

WANDSWORTH SECTION 19 FLOOD INVESTIGATION



PREPARED FOR LONDON BOROUGH OF
WANDSWORTH

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Date June 2023
Version 2.0

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REVISION HISTORY

Version	Date	Description	Prepared	Approved
1.0	March 2023	Full Draft for Client Review	EJ	MM
2.0	June 2023	Final following Stakeholder Review	EJ	MM

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EXECUTIVE SUMMARY

This flood risk investigation report was written as part of the London Borough of Wandsworth Council's (Wandsworth Council) duty as Lead Local Flood Authority (LLFA) under Section 19 of the Flood and Water Management Act (2010). A number of boroughs in London were affected by heavy rainfall events in July 2021 which caused significant flooding. The London Borough of Wandsworth (Wandsworth) experienced flooding on the 12th July and then again on the 25th July. There were a total of 15 incidents reported across the two dates; 14 of these were internal flooding incidents with one report of highway flooding. The flooding incidents on the 12th July were focused around an area near to Putney Common and on Cambalt Road, both in the west of the borough. The flooding on the 25th July was focused around the Diamond Estate Area in the east of the borough, with one additional isolated incident.

This Section 19 investigation was prepared in response to these significant flooding events and aims to identify the likely causes of flooding, as well as the actions of the Risk Management Authorities (RMAs) involved in responding to these flooding events. The RMAs include Wandsworth Council, the Environment Agency (EA) and Thames Water Utilities Limited (TWUL).

The hydrological catchments used in the analysis of the flood events in this report were produced as part of the Surface Water Management Plan (SWMP) for Wandsworth (2021). Wandsworth incorporates seven of these identified hydrological catchments, with the flooding incidents investigated in this report distributed across three: W01 Putney, W05 Earlsfield, and W07 Clapham Common.

The flooding incidents reported over the two events were mapped and the details analysed. The contribution of differing flooding mechanisms and flood risks were assessed for each incident, along with the actions of RMAs before, during, and after the events. Through this, recommendations are suggested.

It is likely that across both events the sewers were overwhelmed with the volume of surface water entering the network. The distribution of the intensity of rainfall varied between the two dates which corresponded with the locations and concentration of the reported flooding incidents. The return period maps of the rainfall events produced by TWUL indicate that on the 12th July rainfall was focused in the west of Wandsworth, with a return period of between 1 in 50 and 1 in 100 years in the north-west of the borough. On the 25th July, the most intense rainfall was located in the east of Wandsworth, with return periods of between 1 in 20 and 1 in 30 years in the north-east. There was no significant fluvial flooding element to the flooding incidents investigated in this report and the primary source of flooding was likely surface water due to inundation of the drainage network combined with the topography of the location of the incidents.

A number of flood alleviation schemes along the River Wandle are currently under investigation by Wandsworth Council, with further assessments into potential solutions in the Diamond Estate area. Other opportunities to implement sustainable drainage systems (SuDS) in Wandsworth are being investigated beyond those discussed in this report, for example at Bolingbroke Walk. Further recommendations for specific areas in Wandsworth are outlined below:

Area near Putney Common

- TWUL to update the surface water drainage network dataset in the area near Putney Common and share this with Wandsworth Council.

- Wandsworth Council to ensure that there are focused actions within future updates to the LFRMS and SWMP that address flooding in the area near Putney Common.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations in the Putney Common area. This could include sharing information on work and feasibility studies completed to progress towards a method for flood alleviation in the area near Putney Common.

Cambalt Road

- TWUL to update the surface water drainage network dataset in the area near Cambalt Road and share this with Wandsworth Council.
- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing in the Cambalt Road area on Wandsworth Council-owned roads, pavements, and areas of hard-standing.
- Wandsworth Council to investigate opportunities to alleviate flood risk for the properties to the north of Cambalt Road, such as sustainable drainage systems (SuDS) or increasing the area of permeable surfacing.

Diamond Estate Area

- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of Wandsworth Council-owned roads, pavements, and areas of hard-standing on Robertson Road.
- TWUL to update the surface water drainage network dataset in the Diamond Estate Area and share this information with Wandsworth Council.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Diamond Estate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council and TWUL continuing established communication and engagement with residents providing updates about progress on improving flood risk.
- Cross-boundary approach from Wandsworth Council including collaboration with the London Borough of Lambeth Council (Lambeth Council) on actions relevant to the Diamond Estate Area as this area is close to the boundary between Wandsworth and the London Borough of Lambeth (Lambeth).
- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of council-owned roads or pavements in Gideon Road. Permeability could also be increased with the implementation of SuDS, like rain gardens, for attenuation of surface water.

Fairfield Drive

- Wandsworth Council to investigate the possibility of increasing the area of permeable surfacing of council-owned roads or pavements uphill of Fairfield Drive, in Tonsley Road and Tonsley Hill. Permeability could also be increased with the implementation of SuDS, like rain gardens, for attenuation of surface water.

Shaftsbury Gate

- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Shaftsbury Gate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council to continue the ongoing investigation into the possibility of increasing the area of permeable surfacing and SuDS opportunities in council-owned roads or pavements uphill of Shaftsbury Gate

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ACRONYMS AND ABBREVIATIONS

Abbreviation	Definition
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
FAS	Flood Alleviation Scheme
FEH	Flood Estimation Handbook
FWMA	Flood and Water Management Act (2010)
GIS	Geographic Information System
Lambeth	London Borough of Lambeth
Lambeth Council	London Borough of Lambeth Council
LFB	London Fire Brigade
LFRMS	Local Flood Risk Management Strategy
LiDAR	Light Detection and Ranging
LLFA	Lead Local Flood Authority
MAFP	Multi-Agency Flood Plan
MPS	Metropolitan Police Service
RMA	Risk Management Authority
RoFSW	Risk of Flooding from Surface Water
SWMP	Surface Water Management Plan
TWUL	Thames Water Utilities Limited
Wandsworth	London Borough of Wandsworth
Wandsworth Council	London Borough of Wandsworth Council

1 INTRODUCTION

1.1 Background policy and information

This flood risk investigation report has been prepared by Metis Consultants Ltd for the London Borough of Wandsworth Council (Wandsworth Council). The Flood and Water Management Act (2010) established unitary authorities as Lead Local Flood Authorities (LLFAs). Wandsworth Council is an LLFA and as such is required to investigate significant flooding incidents under Section 19 of the Flood and Water Management Act (FWMA) (2010) and publish the results. Section 19 stipulates that, on becoming aware of a flood in its area a LLFA must, to the extent it considers it necessary or appropriate, investigate:

- Which risk management authorities (RMAs) have relevant flood risk management functions, and
- Whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

Upon completion of the flood investigation, Wandsworth Council must publish the results and notify the relevant RMAs.

Each LLFA sets out the criteria that triggers a Section 19 investigation for their area. The criteria that Wandsworth Council have identified are:

- If one or more residential or commercial properties flood internally* as part of a single flood event.
- If five or more residential or commercial properties are flooded externally (within the curtilage of the property) as a result of a single event in the same location.
- If one or more residential or commercial properties has flooded externally more than twice within a single year.

*Internal flooding: where water crosses the threshold of a commercial or residential building.

These criteria are taken from the Wandsworth Local Flood Risk Management Strategy (LFRMS) (due to be published in 2023).

Two significant rainfall events took place in Wandsworth in July 2021 on the 12th and the 25th which led to a number of flooding incidents. The nature of these flooding incidents meant that a Section 19 investigation was triggered. Across the two dates, there were a total of 15 reports made to Wandsworth Council; five reports were made on the 12th July and ten reports were made on the 25th July. There were 12 reports of internal flooding, two reports of internal and highway flooding and one report of just highway flooding. 33 properties were affected across 15 different roads within Wandsworth.

1.2 Methodology

In order to conduct this investigation, data was collected from the relevant RMAs. The data received and its source is outlined in Table 1-1. To supplement the information received from the RMAs, social media was used to gather further information on the flood incidents. The collation of this along with the data collected by Wandsworth Council on the flood events and the information from RMAs provided context and a better understanding of the flooding events and locations prior to compiling this report.

Table 1-1 Data Sources

Data	Source
Actions taken before, during, and after the rainfall events	Wandsworth Council, TWUL
Detailed River Network	EA
Reports of flooding	Wandsworth Council
Mapping of flood risk from different sources	EA
Rainfall data	EA, TWUL
Return periods for the rainfall events	TWUL
Sewer network data	TWUL

The available data on historical flooding, topography, drainage networks, and geology was used to explore the different potential sources of flooding in the flooded locations. A geographic information system (GIS) program was used to produce maps of the affected locations. The hydrological catchments were defined using the Surface Water Management Plan (SWMP) for Wandsworth (2021) which identified seven catchments that are incorporated within the boundary of Wandsworth. Site visits were conducted to provide supplementary information on the affected locations. Responsibilities of the RMAs for each event at each location were identified.

The results of the investigation were compiled and set out in this report. Conclusions and recommendations for flood risk mitigation are summarised in Section 6. The conclusions of the investigation have been drawn from the data provided, although further information would enhance the conclusions. Information on wider actions taken by RMAs prior to the flooding would enable more focus to the recommendations of this report. Information from Thames Water on reported flooding incidents and its actions before and after the events would improve the accuracy of this report in terms of cross-referencing records of flooding from different RMAs and stakeholders. This has formed part of the recommendations.

2 RISK MANAGEMENT AUTHORITIES

Within Wandsworth there are multiple RMAs responsible for managing the risks of flooding. These RMAs and their responsibilities with regards to flood risk management in Wandsworth are outlined in Table 2-1.

Table 2-1 Borough level RMAs

RMA	Borough-specific Authority	Flood risk management responsibilities
EA	EA	Main rivers and reservoirs
LLFA	Wandsworth Council	Surface water, ordinary watercourses, and groundwater
Water and Sewerage Company	TWUL	Surface water, foul and combined sewer systems (Sewer flooding)
Highway Authority	Wandsworth Council	Public highway drainage

2.1 Environment Agency

The EA is the national flood risk authority for the UK. It is responsible for managing flood risk from main rivers (a statutory type of watercourse), reservoirs, and the sea. The EA develops and publishes the Flood Map for Planning for Rivers and Sea for England which are important for informing Local Planning Authorities how development proposals may influence flood risk. The EA is also responsible for consenting to works on, or that may affect, main rivers. They are also an RMA involved in the planning for, and emergency response to, flooding events.

The main rivers as identified by the EA that flow through Wandsworth are:

- River Thames
- River Graveney
- River Wandle
- Beverley Brook

2.2 London Borough of Wandsworth

Wandsworth Council has multiple duties as an RMA. These responsibilities include its role as the LLFA, a Highway authority, a landowner, and a Category One responder.

The LLFA is responsible for managing local flood risks from surface water, groundwater and ordinary watercourses (watercourses not designated as main rivers by the EA). As part of its duties, the LLFA is required to:

- Develop, maintain and publish a Local Flood Risk Management Strategy.
- Maintain a register of assets that may have a significant effect on flooding in the area.
- Undertake investigations into significant flood incidents.
- Act as a statutory consultee in reviewing surface water drainage proposals for major developments.
- Prepare and maintain Preliminary Flood Risk Assessments (PFRAs), flood hazard and risk maps, and flood hazard plans.

Other RMAs are obliged where necessary to co-operate with the LLFA to carry out the above responsibilities. The LLFA can also carry out necessary work to alleviate the flood risk from surface water, groundwater, and ordinary watercourses in collaboration with other RMAs.

As a **Highway Authority**, Wandsworth Council manage the public highways and highway assets in Wandsworth that are not managed by Transport for London (TfL). The roads managed by TfL running through Wandsworth are:

- A205
- A214
- A24
- A3
- A306
- A3205
- A3220

Part of Wandsworth Council's responsibility as Highway Authority includes the management of surface water drainage on highways, and maintenance of highway gullies, road surfaces and footpaths.

As a **landowner**, Wandsworth Council have a responsibility to safeguard their land and property against flooding. Common law also requires that they do not increase the risk of flooding to neighbouring property, which means carrying out tasks such as drain clearing and maintaining existing flood defences.

As a **Category One Responder** under the Civil Contingencies Act (2004), Wandsworth Council plays a lead role in emergency planning and recovery after a flood event. They must have plans in place to respond to an emergency, such as a flooding event, and liaise with other relevant stakeholders to manage and, where possible, reduce the impacts of the event. These stakeholders are listed in Wandsworth's MAFP (Multi-Agency Flood Plan) which include: the EA, Metropolitan Police Service (MPS), Wandsworth Council, London Fire Brigade (LFB), London Ambulance Service, TfL, National Grid: gas and electricity distribution & transmission, UK Power Network, British Red Cross, UK Health Security Agency, and TWUL.

2.3 Thames Water Utilities Limited

TWUL is a regional water and sewerage company that owns and is responsible for maintaining the sewerage system in Wandsworth. TWUL are the RMA responsible for managing the risk of flooding from public sewers, including surface water, foul, and combined sewer systems. They are required to ensure that their water supply and sewerage systems are resilient. Under Section 94 of the Water Industry Act (1991) they have a duty to ensure the area that they serve is effectively drained, now and into the future. Data from TWUL has been used in this report to analyse local drainage networks.

2.4 Landowners

Landowners have the primary responsibility for protecting their land and property from flooding, including private roads. Under common law landowners are also required to ensure that any developments to their land or property do not increase the risk of flooding to a neighbouring property. Riparian landowners are responsible for ensuring that any structures on their land, or within the watercourse, are kept clear of debris and the watercourse flows naturally. They also have responsibility for maintaining the bed and banks of the watercourse on their lands.

2.5 Category One Responders

All local authorities and blue light emergency services are categorised as Category One Responders under Schedule 1 of the Civil Contingencies Act (2004). For flooding events within Wandsworth the most relevant responders are the LFB, the MPS and the EA. The MPS co-ordinates emergency services and can assist with evacuations, whilst the LFB is responsible for saving lives and can also assist with the pumping of floodwaters.

3 FLOOD INCIDENT DETAILS

3.1 Rainfall events

There were two significant rainfall events that affected London in July 2021 which caused flooding across multiple boroughs, including Wandsworth. These two events occurred on the 12th July and the 25th July. All times listed within this report are British Summer Time (BST).

3.1.1 12th July rainfall event

On the 12th July 2021, there was intense rainfall primarily over the west of London, in which it is estimated by TWUL that a month's worth of rainfall fell in the space of an hour. TWUL produced maps of the distribution of the estimated return periods of the rainfall across London, shown in Figure 3-1. The maps were produced using rainfall radar (RaRA) data from the Met Office using [Flood Estimation Handbook](#) (FEH) 99 calculations (a method for estimating the total flow from any rainfall event) for the spatial visualisation. Figure 3-1 shows the estimated return period of rainfall for each grid square; it can be seen that the west of Wandsworth experienced return periods between the 1 in 2 year and 1 in 100 year event.

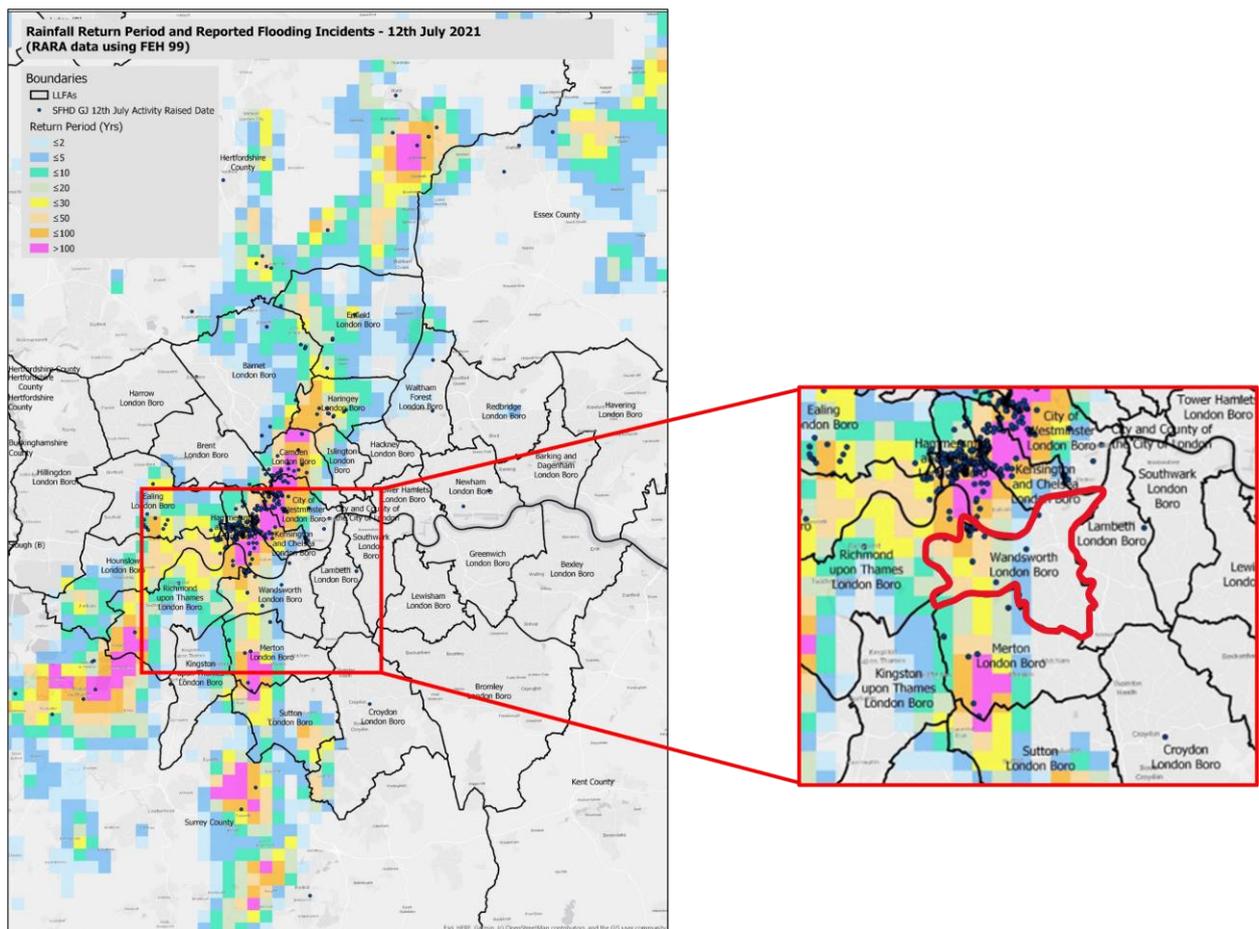


Figure 3-1 Rainfall return period for the 12th July (RaRA data using FEH 99) (TWUL, 2023)

Rainfall data collected by the EA at three rain gauge stations was obtained to assess the two rainfall events investigated in this report. Whilst only the Putney Village rain gauge is located within Wandsworth, the other two gauges are sufficiently close to the boundary as to provide information on the rainfall event, shown in Figure 3-2. These EA rain gauges provide hourly rainfall totals which allow the maximum depth of the rainfall event, and the time it was reached, to be observed.

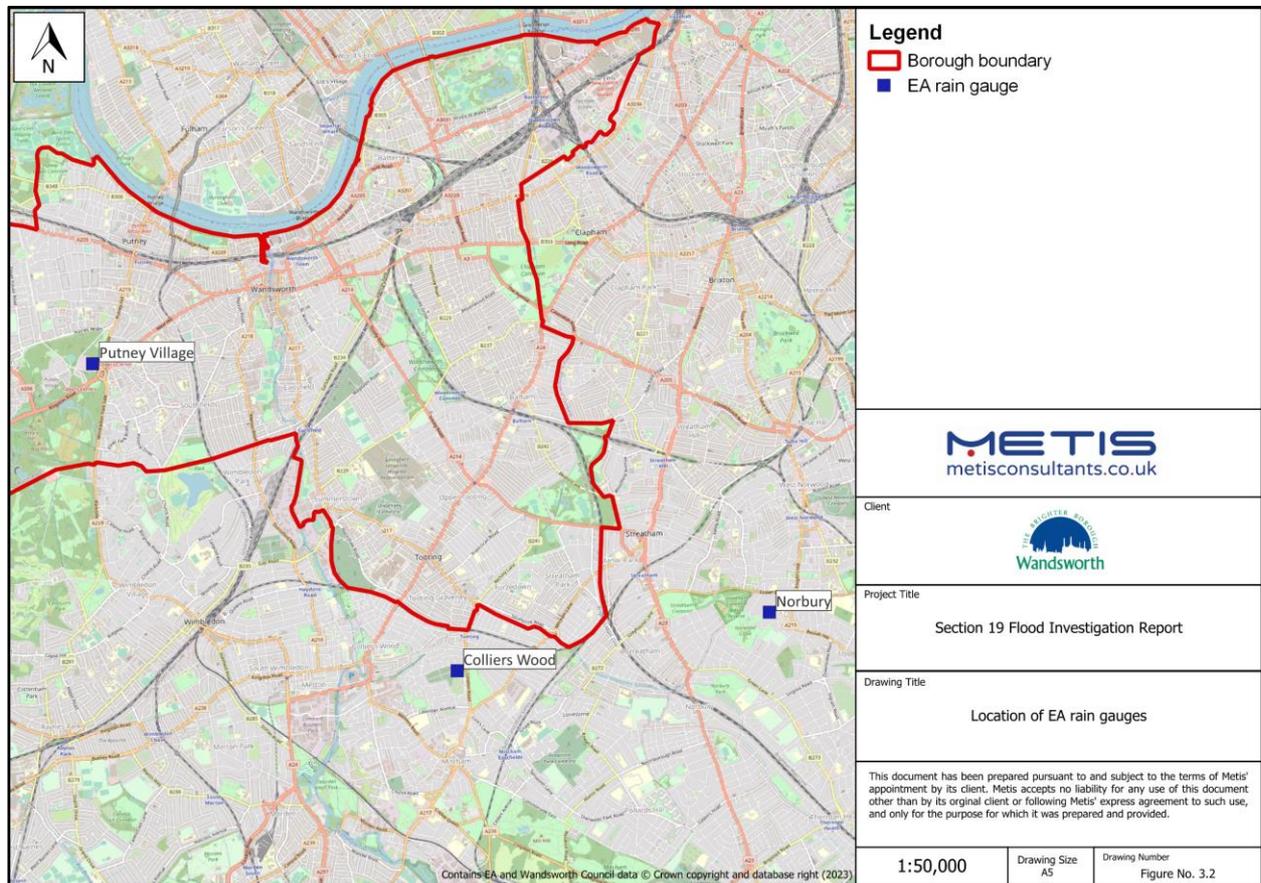


Figure 3-2 Location of EA rain gauges

Gauge data, summarised in Table 3-1 and shown in the hydrograph (Figure 3-3) indicate that the peak of the rainfall event was at 17:00 on 12th July 2021 and a maximum depth of 31.1mm was recorded across the three rain gauges. This supports the information provided in the TWUL return periods map which suggests that the rainfall was most intense in the west of the borough as the rain gauges in Colliers Wood and Norbury experienced much lower, or no, rainfall.

Table 3-1 Summary of EA rain gauge data for 12th July 2021

Rain gauge	Location	Peak time	Peak hourly rainfall total (mm)
Colliers Wood	0.5km outside S borough boundary	18:00	0.7
Norbury	2km outside SE borough boundary	-	-
Putney Village	1.5km inside W borough boundary	17:00	31.1

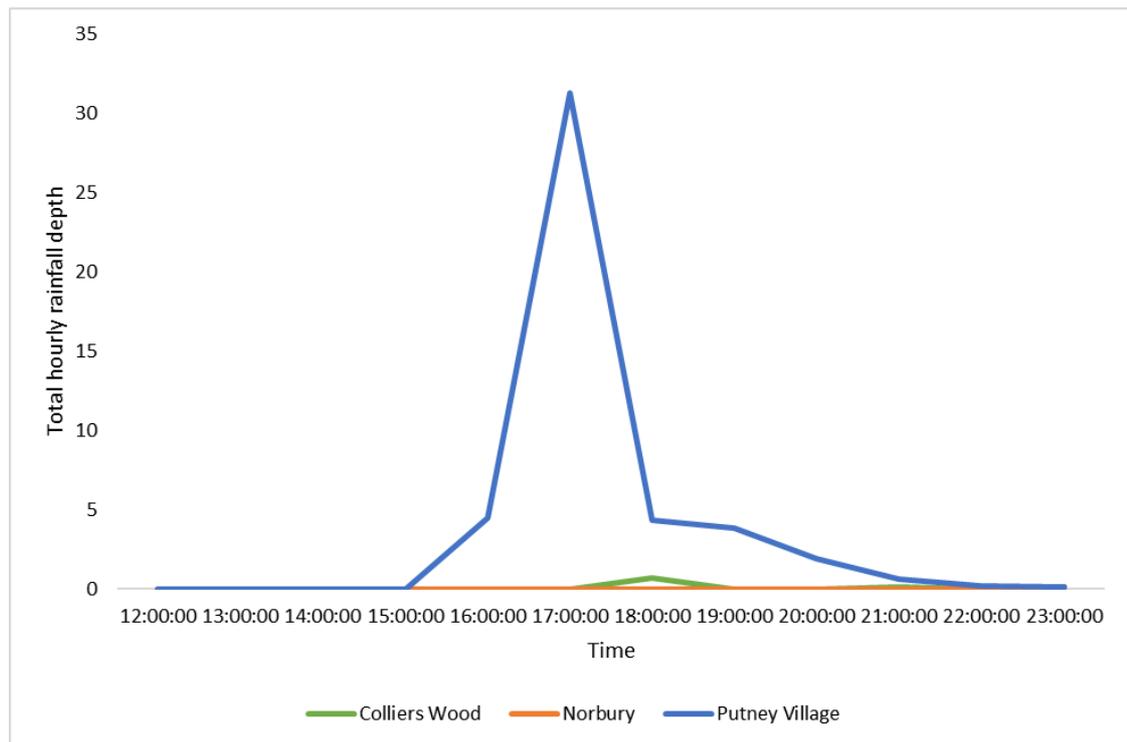


Figure 3-3 12th July 2021 EA gauge total hourly rainfall

3.1.2 25th July rainfall event

On the 25th July 2021, London was again affected by a heavy rainfall event which covered a larger area of London and Essex. A greater area saw rainfall of over 50mm but the intensity was slightly less than the rainfall on the 12th July, with approximately a month’s worth of rainfall falling in two hours. The Met Office upgraded its previously issued yellow weather warning to amber during the storm event. TWUL produced a map of estimated rainfall return periods again for the 25th July event, shown in Figure 3-4. It can be seen in Figure 3-4 that rainfall was more concentrated to the north-east of the borough with the most intense rainfall at a return period of up to 1 in 30 years.

Gauge data collected for the 25th July, summarised in Table 3-2, shows that rainfall began around 13:00 on the 25th July peaking at approximately 15:00. This was dependent on location with the Colliers Wood and Norbury rain gauges recording peak rainfall earlier than at Putney Village. Peak rainfall between the three gauges was recorded at Colliers Wood with a maximum of 11.9mm total hourly rainfall.

Table 3-2 Summary of EA rain gauge data for 25th July 2021

Rain gauge	Location	Peak time	Peak hourly rainfall total (mm)
Colliers Wood	0.5km outside S borough boundary	15:00	11.9
Norbury	2km outside SE borough boundary	15:00	4.8
Putney Village	1.5km inside W borough boundary	16:00	8.2

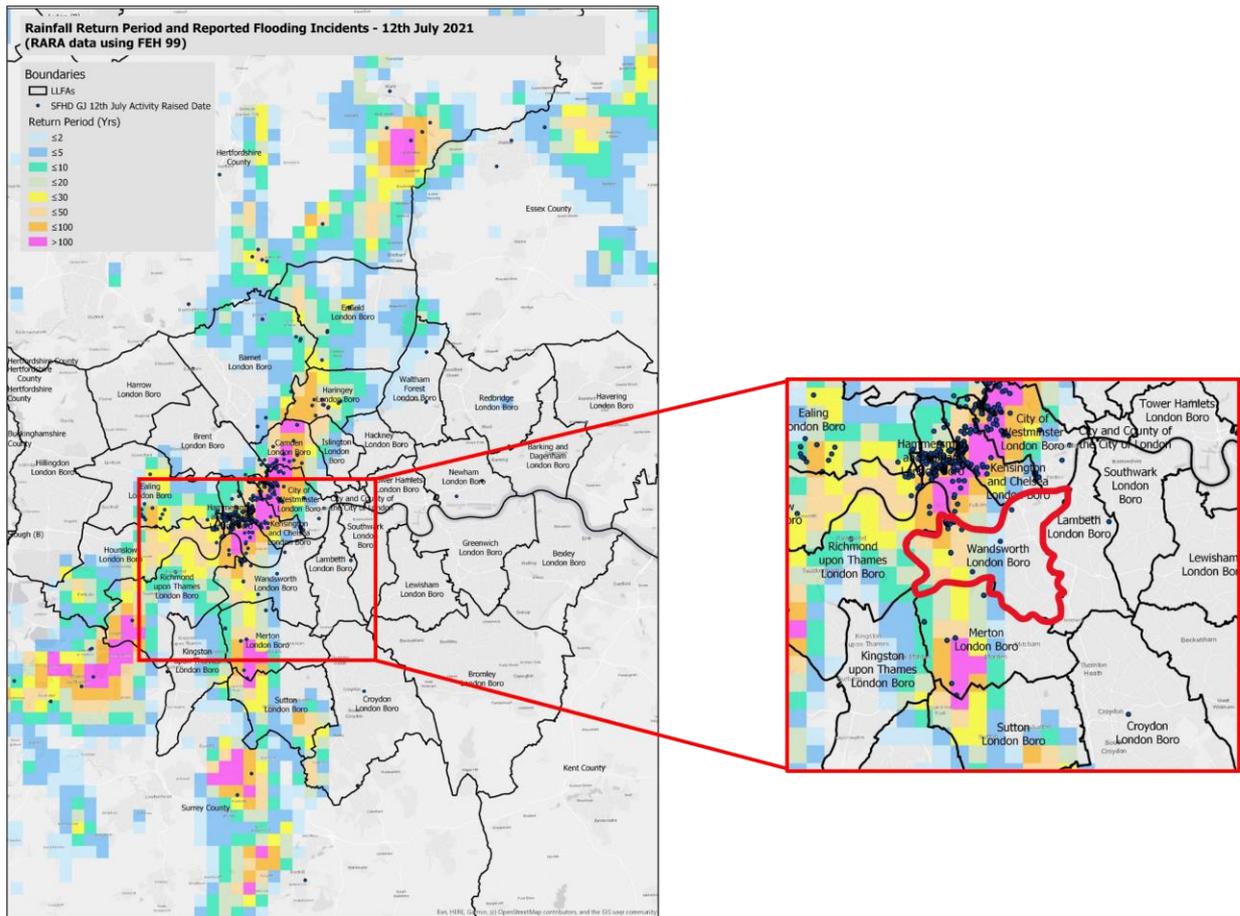


Figure 3-4 Rainfall return period for the 25th July (RaRA data using FEH99) (TWUL, 2023)

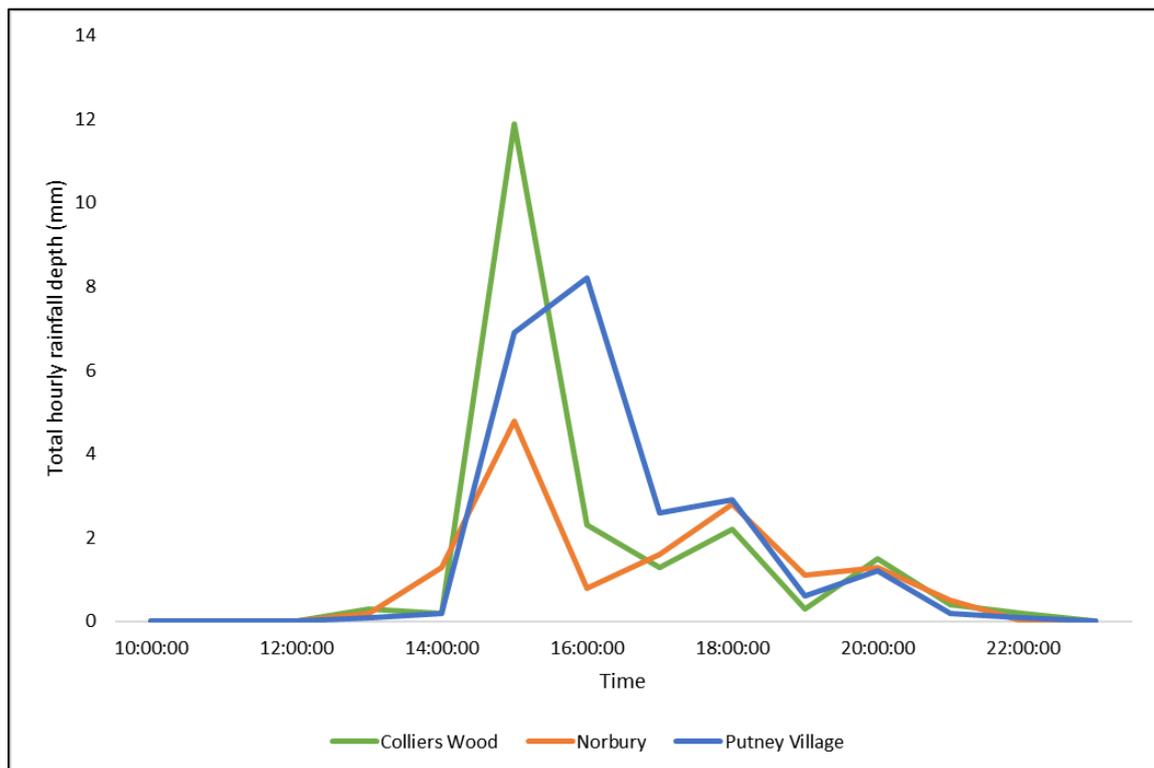


Figure 3-5 25th July 2021 EA gauge total hourly rainfall

3.2 Affected locations and hydrological catchments

On the dates of the two rainfall events, Wandsworth received 15 reports of flooding; five on the 12th and ten on the 25th. These reports were classified into internal and highway flooding as defined below:

- Internal flooding: flooding inside the building, including basements.
- External flooding: flooding within the property boundaries, including gardens and driveways, but not inside buildings.
- Highway flooding: flooding on public roads.

External flooding can be used as a classification of flooding reports and is defined as flooding within property boundaries but not to buildings, this includes gardens, garages and driveways. In this investigation, however, the reports received were of either internal flooding or to the highway, and none specific to external flooding only.

There were 12 reported incidents of internal flooding in total, covering 33 properties. Five of these reports were on the 12th of July, shown in Figure 3-6, and seven were on the 25th July, shown in Figure 3-7.

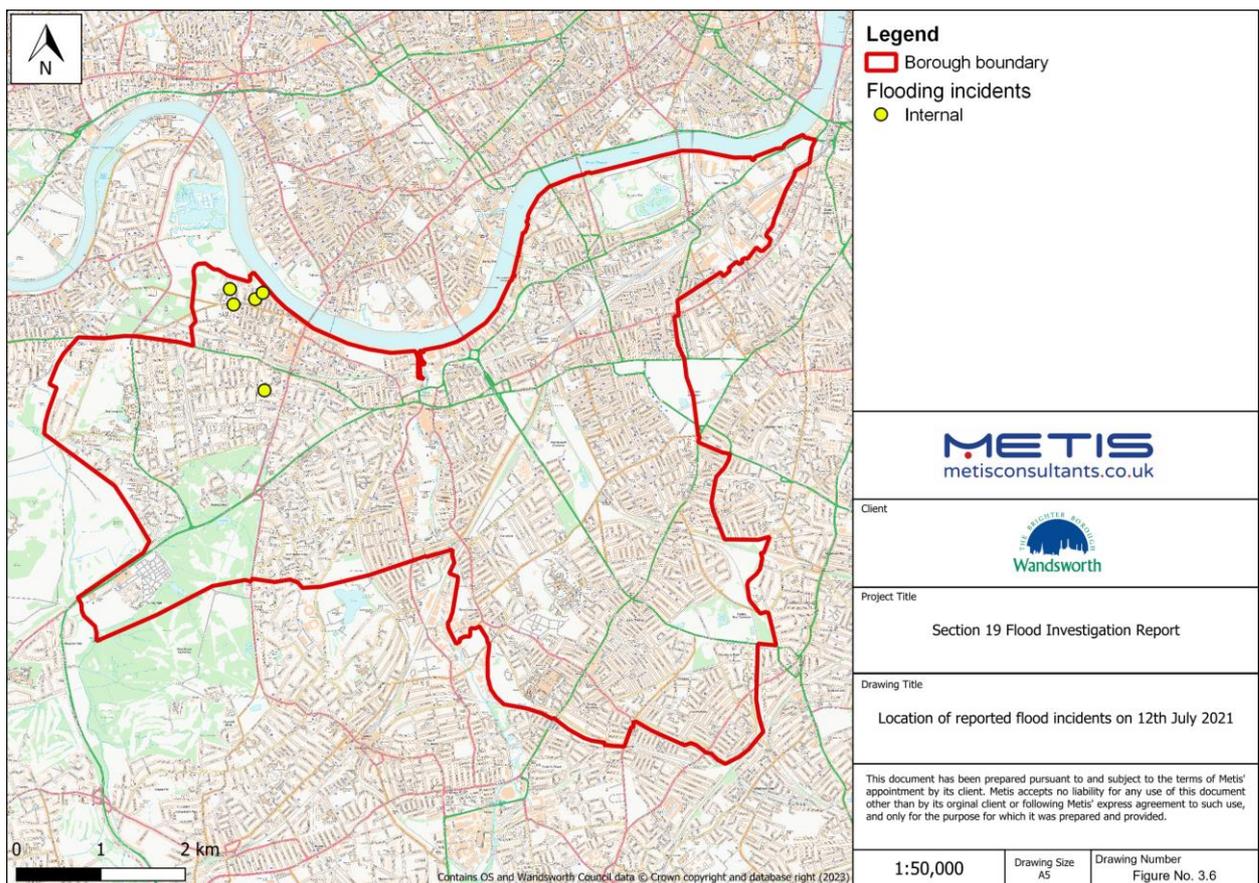


Figure 3-6 Reported flood incidents 12th July 2021

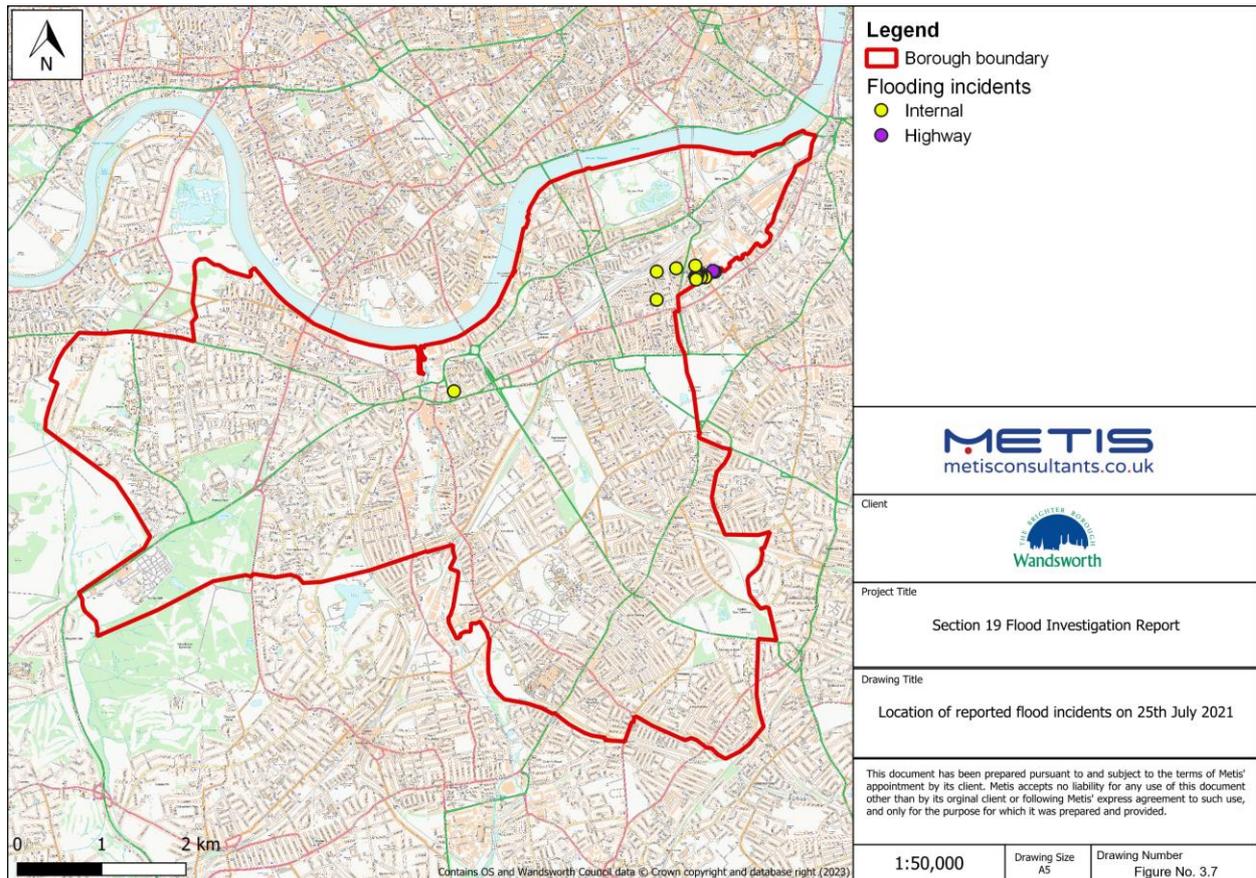


Figure 3-7 Reported flood incidents 25th July 2021

Hydrological catchments within the borough were defined in order to understand the potential causes of flooding to each location. The hydrological catchments used for the analysis within this report were created for Wandsworth’s SWMP (2021), using topography and sewer network data, and are shown in Figure 3-8. Wandsworth covers seven hydrological catchments which are areas of land of which rainfall drains towards the same waterbody, flow path or topographical low point. The flooding incidents on the 12th July were confined to one hydrological catchment in the west of Wandsworth, defined as W01 Putney. On the 25th July, all but one of the flood incidents were located in the W07 Clapham Common catchment and the final in W05 Earlsfield.

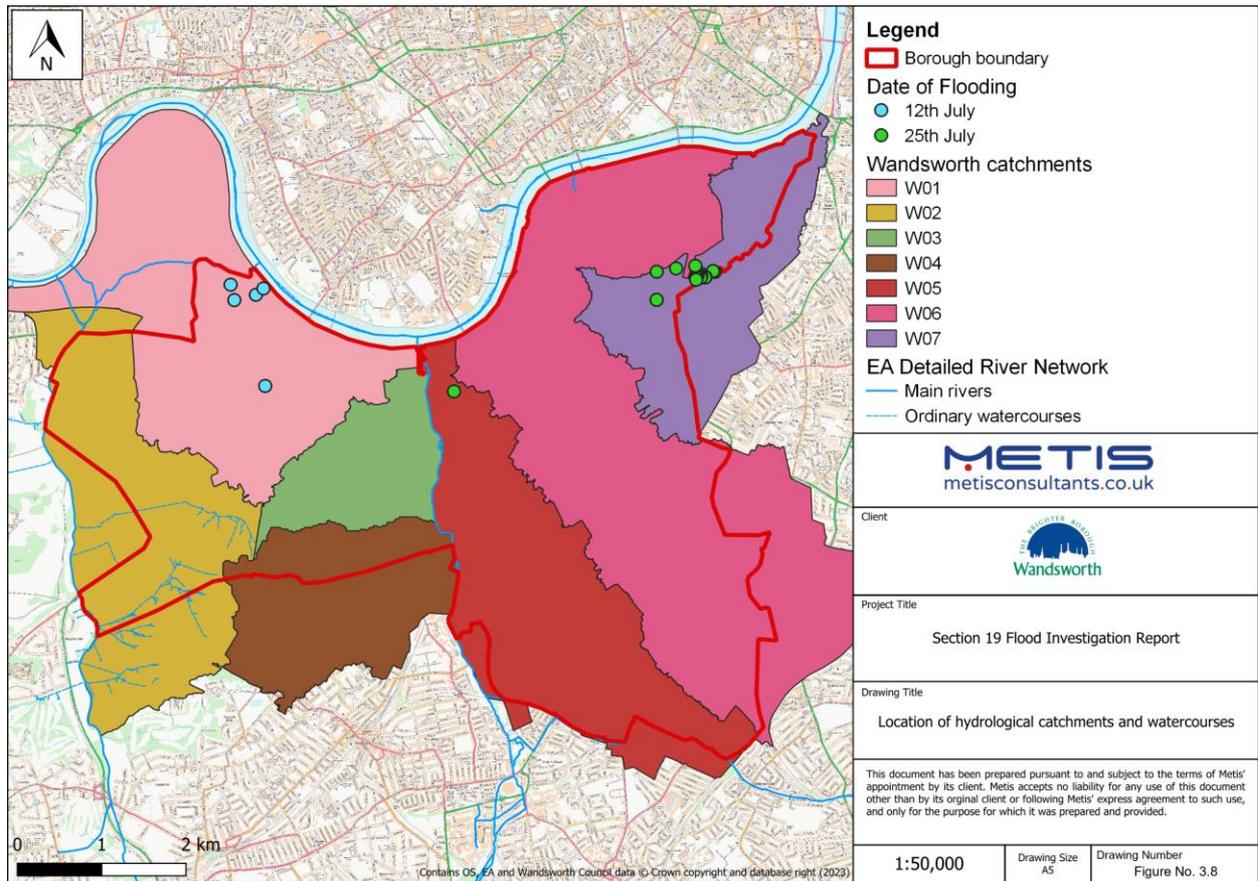


Figure 3-8 Wandsworth hydrological catchments and watercourses

4 12TH JULY EVENT

On the 12th July 2021, large parts of London were affected by intense rainfall which resulted in widespread flooding. The Met Office issued ‘yellow’ weather warnings for the storm event and a ‘most likely’ forecast of 20-30mm of rain. The map produced by TWUL, shown in Figure 3-1, shows that Wandsworth experienced return periods of between 1 in 2 years and 1 in 100 years, concentrated in the west of the borough. There were five reports of flooding made in Wandsworth on the 12th July, covering ten properties, which were all located in the west of the borough where the rainfall was more concentrated. Seven of these properties were in the area near Putney Common, the location of which is shown in Figure 3-6, with a further three located on Cambalt Road, south of the A205.

The specific locations affected, along with the type of flooding experienced are outlined in Table 4-1. As all reported incidents were of internal flooding this exceeded the threshold set by Wandsworth Council, as outlined in Section 1.1, triggering a Section 19 investigation.

Table 4-1 Summary of flooded locations on 12th July 2021

Locations Affected			Type of Flooding	
Area	Street Name	Number of properties	Internal	External / Highway
Near Putney Common	Festing Road	4	✓	
Near Putney Common	Sefton Street	1	✓	✓
Near Putney Common	Rotherwood Road	1	✓	
Near Putney Common	Lower Richmond Road	1	✓	
Cambalt Road	Cambalt Road	3	✓	

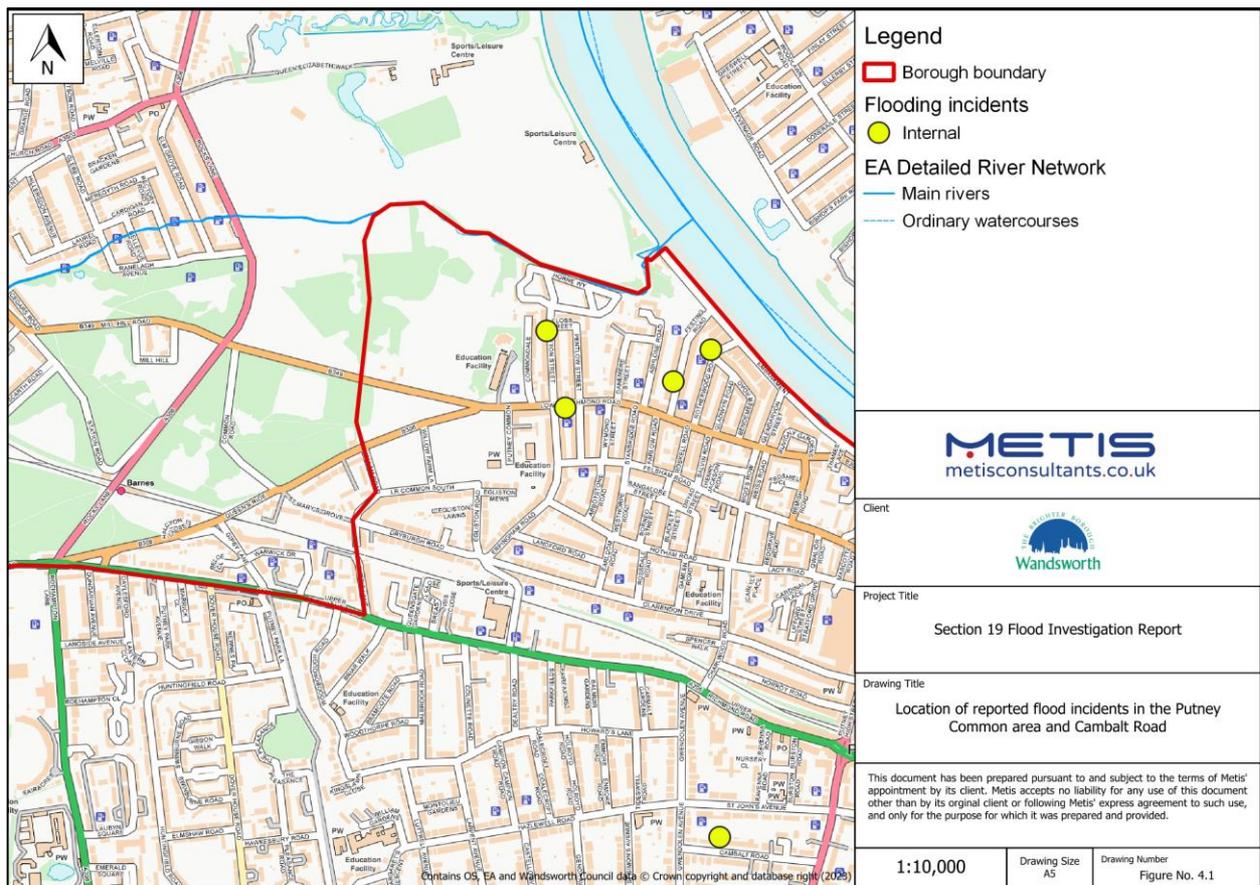


Figure 4-1 Reported flood incidents 12th July 2021

4.1 Local drainage network

The local TWUL sewer network in the two locations primarily affected are shown in Figure 4-2 and Figure 4-3.

Local drainage: Area near Putney Common

The surface water in the area near Putney Common, to the north of Lower Richmond Road, drains primarily into combined sewers which then drain south towards a larger, main combined sewer which runs west to east along Lower Richmond Road. North of Floss Street there are surface water sewers which drain into the Beverley Brook, close to its confluence with the River Thames. A 300mm diameter pipe runs south along Sefton Street and merges with the 1370mm by 910mm pipe at Lower Richmond Road. The sewer network dealing with surface water for Festing Road and Rotherwood Road is less clear as the data is incomplete, as shown in Figure 4-2, making it difficult to draw conclusions about what involvement, if any, the drainage network within these two roads had on the flooding experienced. From the data available from TWUL, it seems that surface water from the Erpingham Road, Fanthorpe Street, Wymond Street and Stanbridge Road drain into combined sewers which likely run north and then converge with the large sewer in Lower Richmond Road.

Local drainage: Cambalt Road

The local drainage network in Cambalt Road can be seen in Figure 4-3 and comprises a combined sewer of 2740mm diameter running west to east in Cambalt Road. A 1000mm diameter combined sewer running north to south on Gwendolen Avenue converges at the western end of Cambalt Road with the Cambalt Road combined sewer. This then diverts south-east and flows under the A219 before continuing east along Carlton Avenue. A further combined sewer travelling west to east cuts north-east from Gwendolen Avenue beneath homes on St John's Avenue to merge into St John's Avenue and continues flowing east.

4.2 Local flood mechanism

Light Detection and Ranging (LiDAR) data from the EA provides elevation data to 1m spatial resolution. The LiDAR data indicate that in the W01 Putney catchment, which incorporates the Putney Common area, there is approximately a 49m drop from the highest point in the catchment, on Putney Heath (55m), to the low points surrounding Sefton Street (6m). This difference in elevation encourages the flow of water from the higher areas further south around Putney Heath and Tippet's Corner towards Lower Richmond Road, and eventually towards the River Thames. The reported flooding incidents in the Putney Common area are all located at the lower elevation area of the catchment, bounded by Lower Richmond Road to the south and Putney Lower Common to the west, with little elevation change across it which encourages flows to collect in this area.

The Cambalt Road area is also located within the same W01 Putney catchment and therefore the flows of surface water from the topographical high point at Putney Heath towards the lower elevations close to the River Thames also affect this location. Cambalt Road itself is at an elevation of approximately 38m below the Putney Heath area. More locally to Cambalt Road, there is a fall of 5m from the east to the west end of Cambalt Road to the junction with Gwendolen Avenue. This spot is also approximately 5m below the southern end of Gwendolen Avenue at its junction with Chartfield Avenue. This fall in elevation suggests that surface water would flow from south to north along Gwendolen Avenue and reach the manholes at the Cambalt Road junction before the manholes at the Gwendolen Close junction or St John's Avenue. The combination of these two directions of flow of surface water towards the west end of Cambalt Road along with existing high water levels in the sewer network may have resulted in ponding on Cambalt Road. Here the road is slightly raised above the properties and thus flow from the road into properties could have resulted in internal flooding.

4.3 Local flood risk

In order to understand the possible flood mechanisms that caused the flooding events on the 12th July, it is important to consider the potential risk of flooding from surface water, main rivers (fluvial), groundwater, sewers, and any other sources. This will help to determine what the likely causes were and therefore help to determine any mitigation strategies.

4.3.1 Surface water flood risk

Flooding from surface water occurs when the volume of rainwater received at a certain location exceeds the capacity of the existing drainage network and is also unable to drain into the ground via infiltration. This results in ponding and overland flows and often occurs during periods of intense rainfall, as experienced on the 12th and 25th of July, exacerbated in urban areas by the large area of impermeable surfacing. Climate change will also increase the risk of flooding from surface water as significant rainfall events become frequent and more intense. The EA defines the risk of flooding from surface water (RoFSW) for an area as within three categories:

Table 4-2 Criteria for risk of surface water flooding categories

Low Risk	This area is predicted to be at risk of flooding from a 1 in 1000 year rainfall event, which means this area has a chance of flooding of between 0.1% and 1% each year.
Medium Risk	This area is at predicted to be at risk of flooding from a 1 in 100 year rainfall event, which means this area has a chance of flooding of between 1% and 3.3% each year.
High Risk	This area is predicted to be at risk of flooding from a 1 in 30 year rainfall event, which means this area has a chance of flooding of greater than 3.3% each year.

As shown in Figure 4-4, there is low to medium risk of surface water flooding in the area at the eastern edge of Putney Common. This incorporates the length of Sefton Street which is at risk of surface water flooding for rainfall events of 1 in 100 year return period and above. This is corroborated by the TWUL return period mapping, shown in Figure 3-1, indicating that this area of Wandsworth experienced a rainfall event of approximately 1 in 100 year return period which resulted in flooding. Isolated patches of Festing Road are at a low risk of surface water flooding whilst the northern end of Rotherwood Road, towards Putney Embankment, has a high risk of surface water flooding.

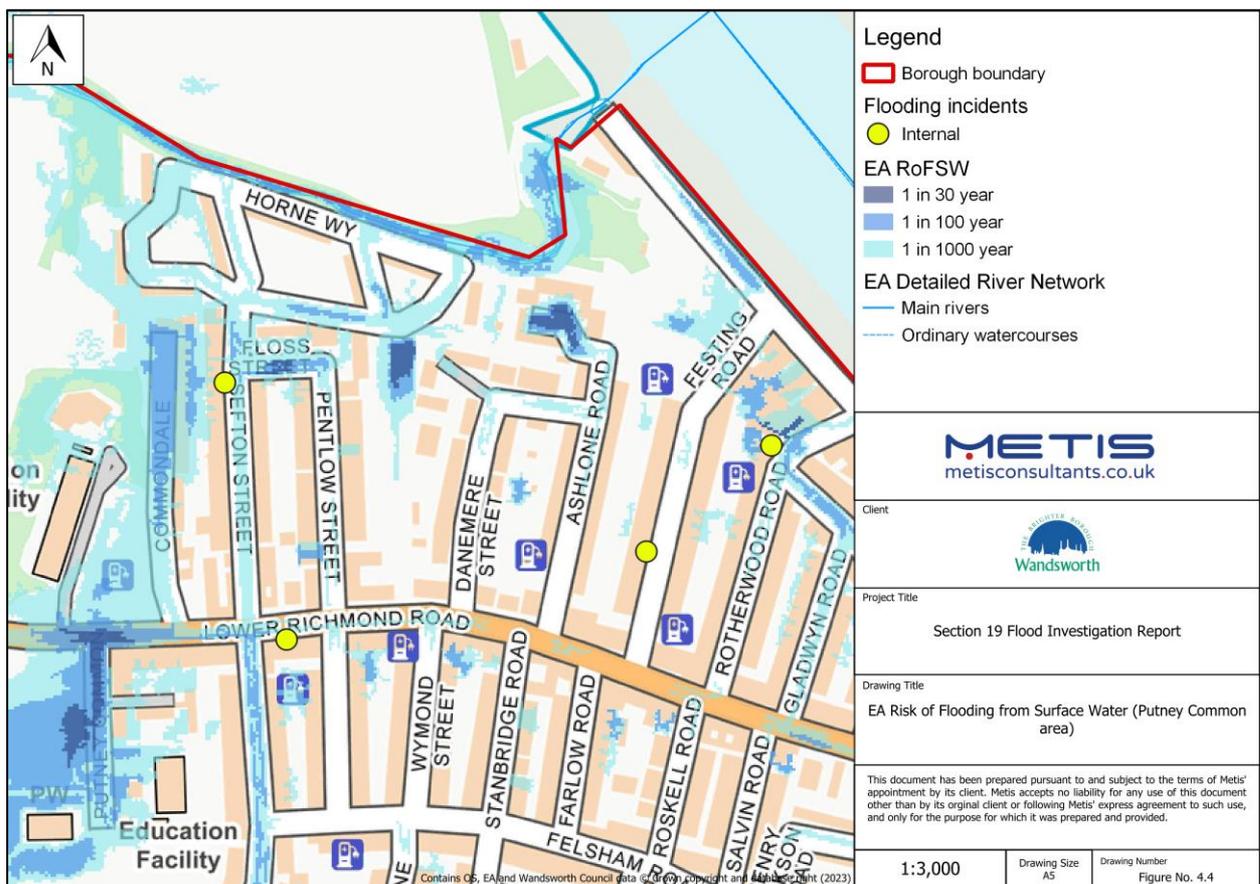


Figure 4-4 EA RoFSW (Putney Common area)

As shown in Figure 4-5, there is low to medium risk of surface water flooding along the length of Gwendolen Avenue. There is low risk of surface water flooding along Cambalt Road. There are areas at high risk of flooding from surface water along Gwendolen Avenue although this is primarily in the road and not property. Towards the centre of Cambalt Road there are areas to the north and south with properties at high risk of surface water flooding, notably Cedar Mews and opposite.

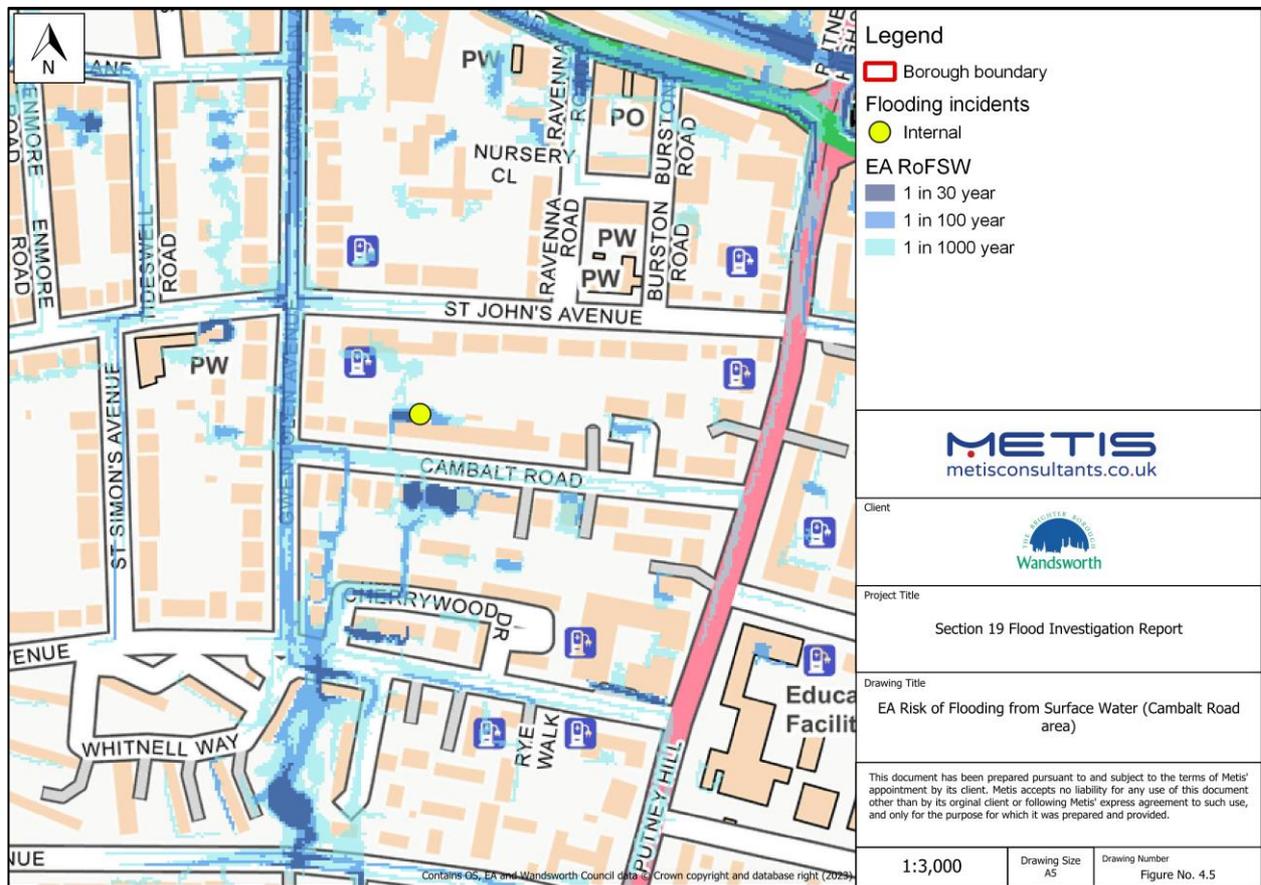


Figure 4-5 EA RoFSW (Cambalt Road area)

4.3.2 Fluvial flood risk

Flooding from rivers, also termed fluvial flooding, occurs when the capacity of a river is exceeded causing banks to be breached and resulting in out-of-bank flow. Areas at risk of fluvial flooding are again divided into three categories by the EA, and incorporating risk of flooding from the sea:

Table 4-3 Criteria for areas at risk of flooding from rivers and sea

Flood Zone 1	Land with less than 1 in 1000 (0.1%) chance each year of flooding from rivers or the sea.
Flood Zone 2	Land with between 1 in 1000 (0.1%) and 1 in 100 (1%) chance each year of flooding from rivers; or with between 1 in 1000 (0.1%) and 1 in 200 (0.5%) chance each year of flooding from the sea.
Flood Zone 3	Land with greater than 1 in 100 chance (1%) of flooding each year from rivers; or with a 1 in 200 chance (0.5%) or greater of flooding each year from the sea.

As can be seen from Figure 4-6 the northern boundary of Wandsworth is in Flood Zone 3, with a greater than 1% chance of flooding each year, particularly in the north-eastern area of the borough. There are also areas in the centre of Wandsworth, along the River Wandle, in Flood Zone 2, with some sections in Flood Zone 3. Cambalt Road, and its surrounding area is outside Flood Zones 2 and 3 meaning it is at low probability of flooding from rivers and the sea. The area near Putney Common, however, is at substantial risk of fluvial flooding with both Flood Zone 2 and Flood Zone 3 extending into this area with risk of flooding from the River Thames to the north and the Beverley Brook to the west.

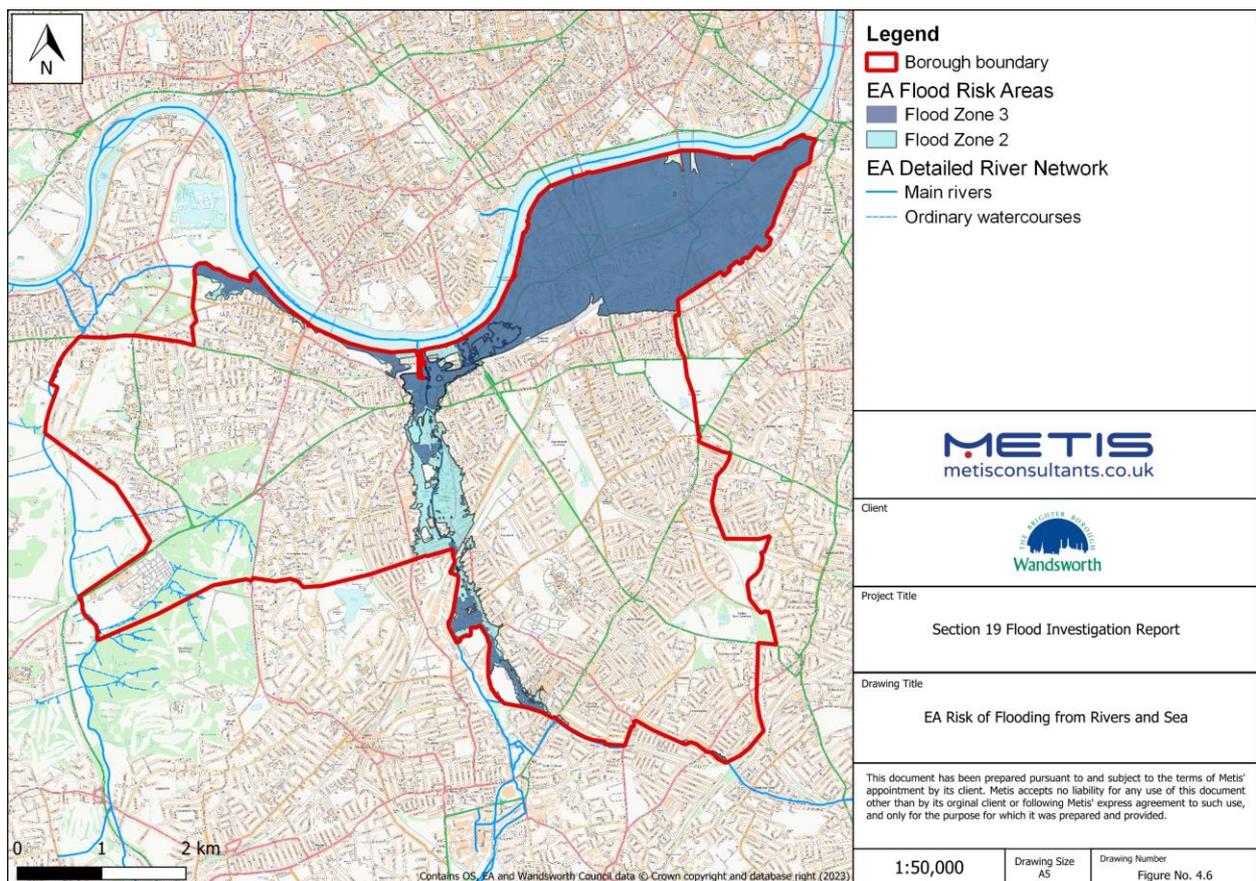


Figure 4-6 EA Areas at risk of flooding from rivers and the sea

4.3.3 Groundwater flood risk

Flooding from groundwater occurs when the underground water table rises above the surface of the ground. This can further exacerbate flooding on the surface, as the saturated ground prevents infiltration from taking place. Normally, this type of flooding occurs following prolonged periods of heavy rain. Dependent on local geology there can be variation in terms of response time to rainfall. The EA dataset 'Areas Susceptible to Groundwater Flooding' shows the proportion of each 1km² that is susceptible to the emergence of groundwater. The area near Putney Common is partly situated in an area of high susceptibility, with ≥ 75% of land susceptible, whilst north of this towards the Thames the susceptibility to groundwater emergence is lower at ≥ 25% < 50%. The Cambalt Road area is entirely covered by an area with a susceptibility of <25%, so can be considered at low risk of groundwater flooding.

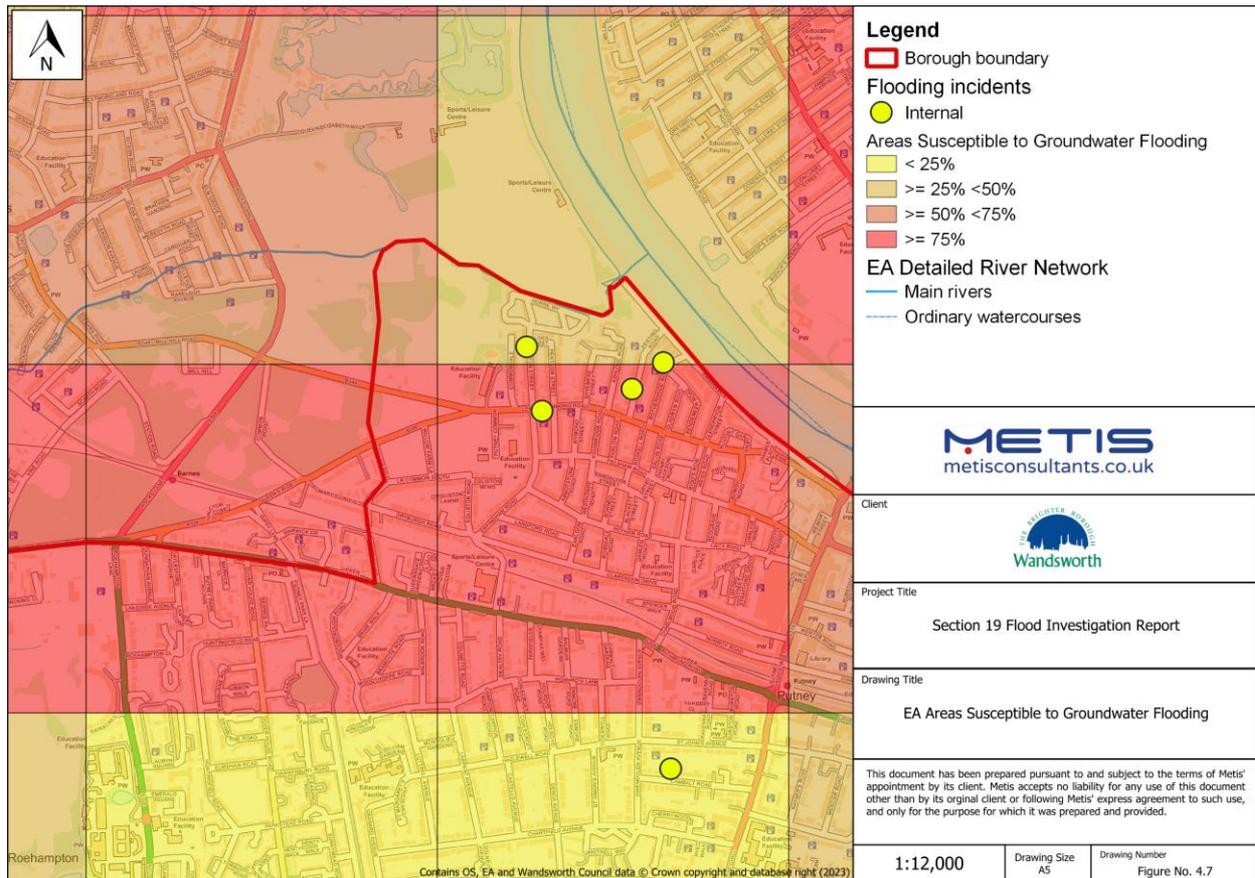


Figure 4-7 Areas susceptible to groundwater flooding (12th July 2021)

4.3.4 Sewer flood risk

Flooding from sewers occurs when the volume of rainfall draining to the sewers exceeds the capacity of the network. This can be because the rainfall event exceeds the designed limits of the sewer or a blockage in the system. This results in the sewers backing up, surcharging and generating overland flow, leading to flooding.

The sewer network data received indicates that in the area near Putney Common, shown in Figure 4-2, the majority of combined sewers to the north of Lower Richmond Road are draining south to the 1370mm x 910mm trunk sewer in Lower Richmond Road. There are some surface water sewers in Horne Way draining to the Beverley Brook. The TWUL sewer data is incomplete in this area meaning that only partial conclusions about the network and flood risk can be drawn. From the information available, shown in Figure 4-2, drainage of the surface water from the roads north of Lower Richmond Road is likely to be through combined sewers to the trunk sewer in Lower Richmond Road.

The Capacity Assessment Framework (CAF) modelling data provided by TWUL within their Drainage and Wastewater Management Plan (DWMP) shows that the combined sewer flowing to the east of Oasis Academy Putney is at risk of surcharge for the 1 in 2 year rainfall event from 2030 onwards. It is difficult to ascertain the direction of drainage of surface water from roads south of Lower Richmond Road. If surface water is draining from these roads to the Lower Richmond Road combined sewer then, together with the topography, sewer flooding would be very likely to occur in the event of rainfall exceeding the design capacity of the sewer network at this point.

The sewer network in the Cambalt Road area, shown in Figure 4-3, comprises a combined sewer flowing west to east, beneath Putney Hill and then continuing east. This is fed by a combined sewer in Gwendolen Avenue flowing north to south, converging with the Cambalt Road combined sewer at the junction of the two roads. CAF modelling data within TWUL’s DWMP indicates that the combined sewer in Cambalt Road is at risk of surcharge for the 1 in 2 year rainfall event from 2035 onwards. The data of the sewer network to the south of Cambalt Road is incomplete which makes it difficult to conclude what further surface water flows are converging in the combined sewer in Cambalt Road. Based on the topography and the slope of the surrounding roads, it is likely that surface water flows are travelling down Gwendolen Avenue from south to north and joining the Cambalt Road combined sewer through the gullies at the junction. This could likely contribute to the surcharging of the combined sewer at this location.

4.3.5 Actions taken by relevant RMAs (and other stakeholders affected)

The actions that were taken prior to, during, and following the 12th July 2021 flood event by the relevant RMAs involved are outlined in Table 4-4.

Table 4-4 Summary of actions taken by RMAs 12th July 2021

Authority	Authority Contributing Action to Flooding Incident
<p>Wandsworth Council</p>	<p style="text-align: center;"><u>Before</u></p> <p style="text-align: center;">No known actions taken</p> <p style="text-align: center;"><u>During</u></p> <p style="text-align: center;">No known actions taken</p> <p style="text-align: center;"><u>After</u></p> <p style="text-align: center;">Highways Team met with residents of Commondale in which a plan of action was identified and shared with residents.</p> <p style="text-align: center;">Engagement with Thames Water to investigate a potential solution for Commondale, in the area near Putney Common.</p> <p style="text-align: center;">Requested information from TWUL on what surveys and cleaning of the sewer network were carried out and requested that TWUL increase the frequency of their cleansing of sewers in the area near Putney Common.</p> <p style="text-align: center;">Setting up of a Flood Group within the Council with officers from Richmond and Wandsworth.</p> <p style="text-align: center;">Requested attendance and contribution of TWUL to relevant council meetings.</p> <p style="text-align: center;">Planning to implement 30 gully sensors across the borough in March/April 2023 in areas of historical or known surface water flooding issues. Highways staff to receive live data and alerts of the gully levels and can then take action in case required.</p>
<p>TWUL</p>	<p style="text-align: center;"><u>Before</u></p> <p style="text-align: center;">‘Yellow’ Weather Warning issued by the Met Office so TWUL convened an ‘adverse’ weather meeting with operational teams to assess risk to services, customers and the environment.</p> <p style="text-align: center;">Actions prepared were based on forecast of 20-30mm of rain.</p>

Authority	Authority Contributing Action to Flooding Incident
	<p style="text-align: center;"><u>During</u></p> <p>Received more than double the number of daily expected telephone calls and contacts via social media, leading the Customer Contact Centre to be overwhelmed. Telephone lines were updated at 17:00 to include a message explaining that they were very busy. This was updated at 20:00 to explain delays were due to flooding in London.</p> <p>London Resilience Group convened a ‘major incident call’ and TWUL provided a list of vulnerable customers.</p> <p style="text-align: center;"><u>After</u></p> <p>TWUL had 98-106 teams supporting customers across London. This was supplemented by 16 specialist crew from around the UK.</p> <p>TWUL Operations team are not aware of any maintenance or unusual reports of issues pre or post 12th July in Wandsworth.</p>

4.4 Source and cause

Sewer flooding was the most likely source of flooding in the area near Putney Common on 12th July 2021. The reports of flooding made by residents to Wandsworth Council outlined lifted manhole covers, discharge from combined sewers and foul water within property boundaries. Based on the rainfall event in this location having an estimated return period of 1 in 100 years, it is likely that the sewer network in this area was overwhelmed as a rainfall event of this magnitude exceeds its design capacity, as corroborated by Thames Water in their [Internal Review](#) into the 12th and 25th July 2021 storms in London. The likely surcharging of the sewer to the east of Oasis Putney Academy is corroborated by the report from residents of lifted manholes in this location. As outlined in Section 4.1, drainage of the surface water from the roads north of Lower Richmond Road is likely to be through combined sewers to the trunk sewer in Lower Richmond Road. If the trunk sewer was at capacity then the smaller combined sewers may have backed up, causing the lifted manholes that were experienced near Putney Common and the combined sewage discharge into back gardens of Sefton Street. The slight topographic slope down from Lower Richmond Road north towards the River Thames may have compounded the situation if the sewers were surcharged; any surface water draining down the slope away from Lower Richmond Road would have been unable to enter the surcharged network and would therefore have collected at this topographical depression. On Festing Road and Rotherwood Road there are raised areas at the northern end of the roads to protect them from high tidal water levels on the Embankment. These raised areas could have prevented the ponding surface water from continuing down the topographical slope and reaching the River Thames.

The flooding experienced in the Cambalt Road area was likely a combination of an overwhelmed sewer network along with the siting of the buildings along the road. There is a gentle slope down Cambalt Road from east to west, with gullies positioned at intervals along the road and at the junction with Gwendolen Avenue. If the Cambalt Road combined sewer’s capacity was exceeded then topographical flows from the eastern end of Cambalt Road and the north of Gwendolen Avenue would have been ponding on Cambalt Road causing flooding. With the sewer network surcharged, surface water flowing down Cambalt Road would not have entered the drainage network and instead flowed down the

access ramps to the housing on the northern side. Once in this enclosed area, lower than the roads on both sides, the water would have ponded and entered properties.

4.5 Recommendations

Area near Putney Common

- TWUL to update the surface water drainage network dataset in the area near Putney Common and share this with Wandsworth Council.
- TWUL to update the surface water drainage network dataset in the area near Cambalt Road and share this with Wandsworth Council.
- Wandsworth Council to ensure that there are focused actions within future updates to the LFRMS and SWMP that address flooding in the area near Putney Common.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations in the Putney Common area. This could include sharing information on work and feasibility studies completed to progress towards a method for flood alleviation in the area near Putney Common.

Cambalt Road

- TWUL to update the surface water drainage network dataset in the area near Cambalt Road and share this with Wandsworth Council.
- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing in the Cambalt Road area on Wandsworth Council-owned roads, pavements, and areas of hard-standing.
- Wandsworth Council to investigate opportunities to alleviate flood risk for the properties to the north of Cambalt Road, such as sustainable drainage systems (SuDS) or increasing the area of permeable surfacing.

5 25TH JULY 2021 EVENT

On the 25th July 2021, London was again affected by intense rainfall which resulted in widespread flooding. The rainfall covered a larger area of London than the 12th July event but was lower in intensity with one month's rainfall falling over two hours, as identified by TWUL in their [Internal Review](#). The Met Office issued a 'yellow' weather warning for the storm event and a 'most likely' forecast of approximately 25mm. The map produced by TWUL, shown in Figure 3-4, shows that the rainfall event was concentrated in central, north and east areas of London. For Wandsworth, this meant that the heaviest rainfall was focused in the north-east of the borough, as shown in Figure 3-4. In this area Wandsworth experienced rainfall with return periods of between 1 in 2 years and 1 in 30 years. There were ten reports of flooding received by Wandsworth Council related to the 25th July, with 23 properties flooded internally. The majority of these properties were located in the Diamond Estate area, which refers to the area bound by Silverthorne Road, Broughton Street, Stanley Grove and Robertson Street. There were two additional flood incidents (Eversleigh Road and Elsley Road) in close proximity to the Diamond Estate area and are included within this area for the purposes of this report. One additional isolated reported incident was located more centrally, on Fairfield Drive, close to East Hill.

The specific locations affected, and the type of flooding experienced there, are outlined in Table 5-1. The majority of the internal flooding incidents in Wandsworth on 25th July occurred on two streets in the Diamond Estate area: Gambetta Street and Montefiore Street. The reported flood incidents in the Diamond Estate area are shown in Figure 5-1; as 22 properties reported internal flooding within the Diamond Estate area, this exceeded the threshold set by Wandsworth Council for a Section 19 investigation, as set out in Section 1.1, of one property flooding internally. The report on Fairfield Drive was of internal flooding, the location of which is shown in Figure 5-2, and thereby also exceeded the threshold for Section 19 investigation.

Shaftesbury Gate development also experienced flooding on the 25th of July, however this information was received after the deadline for evidence gathering and has therefore not been included in the below analysis. This area, located on Elsley Road, southwest of the Diamond Estate, has experienced repeated flood incidents since its development. It is located in a topographical low point, next to a connection to the Heathwall sewer. The Heathwall sewer is the same combined sewer referred to in the below analysis, which runs west to east down Ashley Crescent and converges with the Queenstown Rd sewer at the junction with Robertson Rd. When there is low capacity in this sewer, such as during intense rainfall events, the sewer surcharges into the carpark of the development. During the 25th of July rainfall event, the carpark was filled with contaminated water, which damaged homes and communal areas.

Table 5-1 Summary of flooded locations on 25th July 2021

Locations Affected			Type of Flooding	
Area	Street Name	Number of properties	Internal	Highway
Shaftesbury Estate	Elsley Road	1	✓	
Shaftesbury Estate	Eversleigh Road	1	✓	
Fairfield Drive	Fairfield Drive	1	✓	
Diamond Estate	Gambetta Street	8	✓	
Diamond Estate	Montefiore Street	7	✓	
Diamond Estate	Prairie Street	1	✓	

Diamond Estate	Radcliffe Path	N/A		✓
Diamond Estate	Robertson Street	2	✓	✓
Diamond Estate	Tennyson Street	1	✓	
Diamond Estate	Thackeray Road	1	✓	✓

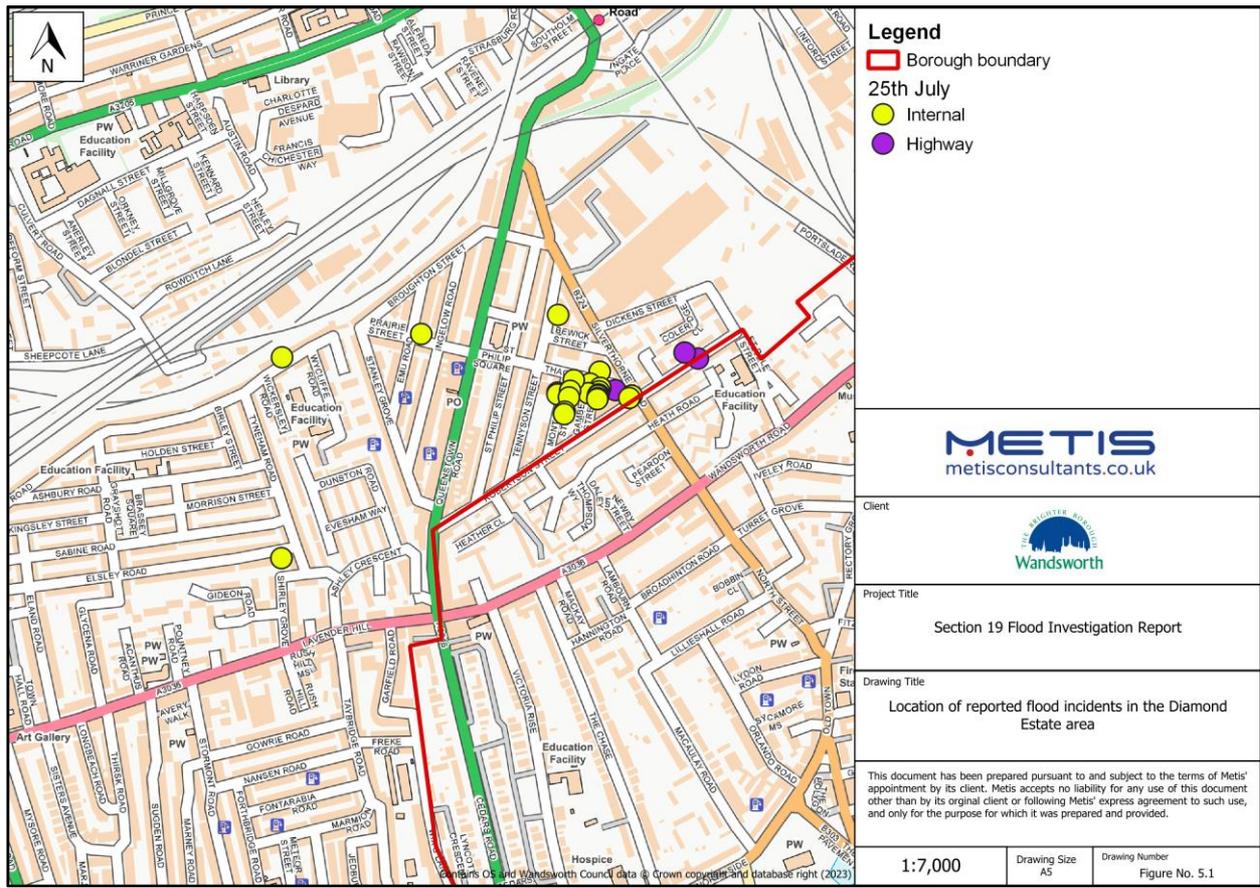


Figure 5-1 Reported flood incidents in the Diamond Estate area

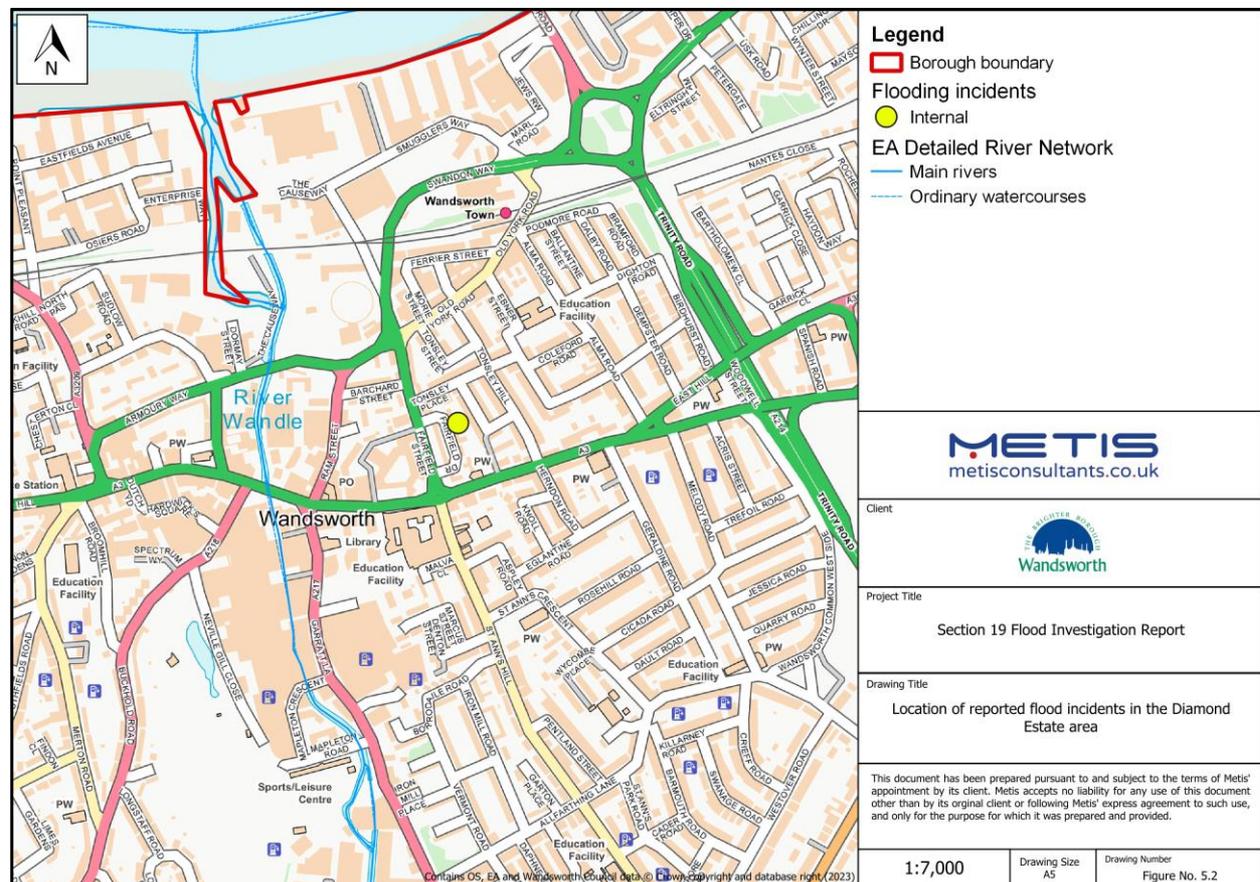


Figure 5-2 Reported flood incidents in the area of Fairfield Drive

5.1 Local drainage network

Local drainage: Diamond Estate Area

The main drainage network in the Diamond Estate area is shown in Figure 5-3. The surface water drainage network in the Diamond Estate Area comprises a 1140mm diameter combined sewer running south to north along Queenstown Road (A3216). This is fed from the west by a combined sewer flowing west to east in Ashley Crescent and converging with the Queenstown Road combined sewer at the junction with Robertson Street. The Queenstown combined sewer is also joined by a combined sewer of diameter 30mm flowing north to south in Robertson Street. The data indicate that a combined sewer flows south in Tennyson Street to converge with the Robertson Street combined sewer. The unconnected combined sewers in Montefiore Street and in Gambetta Street suggest a combined sewer in Montefiore Street and a combined sewer flowing south in Gambetta Street but only partial assumptions can be made about the network here.

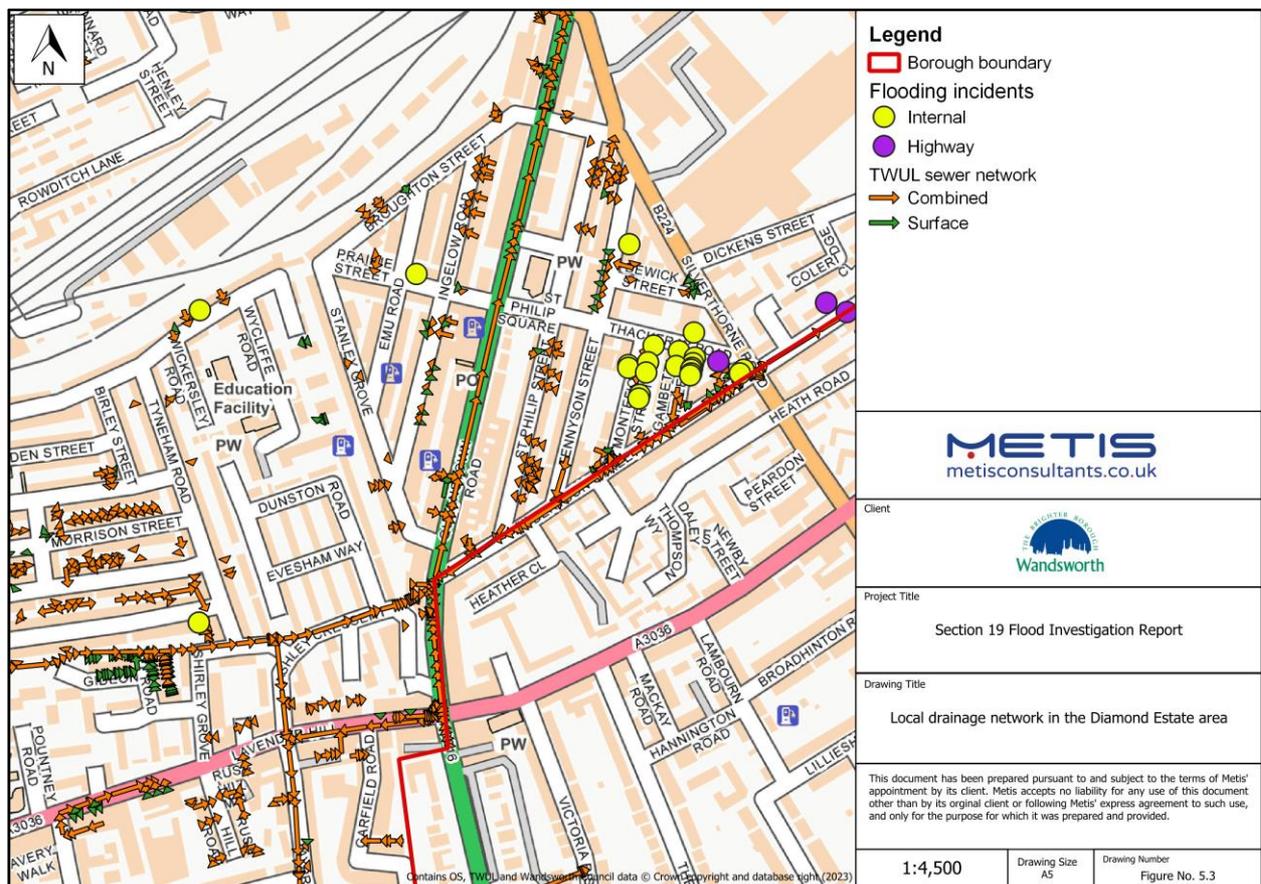


Figure 5-3 Local drainage network (Diamond Estate area)

Local drainage: Eversleigh Road

As shown in Figure 5-3 the drainage network data for Eversleigh Road is incomplete. The unconnected combined sewers suggest the presence of a combined sewer in Eversleigh Road.

Local drainage: Elsley Road

As shown in Figure 5-3, the drainage network data for Elsley Road are incomplete. There is evidence for some combined sewers draining into Elsley Road which would suggest, along with the location of manholes in the road, that there is a combined sewer running the length of Elsley Road although the

direction is unclear. There is a combined sewer of variable diameter running west to east behind the houses on the south side of Elsley Road.

Local drainage: Fairfield Drive

As shown in Figure 5-4, the drainage network data for this area are incomplete. The data suggest the presence of combined sewers in the area of Fairfield Drive although it is unclear which part of the larger network these combined sewers connect to. There is a 1829mm diameter combined sewer running west to east up East Hill (A2), although it is unclear from the partial information whether the surface water from around the Fairfield Drive area drains eventually to this combined sewer.

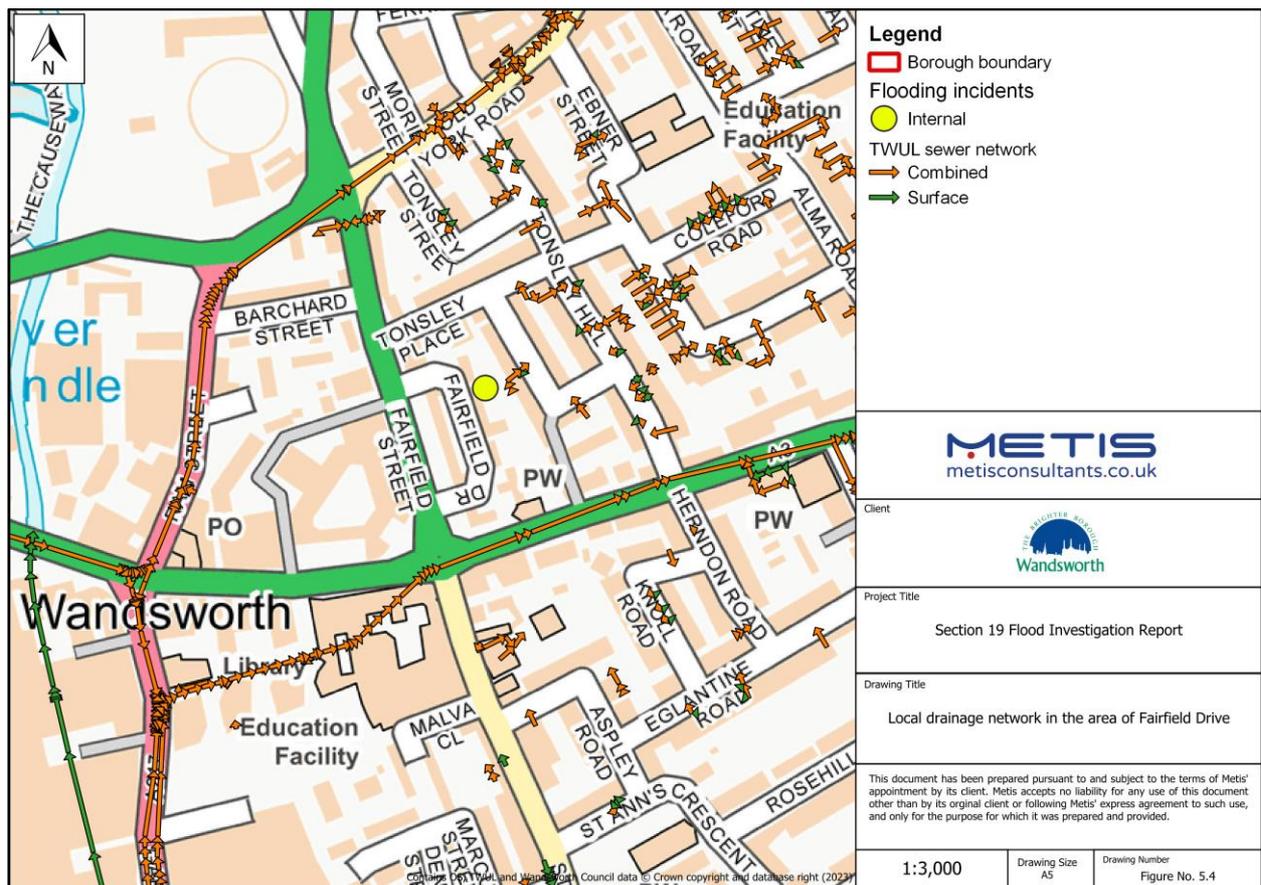


Figure 5-4 Local drainage network (Fairfield Drive)

5.2 Local flood mechanism

The LiDAR data indicate a drop in elevation of approximately 29m across the W07 Clapham Common catchment that incorporates the Diamond Estate area. This change in elevation means that surface water flows are encouraged to flow from the topographical high point, around the southern end of Clapham Common at 30m, to the eastern end of Thackeray Road at around 1m. Silverthorne Road, running north from Wandsworth Road to its junction with Thackeray Road, is downhill with a drop of approximately 10m, forming a flow path for surface water. There are a significant number of reported flooding incidents located at this local low point for the 25th July 2021 rainfall event. The area between the A3036 (Lavender Hill / Wandsworth Road) and the River Thames forms a relative plateau, including the Diamond Estate area. Once surface water flows reach this location they are encouraged to pond as there is no significant gradient to encourage water to disperse. At the northern end of Wickersley Road there is a bund / raised area which means that any surface water flows travelling down the gentle gradient of Eversleigh Road west to east are prevented from diverting down Wickersley Road.

Elsley Road is at a lower elevation than the development to its south, below Lavender Hill. Surface water flowing from higher areas of the catchment to Lavender Hill (A2) may then drain downhill to the Gideon Road development which has flat areas of hardstanding. Once ponding occurs here, water may then flow down to Elsley Road.

The River Wandle runs south to north through the centre of Wandsworth, to its confluence with the River Thames. Fairfield Drive is located in central Wandsworth on a slope down towards the River Wandle, 10m below the high point of the catchment. Fairfield Drive is in the flow path of surface water flows within the catchment as they move from areas of higher elevation to lower; therefore it may be a point for flows to collect as the roads running north-south are perpendicular to the hillslope in this location and could provide flat surfaces that enable ponding.

5.3 Local flood risk

5.3.1 Surface water flood risk

The Diamond Estate area is a significant location in terms of risk of flooding from surface water, as shown in Figure 5-5. Every road in the area has at least a low risk of surface water flooding, with property also at low risk from surface water flooding in the east of the area. Certain roads are at medium risk of flooding whilst at the eastern edge, particularly close to the junction of Silverthorne Road with Thackeray Road, a significant area is at high risk of flooding from surface water. As shown in Figure 3-4, this area of Wandsworth experienced a rainfall event with return period of between 20 and 30 years. Eversleigh Road, in the Shaftesbury Estate and to the west side of the Diamond Estate Area, has a low risk of surface water flooding along the length of the road with high risk of surface water flooding at the eastern end. Elsley Road has a medium risk of surface water flooding with a high risk of surface water flooding between the junctions with Greyshott Road and Tyneham Road, also affecting the properties on the south side of the road. Fairfield Drive has an isolated area of properties on the eastern uphill area affected by low risk of surface water flooding.

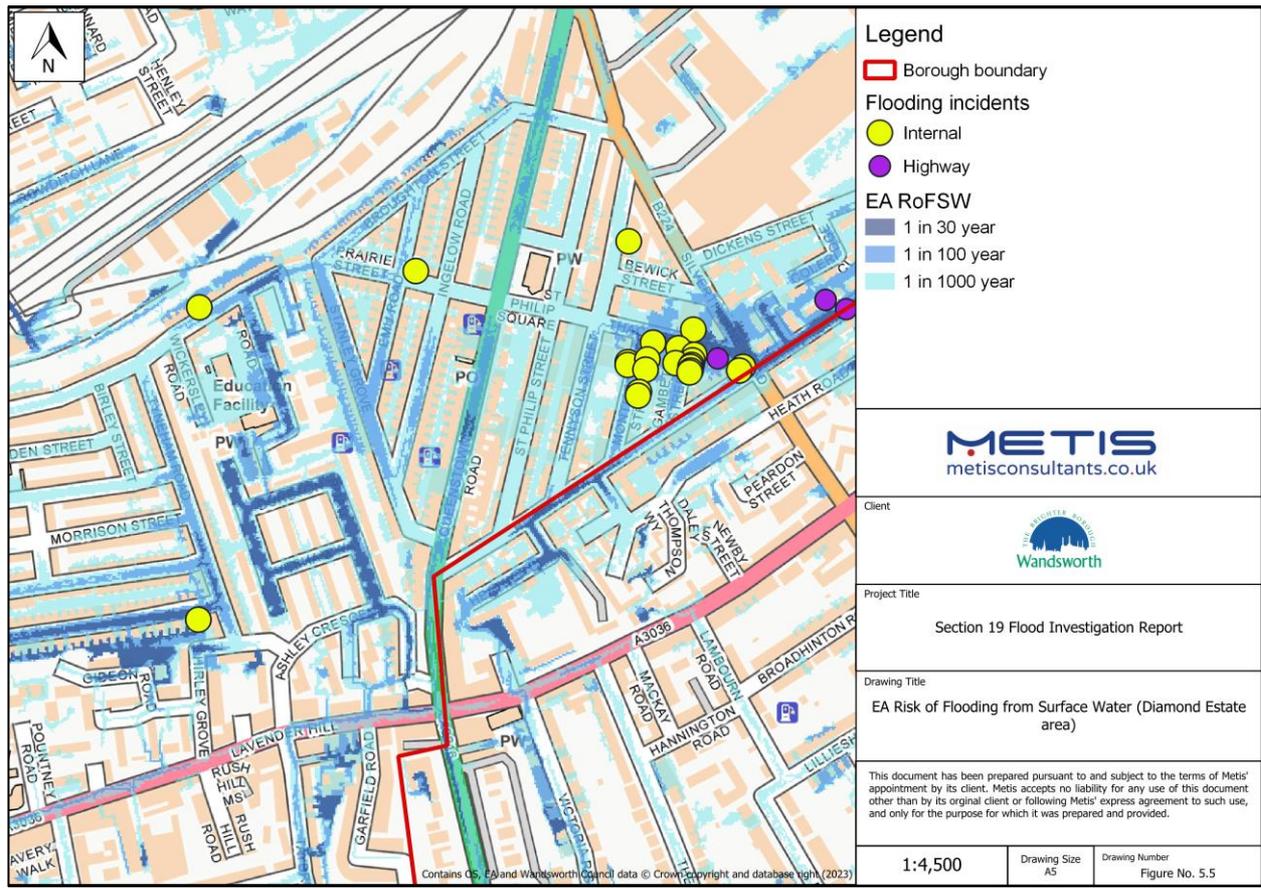


Figure 5-5 EA RoFSW (Diamond Estate area)

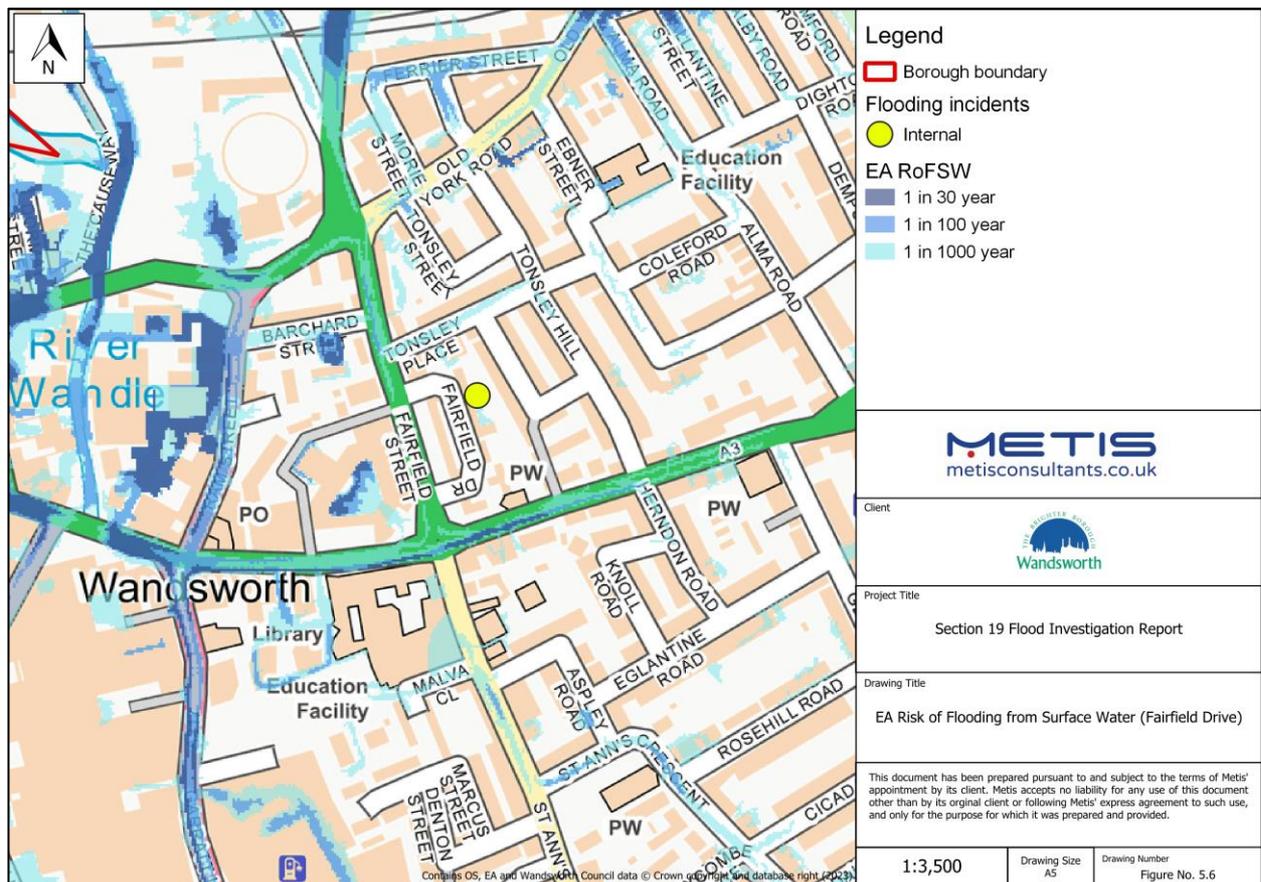


Figure 5-6 EA RoFSW (Fairfield Drive)

5.3.2 Fluvial flood risk

As can be seen from Figure 4-6, the north-eastern corner of Wandsworth, which includes the Diamond Estate area, is contained within Flood Zone 3, which has a greater than 1% chance of flooding each year. Whilst these areas are at higher risk of fluvial flooding, it is highly unlikely that there was flooding from the River Thames as a result of this rainfall event and the river defences were not reported as overtopped. Fairfield Drive sits outside the extent of Flood Zone 2 and Flood Zone 3 and hence is unlikely to be affected by any fluvial flooding.

5.3.3 Groundwater flood risk

As shown in Figure 5-7, the EA data show that the Diamond Estate area is situated in an area with $\geq 50\% < 75\%$ of land susceptible to groundwater flooding. This area of medium to high risk also incorporates Eversleigh Road and Elsley Road. Fairfield Drive has a similar susceptibility to groundwater flooding as it is also located in a 1km^2 grid with $\geq 50\% < 75\%$ of land susceptible to groundwater flooding. These areas can be considered at medium to high risk of groundwater flooding and may be more affected by a higher water table, though there is little evidence in this rainfall event to suggest that groundwater flooding contributed to the reported incidents.

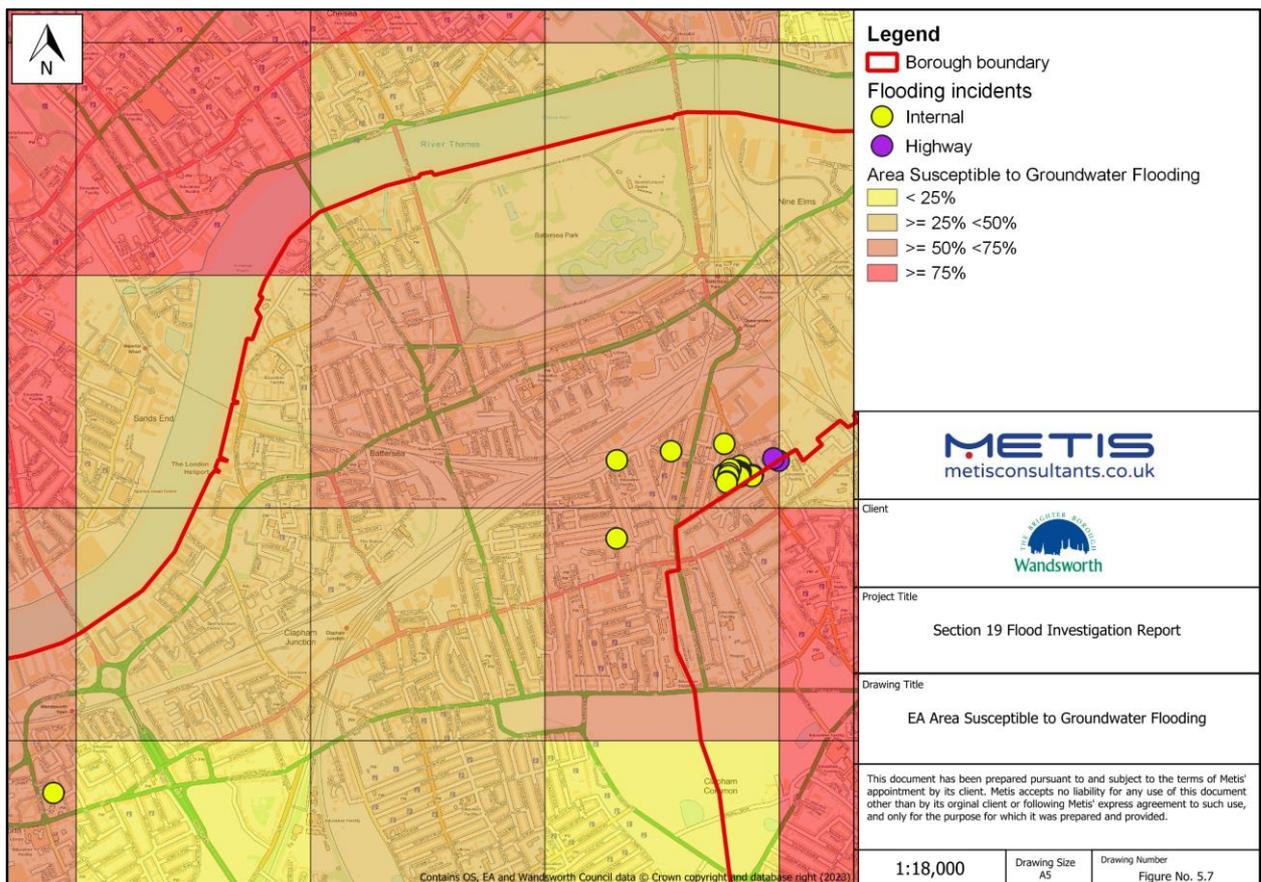


Figure 5-7 Areas susceptible to groundwater flooding (25th July 2021)

5.3.4 Sewer flood risk

The sewer network in the Diamond Estate area can be seen in Figure 5-3. This shows two main combined sewers. A 1140mm x 760mm combined sewer running south to north in Queenstown Road, through the centre of the Diamond Estate area. The second is a 300mm combined sewer in Robertson Street that splits at the junction with Tennyson Street and runs north in one part and south in the other. These two combined sewers, in Queenstown Road and Robertson Street, are both at risk of surcharge for a 1 in 2 year rainfall event from 2020 onwards, as outlined by the CAF modelling data in TWUL’s DWMP. As the rainfall event in this location exceeded the 1 in 2 year return period, it is likely that these combined sewers were surcharged and contributed to flooding at this point.

The corner of Thackeray Road and Silverthorne Road is a point of high surface water flood risk and a topographic low point, making it likely that surface water flows converge here. The junction of Silverthorne Road is at a lower elevation than the junction at the southern end with Queenstown Road, meaning run-off is more likely to travel to the Silverthorne junction end and enter the drainage network at this point. Without further sewer network data, it is difficult to determine what further pressures are put on this portion of the sewer network from the surrounding streets which contribute to the sewer flood risk.

Whilst it is unclear what sewer is primarily serving Elsley Road, the existing data shown in Figure 5-3 suggests the presence of a combined sewer in the road. There is also an 813mm combined sewer running parallel to Elsley Road, behind the properties to the south of the road. Based on data from TWUL’s DWMP this sewer is at risk of surcharge from a 1 in 2 year rainfall event from 2030 onwards. The sewer network data shown in Figure 5-1. indicates that the surface water sewers in Gideon Road converge with the 813mm combined sewer flowing west to east. As this is a location with high risk of surface water flooding, it is possible that the flows collecting in this area were compounded by the surcharging of the combined sewer to the south of Elsley Road.

It is difficult to draw conclusions about the risk from sewer flooding to Fairfield Drive as the sewer network data in this area is incomplete, as can be seen in Figure 5-4. There is evidence that properties north of Fairfield Drive drain to a combined sewer in Tonsley Road but it is unclear where drainage from Fairfield Drive converges with the larger combined sewers in East Hill or Old York Road. This makes it difficult to ascertain what the risk from sewer flooding is in this location.

5.3.5 Actions taken by relevant RMAs (and other stakeholders affected)

The actions taken by relevant RMAs before, during, and after the flood event of the 25th July are summarised below in Table 5-2. Table 5-2 Summary of actions taken by RMAs 25th July 2021

Table 5-2 Summary of actions taken by RMAs 25th July 2021

Authority	Authority Contributing Action to Flooding Incident
<p>Wandsworth Council</p>	<p style="text-align: center;"><u>Before</u></p> <p style="text-align: center;">No known actions before.</p> <p style="text-align: center;"><u>During</u></p> <p style="text-align: center;">Emergency Planning Local Authority Liaison Officer attended the site on Silverthorne Road on 25th July 2021</p>

Authority	Authority Contributing Action to Flooding Incident
	<p style="text-align: center;"><u>After</u></p> <p>Requested that Highways contractors attend the Diamond Estate area on 27th and 28th July to inspect the gullies.</p> <p>Engagement with the Flood Action Group for the Diamond Estate Area, involving residents, the National Flood Forum, and Thames Water.</p> <p>Feasibility studies have been commissioned to investigate the possibilities for flood alleviation in the Diamond Estate Area.</p> <p>Emergency Planning department were involved in debriefs of the events in case further action was required.</p>
TWUL	<p style="text-align: center;"><u>Before</u></p> <p>Increased staffing of call centre.</p> <p>Some pre-planned work was cancelled so that more response teams were available.</p> <p>Tankers were placed strategically to support areas previously impacted.</p> <p>A suitable call-centre automated response, web and social media messaging was in place providing customers with advice on who to contact for help.</p> <p>Communicated the outline of preparatory actions to elected representatives on 23rd July.</p> <p style="text-align: center;"><u>During</u></p> <p>Engineers sent to check on areas that remained a concern as of 12th July incident. Engineers also checked key strategic sites such as pumping stations.</p> <p>Deployed all available contact centre agents.</p> <p>Initiated incident processes which involved contacting local authorities with offers of support.</p> <p>Maintained contact with London Resilience Group to ensure they were abreast of any local issues.</p> <p style="text-align: center;"><u>After</u></p> <p>Made contact with, and offered support to, affected boroughs.</p> <p>TWUL confirmed a clean-up of the main sewers in Diamond Estate Area was conducted.</p>

5.4 Source and cause

Sewer flooding as a result of the capacity of the network being exceeded was the most likely cause of the flooding on the 25th July in the Diamond Estate Area. This area has a known problem with sewer flooding with reports made to the council of multiple incidents on Gambetta Street, Montefiore Street,

Robertson Street and Tennyson Street from rainfall events in 1998, 2007, 2016, and the 2021 event investigated within this report. Reports to the council of the flooding on the 25th July in this area detailed foul water within properties suggesting surcharge of the sewer network. Based on this evidence, in combination with the estimated return period of the event (shown in Figure 3-4) and conclusions from TWUL's [Internal Review](#), the sewer network was likely overwhelmed and unable to cope with the volume of water entering the system. If the sewer network was surcharging then the existing topography would have further exacerbated the problem in the Diamond Estate area, particularly for the roads close to the junction of Thackeray Road and Silverthorne Road. Surface water flows travelling down from Wandsworth Road (A3036) would have reached the junction of Thackeray Road and Silverthorne Road where a number of gullies are located for drainage but would not have been able to drain away. This would have caused ponding and contributed to the flooding along Robertson Street which slopes gently away to the east, with a low point in the middle. Water was also draining to Robertson Street from the east, at the St Rule Street end, as outlined in residents reports to the council.

For Eversleigh Road, the flooding was likely caused by a lack of capacity in the network and water draining towards lower elevations within the catchment, as outlined in Section 5.2. Elsley Road was likely flooded as a combination of sewer capacity issues and topography. The risk of surcharge of the sewer network at this point may have been exacerbated by flows of surface water from Lavender Hill draining to Gideon Road and continuing downhill to the plateau of Elsley Road, as outlined in Section 5.2.

The flooding at Fairfield Drive was likely of a similar cause to Elsley Road, and Cambalt Road on the 12th July. It is situated downhill from roads running perpendicular to the slope. If the drainage network on these roads, such as Tonsley Road, was overwhelmed on 25th July then the water would have continued downhill into the relatively flat area behind the development on Fairfield Drive. The development sits across the slope and therefore water is trapped behind and not able to reach Fairfield Drive and continue draining to Fairfield Street. This is corroborated by the reports of residents that the issue was at the rear of the properties, facing uphill.

5.5 Recommendations

Diamond Estate Area

- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of Wandsworth Council-owned roads, pavements, and areas of hard-standing on Robertson Road.
- TWUL to update the surface water drainage network in the Diamond Estate Area and share this information with Wandsworth Council.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Diamond Estate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council and TWUL continuing established communication and engagement with residents providing updates about progress on improving flood risk.
- Cross-boundary approach from Wandsworth Council including collaboration with the London Borough of Lambeth Council (Lambeth Council) on actions relevant to the Diamond Estate Area as this area is close to the boundary between Wandsworth and the London Borough of Lambeth (Lambeth).

- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of council-owned roads or pavements in Gideon Road. Permeability could also be increased with the implementation of SuDS, like rain gardens, for attenuation of surface water.

Fairfield Drive

- Wandsworth Council to investigate the possibility of increasing the area of permeable surfacing of council-owned roads or pavements uphill of Fairfield Drive, in Tonsley Road and Tonsley Hill. Permeability could also be increased with the implementation of sustainable drainage systems (SuDS), like rain gardens, for attenuation of surface water.

Shaftsbury Gate

- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Shaftsbury Gate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council to continue the ongoing investigation into the possibility of increasing the area of permeable surfacing and SuDS opportunities in council-owned roads or pavements uphill of Shaftsbury Gate.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

This Section 19 investigation for Wandsworth Council was undertaken as a result of the extreme rainfall events experienced in July 2021 which triggered the investigation criteria. A total of 15 reports of flooding were made to the council, with five from the 12th July rainfall event and ten from the 25th July event. Each event resulted in a cluster of flooding events located in different parts of Wandsworth due to the differing location of the concentration of the rainfall. The clustered nature of the flooding reports meant that for each event an area of multiple flood reports was investigated (an area near Putney Common on the 12th July and the Diamond Estate area on the 25th July) and an isolated location for each event (Cambalt Road on the 12th July and Fairfield Drive on the 25th July). All of the flood reports received met the threshold for conducting a Section 19 Investigation. Shaftsbury gate was also affected during the 25th of July event; however, this information was received after the deadline for evidence gathering and has therefore not been included in the analysis.

This investigation identified that the area near Putney Common and the Diamond Estate area, the two locations with high concentrations of flood incidents during the events in July, have significant existing risk of sewer and surface water flooding. The conditions of the rainfall events in July caused flooding but the extent of the flooding was likely worse than if the cause had been only surface water flooding. Based on the return periods of the rainfall and corroborated by resident reports and the conclusions of TWUL's [Internal Review](#), sewer capacity was overwhelmed in certain locations. It was likely therefore a combination of sewer and surface water flooding that caused the flooding experienced. Topography also played a role in the locations that flooded in Wandsworth. Based on the conclusions of the source and cause of the flooding experienced, recommendations were drawn up as part of this report.

6.2 Recommendations

For the locations investigated within this report, recommendations have been made in order to reduce the risk of flooding at these locations and contribute to overall reduced future risk of flooding throughout Wandsworth. As the effects of climate change are anticipated to exacerbate the frequency and intensity of rainfall events like those experienced in July 2021, it is important to mitigate the current and future risk of flooding for Wandsworth.

The recommendations are summarised below by location:

Area near Putney Common

- TWUL to update the surface water drainage network dataset in the area near Putney Common and share this with Wandsworth Council.
- Wandsworth Council to ensure that there are focused actions within future updates to the LFRMS and SWMP that address flooding in the area near Putney Common.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations in the Putney Common area. This could include sharing information on work and feasibility studies completed to progress towards a method for flood alleviation in the area near Putney Common.

Cambalt Road

- TWUL to update the surface water drainage network dataset in the area near Cambalt Road and share this with Wandsworth Council.
- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing in the Cambalt Road area on Wandsworth Council-owned roads, pavements, and areas of hard-standing.
- Wandsworth Council to investigate opportunities to alleviate flood risk for the properties to the north of Cambalt Road, such as sustainable drainage systems (SuDS) or increasing the area of permeable surfacing.

Diamond Estate area

- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of Wandsworth Council-owned roads, pavements, and areas of hard-standing on Robertson Road.
- TWUL to update the surface water drainage network in the Diamond Estate Area and share this information with Wandsworth Council.
- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Diamond Estate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council and TWUL continuing established communication and engagement with residents providing updates about progress on improving flood risk.
- Cross-boundary approach from Wandsworth Council including collaboration with the London Borough of Lambeth Council (Lambeth Council) on actions relevant to the Diamond Estate Area as this area is close to the boundary between Wandsworth and the London Borough of Lambeth (Lambeth).
- Wandsworth Council to investigate the opportunity to increase the area of permeable surfacing of council-owned roads or pavements in Gideon Road. Permeability could also be increased with the implementation of SuDS, like rain gardens, for attenuation of surface water.

Fairfield Drive

- Wandsworth Council to investigate the possibility of increasing the area of permeable surfacing of council-owned roads or pavements uphill of Fairfield Drive, in Tonsley Road and Tonsley Hill. Permeability could also be increased with the implementation of sustainable drainage systems (SuDS), like rain gardens, for attenuation of surface water.

Shaftsbury Gate

- Continued collaboration between Wandsworth Council and TWUL with regards to investigations carried out in the Shaftsbury Gate area. This could include studies of the drainage network and feasibility studies of flood alleviation schemes with continued sharing of this knowledge to progress potential solutions to the repeated flooding in this area.
- Wandsworth Council to continue the ongoing investigation into the possibility of increasing the area of permeable surfacing and SuDS opportunities in council-owned roads or pavements uphill of Shaftsbury Gate.

6.3 General recommendations

Wandsworth Council

- Wandsworth Council should continue to encourage the reporting of flooding incidents through the online [Flood Reporting tool](#). The collation and storing of this information, to be periodically reviewed, will help to identify areas with a recurrent flooding issue.

TWUL

TWUL have specified that the following recommendations can be applied across Wandsworth:

- RMAs responsible for flood risk, including TWUL, should follow the recommendations given in the independent London Flood Review. Chapter 3 of the London Flood Review's [Stage 4 Summary Report](#) outlines the 28 recommendations which are discussed in detail in Chapter 4 of the [Stage 4 Technical Report](#).
- TWUL should finalise and publish their DWMP which sets out long-term actions needed for DWMP areas considering the current state of drainage and wastewater management and future growth, urban creep and climate change.
- TWUL should consider the recommendations of the London Flood Review and continue to prioritise inspection and sewer cleaning based on behaviour and impact on the operation of the sewer network at all sites. TWUL should prioritise sites where the sewer network is causing issues for residents.

APPENDICES

Appendix 1 – EA Rain Gauge Data

Time (BST)	Depth of rainfall (mm)					
	12 th July 2021			25 th July 2021		
	Colliers Wood	Norbury	Putney Village	Colliers Wood	Norbury	Putney Village
00:00	-	-	-	0	0	0
01:00	-	-	-	0	0	0
02:00	-	-	-	0	0	0
03:00	-	-	-	0	0	0
04:00	-	-	-	0	0	0
05:00	-	-	-	0	0	0
06:00	-	-	-	0	0	0
07:00	-	-	-	0	0	0
08:00	-	-	-	0	0	0
09:00	-	-	-	0	0	0
10:00	-	-	-	0	0	0
11:00	-	-	-	0	0	0

Depth of rainfall (mm)						
Time (BST)	12 th July 2021			25 th July 2021		
	Colliers Wood	Norbury	Putney Village	Colliers Wood	Norbury	Putney Village
12:00	0	0	0	0	0	0
13:00	0	0	0	0.3	0.2	0.1
14:00	0	0	0	0.2	1.3	0.2
15:00	0	0	0	11.9	4.8	6.9
16:00	0	0	4.5	2.3	0.8	8.2
17:00	0	0	31.3	1.3	1.6	2.6
18:00	0.7	0	4.3	2.2	2.8	2.9
19:00	0	0	3.8	0.3	1.1	0.6
20:00	0	0	1.9	1.5	1.3	1.2
21:00	0.1	0	0.6	0.4	0.5	0.2
22:00	0	0	0.2	0.2	0	0.1
23:00	0.1	0.1	0.1	0	0	0