

Flood Investigation Report

Victoria Road Area, Southend-on-Sea
Flood of 20th October 2021

March 2023

1. VERSION CONTROL

Issue	Date	Details	Prepared By	Reviewed By	Approved By
0.1	12/09/2022	First draft for internal review	Tom Palmer Senior Engineer	Jo Matthews Principal Engineer	Neil Hoskins Head of Civil Engineering
0.2	14/12/2022	Second draft for stakeholder review	Tom Palmer Senior Engineer	Jo Matthews Principal Engineer	Neil Hoskins Head of Civil Engineering
1.0	29/03/2023	Final report	Tom Palmer Senior Engineer	Jo Matthews Principal Engineer	Neil Hoskins Head of Civil Engineering

This Section 19 Flood Investigation Report has been prepared by Southend-on-Sea City Council Civil Engineering Team.

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2. INTRODUCTION

Southend-on-Sea City Council (SCC) is a Lead Local Flood Authority (LLFA) under the Flood and Water Management Act 2010 (The Act). The Act gives LLFA's a responsibility to undertake an investigation of flooding under Section 19, where deemed appropriate¹:

Flood and Water Management Act Section 19

- (1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate-
 - (a) which risk management authorities have relevant flood risk management functions, and
 - (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.
- (2) Where an authority carries out an investigation under subsection (1) it must-
 - (a) publish the results of its investigation, and
 - (b) notify any relevant risk management authorities.

Southend-on-Sea City Council has adopted the following threshold criteria to determine when a Section 19 Flood Investigation Report will be completed:

- Internal property flooding of 5 or more properties in a single event

OR

- Internal property flooding of one property on more than one occasion

AND

- Ambiguity surrounding the source and/or responsibility of the flooding

This Section 19 report has been completed due to repeated internal property flooding at the location and the potential influence of both local and wider ranging drainage networks.

The findings of this Section 19 Report are based on the information available to SCC at the time of preparation and may be subject to change should additional information become available. SCC expressly disclaim responsibility for any error in or omission from this report. SCC does not accept any liability for the use of this report or its contents by any third party.

¹ Flood and Water Management Act 2010, Section 19: <https://www.legislation.gov.uk/ukpga/2010/29/section/19>

3. SITE INFORMATION

3.1 Site Location

Site Location: The area encompassing Victoria Road, Manilla Road, Northumberland Crescent, Jetty Mews, Retort Close and Shaftesbury Avenue, Southend-on-Sea

Postcode: SS1 2TQ (Victoria Road)

Grid Reference: (589570, 185010)

The location subject to this flood investigation constitutes the immediate area surrounding Victoria Road between Manilla Road and Shaftesbury Avenue including the immediate areas surrounding the junctions of Victoria Road with Manilla Road, Northumberland Crescent, Jetty Mews, Retort Close and Shaftesbury Avenue, Southend-on-Sea. The impacted properties fall entirely within the City of Southend-on-Sea.

The study area ranges between approximately 3.5m and 2.5m Above Ordnance Datum (AOD) and within a localised low point. The surrounding land slopes from east to west with the ground to both the north and south being higher than the site. Ground levels to the north of the site reach 25m AOD with the ground immediately to the east reaching 2m AOD.

Victoria Road and the surrounding areas is located on the edge of the urbanised area of Southend-on-Sea with development to the north, east and west, and the Thames estuary (with a variety of engineered defences) to the south. Land to the north and west of the area constitutes highly developed urbanised coverage with the open grassed area of Southchurch Park to the east. Figure 3.1 shows the site location within Southend-on-Sea.

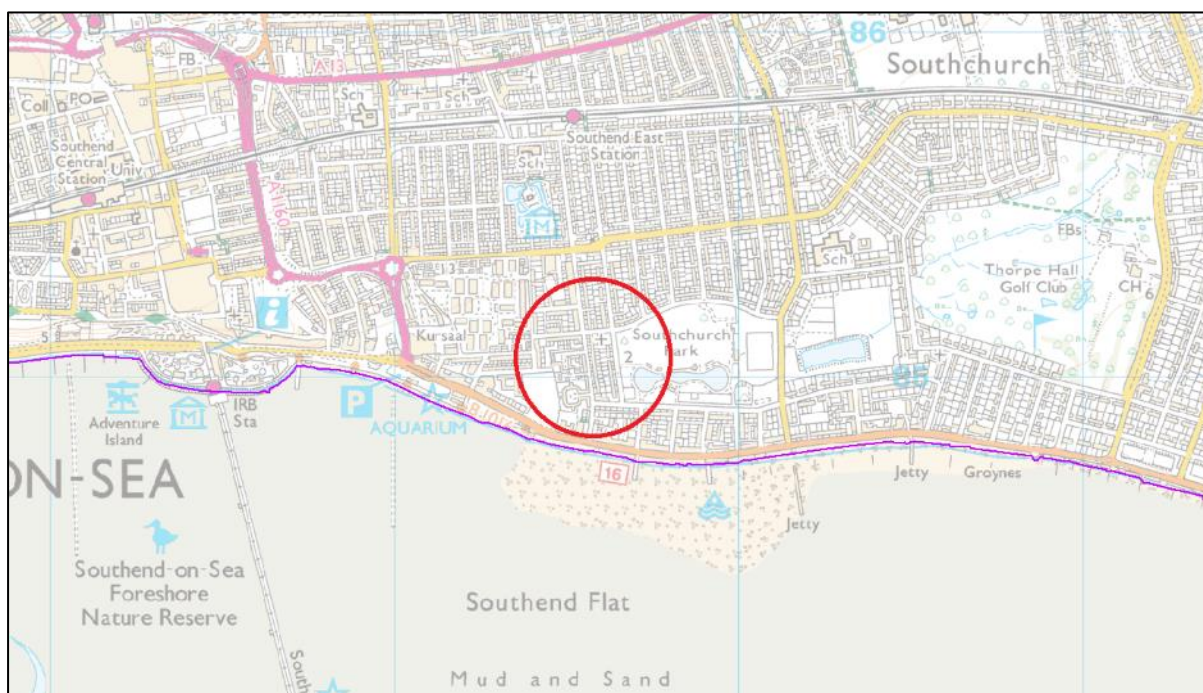


Figure 3.1: Site location within the City of Southend-on-Sea

3.2 Existing Drainage

Highway drainage exists throughout Victoria Road, and all surrounding junction areas, with a higher density of gullies present in Retort Close. Drains exist at roughly 50m intervals on all residential roads in line with UK highway drainage design standards. In Retort Close drains are present at roughly 20m intervals.

A significant number of sewers pass through the area with a 300mm diameter and 900mm surface water sewers and 300mm foul sewer flowing north to south along the entire length of Victoria Road. A 675mm surface water sewer is also present south of Jetty Mews with a 675mm combined sewer north of Jetty Mews.

All surface water drainage in Victoria Road feeds into the area outfalls into the estuary either via the short or long outfalls at Camper Road, 250m and 400m south of the site respectively from the site. Both outfalls have non return valves fitted at the end and it should be noted no diameter information was available.

The combined sewers serving the area drain to a pumping station at the eastern end of Burnaby Road, immediately west of Jetty Mews. This moves flows north to Woodgrange Drive where they connect into a gravity fed combined sewer flowing west. The surface water drainage serving Retort Close, Jetty Mews, Collier Way and Northumberland Avenue west of Victoria Road feeds into this combined system.

Southchurch Park pond to the east of the area is fed by a main river from the west and drains south into the long and short outfalls south of Camper Road. No other sections of main river or ordinary watercourse exist within the study area.

Figure 3.2 shows the recorded drainage in the vicinity of the site. It should be noted that no foul, combined or surface water systems are shown due to restrictions sharing Anglian Water data. Only road gullies relevant to the problem location are detailed.

The ownership and maintenance responsibilities for the drainage at the site lies with multiple landowners and risk management authorities:

Highway Drainage: Responsibility of the Highway Authority, Southend-on-Sea City Council. This includes all gullies and their catch pits and the pipework up to the point where it joins a sewer.

Main Rivers: Responsibility of the adjacent riparian landowner with enforcement and other relevant powers lying with the Environment Agency.

Sewers: Responsibility of Anglian Water. This includes all surface water, foul and combined sewers where they serve more than 2 properties

Surface Water Flooding: Strategic responsibility lies with the Lead Local Flood Authority (LLFA), SCC.

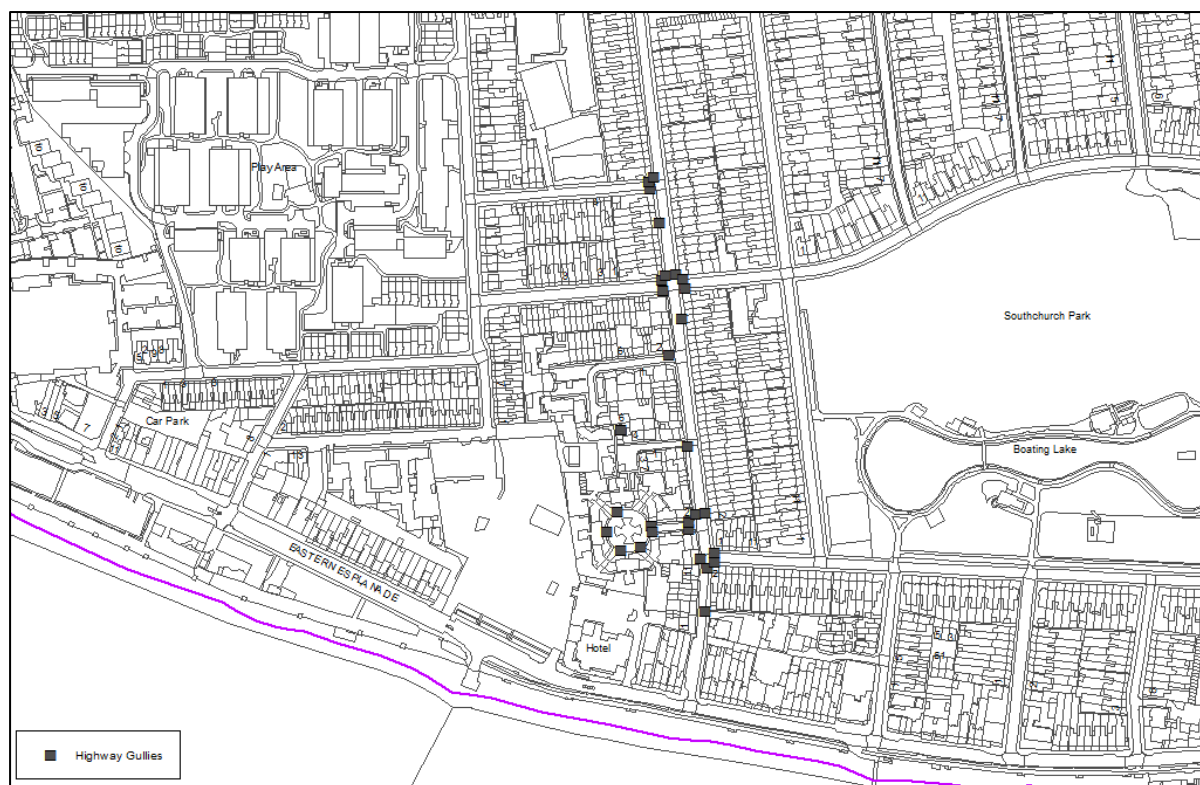


Figure 3.2: Observed and recorded drainage in the investigation area

3.3 Flood Risk

National mapping showing the risks from surface water flooding is produced by the Environment Agency and visible online. Figure 3.3 below shows the risks of flooding to the study area. Risks are divided into the following bands:

High: The extent of flooding that is predicted to occur from a rainfall event that happens on average more than once every 30 years (3.3% AEP – see section 4 for definition).

Medium: The extent of flooding that will occur from a rainfall event that happens on average between once every 30 and once every 100 years (3.3% - 1% AEP).

Low: The extent of flooding that is predicted to occur from a rainfall event that happens on average between once every 100 and once every 1000 years (1% - 0.1% AEP).

Very Low: The extent of flooding that is predicted to occur from a rainfall event that happens on average less often than once every 1000 years (<0.1% AEP).

It should be noted that all information shown by this mapping is a general indicator of a flood risk in an area and it is not suitable for identifying whether an individual property will flood.



Figure 3.3: Environment Agency Surface Water Flood Risk Map² with the site location shown by the red circle

4. FLOOD HISTORY

Significant flooding occurred in the Victoria Road area and surrounding, low lying sea-front location area in both August 2013 and September 2014. Investigations identified that 255 and 61 properties respectively were reported as internally flooding across the city during both of these events. Following the flooding of 2013 an SCC grant was made available to residents to install Property Flood Resilience (PFR) measures.

Rainfall events are quantified based on the probability of their occurrence within a given year, termed the Annual Exceedance Probability (AEP). A rainfall event that on average occurs once per year (1 in 1 event) has a 100% AEP, with a storm that has a chance of occurring on average once every 100 years (1 in 100 event) having a 1% AEP.

It was estimated the August 2013 flood event had a return period between 3.3% AEP (1 in 30) and 2% AEP (1 in 50).

As a localised low point surrounded by many roads and other developed areas the study area is at an increased risk of localised surface water flooding following heavy or persistent rainfall. Table 3.1 below outlines known more significant flooding events that have affected the area subject to this investigation.

There are two recorded Anglian Water sewer flooding (DG5) records within the study area.

² Environment Agency Long Term Flood Risk (surface water) online mapping: <https://www.gov.uk/check-long-term-flood-risk>

Location	Date	Details	Report Source
Victoria Road area	24 th August 2013	Internal flooding to multiple properties, including 8 in the study area	SCC LFRMS
Victoria Road area	19 th September 2014	Internal flooding to multiple properties, including 2 in the study area	SCC LFRMS
Victoria Road area	No specific dates provided	Flooding to carriageways and footways in localised low points following heavy or persistent rainfall	Anecdotal evidence
Victoria Road area	20 th October 2021	Internal flooding to at least 1 property. Widespread flooding to road and footways	Resident reports

Table 3.1: Historic flooding information

5. SUMMARY OF FLOODING EVENTS

Following heavy rain on the evening of 20 October 2021 flooding to Manilla Road commenced at approximately 22:00 with flows containing material from foul sewers. This water then flowed east to the junction of Victoria Road and Shaftesbury Avenue. Water levels reached approximately 200 – 250mm in the low point between the Collier Way and Shaftesbury Avenue junctions with Victoria Road. The flooding persisted for 2-3 hours, receding by around 02:00 on the 21st October, but with significant contaminated silt deposits remaining for several days until cleared by both SCC and Anglian Water.

6. OCTOBER 2021 EVENT CAUSES AND MECHANISMS

6.1 Rainfall

On the day of the flooding incident a slow moving storm passed from west to east across the south of England. Isolated showers occurred throughout the day though the timings and total rainfall volumes are not significant enough to have caused notably higher baseflows within watercourses that resulted in any loss of capacity within piped drainage systems.

In the evening of the 20th October very heavy and intense rainfall occurred affecting the wider South Essex area causing multiple instances of flooding across the boroughs of Castle Point and Basildon, and the City of Southend.

Table 6.1 below details the recorded rainfall volumes at three rain gauges in close proximity to the investigation area. Total rainfall volumes are provided with higher than usual rainfall rates highlighted.

Time Period (20-21 st October 2021)	Rain Gauge Recorded Rainfall (mm)		
	Southchurch Park (500m)	Rayleigh (10km)	Benfleet Barrier (12km)
9.00 - 9.59 pm	6.8	4.6	6.2
10.00 - 10.59 pm	12.7	24.5	30.4
11:00 - 11:59 pm	4.1	9.0	6.6
12.00 - 12.59 am	2.9	4.5	4.4
1.00 - 1.59 am	5.7	5.5	8.0
2.00 - 2.59 am	1.5	0.9	1.6
Total (6hrs)	33.7 mm	49.0 mm	57.2 mm

Table 6.1: Rainfall data from the closest gauges in the vicinity of the investigation area³. Distances from the investigation site are shown in brackets.

The above rainfall totals and intensities can be used to determine the AEP of the storm. Calculations have shown that the rainfall event causing the flooding on the 20th and 21st of October equates to being between a 10% AEP (1 in 10) and 5% AEP (1 in 20) event.

6.2 Flood Mechanisms and Identified Issues

Anecdotal information suggests that shortly following the intense rainfall peaks around 10-11pm some surface water started flowing from the surrounding higher land towards Victoria Road using the road surfaces as a drainage flow path. Shortly after surface water mixed with foul effluent started surcharging from the Manilla Road area, flowing east to Victoria Road and then south impacting the areas along Victoria Road and affecting areas around the Northumberland Crescent, Collier Way, Jetty Mews and Shaftesbury Avenue junctions. These flows gathered at the localised low point on Victoria Road between Collier Way and Shaftesbury Avenue. Figure 6.1 outlines the maximum flood extent and surface flow routes.

³ Gaugemap online rain gauge data <https://www.gaugemap.co.uk/#>

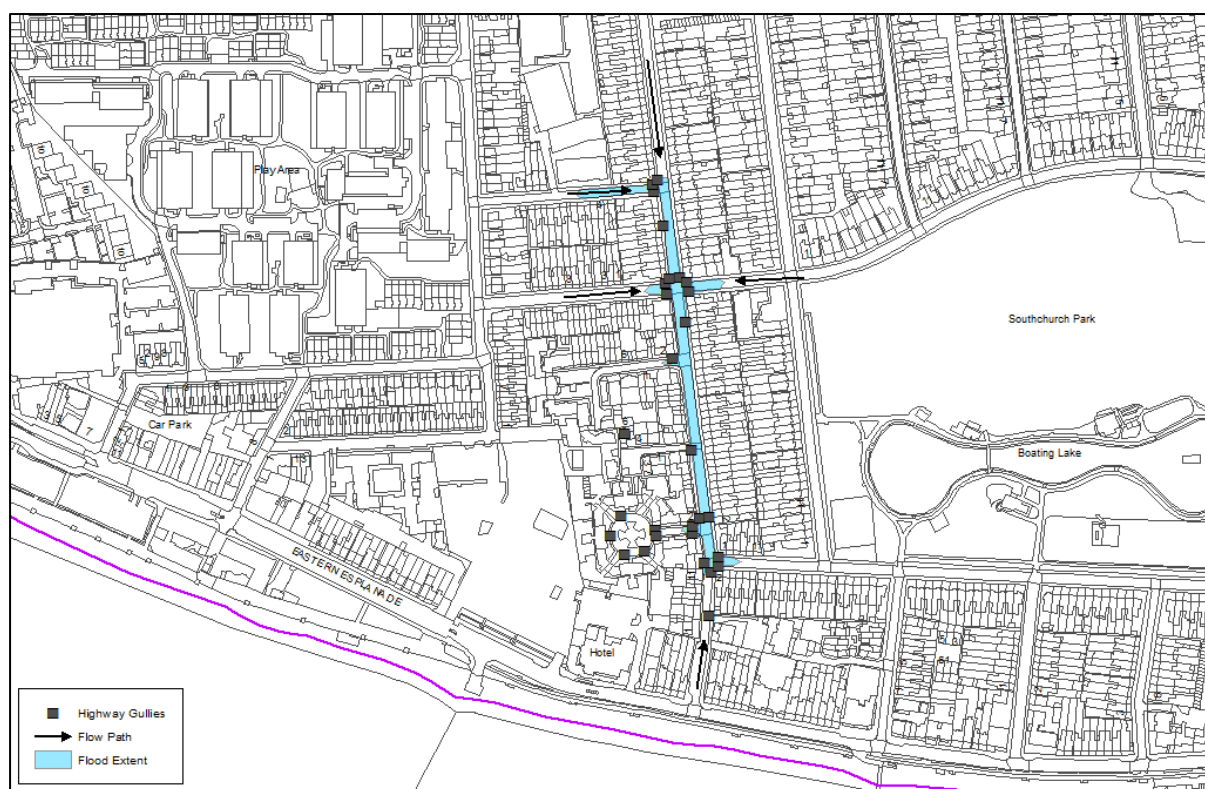


Figure 6.1: Map showing the flood extent and recorded flood flow routes

The following issues and their impact on the flooding are outlined in Table 6.2. Due to the involvement of piped drainage networks, which are influenced by wider catchment areas and are unable to be viewed during the time of the flooding, a likelihood of relevant aspects being a factor is also included based on the information gathered as part of this report.

Aspect	Details	Likelihood	Impact
Rainfall volume and intensity	The amount of rainfall that the area received over the 6 hour period of the evening of the 20 th of October was significant, as was the intensity of the rainfall that occurred between 10 and 11pm. The return period of this event is at the upper limit of highway drainage design standards (3.3% AEP) and as such many drainage systems were overwhelmed. This is the primary cause of the flooding	High	High

Aspect	Details	Likelihood	Impact
Highway drains (pipework and gully blockages)	During the autumn months highway drainage is more prone to blockages from falling leaves, twigs and other debris. Reports suggest that this was not a significant factor in causing the flood event and no evidence was found of debris blockages during subsequent inspections, however due to the high winds in the proceeding week the potential for debris to have created localised blockages or restrictions during the flood event is possible	Low	Medium
Highway drains (number)	The number of gullies present are within the ranges expected for current highway drainage design standards. It should be noted that the rainfall volume almost exceeded the designed drainage rates and that water drained away quickly once the rainfall subsided, indicating the pipework to be clear and the flooding to be linked to the volume and intensity of the rainfall	Medium	Medium
Surface water sewers (capacity)	Mapping shows there to be a large number of surface water sewers in the area of flooding, all of which are of large diameters. As such the local drainage is not likely to be a factor in the flooding	Low	Low
Surface water sewers (connectivity)	Mapping also shows that the sewers serve a larger catchment area than the study area and as such water draining from these will have reduced the capacity of the sewers in the study area, reducing the ability for water to drain away and potentially causing surcharging where water cannot enter into systems or is arriving more quickly into the area than it can drain away. There is no direct evidence of surface water sewer surcharge however it is likely that capacity was reduced during the flood event	Medium	High
Tide locking	High tide was at 1:39 am on 22 October with a recorded height of 5.75m, which is at the upper of the local range. It is highly likely that flap valves on the outfall with have been mostly closed and water within the sewers feeding them will have backed up until depths reached those similar to the sea level and pressures equalised to allow the valves to open. This will have significantly reduced capacity in the sewers immediately upstream and is a likely factor in the flooding	High	High
Combined sewers	There are a large number of combined sewers in the area and the reports indicate that there were capacity issues with these due to the material present above the surface. These systems are fed by surface water flows and combined with the heavy rainfall and wider network issues and capacity will have had a significant impact on the flooding. This is a primary cause of the flooding	High	High

Aspect	Details	Likelihood	Impact
Foul sewers	It was later reported that there was a collapse within a pipe feeding the Southend Sewage Treatment Works. As all foul systems arrive at this point and it was restricted at the time of the event it is likely that this subsequent reduction in foul sewer capacity was likely a contributing factor in the flooding experienced	Medium	High

Table 6.2: Summary of factors identified as contributing to the flood incident and their impact on the event

6.4 Event Responses

After the flood, incident recovery activities including the clear-up and cleansing of foul flooding areas by Anglian Water and inspection and cleansing of highway drainage by SCC. Table 6.3 below details the inspections and cleansing completed including the actions undertaken or scheduled to be completed in response to the defects found.

Authority	Date	Details	Actions
AW	October 2021	Cleaning	Removal of foul material and cleansing of area
AW	November 2021 onwards	Sewer checks	Checks to capacity, condition and functionality of all sewers, outfalls and flap valves in the area
SCC	October 21 st 2021	Cleansing	Road sweeping to clear debris from carriageways and footways
SCC	November 2021	Gully cleansing	Checking and cleansing of all highway drainage
SCC	November 2021	Consideration for PFR scheme	Investigated potential SCC and EA funding sources
SCC	November 2021	Consideration for drainage improvement works	Added to long-list for potential receipt of capital surface water drainage improvement works

Table 6.3: Flood response activities undertaken by relevant risk management authorities

7. RECOMMENDATIONS

Table 7.1 outlines the recommended actions to be taken based on the findings of this Section 19 report.

Recommendation	Responsible Authority	Status / Next Steps
Undertake joint works and investigations with Anglian Water to fully understand the impact of the drainage networks and influence of tide locking, including storm tank operation	SCC and AW	Ongoing at time of report
Consider joint capital drainage improvement works and/or SuDS retrofit type measures	SCC / AW / EA	At the time of this report a small budget is available for such works, however these will only be progressed once the contribution of the Manilla Road tank and Anglian Water drainage network is confirmed
Consider gully cleansing, jetting and CCTV survey, though evidence suggests pipework is clear	SCC	As no issues of blockages were indicated jetting will be undertaken as per the ongoing maintenance regime with ad-hoc to be considered when heavy rainfall is predicted
Improve links to social media to promote riparian ownership etc	SCC	Ongoing at time of report
Area to be considered as part of a wider Property Flood Resilience (PFR) programme	SCC	No funding is available from SCC currently. The EA have been approached and a widespread scheme needs to be identified to secure grant funding. Current records and possible locations do not meet this threshold so alternate funding sources are currently being investigated
Residents to consider installing measures to reduce flood risk or protect their property, such as flood barriers, de-paving, water butts and other runoff reduction techniques	Residents	Ongoing. As above a grant to support such works is currently being explored

Table 7.1: Section 19 report recommendations

8. APPENDICES

Appendix 1: Photos from incident on 20 October 2021



Photo 1: Extent of flooding, looking towards Victoria Road and Collier Way junction (1)

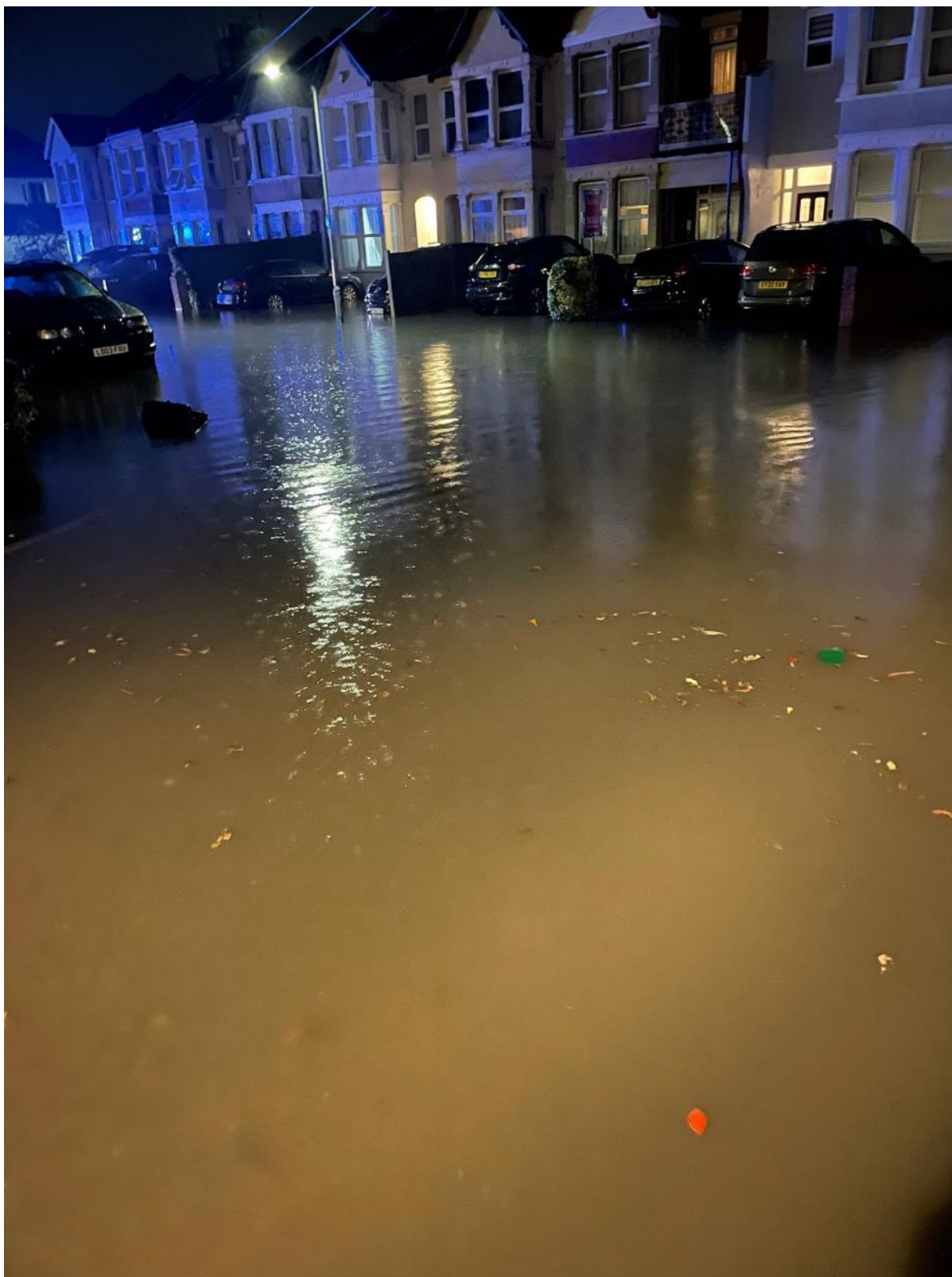


Photo 2: Extent of flooding, looking towards Victoria Road and Collier Way junction (2)



Photo 3: Extent of flooding at the Victoria Road and Collier Way junction



Photo 4: Flood depths on Victoria Road



Photo 5: Post flooding debris (1)



Photo 6: Post flooding debris (2)