to identify how surface water can be more effectively managed to reduce the amount of surface water entering the sewer network.

- Investigate feasibility of options within the SWMP for the Chatham area (specifically the construction of a bund further upstream in the catchment to attenuate overland runoff and sewer flows).

3.6 Land and property owner action

Provision of information regarding flood events.

Landowners can document and photograph flood incidents where possible and report flooding to Medway Council. This helps to further understand the causes and impacts of flooding in the area.

- Residents can report blocked gullies to the council to ensure that the highways drainage provision remains effective

Property protection

It is the land/property owner's responsibility to take measures to protect themselves and their property when flooding is imminent. Property level protection may be appropriate to prevent water ingress during intense rainfall events. Such measures include:

- Barriers which can be fitted to prevent water entering a property.
- Air brick covers can be fitted over existing airbrick and air vents to prevent ingress of floodwater.
- Non return valves can be fitted to drains to prevent floodwater and foul sewage backing up into buildings.
- Ensure that all drains within the curtilage of the property are kept clear of debris and ensure that no oils, fats, concrete or similar are passed down the drain.
- Ensure that any driveways are constructed in a permeable material and to a gradient that allows surface water runoff.
- Consider the use of water butts, rain gardens or rain water harvesting (for more information visit www.susdrain.org).

Medway Council have provided information regarding the use of property level protection to affected homeowners and businesses. A list of sources of information is included at the end of this report.

4 Summary

The purpose of the Flood Investigation report was to understand the flooding problem, establish which Risk Management Authorities have relevant flood risk management functions under the Flood and Water Management Act 2010 and ascertain if those Risk Management Authorities' had undertaken or were planning to undertake actions related to those functions to reduce/alleviate the risk of flooding.

The majority of areas where flooding was reported were within areas considered to be at high risk of surface water flooding. The storm event has been estimated to have a return period of 1 in 36 years (2.7% AEP) which is commensurate with a medium flood risk event. Public and highways sewerage infrastructure is not designed to store this extent of surface water and the capacity of the network was overwhelmed. This was compounded by overland flow.

Risk Management Authorities have carried out a number of flood risk management functions in order to reactively investigate the flood incident and proactively seek to reduce the risk of re-occurrence in the context of available budgets and legislative responsibility. These actions have included post event inspections and CCTV survey, 'quick win' solutions to improve highway drainage, particularly in areas which experience regular drainage problems, and further investigation of potential schemes within areas which are at high risk of flooding.

It is concluded that Risk Management Authorities satisfactorily carried out their flood risk management functions in response to the flood event, however, a number of actions have been identified to better address preparedness and response to a surface water flood event.

At the time of this report, neither a technical solution nor guaranteed investment to deliver long-term flood alleviation can be identified at this time. These conclusions are based on the evidence available at the time of investigation and may change following further study.

Acronyms:

RMA: Risk Management Authority
LLFA: Lead Local Flood Authority
SW: Southern Water
EA: Environment Agency
SfA: Sewers for Adoption
AEP: Annual Exceedance Probability
MEP: Major Emergency Plan
MAFP: Multi Agency Flood Plan
KFRS: Kent Fire and Rescue Service
SuDs: Sustainable Drainage Systems
SWIMS: South West Information Management
SWAG: Severe Weather Advisory Group
KRF: Kent Resilience Forum

Useful Contacts and Links:

Medway Council
Out of hours incident line 01634 304400
Customer Contact: 01634 333333

Advice and guidance for property owners:

EA - Prepare your Property for Flooding: Reducing flood damage; flood protection products and services
www.gov.uk/government/uploads/system/uploads/attachment_data/file/451622/LIT_4284.pdf

Medway Council – Managing local flood risk in Medway
www.medway.gov.uk/floodrisk

National Flood Forum – Blue Pages: Advice and contacts for flood protection products
www.bluepages.org.uk/

Six Steps to Flood Resilience: Step-by-step guidance and advice for property owners interested in Property Level Protection
www.smartfloodprotection.com

Appendix 1 – Flood areas and actions taken to date

Site	Description	History	Highways Service actions	Southern Water actions
Albatross Avenue, Strood	External property flooding	YES	None planned	N/A - no formal drainage here
Albany Road, Chatham	External property flooding	YES	None planned	N/A - no formal drainage here
Balmoral Road, Gillingham	Highway flooding	YES	Further monitoring during rainfall	Ongoing modelling work to establish capacity of system
Beacon Hill, Chatham	Internal/external property flooding	YES	Initial survey of highways drainage	Survey of SW system to establish connectivity
Beacon Road, Chatham	External property flooding	YES	Highways have undertaken a site visit and minor CCTV survey. Passed to Southern Water to	Survey of SW system to establish connectivity
Bells Lane, Hoo	Highway flooding	YES	None planned	None planned
Brompton Farm Road	Internal/external property and highway flooding	YES	Repairs to highway main carrier undertaken. Repairs to soakaway planned and fitting of a flap valve in 2019/20	N/A no formal drainage here
Buckland Road, Rochester	Highway flooding	YES	None planned. Rural area, no formal drainage in place	N/A no formal drainage here
Canadian Avenue, Gillingham	Internal/external property flooding	YES	Additional (six monthly) gully cleansing	Ongoing modelling work to establish capacity of system
Capstone Road, Chatham	Internal/external property flooding	NO	Emergency CCTV surveys of Drainage by Medway and southern water. Resurfaced	CCTV survey of drainage
Centenary Gardens, Gillingham	External property flooding	NO	None planned (private unadopted Highway). Highways have advised on a new system	N/A no formal drainage here
Chatham High Street	Internal/external property flooding	NO	None planned	N/A no formal drainage here
Cherry Tree Road, Rainham	Internal/external property flooding	YES	Further investigations planned 2019/2020	Prior surveys of system before 2018 event
Churchill Avenue, Chatham	Highway flooding	NO	None planned	None planned
Cornwallis Avenue, Gillingham	Highway flooding	NO	None planned	N/A no formal drainage here
Rochester Road, Chatham	External property flooding	NO	Additional gully cleansing	N/A no formal drainage here
Darnley Road, Strood	Highway flooding	YES	Increase in size of 5 gully grates to be constructed in 2019/20	N/A no formal drainage here
Esplanade (Rochester)	Highway flooding	YES	Unblocked manhole chamber leading to flap valve	None planned
Four Elms Hill	Highway flooding	YES	Repair works carried out to main carrier and gullies	N/A no formal drainage here
Gillingham Road, Gillingham	Internal/external property and highway	YES	Working with Network Rail to install a drainage system	None planned
Grasmere Grove	Internal flooding	YES	Installation of new soakaway and gullies.	N/A no formal drainage here
Guelder Rose Drive	External property and highway flooding	YES	Passed to Southern Water for further investigations	Surface water system surveyed and cleaned
Haig Avenue, Chatham	Internal/external property flooding	NO	2 additional gullies at Haig Ave. One additional gully at Wilson Avenue installed and CCTV survey of whole system.	N/A no formal drainage here
Jarrett Avenue, Wainscott	Highway flooding	YES	Additional gullies to be constructed in 2019/20	N/A no formal drainage here
Kellaway Road, Walderslade	Internal/external property flooding	NO	Highways main carrier cleaned	N/A no formal drainage here
Laburnum Road, Rochester	Internal/external property flooding	NO	Installation of new gully	N/A no formal drainage here
Lordswood School	Internal/external property flooding	NO	Not a highways/sewerage issue, school investigating with LLFA	N/A no formal drainage here
Main Road Hoo	Highway flooding	YES	N/A not highway related	N/A
Maidstone Road, Rochester	Internal/external property flooding	YES	Under investigation.	None planned
McKenzie Road, Chatham	Internal/external property flooding	NO	None planned	N/A no formal drainage here
Millpond Close, Rochester	External property flooding	YES	Additional soakaway cleansing	N/A no formal drainage here
Nelson Terrace, Chatham	Highway flooding	NO	Gully cleansing and inspection	N/A no formal drainage here
Old Castle Walk, Parkwood	Internal/external property flooding	NO	Not highway related	N/A no formal drainage here
Pier Road, Gillingham	Highway flooding	YES	Not Highway related - Southern Water Pumping Station issue	Ongoing monitoring
Pine Grove, Hempstead	Internal/external property flooding	YES	Has been investigated, historic additional gullies, no further actions at present	N/A no formal drainage here
Purbeck Road, Chatham	External property flooding	YES	Installation of 2 new 600mm gullies on corner of Maidstone Road with Athelstan Road and replacement of 2 existing gullies at junction with Purbeck Road with 600mm gullies	N/A no formal drainage here
Rede Court Road, Strood	Highway flooding	YES	Soakaway tested and due to be cleaned	N/A no formal drainage here
Renown Road, Chatham	Internal/external property flooding	NO	Additional gully cleansing	N/A no formal drainage here
Rother Vale, Lordswood	External property flooding	NO	None planned	None planned
Station Road, Rainham	External property flooding	YES	Monitoring during heavy rainfall	None planned
Sundridge Drive, Chatham	Internal/external property flooding	YES	Increased grate sizes to nearby gullies to increase inteception	N/A no formal drainage here
Thomas Harris Close, Halling	Internal/external property flooding	YES	Private road (unadopted Highway)	N/A no formal drainage here
Toronto Road, Gillingham	Highway flooding	YES	Clean Gullies every 6 months	Ongoing modelling work to establish capacity of system
Wigmore Road, Gillingham	External property flooding	NO	Ditch and vegetation clearance	None planned
Walderslade Village (Highway and bypass)	External property flooding	YES	Drainage investigated. Patch lining in gully outside petrol garage	Further survey work planned