

# Section 19 Flood Investigation Report Caterham on the Hill

**Incident: 7<sup>th</sup> June 2016**

**Published: 11<sup>th</sup> November 2016**



**SURREY**

# Section 19 Report

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## Purpose

This document has been prepared specifically for the purpose of meeting the requirements of Section 19 of the Flood and Water Management Act 2010. This report should be read in conjunction with the SCC commissioned report “Caterham on the Hill Surface Water Management Study” carried out by Atkins (see references).

The purpose of this report is to investigate which Risk Management Authorities (RMAs) had relevant flood risk management functions during the flooding that took place in the Caterham on the Hill and Caterham Valley surface water catchment on 7<sup>th</sup> June 2016, and whether the relevant RMAs have exercised, or propose to exercise, their risk management functions (as per section 19(1) of the Flood and Water Management Act 2010). It does not address wider issues beyond that remit.

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 locations of the Section 19s identified, 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.

# 1.Executive Summary

A flash flood occurred in north Tandridge on Tuesday 7<sup>th</sup> June, 2016 from 12.30 to 15.00. The areas affected included Caterham on the Hill, Caterham Valley and Whyteleafe. Surface water flooding also affected areas to the north in the London Borough of Croydon (LBC) including Coulsdon Common and Caterham Drive. This report is focused on the Caterham on the Hill catchment. Neighbouring areas to the catchment that were also affected by the same storm event e.g. Chaldon are not part of this Section 19. These areas can be investigated as a separate flood enquiry. The areas affected in Croydon will be addressed by a Section 19 report written by Croydon Council (CC).

The rainfall event was localised and one and a half times the total June average rainfall fell over a 2 hour period in the Caterham on the Hill area. The flooding event was therefore primarily a result of flash surface water flooding. The flooding was not caused from fluvial sources. The groundwater levels for June were “above normal”<sup>1</sup>. While it is unknown if any groundwater contributed to the flooding event, it is considered unlikely that groundwater played a significant part.

The flooding incident overwhelmed the local road and drainage infrastructure resulting in over 86 internal property floods (this includes flats) and 63 external property floods. Many of the internal property floods included sewage. The property flood data is based on information recorded by the risk management authorities (RMAs) following resident engagement during the incident response. 40 roads/road sections were affected by the flooding with seven road closures carried out by the Police and one by Surrey County Council Highways during the incident. Many of the flooded roads were impassable resulting in traffic grid-lock during the height of the flooding. During the incident Surrey County Council (SCC), Tandridge District Council (TDC), Thames Water (TW) and emergency services attended the area.

In the recovery phase, SCC and TDC carried out gully and road surface cleaning. SCC arranged for the National Flood Forum to conduct follow up events to engage with residents in Caterham on the Hill. This was attended by officers from SCC, TDC, the Environment Agency (EA) and Thames Water in order to provide advice and information. The National Flood Forum has facilitated the setup of a flood action group in Caterham on the Hill to provide a mechanism for residents to improve communications with risk management authorities (RMAs).

CC are working on a separate Section 19 investigation covering the cross administration border area of the Caterham on the Hill catchment focused on Caterham Drive.

The EA is the lead RMA for incidents of fluvial flooding from Main Rivers. SCC is the lead RMA for incidents of surface water and groundwater flooding. TW and TDC also performed other functions during the event, some of which were under different legislation including the Civil Contingencies Act (2004), the Water industry Act (1991), and the Water Resources Act (1991). The actions of all authorities involved in the flooding event are summarised in chapter 4.

## 2. Introduction

### 2.1. 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.

A 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.

### 2.2. Trigger for Section 19 Report

The Caterham on the Hill catchment area is the focus of this Section 19 investigation. There were over 86 internal property floods (this includes flats) and 63 external floods. Many of the internal property floods included sewage. This property flood data is based on information recorded by RMAs following resident engagement during and after the incident.

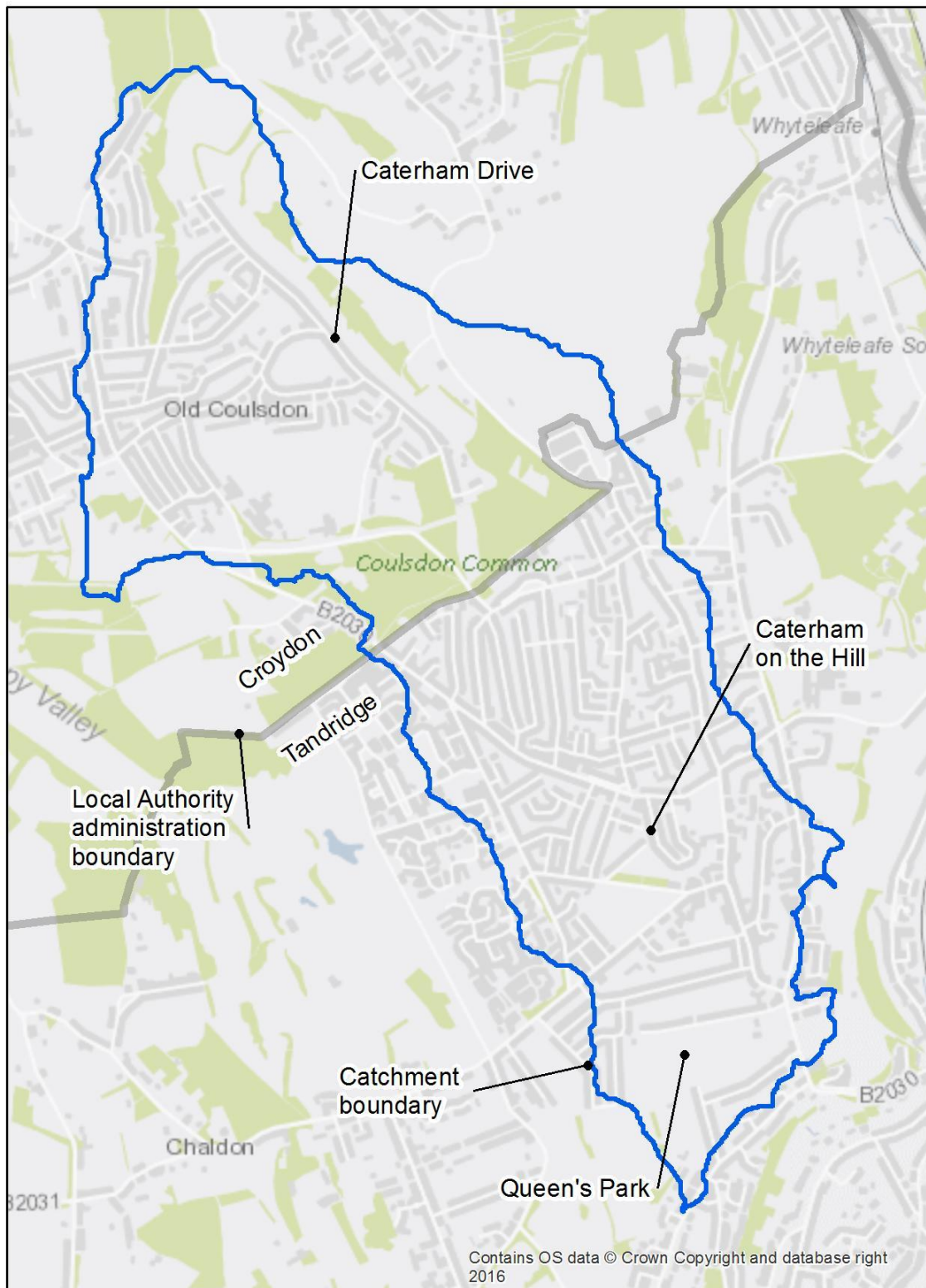
Forty roads/road sections were affected by the flooding with seven road closures carried out by the Police and SCC Highways. Many of the flooded roads were impassable resulting in traffic grid-lock during the height of the flooding.

The number of internally flooded properties and road closures exceeded the threshold for a Section 19 investigation. The threshold for a Section 19 is six internal property floods.

### 2.3. Location of this investigation

The area affected covered the north west of Tandridge. The Caterham on the Hill catchment is the main focus of this investigation (Figure 1). There was also surface water flooding in Caterham Valley and Whyteleafe. There were smaller flooding events around Tandridge including Smallfield and Godstone.

Details of the flooding to the north of the county boundary will be outlined in the CC Section 19 report (due for publication in Autumn 2016). The northern downslope section of the Caterham on the Hill catchment was affected. Caterham Drive which is located just north of the Croydon / Tandridge boundary was badly flooded.



**Figure 1. Location of the Caterham on the Hill catchment and parts of the catchment located in Croydon. Catchment/drainage divide has been extracted from digital elevation starting at a location just north of Caterham Drive, Croydon.**

## 3. Flooding Incident

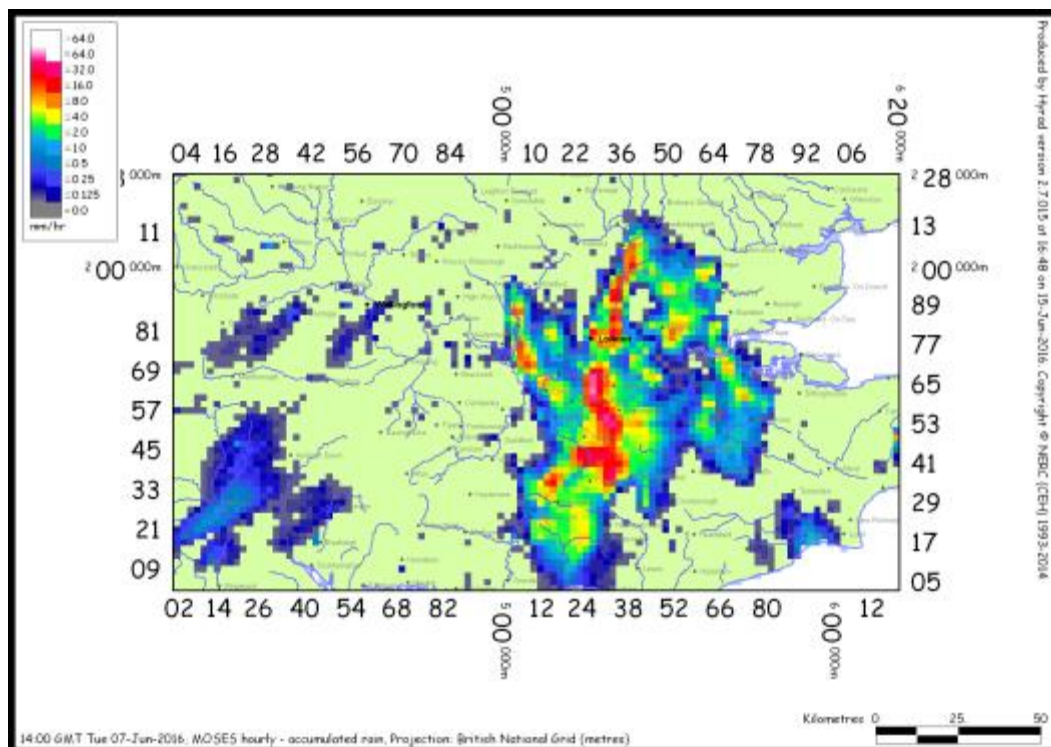
### 3.1. Weather Conditions

The South London area including the North Downs area of Tandridge was dominated by a series of low pressure weather systems that resulted in intense rainfall events and thunderstorms during June 2016 (EA water situation report<sup>1</sup>). The intense storm event that caused the flooding within the Caterham on the Hill catchment occurred on 7<sup>th</sup> June 2016, during a time period between 12.30 and 15.30.

#### Key points:

- The Kent and South London region received 198% of the long term average rainfall for June.
- The South London catchment rainfall total indicates that this area was the wettest June on record.
- The Mitcham weather station located to the North of Tandridge recorded its highest monthly June average since records began (EA water situation report<sup>1</sup>).
- The surface water flooding resulting from the rainfall events was localised. The response to the river telemetry network was small and no fluvial flood alerts were issued.

The radar image in Fig. 2 shows the storm intensity and extent at 14.00 on the 7<sup>th</sup> June. The red and light pink tones indicate relatively high rainfall intensity across the region with the highest values located in the north Tandridge area.



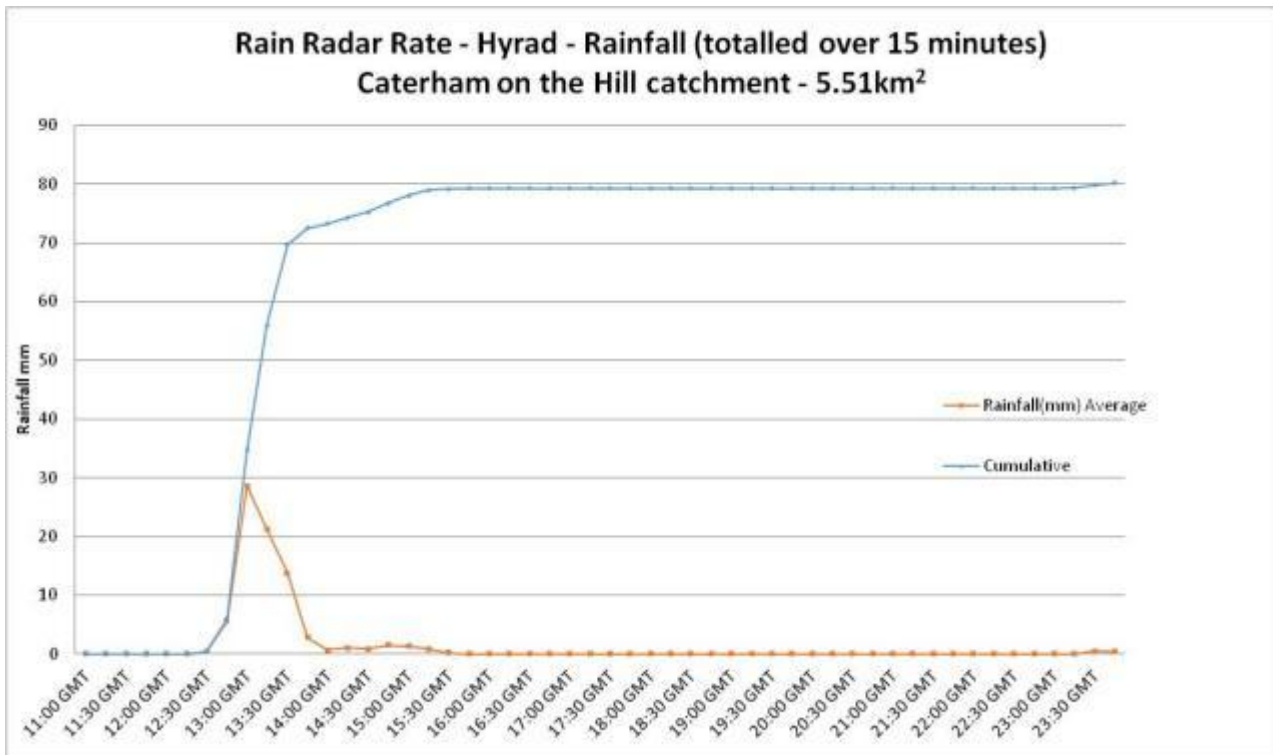
**Figure 2. Rainfall Intensity map on the 7<sup>th</sup> June at 14.00 showing the storm location. (Image supplied by the Environment Agency).**

The observed radar rainfall map, showing the variation in rainfall totals (from 12.30 – 14.00), indicates localised variation in the total rainfall during this time period. Relatively high rainfall totals are shown to the west of the catchment.



### 3.2. Rainfall data

The Mitcham Weather Station recorded a total of 41mm of rainfall accumulated in a 75 minute period from 12.30 to 13.45 on the 7<sup>th</sup> June. The EA have supplied estimated radar-observed rainfall data at 15 minute intervals for the Caterham on the Hill catchment (5.5km<sup>2</sup> area). Between 12.30 and 15.00, a 2.5hr period, 77.62 mm accumulated average rainfall occurred in the Caterham on the Hill catchment (Figure 3). This average rainfall for the catchment contrasts with the average June rainfall for the Caterham area. The average June rainfall for the Caterham area, based on the Kenley Weather Station, is 53.4mm (source: Met Office <sup>2</sup>). Just under 1.5 times the monthly June average rainfall fell on the Caterham on the Hill catchment in 2 hours.



**Figure 3. Cumulative average rainfall intensity graph for the Caterham on the Hill catchment (5.5km<sup>2</sup>). EA have supplied the radar observed rainfall data. The catchment extent used to calculate the average rainfall totals for the area are shown in Figure 6, Appendix 2.**

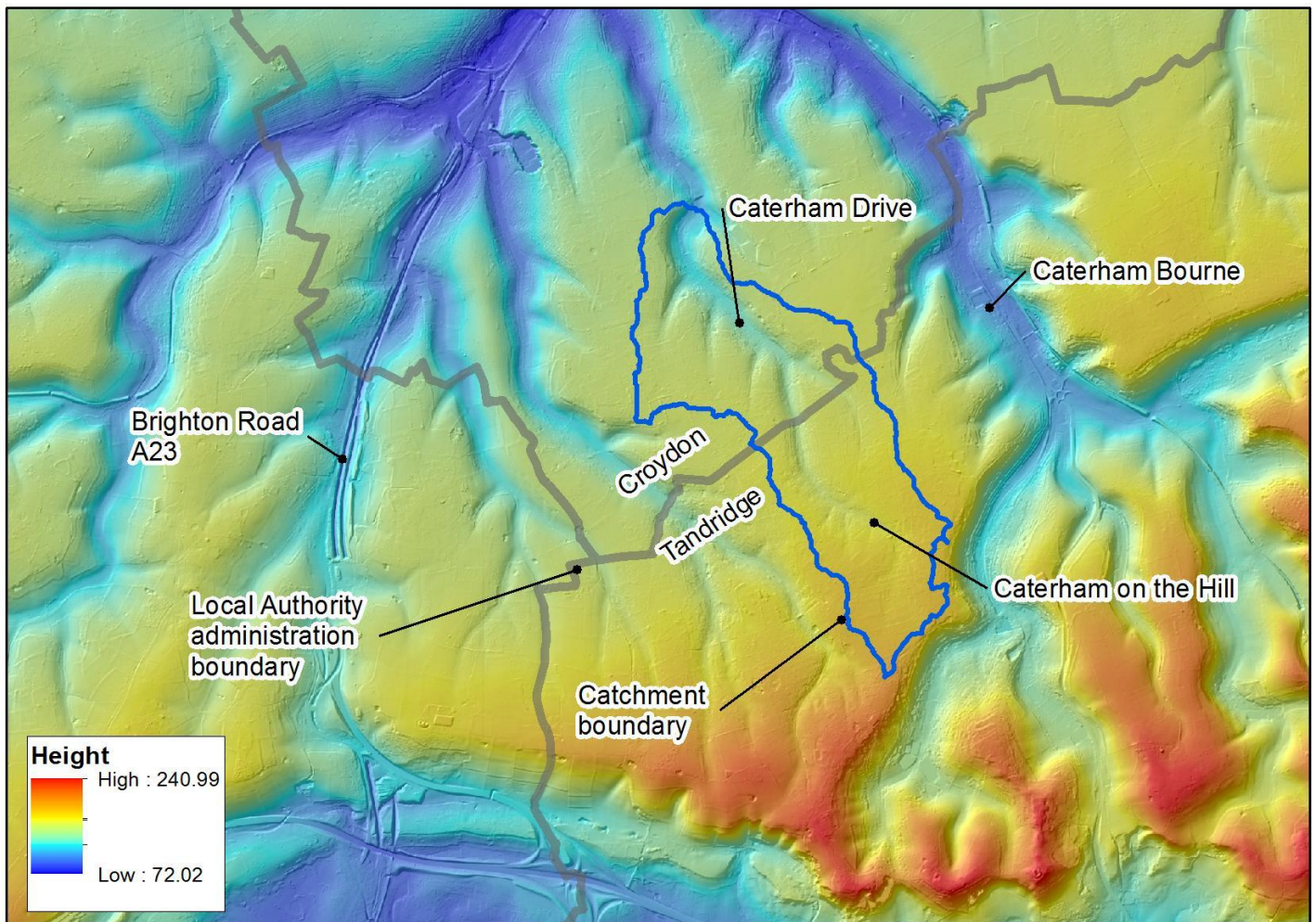
There is a local weather station located in the upper part of the Caterham on the Hill catchment (see ref. <sup>3</sup>). The accumulated rainfall for this station is 72.6mm in 2 hours, recorded between 13.00 and 15.00. This supports the observed radar accumulated rainfall values for the same time period.

### 3.3. Catchment Description

Caterham on the Hill is located in the north of Tandridge just south of the Croydon – Tandridge administration boundary (Figure 4). This catchment and two other south to north oriented catchments dissect the terrain located between two main valleys; the river dominated Caterham Bourne valley to the east and the Brighton Road A23 Valley further to the west (Figure 4).

The Caterham on the Hill catchment is a watercourse <sup>4</sup> that is piped along its course into Croydon.





**Figure 4. Regional geomorphology of the area showing surface watercourse routes. The blue outline indicates the Caterham on the Hill and cross administration boundary drainage divide area. Height data source: Environment Agency LiDAR derived DTM 1m. The red colour tones indicate relatively high elevation and blue tones relatively low elevation.**

Caterham on the Hill is located in the upper reach of the catchment to the west of the Bourne valley. This section of the catchment decreases in elevation northwards towards the Tandridge border on Coulsdon Common. The catchment continues northwards into Croydon and joins the Bourne southwest of Purley.

There are no watercourses listed on the Environment Agency and Ordnance Survey mapping data. However, the generalised geomorphology indicates a surface watercourse draining to the north (Figure 4). The surface water flow route and piped watercourse/surface water sewer is described in detail in the Caterham on the Hill Surface Water Management Study (Figure 1-1<sup>4</sup>) and follows a decrease in terrain to the north into Croydon. The size of the catchment is 1.2 km<sup>2</sup>. The elevation range for the Caterham on the Hill section of the catchment ranges from a minimum of 152m AOD to maximum of 196m AOD<sup>4</sup>. A map of the modelled surface water flow route is shown in Figure 5, **Appendix 2**.

The area is mainly residential with businesses located along the High Street and Westway. There are five areas of open space including Coulsdon Common and Queens Park recreation ground located at the top of the catchment.

### 3.4. Flood Risk and History of Flooding

The flood risk and history of flooding is summarised in the SCC Highways commissioned report “Caterham on the Hill, Surface Water Management Study”<sup>4</sup> carried out by Atkins. The catchment is at a high risk of surface water flooding; see the modelled surface water risk map in Figure 5 and Figure 3-2 ref.<sup>4</sup> Surface Water Management Study. The EA risk of flooding from surface water modelled risk map clearly delineates the surface water flow route along the catchment. Analysis was carried out to indicate the number of properties that are at risk of surface water flooding (see Table 3-4 in Surface Water Management ref.<sup>4</sup>). The location of historic floods and surface water flooding is shown in Figure 3-2 ref.<sup>4</sup> of the Surface Water Management Study.

The British Geological Survey “Susceptibility to Groundwater flooding” dataset indicates that the area to the north of Banstead Road has a “very high” susceptibility to groundwater flooding to occur at surface<sup>4</sup>. High ground water levels can indirectly affect the capacity of the surface water sewer where groundwater infiltrates the surface water sewer and can reduce the capacity of the soakaways.

There is historic flooding in the catchment. SCC record historic highway flooding, known as wetspots, located on four roads; Queen’s Park Road, Money Road, Banstead Road and Ninehams Road / Stites Hill Road (see table 3-1 ref.<sup>4</sup>). Within the catchment there have been previous reports of internal flooding in Park Road and Court Road.

### 3.5. Drainage System

The aim of the Caterham on the Hill Surface Water Management Study<sup>4</sup> was to survey the piped watercourse/surface water sewer and to investigate surface water flooding in the catchment, assess the surface water infrastructure and to develop options for reducing the current flood risk. The report focused on:

- Drainage asset data review and scoping
- Highway drainage survey
- Flood risk review and economic appraisal
- Conceptual option development

The Caterham on the Hill flow route is a piped watercourse/surface water sewer with a series of surface water and highway drainage assets located along its length. There are two separate sewer systems consisting of a foul and surface water network. The surveyed main storm route is shown in Figure 2-11 of the study<sup>4</sup>. This map also shows the location of the main drainage assets.

The investigation details the drainage assets and sewer network present in the catchment. This section 19 refers to the details outlined in the Surface Water Management Study. The Money Pit is a SCC owned structure and is located on the piped watercourse adjacent to St Michaels Road. There is ongoing work into examining the ownership of the piped watercourse as there is ambiguity over the land ownership and responsibility throughout the catchment. The Money Pit structure was inspected as part of the study<sup>4</sup> and details on condition is outlined in the report. At the time of going to print, The Money Pit is being further investigated and cleaned by SCC.

Note:

### **Land Drainage Act 1991 Clarification**

Section 72 Land Drainage Act 1991:

“watercourse” includes all rivers and streams and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers within the meaning of the Water Industry Act 1991) and passages, through which water flows.

## 4. Risk Management Functions carried out during the flood event

### 4.1. RMA Responsibilities

RMAs have defined flood risk management functions under the Flood and Water Management Act (2010). A flood risk management function is a function listed in the Act (or related Acts) which may be exercised by an RMA for a purpose connected with flood risk management. The following section sets out the strategic actions and relevant flood risk management functions that were carried out before, during and after the flooding that occurred in Caterham during the 7<sup>th</sup> June flood event.

#### Environment Agency

The EA is responsible for taking a strategic overview of the management of all sources of flooding and coastal erosion in England and Wales. They have prepared strategic plans which set out how to manage risk, provide evidence (for example, their online flood maps), and provide advice to the Government. They provide support to the other RMAs through the development of risk management skills and provide a framework to support local delivery. The EA also has operational responsibility for managing the risk of flooding from Main Rivers, reservoirs, estuaries and the sea, as well as being a coastal erosion RMA. Main Rivers are defined through an agreed map which is updated annually. These tend to be the larger rivers in the country.

The EA are Category 1 responders regarding flood risk (Civil Contingencies Act 2004). They are required to warn and inform of flood risk.

#### Thames Water

Thames Water have flood risk management functions under the Water Resources Act (1991). Relevant actions of water companies include: the inspection, maintenance, repair and any works to their drainage assets which may include watercourses, pipes, ditches or other infrastructure such as pumping stations.

#### Civil Contingencies Act 2004 (CCA)

- Designates water and wastewater undertakers as statutory Category 2 responders to national disasters and emergencies, placing on them duties to share assured information with other responders in an appropriate manner.

#### Flood and Water Management Act 2010

- Requires the management of risks associated with assets or processes that may cause or be affected by flooding.
- Requires water companies to share data with other flood risk authorities.

#### Surrey County Council

##### Emergency Management

Emergency Management Team / Surrey Local Resilience Forum (SLRF) are Category 1 responders (Civil Contingencies Act 2004).

### Surrey County Council Highways

SCC, as LLFA, has flood risk management functions which include (but are not limited to); the provision of a Local Flood Risk Management Strategy (LFRMS – see ref. <sup>5</sup>), designation and maintenance of a register of structures or features that have a significant effect on flood risk, consenting and enforcement works on Ordinary Watercourses, undertaking works to mitigate surface water and groundwater flooding and undertaking Section 19 investigations. SCC also has responsibilities as a Highway Authority and as an Emergency Responder (under the Land Drainage Act 1991 and the Civil Contingencies Act 2004 respectively) which may relate to flooding. Highway Authorities are responsible for providing and managing highway drainage which may include provision of roadside drains and ditches, and must ensure that road projects do not increase flood risk.

The Highway Authority has a duty under the Highways Act (1980) to maintain highways that are maintainable at public expense. This includes a duty to maintain existing highways drainage. The Highway Authority also has powers to improve drainage systems but no duty to do so.

#### *Highway Drainage Maintenance:*

It is the Council's policy that roadside gullies are subject to routine maintenance. The frequency of cleaning is dependent on their categorisation of risk. The level of risk is determined by a number of factors such as location and the amount of silt present at each clean.

Highway drainage systems are designed to take only water from the road surface and not run-off from the surrounding land. These systems are currently designed to take the highway surface water for a 1 in 5 (20%) annual chance rain event (see ref. <sup>6</sup>). Highway drainage systems do not have the capacity to take the surface water resulting from an extreme flash flood or another event when rainfall volumes are higher. In these events even a drainage system operating at full capacity can be overwhelmed resulting in surcharging and flooding until the water can get into the network.

### **Tandridge District Council**

District and Borough Councils can carry out flood risk management works on minor watercourses, working with the LLFA. Through the planning process they control development in their area, ensuring that flood risks are effectively managed. If they cover part of the coast, then District, Borough and Unitary councils also act as coastal erosion risk management authorities.

The Council will help where it can as a category 1 responder by:

- Providing sandbags to residents and businesses where property is at risk of flooding
- Supporting Emergency Services on request by providing an Incident Liaison Officer
- Providing emergency accommodation – i.e. set up rest centre as required and other welfare provision
- Assisting with arranging transport or evacuation area.
- Participating in a Vulnerable People Search
- Assisting with co-ordination of recovery

### **Croydon Council**

CC is the Lead Local Flood Authority for the LBC and has the same responsibilities as SCC for its area, namely:

- A duty under Section 19 of the Flood and Water Management Act 2010, to investigate a flooding when it is considered necessary or appropriate to do so.
- Responsible for maintenance of the Highway drainage.

### **All RMAs**

All RMAs under the Flood and Water Management Act (2010) have a responsibility to cooperate and coordinate with regards to their flood risk management functions, including raising awareness of flood risk and the sharing of information.

Landowners also have riparian responsibilities under the Flood and Water Management Act (2010) to maintain and undertake any necessary works on assets on their land (with consent from the relevant RMA) which may have an effect on flood risk including watercourses and drainage assets.

Information regarding responsibilities on flood risk and water flow responsibilities is described in the “Living on the Edge”<sup>7</sup> EA publication. Responsibilities include:

- “You must let water flow through your land without any obstruction, pollution or diversion which affects the rights of others.”
- “You must accept flood flows through your land, even if these are caused by inadequate capacity downstream.”

## **4.2. Severe Weather Warnings pre-incident**

The severe weather group of the Surrey Local Resilience Forum (Category 1 responders in Surrey) carried out a teleconference the day before the event following Met Office warnings of severe weather forecast for the Surrey Area. A yellow rain alert was issued indicating isolated heavy showers and thunderstorms in SE England. The warning indicated that prolonged rainfall from several showers over a short period of time could lead to surface water flooding. The warnings were not location specific and covered the whole of SE England. This Surrey Local Resilience Forum meeting included category 1 responders including SCC Emergency Management.

## **4.3. Incident Response**

The emergency services started to receive phone calls from the public in Caterham on the Hill regarding the severity of the flash flooding in the early afternoon. Blue light category 1 responders (Civil Contingencies Act 2004) reacted to the evolving incident and contacted SCC and TDC emergency management.

The following section outlines the response carried out by each of the RMAs.

### **Environment Agency**

The EA response to the incident was focused on fluvial flooding in the area including critical watercourses. There were no EA operational response staff deployed to Caterham on the Hill as the area is a surface water catchment. The Caterham on the Hill area is not in a fluvial flood alert/warning area.

## Surrey Local Resilience Forum

Blue light services attended the flooded area. Surrey Fire and Rescue Service (SFRS) and Police were called out by residents and contacted both SCC and TDC emergency management. Blue light service response details are outlined in the RMA section below.

## Surrey County Council

### Emergency Management

The Surrey Contact Centre received calls from residents and other agencies during the flood event. An emergency meeting took place at TDC early on into the incident which included the Chief Executive of TDC. This meeting allowed an assessment of the developing situation and provided actions for blue light responders and RMA staff; this included the request for the setup of a rest centre. Adult Social Care were included in the meeting and were able to prioritise response to key locations in Caterham on the Hill during the incident. Adult Social Care together with TDC carried out a vulnerable people search.

### Surrey Highways

The Surrey Highways Duty Manager was contacted by Emergency Management early afternoon. The duty manager informed highways emergency crews from SCC contractors Kier and Conways to attend specific enquires. 11 emergency actions were carried out on the 7<sup>th</sup> June which included an emergency road closure of Ninehams Road. There were 13 Conway tankers in the Caterham area which were co-ordinated by SCC Highways and TDC.

## Tandridge District Council

TDC were made aware of the severity of the flooding at an early stage of the incident. Key actions carried out by Tandridge during the response included:

- Emergency management meeting at TDC with the Chief Executive to assess the developing incident and plan response.
- Parks and Open Spaces manager informed TDC Corporate Management Team that a nursing home in Queens Park Road was flooded.
- Tandridge responded to resident calls for sandbags. Deployment of sandbags was difficult in places due to traffic grid-lock.
- TDC worked with SCC to carry out vulnerable people search and worked with Adult Social Care to assess level of high need clients.
- Douglas Brunton Centre was put on standby to set up a rest centre.
- TDC was involved in Surrey Local Resilience Forum incident meeting/teleconferences during the day.
- It was noted that during the height of the incident the mobile phone network in the area was unavailable for part of the afternoon which led to issues with communications.

A more detailed timeline of events and actions carried out during the day are listed in **Appendix 3**.

## Thames Water

The main focus during the event was on maintaining customer services, protecting assets vital for the ongoing delivery of service and on ensuring that where there was disruption, normal service was able to resume as soon as possible. The following lists the main actions carried out:



- On the 7th June 2016 the first call from the area was from Station Ave CR3 6 at 14.33; this was following the start of very heavy rainfall in the area. The report was for internal sewer flooding.
- Following this call TW attended a range of locations across the area mostly contained within the CR3 5 and CR3 6 postcode areas. These calls related to flooding from either the surface water system or the foul sewer network.
- Some significant surface water flooding was also attended to by TW staff in Caterham Drive CR3 1, which is in the LBC's part of the catchment.
- Approximately 40 calls were received on the 7th June with a further 40 on the 8th June. Tankers were supplied to pump away flood and foul water and generally support customers and local residents.
- Main sewer routes were inspected to understand where incapacities in the system were located.

TW initial investigations in the area concluded that the sewer network in the area became overloaded due to the very significant surface water that was present across the area. This surface water caused the sewer system to hydraulically overload. In some locations the surface water flooding was in excess of 900mm deep.

### **Croydon Council**

On the 7 June 2016, the Croydon Technical Support Team started receiving telephone calls and emails from residents in the Coulsdon area. CC contractor (Kier) deployed the gully cleansing crew to assist by removing standing water and clearing nearby gullies that may have been blocked. Due to the volume of enquiries that were received on 7<sup>th</sup> June, the crew were not able to attend Caterham Drive until 8<sup>th</sup> June at 13.25. When they arrived on site "Lanes for Drains" (TW contractor) was already in attendance as the flooding was reported to relate to TW drainage assets. The Croydon crew left site after five minutes as TW were in attendance.

## **4.4. RMA response to flooding - recovery**

The recovery phase following the incident started on the 8<sup>th</sup> June. Multi-agency response including category 1 responders and emergency services changed to RMA agency staff responsible for supporting residents and prioritising help. Resources from both SCC and TDC jointly prioritised clean-up operations, identification of vulnerable people and community support. The following section lists the actions taken by the RMAs during the recovery phase.

### **Environment Agency**

The EA supported community engagement in the recovery phase by attending meetings and supplying weather information. They supported both National Flood Forum meetings.

### **Thames Water**

During the recovery phase TW provided customer assistance in providing a basic clean up service either internally or externally as required to customer properties. All TW main sewer assets were inspected throughout the catchment via CCTV and have found no defects. TW provided support at the National Flood Forum trailer. TW have attended the first Section 19 meeting and intend to be an active party in any future meetings or working groups.

## **Croydon Council**

Council Officers and Local Ward Councillors have met with affected residents of Caterham Drive and have taken eye witness accounts of the flooding and damage as well as accounts of similar historical events experienced by residents. They are in the process of appointing a consultant to carry out a flood investigation under Section 19 of the Flood & Water Management Act 2010. The investigation commenced in August 2016 and a first draft report will be available for comments by the end of October 2016.

CC are inspecting/cleaning and CCTV surveying all of the gullies, soakaways and connecting pipes in Caterham Drive to ensure they are fully operational, and carrying out remedial works where defects have been identified. So far, two collapsed gully outlets have been identified but it is not believed these had any contribution to the flooding.

A meeting was held with Thames Water to understand how they had investigated the sewers in the area of Caterham Drive as residents reported that the sewers were surcharging in the road and foul sewage entered their properties. They have concluded that the sewers have significant capacity and surface water has entered the foul sewer during the flood event. A previously unrecorded sewer has been discovered connecting Sites Hill Road in Tandridge to Caterham Drive crossing Coulsdon Common. This may be carrying significant extra flow to Caterham Drive from Caterham.

The next day after the water had subsided the Council received a request from a resident in Caterham Drive regarding road cleaning. A road sweeper was deployed to clear up debris that was washed onto the road and driveway of those that were affected. A gully sucker was also requested and deployed to clean out the roadside gullies. Sandbags were delivered to the residents of affected properties in Caterham Drive to help with any further flooding.

## **Surrey County Council**

### Emergency Management

Emergency Management staff attended the National Flood Forum meetings that were held on the 13<sup>th</sup> and 28<sup>th</sup> June. Emergency Management also worked with TDC regarding the supply of skips for house cleaning.

Emergency Management arranged several teleconference communication meetings following the incident in order to update partners on the recovery process and to ensure actions had been carried out.

Emergency Management facilitated a debrief meeting with partners on 20<sup>th</sup> July 2016 to review response and recovery actions. Many of the recommendations form part of section 5 of this report.

### SCC Highways

The Local Highways team, emergency response (Kier) and Strategic Network Resilience team identified areas for gulley cleaning and road repairs. This was in addition to flood enquiry requests made by residents following phone calls and information gathered from the public meetings. The key actions carried out were:

- SCC organised the deployment of the National Flood Forum for meeting on 13<sup>th</sup> June and 28<sup>th</sup> June.
- Local Highways and Strategic Network Resilience staff attended the Parish Meeting held in the Hillcroft Primary School on Wednesday 13<sup>th</sup> July.

- Over 40 roads/road sections were identified as being affected by the flooding. These roads were prioritised for gully cleaning. Local Highways together with Kier planned recovery phase gully jetting. 38 roads had their gullies cleaned. Court Road and Park Road were not cleaned during this recovery period due to parked cars.
- During the gully cleaning operation, park cars hindered cleaning operations.
- Local Highways responded to resident enquires.
- Local Highways worked with TW on damaged road sections in the area including a soakaway surcharge that damaged the road surface in Seymour Avenue.

## National Flood Forum

The National Flood Forum, at the request of Surrey County Council, organised a flood surgery meeting on Monday 13<sup>th</sup> June. This was held at the Douglas Brunton Centre. The National Flood Forum were supported by representatives from SCC (Highways and Emergency Management), SFRS, TDC, Thames Water and the Environment Agency. The meeting started at 12.00 and finished at 20.00. Councillors from SCC, TDC and CC attended.

Another meeting took place on 28th June at Caterham Hill Library and was supported by the RMAs listed above. The National Flood Forum provided advice on flood insurance.

The National Flood Forum are engaged with the residents and have facilitated the development of a flood action group.

## Tandridge District Council

TDC carried out several functions during the recovery phase.

- Bulky Waste collections: Sandbags were delivered to affected homes and special bulky waste collections provided to remove flood damaged furniture and rubbish. At least 21 collections were made but some properties were visited on more than one occasion.
- Additional Street Cleaning: The street sweeping team carried out additional street cleaning to remove debris from roads/alleyways to 13 roads.
- Three skips were arranged with SCC for residents who had no insurance or were struggling to remove larger items.
- On the 13th July 2016 TDC Chief Executive attended the Caterham on the Hill Parish Council meeting.
- TDC attended a meeting for residents of Hillcroft Court, Chaldon Road (and their families) on 28th July 2016. The meeting was to provide information on Council Tax discounts and additional information on how the Council could assist the 18 properties that had been impacted.
- Resident Call-backs: Approximately 70 residents contacted the Council directly to ask for assistance. This comprised of requests for sandbags, help with bulky waste collection, Council Tax enquires or flood prevention advice. The majority of requests were actioned in the first contact and approximately 27 residents were called back or emailed to find out if any further assistance could be given.
- Emergency Parking Order: TDC organised with SCC for an Emergency Parking Order to be put in place in Park Road to enable contractors to park outside impacted properties, which allowed the clean-up work to take place.
- Press releases: press release issued to Councillors, parishes, media, posted on website, twitter, Streetlife, newsdirect. For a detailed list of communications please see **Appendix 3**.
- Council Tax discounts: TDC offered Council Tax discounts to those households that had been displaced.

## 4.5. Ongoing Work

There is an ongoing multi-agency investigation into the effect of flooding on the whole Caterham on the Hill catchment including the cross administration boundary area in LBC. A multi-agency meeting took place on 18<sup>th</sup> July in the TDC offices and was used to collate RMA responses to the incident and during the recovery phase. Ongoing investigation and surveying in the catchment is being carried out based on flood enquiries and FOI requests from the public. A multi-agency infrastructure and works steering group has been setup to monitor and report on work progress carried out by the joint agencies including SCC, TDC, CC, TW and LBC.

The government published a report<sup>6</sup> on 8<sup>th</sup> September 2016 entitled “National Flood Resilience Review” which looks at flood resilience in light of the recent flooding that has occurred over the last two years. The report includes a review on how to improve the resilience of local infrastructure (Chapter 4<sup>6</sup>). The multi-agencies in Surrey are looking at the resilience of the drainage infrastructure in this area.

### Thames Water

TW are currently working with the lead local flood authorities in Surrey and Croydon and await the publication of the Section 19 documents to understand the recommendations and any Thames Water actions.

They are reviewing their sewer network in the area to further understand how they could reduce the impact of heavy rain and surface water is having on the network.

### Croydon Council

CC intend to engage in a partnership project with TW and SCC to address the wider drainage problems in the area. This should include identifying illegal / legal connections of surface water to the sewer and identifying opportunities for open space sustainable drainage (SuDS) in the parkland areas.

### Surrey County Council

#### Surrey Highways

- To carry out joint investigation of the piped watercourse / surface water sewer including ownership and maintenance.
- Multi agency investigation into the infrastructure in the Caterham on the Hill catchment
- At the time of this Section 19 publication, the Money-Pit has been surveyed and maintenance work is being carried out.
- The outcome of the multi-agency investigation will be reported to the local committee and flood action group.

## 5. Findings

The Section 19 report for this flood event outlines the incident response and subsequent recovery phase actions carried out by the RMAs.

The storm event that traversed east across SE England on June 7<sup>th</sup>, 2016 caused localised surface water flooding. One of these localised downpour events, over a period of 2 hours, caused flash flooding along the piped watercourse/surface water sewer in Caterham on the Hill, Caterham Valley, Whyteleafe and Croydon. Over 86 internal property floods occurred in the Caterham on the Hill catchment. There were 63 external property floods. There were seven road closures in the Caterham area with 40 roads affected.

### 5.1. Incident Response

- Multi-agency emergency management meetings were setup quickly and allowed assessment of the evolving situation and prioritisation of staff deployment to vulnerable locations.
- SCC Adult Social Care officers located at the TDC offices were able to attend the incident.
- TDC and SCC officers were onsite quickly.
- Evacuations of vulnerable people were carried by TDC and SCC staff.
- Roads closed by Police and SCC Highways.
- Five schools were closed.

### 5.2. Recommendations

The following recommendations will be monitored on progress at the local members committee and the flood action group.

#### Incident Response

- 5.2.1. Surrey Highways Duty Manager to be included on the Surrey Local Resilience Forum severe weather teleconference if this is not current protocol.
- 5.2.2. SCC to clarify Highways Duty Managers role and Strategic Network Resilience role during a flood incident.
- 5.2.3. For the RMAs to work with residents and parish councils to identify vulnerable people and properties at risk of flooding and develop a community resilience plan.

#### Recovery phase

- 5.2.4. For RMAs to review and update where necessary response and recovery emergency plans.
- 5.2.5. SCC Highways to internally clarify the reactive maintenance response following an incident of this magnitude.
- 5.2.6. RMAs to examine ways of coordinated maintenance following a flood event.

#### Drainage network investigation

- 5.2.7. At the time of this report, there are continuing works on the Money Pit structure including an extensive survey and maintenance. Details on completed works will be made available to the Flood Action Group and local members.
- 5.2.8. SCC, TDC and TW to investigate the ownership of the piped watercourse/surface water sewer network connections in-order to clarify maintenance responsibilities.
- 5.2.9. Relevant RMAs to submit a Grant in Aid mandate for works.

**5.2.10.** SCC to work together with TDC, CC and TW to form a multi-agency group to:

- 5.2.11.** Review and expand the recommendations of the Caterham on the Hill Surface Water Management Study<sup>4</sup> with an aim to continue the options appraisal to mitigate flooding.
- 5.2.12.** To investigate sewer connections to the surface water network and to review options to reduce internal sewer flooding.
- 5.2.13.** To arrange a multi-agency meeting to review the infrastructure in the Caterham on the Hill catchment.
- 5.2.14.** To identify funding opportunities to contribute to future feasible schemes.

## **Resident Engagement**

- 5.2.15.** For residents to work with the National Flood Forum to create a Flood Action Group in the Caterham on the Hill area to address areas of ongoing concern and develop resilience for those properties at risk of flooding. This Flood Action Group will be the conduit for the RMAs to communicate to the residents and for the residents to monitor progress on specific issues.

## 6.Acknowledgements

- The residents and Councillors of Caterham on the Hill, Caterham, Whyteleafe and Croydon for providing information.
- Environment Agency for supplying Radar data, weather situation reports.
- National Flood Forum for setup of recovery phase resident engagement.
- All RMAs for attending National Flood Forum meetings.
- All RMAs for input into this report.



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[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/454562/LIT\\_7114.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/454562/LIT_7114.pdf)
8. Government paper: “National Flood Resilience Review”, 8<sup>th</sup> September, 2016.  
<https://www.gov.uk/government/publications/national-flood-resilience-review>

# Appendix 1

## Glossary

The table below defines some of the frequently used terminology within the flood risk management industry and within this document.

Acronym/Term	Definition
AMAX	Annual Maximum Flow Series- a series of the maximum river flows each year for use in hydrological estimations.
Annual Probability	Throughout this document, flood events are defined according to their likelihood of occurrence. The term 'annual probability of flooding' is used, meaning the chance of a particular flood occurring in any one year. This can be expressed as a percentage. For example, a flood with an annual probability of 1 in 100 can also be referred to as a flood with a 1% annual probability. This means that every year there is a 1% chance that this magnitude flood could occur.
AOD	Above ordnance datum.
DTM	Digital Terrain Model: computer model of "bare earth" terrain surface with surface features such as trees and houses removed.
EA	Environment Agency
FAS	Flood Alleviation Scheme.
Flooding Asset Register	The register is a record of all structures or features designated by the Environment Agency, the Lead Local Flood Authority, the district and borough councils or the Internal Drainage Board which have an effect on flood risk. More information on the Flooding Asset Register can be found on Surrey County Council's <a href="#">website</a> and in Schedule 2 of the Flood and Water Management Act (2010).
Flood Risk Management Function	A flood risk management function is a function listed in the Act (or related Acts) which may be exercised by a risk management authority for a purpose connected with flood risk management.
Very Low Flood Risk	Area with a very low probability of flooding from rivers (< 1 in 1,000 annual chance of flooding or <0.1%).
Low Flood Risk	Area with a low probability of flooding from rivers (between a 1 in 1000 and 1 in 100 annual chance of flooding or between 0.1% and 1%)
Medium Flood Risk	Area with a medium probability of flooding from rivers (between a 1 in 100 and 1 in 30 annual chance of flooding or between 1% and 3.33%).
High Flood Risk	Area with a high probability of flooding from rivers (> 1 in 30 annual chance of flooding or greater than 3.3%).
LiDAR	Light Detection and Ranging is a surveying method that measures terrain height.
LLFA	Lead Local Flood Authority
Main River	Main Rivers are usually larger streams and rivers, but some of them are smaller watercourses of local significance. Main Rivers indicate those watercourses for which the Environment Agency is the relevant risk management authority.
Ordinary Watercourse	Ordinary Watercourses are displayed in the mapping as the detailed river network. An Ordinary Watercourse is any watercourse (excluding public sewers) that is not a Main River, and the Lead Local Flood Authority, District/Borough Council or Internal Drainage Board are the relevant risk management authority.
RMA	Risk Management Authority
SCC	Surrey County Council
SLRF	Surrey's Local Resilience Forum is a multi-agency partnership made up of representatives from local public services, including the Emergency Services, Local Authorities, NHS England and the Environment Agency, which are all Category 1 responders under the Civil Contingencies Act 2004.
CC	Croydon Council
TDC	Tandridge District Council
TW	Thames Water

## Sources of Flooding

The source of the flooding is predominantly pluvial resulting from high rainfall from the storm event. The duration of the flooding indicates that it was mainly a surface water flood through the catchment, however groundwater cannot be totally ruled out. There is no evidence of groundwater contribution to the flooding event.

Source	Description
Surface water flooding	Intense rainfall exceeds the available infiltration capacity and / or the drainage capacity leading to overland flows and surface water flooding. Climate change is expected to increase the risk of surface water flooding in the future. This source is also referred to as pluvial flooding.
Groundwater flooding	Emergence of groundwater at the surface (and subsequent overland flows) or into subsurface voids as a result of abnormally high groundwater flows, the introduction of an obstruction to groundwater flow and / or the rebound of previously depressed groundwater levels.
Sewer flooding	Flooding from sewers is caused by the exceeding of sewer capacity and/or a blockage in the sewer network. In areas with a combined sewer network system there is a risk that land and infrastructure could be flooded with contaminated water. In cases where a separate sewer network is in place, sites are not sensitive to flooding from the foul sewer system.

## Flood Risk Data Sources

The following sources of data have been used in preparing this report:

- Fluvial Flood Risk
  - Risk Mapping (Risk of Flooding from Rivers and Sea; EA)
- Surface Water Flood Risk
  - Risk of Flooding from Surface Water (EA)
- Groundwater
  - Susceptibility to Groundwater Flooding (British Geological Survey)
- Historic Flood Evidence
  - Historic Flood Map (EA)
  - Wetspots (SCC)
  - Property Flooding Database (SCC)
  - Historic Flooding Incidents Database (SCC)

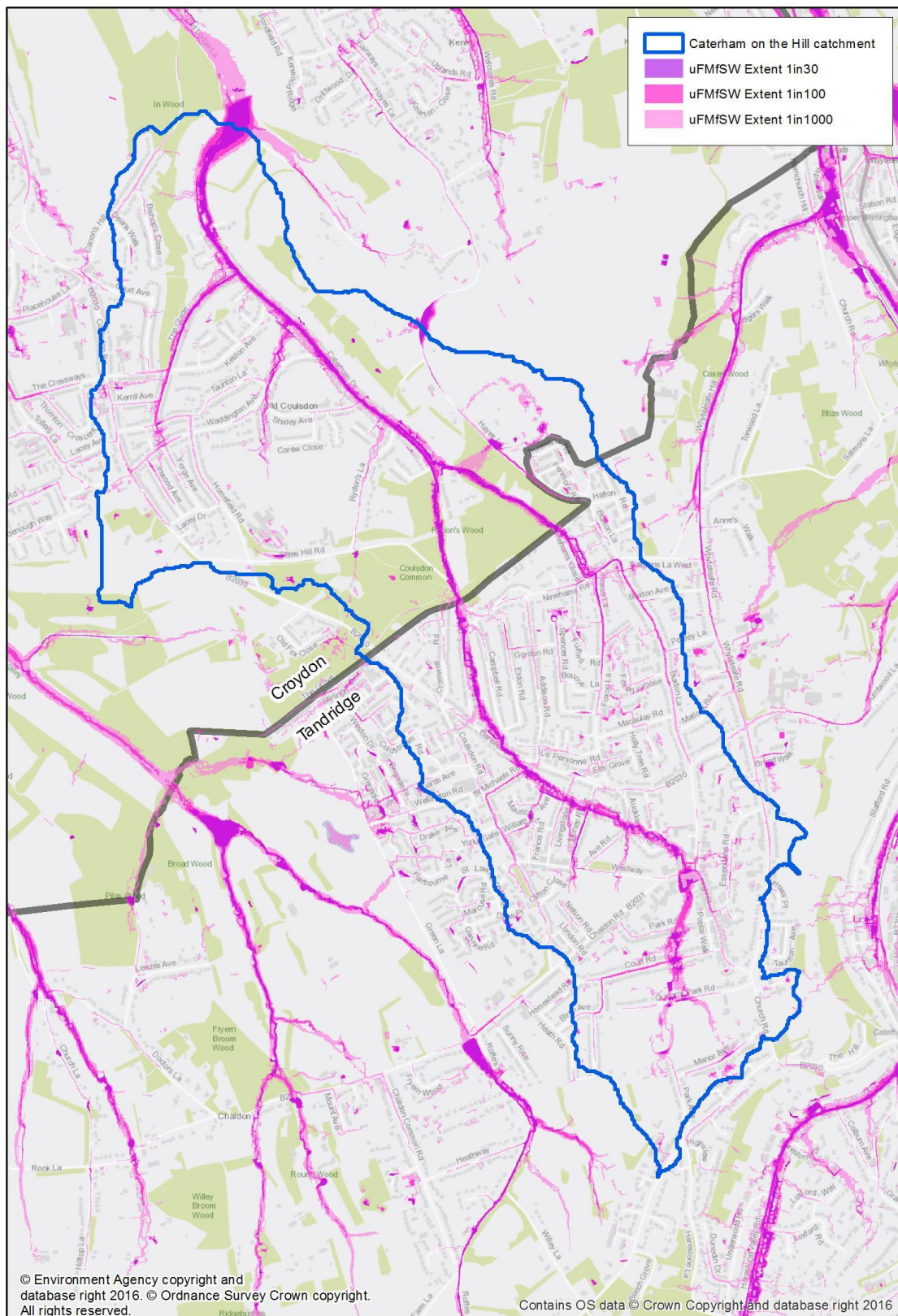
If you are aware of any historical flooding in the area which is not highlighted on the mapping please report it, with any evidence you have (for example photos or videos), to [flooding.enquiries@surreycc.gov.uk](mailto:flooding.enquiries@surreycc.gov.uk).

## Other data sources

The following sources of data have been used in preparing this report and its associated mapping:

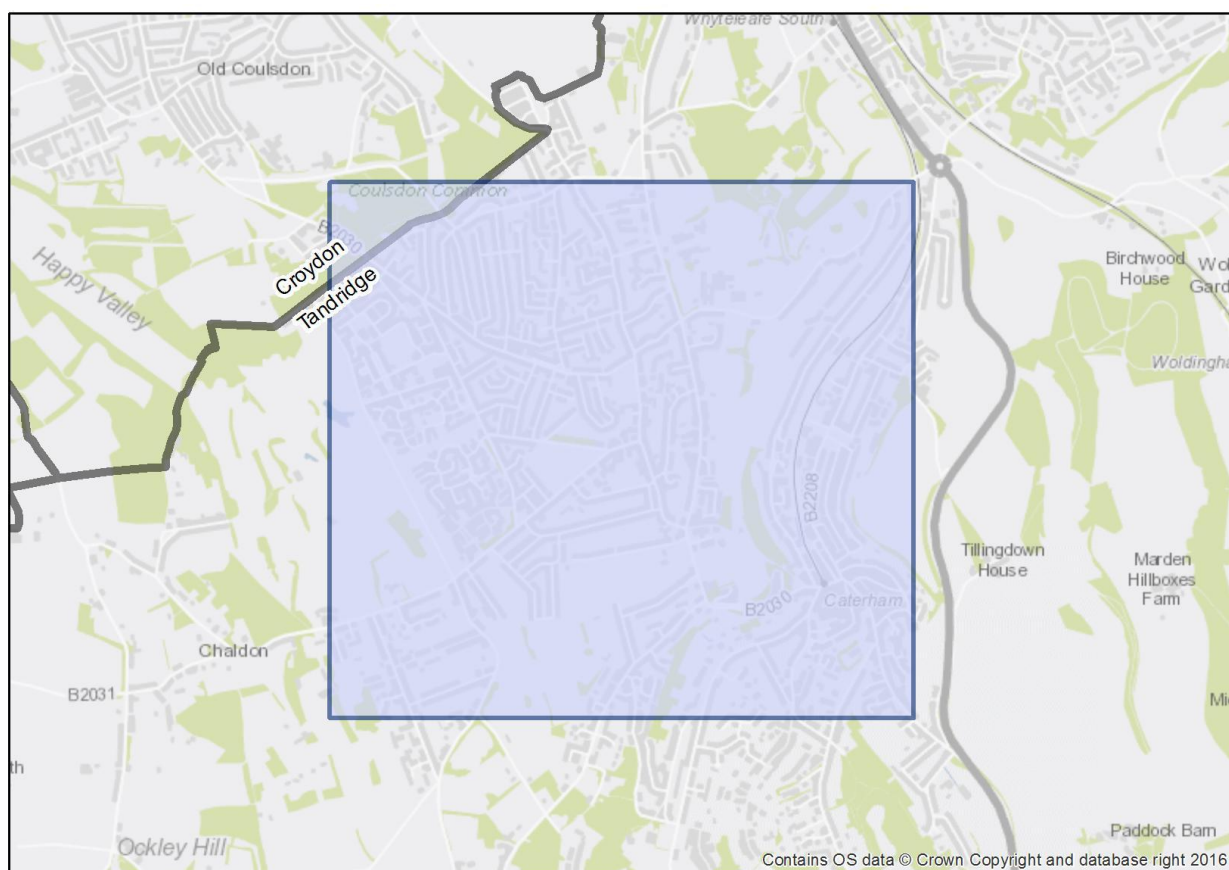
- RMA collated information on property flood information
- MetOffice / EA reports / data on the rainfall event.

## Appendix 2

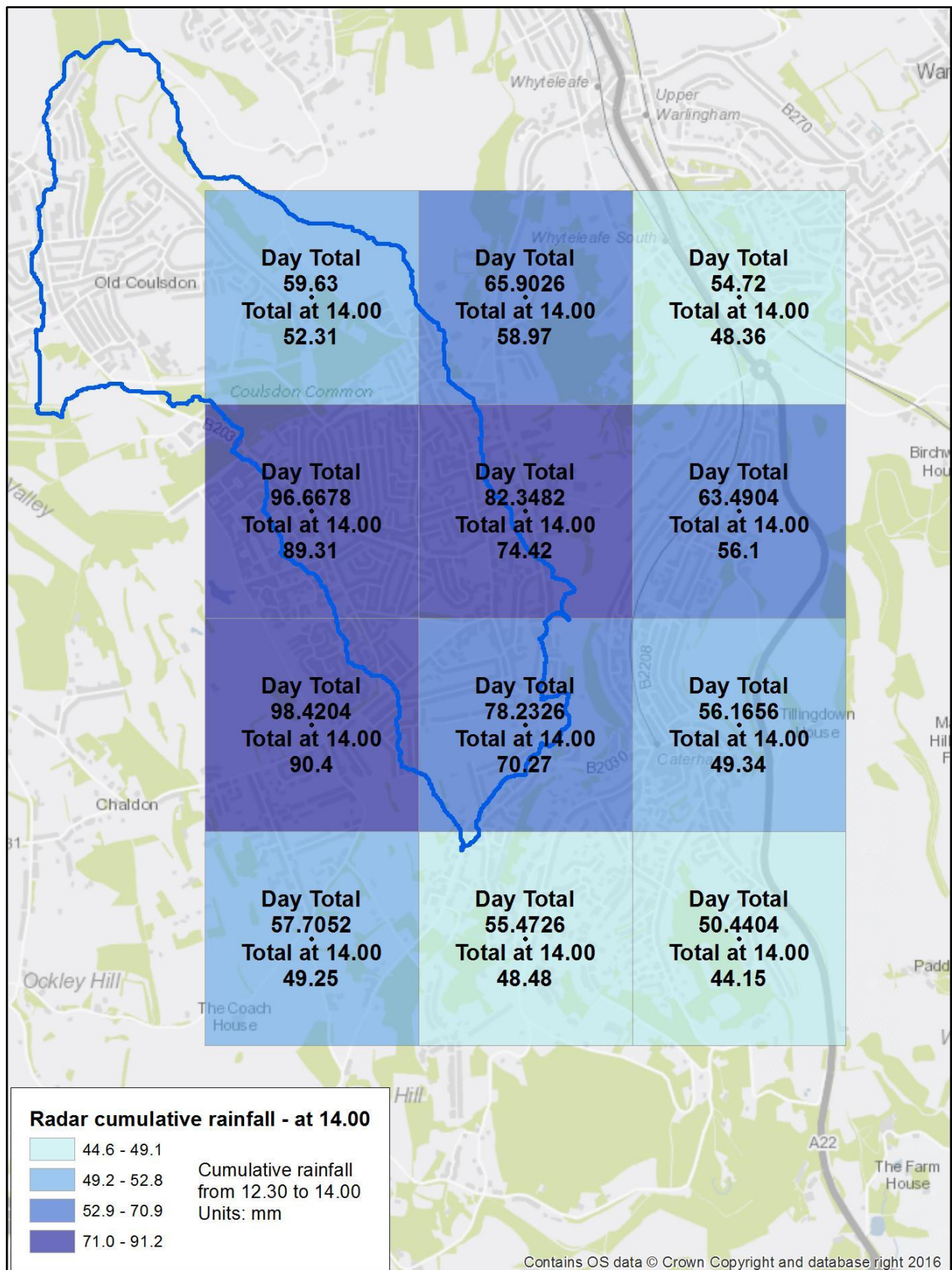


**Figure 5. Map showing modelled Risk of Flooding from Surface Water extents (data currency: May 2016) for the Caterham on the Hill catchment.**





**Figure 6. Map showing the extent of the radar rainfall data used to generate the rainfall total graph in Figure 3.**



**Figure 7. Map showing the radar observed rainfall totals for the Caterham area on 7<sup>th</sup> June. The blue colour coding of the 1km<sup>2</sup> radar data shows the rainfall cumulative total from 12.30 to 14.00. This shows localised rainfall variation across the catchment (care must be taken in interpreting individual radar pixel values). The upper label for each 1km<sup>2</sup> square shows the day total cumulative rainfall. The lower value shows the cumulative rainfall total from 12.30 to 14.00. Data supplied by the Environment Agency.**

## Appendix 3

This section includes supporting detail to the Response and Recovery section.

### Response

Table 1. Timeline of events on the 7<sup>th</sup> June with details on TDC and SCC responses.

Time	RMA involved	Response
7 <sup>th</sup> June		
15.07	SFRA, TDC, SCC EMT	SFRS made a call to Surrey EMT to report flooded properties in Caterham. Surrey EMT called TDC to make them aware and request a check on an elderly resident in Coulsdon Road.
15.10	TDC	Parks and Open Spaces manager informed TDC Corporate Management Team that a nursing home in Queens Park Road (Coombe Dingle nursing Home) had been flooded and that Queens Park was flooded.
15.30	TDC	Calls from residents received into TDC to request sandbags.
15.41	TDC	Incident Liaison Officer deployed to Queens Park to assess the damage and liaise with the Emergency Services. This included a site visit to Coombe Dingle Nursing home and Hillcroft Court sheltered accommodation. Seven roads were closed (see below) and flooding on neighbouring roads resulted in difficult driving conditions. The conditions impacted on the delivery of sandbags. <ul style="list-style-type: none"> <li>• Croydon Road</li> <li>• Buxton Lane</li> <li>• Brigade Place</li> <li>• Queens Park Road</li> <li>• Court Road</li> <li>• Ninehams Road</li> <li>• Timberhill Road</li> </ul>
15.45	TDC / SCC	TDC worked with SCC to carry out Vulnerable people Search and worked with Adult Social care to assess level of high needs clients.
15.50	TDC / EMT	Douglas Brunton Centre was put on standby to set up a rest centre – Which was later stood down at 9pm.
	Highways (Kier / Conways)	13 tankers in Caterham on the Hill
17.30	SLRF, RMAs	TDC participated in SLRF teleconference
17.30	TDC	Chief Housing Officer & Chief Community Services Officer attended Hillcroft Court to help with the coordination of residents
20.45	TDC	Out of hours duty officer received notification of a sink hole in Raglan Precinct. The officer made the area safe and contacted the Property Management Company. Two further sink holes were later established at Town end – Car Park and York Gate, which were investigated by TDC Officers.
21.00	TDC	Handover given to Out of hours on call Officers.
21.00	TDC	Rest Centre at Douglas Brunton Centre was stood down.
8 <sup>th</sup> June		



8.15	SLRF, TDC	TDC participated in SLRF teleconference
9.00	TDC	TDC Meals on Wheels van was put on standby to assist with provision of meals for displaced residents.
	TDC	TDC drafted and then released a press release Flood recovery advice was posted on TDC's website.

## Recovery

This section contains details on the RMAs response during the recovery phase. SCC EMT arranged several teleconferences following the incident in order to update SCC and TDC officers on recovery phase works and actions. Table 2 shows

Table 2. Main recovery phase meeting and actions.

Date / Time	RMA involved	Response
13/06/2016	NFF, SCC Highways, SCC EMT, SFRS, SCC Community Resilience, TDC, TW, EA,	National Flood Forum meeting at the Douglas Brunton Centre, Caterham on the Hill. Risk Management Authorities attended the meeting.
14/06/2016	Highways	Surrey Highways Area Teams supported by Strategic Network Resilience team to plan gully cleaning in roads affected.
13/07/2016	Parish Meeting	RMAs answered questions from residents.
28/07/2016	NFF, SCC Highways, SCC EMT, SFRS, SCC Community Resilience, TDC, TW, EA,	National Flood Forum meeting at Caterham on the Hill Library. Risk Management Authorities attended the meeting.

## Tandridge

Tandridge District Council carried out several functions during the recovery phase.

### Bulky Waste collections

Sandbags were delivered to affected homes and special bulky waste collections provided to remove flood damaged furniture and rubbish. At least 21 collections were made but some properties were visited on more than one occasion.

### Additional Street Cleaning

The street sweeping team carried out additional street cleaning to remove debris from roads /alleyways this included :-

- Whyteleafe Hill
- Hillbury Rd Wyhteleafe
- Hillside Rd Wyhteleafe
- Waller Lane Caterham Valley
- Ninehams Rd Caterham On The Hill
- Banstead Rd Caterham On The Hill
- Chaldon Rd Caterham On The Hill
- Church Hill Caterham Valley
- Tillingdown Hill Caterham Valley

- Whitehill
- Spring Bottom Lane
- Outwood Lane Bletchingley
- Titsey Hill

Skips (two on Banstead Road and one on Court Road) were arranged with SCC for residents who had no insurance or were struggling to remove larger items.

Two National Flood Forum surgeries took place on 13th and 28th June at the Douglas Brunton Centre and Caterham Hill Library. Flood Forum staff were joined by TDC / SCC Members and Officers, together with representatives from the Environment Agency and Thames Water. 13th July 2016, TDC Chief Executive attended the Caterham on the Hill Parish Council meeting.

TDC attended a meeting for residents of Hillcroft Court, Chaldon Road (and their families) on 28th July 2016. The meeting was to provide information on Council tax discounts and additional information on how the Council could assist the 18 properties which had been impacted.

#### Resident Call-backs

Approximately 70 residents contacted the Council directly to ask for assistance. This comprised of requests for sandbags, help with bulky waste collection, Council Tax enquires or flood prevention advice.

The majority of requests were actioned in the first contact and approx. 27 residents were called back or emailed to find out if any further assistance could be given.

#### Emergency Parking Order

TDC Organised with SCC for an Emergency Parking Order to be put in place in Park Road to enable contractors to park outside impacted properties.

#### Press releases

- 8 June – press release issued to Councillors, parishes, media, posted on website, twitter, Streetlife, newsdirect.
- 10 June - flood forum surgery (13 June 12-7pm) promoted and information circulate to the above contacts and posted online.
- 24 June – flood forum surgery (28 June 3-6pm) promoted and information circulate to the above contacts and posted online.
- 1 July – press release issued as above.
- 12 July – press release re council tax exemption extended issued to the above Various press enquiries from BBC Surrey and Surrey Mirror responded to, radio interview on BBC 22 June re council tax exemptions.
- Leaflet produced on Council tax schemes, flood recover and useful contacts, handed out at Flood forum on 24 June.

#### Council Tax discounts

TDC offered Council Tax discounts to those households who had been displaced.