



# **Section 19 Report**

**Nork and Tattenhams – Flooding in July 2021**

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# Section 19 Report into flooding in Nork and Tattenhams

## Introduction

This report is being written following flooding to multiple properties in the Nork and Tattenhams area of Reigate and Banstead borough. The flooding in most locations was a repeated event with similar flooding happening on 13<sup>th</sup> August 2020.

This report details the results of the investigations undertaken into the flooding that occurred on 12<sup>th</sup> July 2021. The report will describe the flooding impacts, causes of the flooding and which Risk Management Authorities (RMAs) have duties related to the flooding at each of the locations impacted in Nork and Tattenhams.

Recommendations will be made for ways that the risk of flooding can be mitigated in those locations which will be passed to the relevant RMA or team for decisions. Overarching recommendations will also be made for the wider area. This document is not an action plan or an agreement that the recommendations provided in this report will be completed by the relevant RMAs.

The supporting data has been put together based on records of internal property flooding and road closure information from a variety of sources. While every effort has been made to verify the information, the nature of the data and the methods used to collate this information mean that it does not include every occurrence of flooding. This data only identifies where flooding has been reported and is indicative only.

## Section 19 Flood Investigation Requirement

Under the Flood and Water Management Act (2010) the Lead Local Flood Authority (LLFA) must (to the extent that it considers it necessary or appropriate) undertake an investigation on becoming aware of a flood incident within its area.

An LLFA is defined under Section 6(7) of the Flood and Water Management Act as being the County Council for that area. Section 19(1) requires that the investigation determines the RMAs that have relevant flood risk management functions and whether each of those authorities have exercised or is proposing to exercise those functions in response to the flood.

Section 19(2) requires that the LLFA publishes the results of its investigation and notifies the relevant risk management authorities accordingly.

The Surrey Flood Risk Partnership Board has set out parameters for when a formal Section 19 report is triggered. These can be viewed on the [Surrey County Council website](#).

## Method

This investigation has been undertaken using both desk and site-based studies while also referring to previous investigation reports from similar flooding in August 2020.

### Desk Study

The desk studies undertaken for each site reviewed flood risk data including surface water flood risk and groundwater flood risk as well as utilising existing reports of flooding held by Surrey County Council. Photos have also been provided by impacted residents giving a good indication of how the flooding occurred and these were reviewed at this stage. Kaarbontech (SCC's highway drainage database) has also been used to identify drainage features in the area and their maintenance records.

## Flood Risk

- Surface Water Flood Risk
  - There is a high risk of surface water flooding at each of these catchments
- Groundwater Flood Risk
  - The Nork and Tattenhams area is marked as having limited potential of groundwater flooding. This is likely due to the permeable nature of the chalk bedrock though as times of high groundwater may come to the surface.
- Fluvial Flood Risk
  - The area is in flood zone 1 and at very low risk of being flooded by rivers with no main rivers close to these catchments.

## Site Visit

A visit has been undertaken to each of the sites identified in this report to confirm the impact and extent of the flooding that occurred to properties on the 12<sup>th</sup> July 2021.

## Report Structure

For the purposes of this report the Nork and Tattenhams area has been split into four sub catchments. These are shown below in Figure 1. The area has been split to provide bespoke recommendations for each catchment and in some cases specific flow routes. These specific and targeted recommendations may also have a wider impact to the flooding experienced within the greater area.

Catchment 1 comprises Great Tattenhams, Uplands Way, Rosebushes and Reigate Road. Catchment 2 comprises: Nork Way, Roundwood and Green Curve. Catchment 3: Waterer Gardens, Tangier Way and Tattenhams Way. Catchment 4 comprises: Hatch Gardens. For each catchment a desk study and site investigation will be provided, identifying the source, cause and impact of flooding. This will be concluded by a list of recommendations for the consideration of the designated risk management authority.

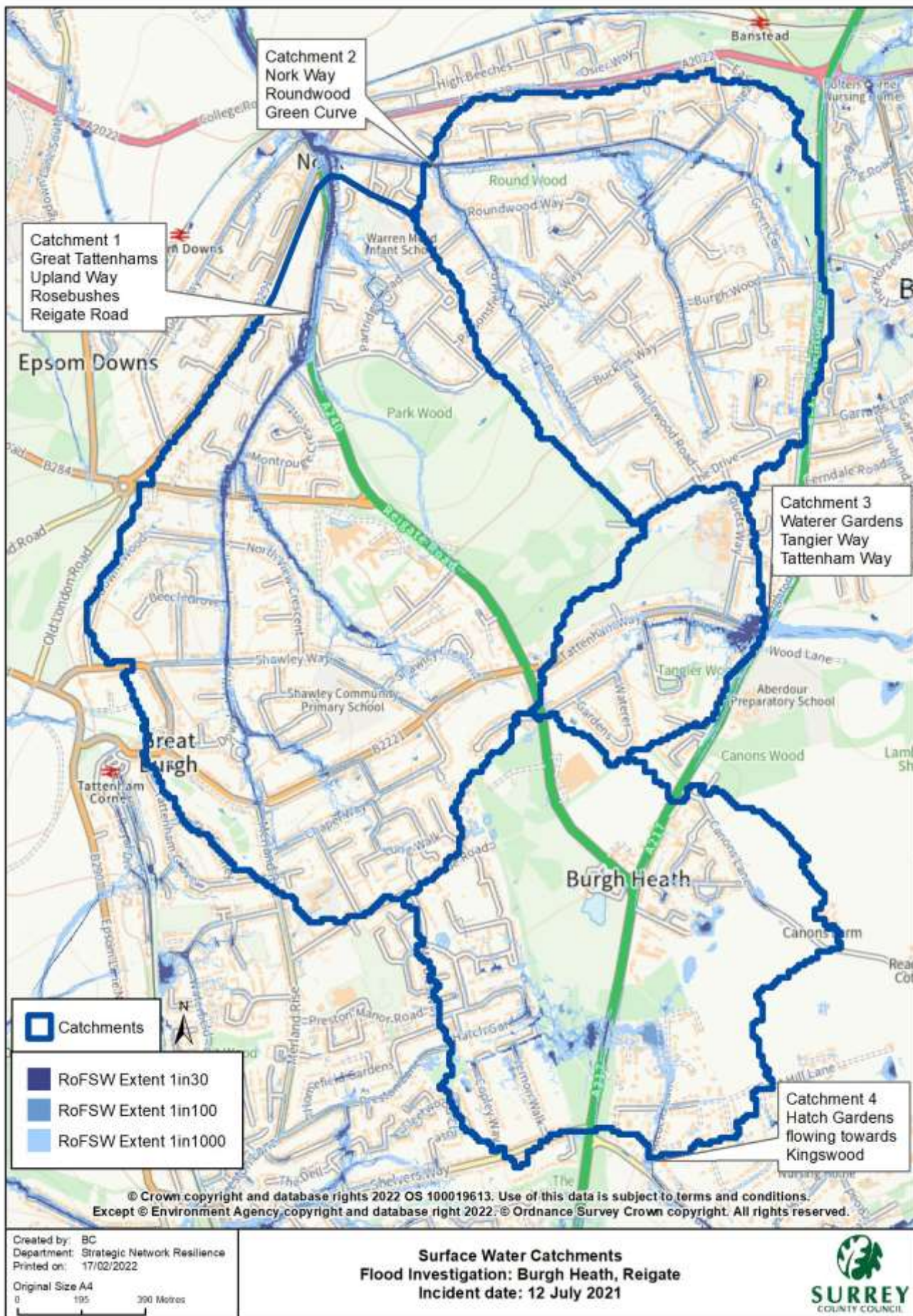


Figure 1 - Map showing the 4 catchments that have been investigated in Nork and Tattenhams. This uses Risk of Surface Water Flooding data - Check the long term flood risk for an area in England - GOV.UK ([www.gov.uk](http://www.gov.uk))

## Catchment 1 – Great Tattenhams, Upland Way, Rosebushes and Reigate Road, and Shawley Way and Shawley Crescent

Catchment 1 is made up of 3 smaller flow routes from Great Tattenhams and Shawley Crescent and Shawley Way.

### Local Drainage Features

The highway drainage in the area all drains to soakaways on and around the highway as well as private soakaways off the highway. Kaarbontech, Surrey County Council's highway drainage database, shows that the gullies and soakaways were inspected in late 2020 (either November or December 2020). These showed that gullies have collected silt to 25-50% full. These were found to be functioning allowing water to flow away. Further inspections were carried out the day after the flooding (13<sup>th</sup> July 2021). These also showed that most gullies and soakaways were draining well.

Garlic Hill Road has quite an even spacing of gullies along the road but soakaways are only located where there is a junction with other roads, such as the roundabout with Shawley Way and the junction with Yew Tree Bottom Road. The gullies on Garlic Hill Road were last inspected in May 2019 and the soakaways were last inspected in 2005 or 2006. At the junction with Yew Tree Bottom Road more recent inspections have been carried out on or after December 2020. Work has also been done to enlarge a gully pot on the low point of the footpath in July 2021. On Rosebushes, most of the drainage has been inspected on or after 2019 however again there are some soakaways which have not been inspected since 2005/2006.

### Recorded Historic Flooding information

The properties identified in this area are recorded to have flooded previously in August 2020. This was reported following local flooding in the area on 13<sup>th</sup> August 2020.

The area also has a recorded Wetspot (Rei043) which has a score of 158. Wetspots with scores of over 150 are classed as a high scoring Wetspot and are prioritised for capital works. For further information about Wetspots, please refer to the Surrey County Council website.

[Flooding and wetspots - Surrey County Council \(surreycc.gov.uk\)](https://www.surreycc.gov.uk)

The wetspot record notes that previous flooding has occurred to an affected property in Great Tattenhams in June 2016, September 2018 and November 2018 and that flooding to some extent occurs at this location 3-5 times per year.

### Site Visit Findings

The extent of flooding to properties is shown below:

Internal flooding	6 properties
External flooding	26 properties
Of which reported Sewage interaction	5 properties

*Table 1- Numbers of properties impacted in Catchment 1*

In several cases, internal flooding was avoided by actions undertaken by homeowners. These measures include the use of barriers, sandbags and pumps to divert water away from properties.

The findings of this site visits revealed that there was a short lag time between the rainfall starting in the area and water pooling in the low points. This indicates that the nature of the flooding is quite flashy and likely stems from the very steep nature of the slopes in this area. Residents also reported that due to the speed of the water flowing down the highway, water was skipping over many of the gullies on the highway. This means that water is all flowing to the lowest point in the area. This exceeded the capacity of the drainage at the low point and resulted in flooding at these locations.

This catchment also had a significant number of front gardens which are paved. This is increasing water runoff from surrounding areas on to the highway.

Residents also reported issues of foul water flooding. In each of these cases residents reported that foul water surcharged through manholes either on the highway or next to properties.

The resident of a property in Great Tattenhams also reported flooding however this was solely from the foul sewer manhole in the back garden with no impact from surface water flows coming from the highway.

A further site visit to Reigate Road also found that properties on the eastern side of the road had experienced flooding where properties are situated lower than the highway. Water flows to this location from both Nork Way and Rosebushes following to low points and crossing the footpath via vehicle crossovers to flood driveways and front gardens.

## **Causes of Flooding**

### **Catchment wide**

#### High Rainfall

On the 12<sup>th</sup> July 2021 the Nork and Tattenhams area, like many areas of Surrey, experienced a very high level of rainfall including pockets of rainfall which exceeded 32mm/hr. The average rainfall for the area is approximately 43mm for July.

#### Catchment terrain

This high rainfall and the highly urbanised nature of the area, including lots of hard standing and paved front gardens, meant that water could not soak up into the ground. This caused water to flow overland following the natural topography of the area instead. The paved driveways also rarely have any drainage to prevent water flowing onto the highway. The lack of green space through the catchment means that there is little capability for water to be slowed or drained through infiltration along the flow route. An example of this is at Shawley Community Primary School on Shawley Way has a large, paved playground which drains towards the highway.

The natural topography of the area is what directs surface water flow, with water flowing to the next lowest point. In many cases within Catchment 1, properties have been built in the path of the flow route. The topography of the area is also generally very steep. This leads to water flowing very quickly over the land and in some cases causes water to flow over road gullies rather than draining away. This also directly contributes to the quick lag times between the rainfall starting and properties being impacted as water flows to the various low points, pooling and flowing over kerbs towards properties.

#### Local Drainage

The only recorded surface water drainage for the area is the highway drainage. As previously mentioned this consists of gullies and soakaways. Highway drainage is only designed to drain the water falling on the highway, usually for a 1 in 5-year storm event (20% chance of occurring in any

given year). With water flowing from paved driveways and other areas of hard standing on to the highway, and water flowing over highway gullies due to the velocity of the water, the capacity of the gullies and soakaways where water was pooling in these low spots was exceeded during this storm event.

The only other drainage system in the area is the foul sewer, owned by Thames Water. There were reports of foul flooding across the catchment. This is likely to have been caused by surface water entering and inundating the foul network. Surface water can enter the foul sewer via various means, including misconnections from private drainage systems, landowners opening manholes to drain surface water away to protect their own properties or by naturally flowing into gaps in the sewer pipework underground or unsealed manholes.

### **Localised issues**

As well as the wider issues, there are also some more localised issues which contributed to the flooding of certain properties in the catchment.

#### **Vehicle Crossovers (VCO)**

With water flowing quickly over the highway, water generally doesn't cause any property flooding issues until it is able to pool over the height of the kerb. In some areas though, specifically at Shawley Crescent. A new VCO, also known as a dropped kerb, has been installed in Shawley Crescent. From conversations with residents, water previously did flow onto the footpath along the road but did not cause as many issues because more water was stored on the highway. The current situation with the new VCO means that the surface water flow is getting onto the footpath quicker and more directly before flowing onto the drives of the properties the water flows past.

This was also the case at Reigate Road where water flowed down the eastern side of the road due to the camber of the highway and was able to reach properties by flowing over dropped kerbs. This water then collected in driveways and front gardens that sit lower than the highway with nowhere for water to flow beyond.

#### **Obstructions to the flow route**

In a number of places along the catchment, the natural flow of water along the catchment has been obstructed increasing the local flood risk. This includes obstruction to the flow of water by properties themselves which in many cases have been built where water is trying to flow but also includes smaller features such as extensions and boundary walls which are placed in the way of the surface water flow routes. Examples of this are extensions built at properties in Great Tattenhams and construction work being done at a property in Great Tattenhams. Previously water would have flowed around the side of the properties. The new works undertaken blocked water attempting to flow around the property and increased the pooling of water at these properties. In both cases during the flood events, doors were opened up to allow water to flow around or through the property during the event. Other examples are three walls on Rose Bushes. The first located on the boundary of the footpath south of properties at Rose Bushes, one located at the back of a property, and the final one along the boundary of a property. The first wall stores water on the footpath but this water collects until it is deep enough to weir over the top of the wall. This increases the speed of the flow of water towards the properties. The wall behind one of the properties, during the August 2020 storms, obstructed the onward flow of the water and caused a backup into properties until the wall collapsed and water surged downstream, knocking down the wall to the nearby property in the process. This was shown to be a direct factor in the flooding to one of the properties in Rose Bushes as the wall has not since been repaired and while water got close to entering the property in July 2021, water mostly continued flowing. Internal flooding at this property in Rosebushes was also prevented in July 2021 due to measures installed by residents including flood barriers. Since this

wall has been knocked down and has not been re-instated the subsequent flooding has not since breached the property threshold thus the risk of flooding to the property has been reduced. The final wall at one of the properties also obstructs the flow of water and causes pooling on the service road. This wall has been rebuilt but water flows underneath the wall and around the property.

## Recommendations

The following options should be examined by the risk management authorities and residents to be assessed for their feasibility and financial viability. These should be considered as part of an adaptation to the catchment rather than specific intervention which will remove this surface water flow route. Recommendations are not instructions and need to be examined by the relevant Risk Management Authority or individual.

1. Natural flood management – Small-scale interventions to hold water along the catchment to reduce the surge of water through the catchment which could include small soakaway features such as rain gardens or shallow soakaways.

**Relevant RMAs** – Surrey County Council Highways and Flood and Climate Resilience

2. Property Adaptations – Homeowners could consider examining possible adaptations on their property to manage the flow of water more effectively within their property boundary. This could include Property Flood Resilience measures which reduce the overall impact of flooding to the properties.

**Relevant RMAs** – Homeowners

3. Catchment Wide small-scale interventions – Measures such as attenuating water butts to intercepting driveway runoff from reaching the highway, to increase the ability of highway drainage features draining away water that falls on the highway.

**Relevant RMAs** – Homeowners and Landowners

4. Household Flood Action Plans – Residents could consider what plans and actions they can put together or take to reduce the impact of future flood events.

**Relevant RMAs** – Homeowners supported by Reigate and Banstead Borough Council Emergency Planning Team and Surrey Prepared.

5. Surveying of existing drainage – This includes both surface water and foul drainage. The surface water drainage in the area, mainly gullies and soakaways, should be considered for surveys to better understand the condition. The foul drainage should also be considered for surveys to ensure that there are no blockages in the system.

**Relevant RMAs** – Surrey County Council Highways (surface water drainage), Thames Water (foul drainage)

6. Maintenance following surveys – To make good any drainage features shown to be obstructed following surveys to ensure they are working to full capacity.

**Relevant RMAs** – Surrey County Council Highways (surface water highway drainage), Thames Water (foul drainage)

7. Disconnecting properties surface water drainage from the foul sewer – Thames Water could consider ways of disconnecting surface water from the foul drainage system to mitigate the risk of surface water overwhelming the foul sewer.

**Relevant RMAs –Thames Water**

8. Promotion of the use of permeable surfaces –The Local Planning Authority, Reigate and Banstead Borough Council Planning Teams could investigate ways of clarifying permitted development rights for works such as paved driveways to use more permeable surfaces to reduce runoff from private land onto the highway.

**Relevant RMAs – Reigate and Banstead Borough Council Planning Teams**

9. Enforcement of properties draining onto the highway – Where surface water flows from private land over a footpath onto the highway, Surrey County Council should consider using their powers to ensure landowners manage water within their own land (Section 163 of the Highway Act 1980).

**Relevant RMAs – Surrey County Council Highway**

10. Ensuring minor developments have effective drainage schemes – Ensure scrutiny is put on drainage schemes for new developments to ensure that they do not increase flood risk elsewhere.

**Relevant RMAs – Reigate and Banstead Borough Council Planning Team**

11. SuDS retrofitting at Shawley Community Primary School – Look at the possibility of replacing hard standing areas with more permeable surfaces to reduce runoff from the site towards the highway.

**Relevant RMAs – Surrey County Council Estates Team and Sustainable Drainage and Consenting team**

12. Consideration of surface water flood risk within Vehicle Crossover application process– The relevant authority could look at the way that surface water flood risk is taken into account at the application stage for new vehicle crossovers to mitigate the risk that surface water flow routes are shifted by works.

**Relevant RMAs – Surrey County Council Highways**

## Catchment 2 – Nork Way, Green Curve and Roundwood Way, Burgh Wood

These locations, although not on the same sub catchments, all link into the same flow route to the north. Further downstream this flow route joins up with the water flowing down Reigate Road. While on different flow routes, the issues experienced at each of these sites are very similar.

### Local Drainage Features

As with catchment 1, the surface water drainage in catchment 2 consists of gullies and soakaways on the highway and private soakaways. The only mapped piped drainage system in the area is the Thames Water foul sewer.

The highway drainage in Nork Way is mapped with connections to soakaways. The gullies, connections and soakaways have been recently inspected between June 2020 and March 2021 and were found to be operational. One soakaway in Nork Way which was last inspected in October 2017 was also operational at the time. The gullies and soakaways at Green Curve were also inspected between October 2018 and May 2021 and were operational. Connections to soakaways have not been mapped. Finally, at Roundwood Way, the drainage was last inspected in 2019 however many of the features have not been inspected fully for some time as vehicles have obstructed access or covers could not be lifted. There is also very little drainage recorded on Roundwood View.

### Recorded Historic Flooding Information

There are limited records of flooding in this catchment with an historic low scoring Wetspot (Rei022) at Nork Way. There is also a historic Wetspot in front of the properties impacted on Green Curve (Rei061) which had a medium score however still was not high enough a score to be considered for capital works.

### Site Visit Findings

The main trends from the site visits are discussed below.

The extent of flooding to properties is shown below:

Internal flooding	0 properties
External flooding	8 properties

*Table 2 - Numbers of properties impacted in Catchment 2*

In several cases, internal flooding was avoided by actions undertaken by homeowners. These measures include the use of barriers, sandbags and pumps to divert water away from properties.

Flooding also occurred in August 2020 at Nork Way with some two properties also impacted by foul sewage. One was flooded internally with foul sewage. The issue was reported to Thames Water at the time and was found to be caused by damaged non-return valves which have since been replaced. The property has installed flood gates at the front door and internal access from the garage but these have been left up permanently as the resident is elderly and concerned about future impacts.

Residents of the impacted properties reported very similar issues to those in Catchment 1. Water collected in areas quickly after the rain began falling, flowing across the highway towards the low points in front of affected properties. On Nork Way and Green Curve, it was reported that the speed

of the water flowing over the gullies and continued down to these low points. While there is a constant fall towards the impacted properties at Roundwood Way the topography is not as steep as that at Nork Way and Green Curve. As such, the gullies do drain a lot of the water however residents did report that water eventually surcharged from a soakaway on the highway. This water then flowed towards the properties.

The other issue identified at Roundwood Way is that an adjoining road, Roundwood View, slopes towards Roundwood Way. Roundwood View has little drainage with only two gullies to capture the water draining from the road. As such, with the high level of rainfall the area experienced, water is very likely to have drained straight towards the low point in Roundwood Way once the capacity of these gullies had been exceeded.

The 3 areas in Catchment 2 also have a large amount of additional hard standing from paved front gardens with few having their own drainage. This increases the amount of water flowing onto the highway and as such reduces the time that it would take for the capacity of the highway drainage features to be exceeded.

## **Causes of Flooding**

### **Catchment wide**

#### High Rainfall

On the 12<sup>th</sup> July 2021 the Nork and Tattenhams area, like many areas of Surrey, experienced a very high level of rainfall including pockets of rainfall which exceeded 32mm/hr. The average rainfall for the area is approximately 43mm for July.

#### Catchment Terrain

Each of the areas have constant falls towards the low points where the impacted properties are located, with some having steeper slopes than others. In each of these cases though, more water is draining to these points than the drainage is designed to cope with, whether that is because there is a lack of drainage or water is flowing over the drainage which is in place is unknown. Water also drains off of the paths around the Nork Community Centre towards a property in Nork Way. This means that the drainage at the low points clearly had its capacity exceeded which is what led to water pooling on the highway before it rose high enough to flow over the footpath towards the properties.

As with Catchment 1, there is a large amount of additional hard standing from paved front drives and gardens, few with their own drainage and many sloping towards the highway. This means that during times of heavy rainfall, more water is draining from these areas to the highway. This increases the area that the highway is having to drain as water from these driveways flows onto the highway.

## Localised issues

### Maintenance of Highway Drainage

Over the three areas discussed in Catchment 2, most of the highway drainage was recorded as being operational with the issue being that the gullies are not capturing water rather than not functioning. The drainage on Roundwood Way however has not been inspected for approximately 3 years as access to many of the gullies and soakaways has not been available with cars parking over them or covers being stuck down. With residents indicating that gullies are surcharging, while this is likely due to the capacity of drainage being exceeded, it is important that drainage features can be inspected and maintained regularly.

## Recommendations

The following options should be examined by the risk management authorities and residents to be assessed for their feasibility and financial viability. These should be considered as part of an adaptation to the catchment rather than specific intervention which will remove this surface water flow route. Recommendations are not instructions and need to be examined by the relevant Risk Management Authority or individual.

1. Natural Flood Management – Small-scale measures along the various flow routes can reduce the peak flow of water. The implementation of measures to slow the flow of water such as bunds to keep water on green spaces of the playing fields next to the Nork Community centre or the use of rain gardens or other small soakaways in verges.

**Relevant RMAs** – Surrey County Council Flood and Climate Resilience and Reigate and Banstead Borough Council

2. Installation of drainage into the verge on Green Curve – To consider ways of better intercepting surface water flow at the verge next to Green Curve. This could include the use of additional gullies or other drainage features.

**Relevant RMAs** – Surrey County Council Highways

3. Surveying of existing drainage – The surface water drainage in the area, mainly gullies and soakaways. This should be considered for surveys to better understand the condition.

**Relevant RMAs** – Surrey County Council Highways

4. Maintenance following surveys – To make good any drainage features shown to be obstructed following surveys to ensure they are working to full capacity.

**Relevant RMAs** – Surrey County Council Highways

5. Ensuring the ability to maintain the highway drainage system – Highways to consider measures to ensure access to gullies and soakaways when maintenance work is planned to be carried out.

**Relevant RMAs** – Surrey County Council Highways

6. Property Flood Resilience Measures – Residents could investigate ways to make their properties more resilient to flooding and reduce the overall impact of the flooding.

**Relevant RMAs** – Homeowners

7. Enforcement of properties draining onto the highway – Where surface water flows from private land over a footpath onto the highway, Surrey County Council should consider using their powers to ensure landowners manage water within their own land (Section 163 of the Highway Act 1980).

**Relevant RMAs – Surrey County Council Highways**

## Catchment 3 – Waterer Gardens, Tangier Way and Tattenham Way

Catchment 3 focuses on the surface water flow route which starts in Waterer Gardens and flows east towards Tattenham Way at the low point next to the A217 (Brighton Road). The flooding at the bottom of the catchment, at Tattenham Way, happened very similarly to that recorded in the flooding report produced following storms in August and October 2020. Please refer to this report for the detail on local drainage and issues found at this location.

### Local Drainage Features

The mapped drainage in the areas identified on this flow route again consist of highway gullies draining to soakaways and a piped foul sewer.

The highway drainage on Waterer Gardens leads into 2 soakaways near the low point of the road. Most of the connections towards these soakaways appear to be mapped however they were last inspected in 2012. The gullies were last inspected in May 2019 and the soakaways last inspected in April 2021 and were found to be operational. There is minimal drainage mapped on Tangier way with only gullies but no connections or storage features. The gullies were last inspected in 2017 or 2018 and at the time were operational.

### Recorded Historic Flooding Information

A number of properties are recorded as having flooded during the August 2020 storm event at Tattenham Way. These are recorded in the flood report for this incident. There are no other reports of flooding or Wetspots in this catchment.

### Site Visit Findings

The main trends from the site visits are discussed below.

The extent of flooding to properties is shown below:

Internal flooding	1 properties
External flooding	14 properties

*Table 3 - Numbers of properties impacted in Catchment 3*

In several cases, internal flooding was avoided by actions undertaken by homeowners. These measures include the use of barriers, sandbags and pumps to divert water away from properties.

The main finding of this catchment is that the flow route appears to establish itself in two places, rather than continuing along the whole route. The start of the flow route at Waterer Gardens continues through the gardens and onto the highway of Tangier Way before collecting at the junction of Tangier Way and Tattenham Way. The surface water flood risk maps shows that the flow route continues through the gardens of Tattenham Way until it reaches the low point adjacent with the A217. While there is reported evidence of water flowing into the garden of a property in Tattenham Way, there are no reports of flooding between this point and the properties around the A217, other than garage flooding on Meadow Way however this was the result of surface water flow from Tattenham Way. This suggests that the flooding at the bottom of the catchment is not the result of one large flow route but instead the result of multiple smaller flow routes collecting in the same spots.

There is a significant amount of water flowing along the highway towards the various low points. Water again has been found to be flowing over gullies located on steep sections of the highway. This is particularly evident at Waterer Gardens and Tattenham Way.

The residents on Tangier Way report that the land where properties on Waterer Gardens have been built used to be garden space for another property in Waterer Gardens. This was confirmed by the landowners. Water was found to flow over the hard standing of the private road and through a back garden into the back garden of a property in Tangier Way. Water then flowed from this property into the garden of the neighbouring property. Before August 2020 there had been no reports of water flowing from Waterer Gardens to Tangier Way.

The flooding at the low point of Tattenham Way happened in a very similar manner to that in August 2020. Please see the investigation report for this incident for the detail of this flooding.

In addition to this report, another property in Tattenham Way confirmed that their property flooded as a result of water pooling in the highway before it then flowed over the footpath towards the property. Water entered the property by flowing through airbricks and then coming up through the floorboards.

In July 2021, the flood water came through the front of the property. The issue was exacerbated by cars driving through the flood water on the highway causing bow waves.

Water also flowed onto Tattenham Way from Piquet Way with properties flooded externally on a cul-de-sac.

## **Causes of Flooding**

### **Catchment wide**

#### **High Rainfall**

On the 12<sup>th</sup> July 2021 the Nork and Tattenhams area, like many areas of Surrey, experienced a very high level of rainfall including pockets of rainfall which exceeded 32mm/hr. The average rainfall for the area is approximately 43mm for July.

#### **Catchment Terrain**

The steep slopes along the catchment also mean that water is able to flow quickly overland downhill. This means that while some water is draining into gullies, a lot is flowing straight over the top of them and running to the low points. Gullies and soakaways are only designed to drain water falling on the immediate area around the features for up to a 1 in 5-year storm event. As such the additional runoff coming to this area quickly overwhelms the highway drainage at the various low points.

Catchment 3 experiences similar issues to that of other areas with large amount of hard standing and additional areas from paved front gardens. This is particularly the case on the northern side of Tattenham Way where the properties slope towards the highway. As previously said this increases the area that the highway is having to drain and means that highway drainage is more easily exceeded. Residents report that resurfacing work on the A217 may have increased the slope down to Tattenham Way which in turn allows more water to collect at the junction. As stated in the report into the flooding that occurred in August 2020, there does not appear to have been a significant increase in height from this work.

### **Localised issues**

#### **Loss of green space**

The development of green space removes area for water to drain once it flows over the surface. While the development of the area north of Waterer Gardens has not caused this flow route, it is likely to have made it easier for water to flow over the land due to the increase in hard standing and reduced capability for infiltration.

Highway drainage connecting to the same point

At Waterer Gardens, the majority of the gullies on the highway connect into the same soakaway at the low point. With surface water flowing across the highway to the low point as well as water draining through the gullies, the storage on the highway will fill up quickly and the capacity will be exceeded quickly during high rainfall events

## Recommendations

The following options should be examined by the risk management authorities and residents to be assessed for their feasibility and financial viability. These should be considered as part of an adaptation to the catchment rather than specific intervention which will remove this surface water flow route. Recommendations are not instructions and need to be examined by the relevant Risk Management Authority or individual.

1. Further survey work of the highway drainage system - Surrey County Council Highways to consider further survey work to ensure that drainage features in this catchment. This includes but is not limited to the soakaways under the A217, in front of specific properties in Tattenham Way and drainage features on roads sloping down to Tattenham Way are fully functioning.

**Relevant RMA – Surrey County Council Highways**

2. Maintenance following surveys – To make good any drainage features shown to be obstructed following surveys to ensure they are working to full capacity.

**Relevant RMAs – Surrey County Council Highways**

3. Natural flood management – Small-scale interventions to hold water along the catchment to reduce the peak flow of water through the catchment. This could include small soakaway features such as rain gardens, shallow soakaways or attenuating water butts.

**Relevant RMAs – Surrey County Council Highways and Flood and Climate Resilience and Homeowner**

4. Property Flood Resilience Measures – Residents could investigate ways to make their properties more resilient to flooding and reduce the overall impact of the flooding.

**Relevant RMAs – Homeowners**

5. Enforcement of properties draining onto the highway – Where surface water flows from private land over a footpath onto the highway, Surrey County Council should consider using their powers to ensure landowners manage water within their own land (Section 163 of the Highway Act 1980).

**Relevant RMAs – Surrey County Council Highways**

## Catchment 4 – Hatch Gardens, continuing into Kingswood

Unlike the flooding in Catchments 1-3, the flooding at Catchment 4 is not related to water flowing over the highway but instead flows from a new development to the north. This makes up the start of a surface water flow route which continues towards Kingswood, past Chipstead Valley Road and into The London Borough Croydon.

### Local Drainage Features

The local drainage features for Catchment 4 are made up of the drainage strategy for the new development to the north of Hatch Gardens. The drainage on the site consists of gullies, deep bore soakaways and small areas of permeable paving, including two marked on the boundary with the properties on Hatch Gardens (marked car parks 16 and 17 on the drainage plans).

There is an old ditch line on the eastern boundary of the development however there is limited evidence of this ditch now. There is no evidence of where this ditch runs to so it is possible that this feature used to act as a soakaway ditch to catch water running off the old school field.

The Thames Water foul sewer runs along the boundary of the new development. It then continues to the south through the gardens of Hatch Gardens.

### Recorded Historic Flooding Information

The properties in Hatch Gardens on the boundary of the new development previously flooded in a similar manner during the heavy storm on the 13<sup>th</sup> August 2020.

There are no recorded Wetspots in the area.

### Site Visit Findings

The main trends from the site visits are discussed below.

The extent of flooding to properties is shown below:

Internal flooding	1 properties
External flooding	4 properties

*Table 4 - Numbers of properties impacted in Catchment 4*

In several cases, internal flooding was avoided by actions undertaken by homeowners. These measures include the use of barriers, sandbags and pumps to divert water away from properties.

It was determined on site that the water that impacted the properties on Hatch Gardens flowed under the fences of the northern boundary and flowed down the front gardens which slope towards the properties. Water pooled in the garden and built up next to properties, flooding one internally. There were also properties close to flooding which were prevented by measures taken by the homeowners.

The water continued to flow through side passages and split, with flow both continuing south onto the highway but the main flow following the footpath to the east. This second route is consistent with the mapped surface water flow route which goes towards Kingswood.

Residents indicate that the flow route coming from the new development has always been present however the severity of the flow route has increased since the development of the land to the north.

Conversations with residents and the site manager of the development indicate that a French drain has been installed as part of the development to catch runoff reaching the southern boundary of the development which discharges to the ditch on the eastern boundary of the development. Upon consulting the drainage plans for the development, there is no evidence that this is the case.

## **Causes of Flooding**

This is the start of the surface water flow route and therefore the only contributing factor to the cause of flooding at the top of this flow route is from surface water run-off during intense rainfall events.

### **High Rainfall**

On the 12<sup>th</sup> July 2021 the Nork and Tattenhams area, like many areas of Surrey, experienced a very high level of rainfall including pockets of rainfall which exceeded 32mm/hr. The average rainfall for the area is approximately 43mm for July.

### **Site Terrain**

The additional hard standing of the development has reduced the surface area that is able to drain water away through infiltration. This is because the switch from green space and natural infiltration to a paved site where gullies collect water and drain to the soakaway. As discussed elsewhere in this report, a gully is only able to drain to a certain design standard, so if a heavy rainfall event occurs, the gully will only be able to drain up to the design limit with the rest of the water flowing down to the next gully or beyond.

The site has a consistent slope towards Hatch Gardens. This means that any water falling on the site which exceeds the capacity of the drainage system will continue to flow towards Hatch Gardens. The exceedance plans for the development do show that water flows towards the southern boundary of the development and, as mentioned on site by the development site manager, that a land drain would be placed on the boundary of the property.

### **Site Drainage**

It is not clear if the French drain on the southern boundary of the development is actually in place. The conversations on site did not make this clear. As well as this, the area of gravel on the site boundary is approximately 1m wide and slightly elevated from the car parking areas. This limited size of the gravel area means that the ability to drain water is less than if the area was larger.

## Recommendations

The following options should be examined by the risk management authorities and residents to be assessed for their feasibility and financial viability. These should be considered as part of an adaptation to the catchment rather than specific intervention which will remove this surface water flow route. Recommendations are not instructions and need to be examined by the relevant Risk Management Authority or individual.

1. Reduction of surface water runoff from new development - Consideration given to implement features on the southern boundary of the new development site. This is to prevent water from leaving the site during exceedance events. This could consist of a bund or the raising of kerb levels to prevent water shedding from the site.

**Relevant RMA – Site developers**

2. Drainage investigation of development site – Consider investigating the existence and condition of the French drain on the southern boundary of the new development. If the existence of the French drain is confirmed, the size of the gravel area could be increased to improve the potential for drainage.

**Relevant RMA – Site developers**

3. Property Flood Resilience Measures – Residents could investigate ways to make their properties more resilient to flooding and reduce the overall impact of the flooding.

**Relevant RMAs – Homeowners**

4. Consideration of surface water flow routes during the planning process – Surface water flow routes to be considered for major and minor planning applications and their impacts both on and off site.

**Relevant RMAs – Reigate and Banstead Borough Council Planning and Surrey County Council Flood and Climate Resilience**

5. Reinstate watercourse adjacent to the development site - Developers to consider reinstating the ditch to the east of the development to act as additional storage for surface water during high rainfall events.

**Relevant RMA – Site Developers**

## Conclusions

The heavy rainfall that occurred in July 2021 resulted in flooding along the modelled surface water flow routes in the Nork and Tattenhams area.

Urbanisation within the catchment area by development and an increase of hard landscaping has increased surface water flow along the flow routes and has reduced infiltration locally.

The flooding has been exacerbated by the nature of the local topography. The steep valley sides impact upon the ability for surface water to drain efficiently into the existing drainage network. As a result, water accumulates at these topographical low points. Eventually the water overtops the kerb threshold and flows towards the properties. These are situated at a lower elevation to that of the road and the associated drainage system. The flooding experienced has been increased where residents have extended their properties into the surface water flow route, or erected features which have diverted flow routes.

The recommendations made in this report are catchment specific and have been provided for consideration of the relevant risk management authorities or individuals. These should be considered as part of an adaptation to the catchment rather than specific intervention which will remove this surface water flow route.

## Reporting Routes for Flooding Issues

The below reporting routes and websites have been provided to aid residents within this catchment report future issues to ensure the correct Risk Management Authorities have been informed.

If however there is a threat to life with the issue being reported, please call 999.

Issue to be reported	Risk Management Authority	Contact information and website
Threat to life	Surrey Fire and Rescue	Call: 999
Flooding to the Highway	Surrey County Council  Highways	Call: 0300 200 1003  <a href="mailto:highways@surreycc.gov.uk">highways@surreycc.gov.uk</a>  <a href="https://www.surreycc.gov.uk/report-it-online">Report it online - Surrey County Council (surreycc.gov.uk)</a>
Flooding to the Highway with risk to property	Surrey County Council  Highways Emergency Hub	<a href="https://www.surreycc.gov.uk/road-emergencies">Road emergencies - Surrey County Council (surreycc.gov.uk)</a>
Flooding to property	Surrey County Council  Flood and Climate Resilience	Call: 0300 200 1003  <a href="mailto:flooding.enquiries@surreycc.gov.uk">Flooding.enquiries@surreycc.gov.uk</a>
Sewer Flooding (Foul and Surface Water)	Thames Water	0800 316 9800  <a href="#">Flooding   Emergencies   Help   Thames Water</a>
Planning Enforcement	Reigate and Banstead Borough Council	<a href="#">About planning enforcement   Planning enforcement   Reigate and Banstead (reigate-banstead.gov.uk)</a>
Emergency Management	Reigate and Banstead Borough Council	<a href="#">Emergency contacts   Emergency contacts   Reigate and Banstead (reigate-banstead.gov.uk)</a>