Section 19 Flood Investigation Report: Tandridge

28 October 2015

Section 19 Report

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.

The report investigates which risk management authorities (RMAs) had relevant flood risk management functions during the flooding that took place in the winter of 2013/14. The report also considers whether the relevant RMAs have exercised, or propose to exercise, their flood risk management functions. 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.

Location Name	**Tandridge;** Burstow, Caterham, Felbridge, Godstone & Blindley Heath, Horne, Limpsfield & Oxted, Lingfield, Nutfield, Outwood, Smallfield, Warlingham
Date(s) of Incidents	Winter 2013/14
Section 19 Trigger(s)	Internal property flooding at multiple addresses Road closures

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.
EA	Environment Agency
FEH	Flooding Estimation Handbook
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 website and in Schedule 2 of the Flood and Water Management Act (2010).
FEH	Flood Estimation Handbook – by Centre for Ecology & Hydrology offering guidance on rainfall and river flood frequency estimation in the UK.
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%).
IDB	Internal Drainage Board
Instances of property flooding	This is a count of the reported incidents of internal property flooding that occurred across Winter 2013/2014. This means that properties which were flooded twice are accounted for twice. It is therefore not a count of the number of properties.
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 is the relevant risk management authority.
SCG	Strategic Command Group
RMA	Risk Management Authority
SCC	Surrey County Council
TDC	Tandridge District Council
TW	Thames Water
SWS	Southern Water Services
uFMfSW	Updated Flood Maps for Surface Water

Sources of Flooding

The following report considers the flooding which occurred in the winter of 2013/14. The table below describes different sources of flood risk.

Source	Description
Fluvial flooding	Exceeding of the flow capacity of river channels (whether this is a Main River or an Ordinary Watercourse), leading to overtopping of the river banks and inundation of the surrounding land. Climate change is expected to increase the risk of fluvial flooding in the future.
Tidal flooding	Propagation of high tides and storm surges up tidal river channels, leading to overtopping of the river banks and inundation of the surrounding land.
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.
Other sources of flood risk	Flooding from canals, reservoirs (breach or overtopping) and failure of flood defences.

Flood Risk Data Sources

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

- Fluvial Flood Risk
  - Risk Mapping (Risk of Flooding from Rivers and Sea; EA)
  - Flood Warning and Alert areas (EA)
- Surface Water Flood Risk
  - Updated Flood Maps for Surface Water (uFMfSW) (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.

Other Data Sources

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

- Geological information
  - Superficial geology (Geology of Britain Viewer; British Geological Survey)
  - Bedrock geology (Geology of Britain Viewer; British Geological Survey)

Contents

1. Executive Summary

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 within the boundary of Tandridge District Council (TDC) in the winter of 2013/14. The report also considers 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 flooding in Tandridge was a combination of fluvial, surface water, groundwater and sewer flooding. This was caused by unprecedented rainfall during the winter 2013/14 period (275% compared with an average winter). There were approximately 180 incidents of internal property flooding in Tandridge during winter 2013/14.

The flooding experienced from the Caterham Bourne in Woldingham and Whyteleafe has been covered in more detail in a separate S19 report.

The Environment Agency (EA) is the lead RMA for incidents of fluvial flooding from Main Rivers, and Thames Water (TW), Surrey County Council (SCC) and TDC also performed other functions during that event in relation to their responsibilities as RMAs, some of which were under different legislation including the Civil Contingencies Act 2004 and the Water industry Act 1991. The actions of the authorities are summarised below:

1.1. Environment Agency

- Operated Flood Alert and Flood Warning service.
- Sent out flood ambassadors and flood data recorders to the areas affected by flooding.
- Supported resident engagement events, such as Flood Forum groups.
- Cleared blockages and maintained Main River sections.
- Are undertaking initial investigations into potential flood alleviation schemes to reduce the risk of flooding in the future.

1.2. Thames Water

- Main focus during event was on maintaining customer services, on protecting assets vital for the ongoing delivery of service, and on ensuring that where there was service disruption they were able to resume it as soon as possible.
- Pumped foul water out of the sewer system to reduce the risk of flooding to properties.
- Jetted their sewer systems to clear blockages and improve capacity.
- Cleaned roads that were affected by sewer flooding.

1.3. Surrey County Council

- SCC staff assisted residents on the ground, working in partnership with other RMAs to help inform residents, answer their queries (also via the call centre), deploy signs and sandbags to inform the community of risks, such as road closures and reduce flooding to the highway respectively.
- Since the flooding the affected highways and their drainage assets have been inspected and repairs carried out or a programme of works developed to address the damage caused.
- Administered the Repair and Renew Grant to help protect properties from flooding in the future.
- Undertaken the necessary works to improve, repair or refurbish/restore drainage assets.

- Undertaking initial investigations into potential schemes to reduce the risk of flooding in the future.
- Cleared blockages and jetted drainage assets to ensure water can flow freely. Carried out other maintenance works (with riparian owners) where necessary.
- Supported resident engagement events, such as Flood Forum groups.
- Investigated the causes behind the flooding.
- Plan to increase the capacity of the highway culvert on Tandridge Lane (Crowhurst).
- Are undertaking an assessment of potential options to reduce flood risk in the Burstow.
- Are undertaking a detailed assessment of the catchment to better understand the mechanisms of flooding and develop option to reduce and manage the existing flood risk in Woldingham, Whyteleafe and Kenley.

1.4. Tandridge District Council

- Provided residents with sandbags during the flood incident.
- Informed residents of the repair and renew grant.
- Assisted SCC in investigating the flooding issues.

2. Introduction

2.1. Section 19 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 upon 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 propose to exercise those functions.

Section 19(2) requires that the LLFA publishes the results of its investigation and notify the relevant RMAs accordingly.

This report covers flooding during the winter of 2013/14 only. As flooding was widespread across Surrey, multiple reports have been produced.

2.2. Locations of the investigations

This report addresses sites that flooded within the district of Tandridge. There are 70 sites in total, spread across 11 sub areas. There were approximately 180 incidents of internal property flooding in Tandridge.

Due to the sensitivities in publishing property flooding information, this report does not contain a comprehensive list of the S19 sites but supporting maps showing the sub areas in more detail are available.

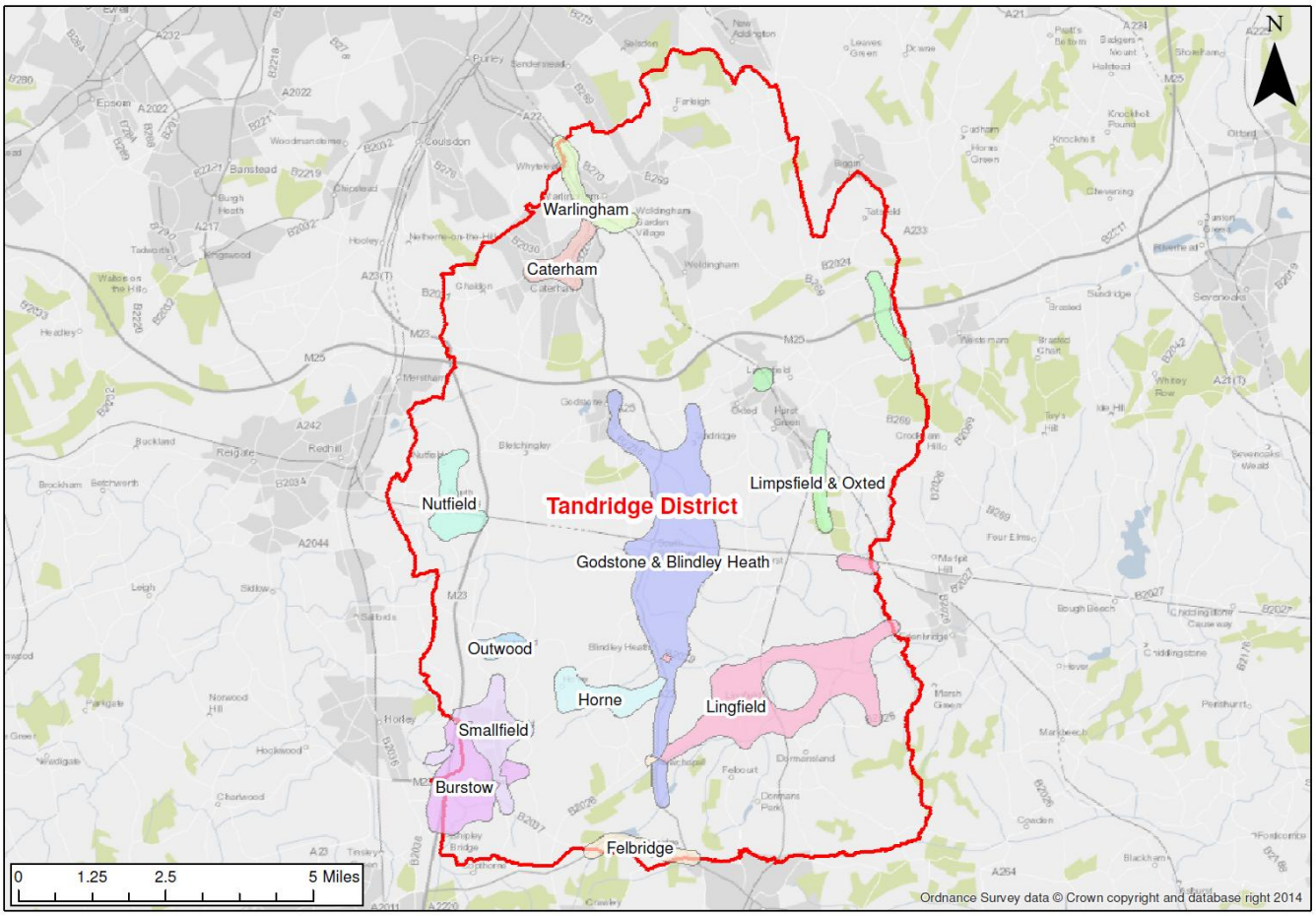

Figure 2-1 Location of Sub areas within Tandridge District for this report

3. Background Weather and Catchment Conditions

3.1. Weather Conditions

Storm events hit the UK on December 18 to 19, 23 to 27 and 30 to 31 2013, followed by January 3 and 5 2014.These storms came from the Atlantic and were characterised by unusually large and deep areas of low pressure, which brought rainfall and very strong winds. The rainfall is reflected by the spikes in daily rainfall totals, representing major rainfall events, shown in Figure 3-1 below.

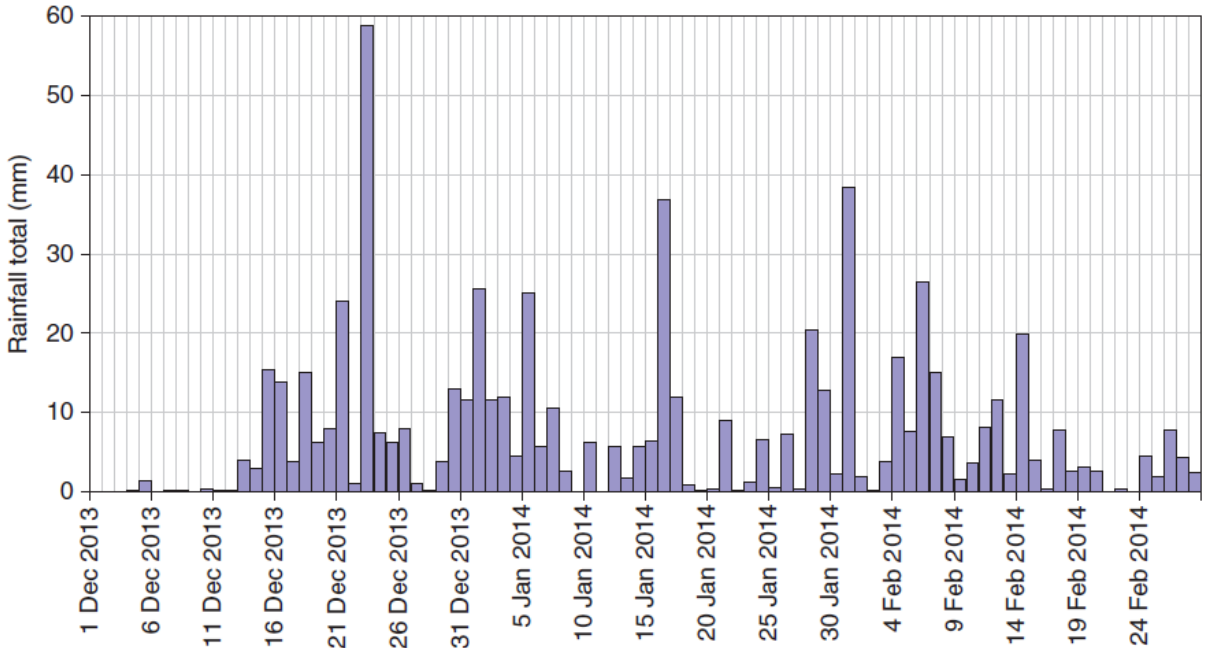

Figure 3-1 Daily Rainfall totals at Charlwood, Surrey for Winter 2013-14

The major storm event occurring on the 23 to 25 December resulted in 50-70mm of rainfall within 24 hours over an area from Dorset to Kent. This is indicated by the peak in rainfall of nearly 60mm in Figure 3-1. This daily rainfall represents approximately two-thirds of the monthly average rainfall for December.

Combined with the saturated soil from the high levels of rainfall leading up to the event, the rainfall gave rise to local surface water flooding and also subsequent fluvial flooding from the River Mole and its tributaries. The persistent high levels of rainfall for this period lead to a sharp rise in river flows leading to fluvial flood warnings across the south east of England.

3.2. Catchment Conditions

Upper River Mole

The western part of Tandridge lies within the Upper Mole catchment with the Burstow Stream, Nutfield Brook, Salfords Stream, and associated tributaries flowing generally in the westerly and northerly direction towards the River Mole.

Burstow rain gauge is located in the Upper River Mole catchment. The records from this gauge have been analysed by the EA to calculate indicative rainfall event return periods.

The available data suggests rainfall was reasonably homogeneous over the Mole headwater region. Over 23 and 24 December, the Upper Mole catchment received up to 76mm of rain on land that was already saturated. During the Christmas Eve event almost 70mm of rainfall was recorded at the Burstow gauge. Data from this rain gauge suggests that the maximum return period observed for any single event during winter 2013/14 was 31 years. In contrast, the maximum accumulated rainfall totals for durations of 30, 60 and 90 days gives return period estimates of 61, 103 and 52 years respectively. The 30 and 60 day accumulations are the greatest in the 35 year rainfall AMAX series, with 314mm and 546mm respectively.

The upper catchment overlies Wealden Group geology which is typically very impermeable in nature, giving rise to a rapid river response to the rainfall events. The “flash” nature of the individual events was witnessed in the River Mole with water levels reported to have risen by approximately 0.3m per hour, and following its peak, returning to its regular level 10 hours later. This rapid response can be seen in Figure 3-2 below with the sharp peaks on 24 December 2013, 17 January and 1 February 2014.

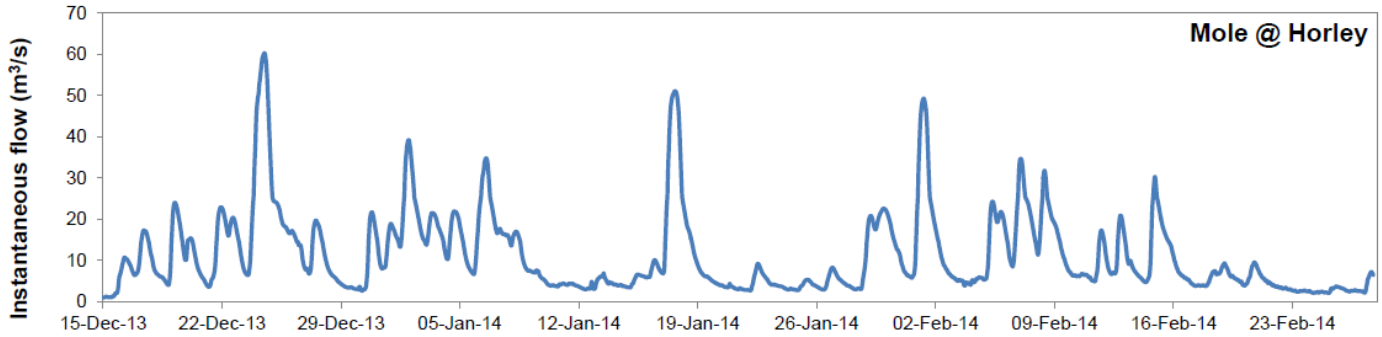

Figure 3-2 Instantaneous Flow in the River Mole at Horley, Winter 2013-14

Due to its responsive catchment type, the River Mole experienced its maximum peak flow in excess of 60m^3/sec at Horley on December 23 to 24. However, it was the duration and repetition of high flow events that contributed to the scale of the flooding encountered during winter 2013/14. While the mean flow recorded at the Horley gauge is 1.4m^3/sec, a flow of 10m^3/sec was exceeded 26 times over this winter period.

Table 3-1 Indicative Return Periods for the Mole Catchment Winter 2013-14

Communities	Watercourse	Annual Chance (%)	Return Period (years)	Source of estimate
Crawley	River Mole	1.25	80	Analysis of peak flow rates using FEH methods.
Dorking, Leatherhead	River Mole	2	50	Analysis of peak flow rates using FEH methods.
Cobham, Esher	River Mole	2	50	Analysis of peak flow rates using FEH methods.
Gatwick Airport	Gatwick Stream	3.3	30	Analysis of peak flow rates using FEH methods.
Redhill	Redhill Brook	2	50	No flow data available, so estimate based on correlation with nearby sub-catchments, and rainfall data.

Table 3-1 provides the indicative flood event return periods for the River Mole catchment. These have been determined by comparing gauged peak flow with design flood peaks estimated using the industry-standard Flood Estimation Handbook (FEH) methods. Although the winter was the wettest since records began, the return period flows in the river are less rare, with flows thought to peak around the 1 in 50 year annual chance event.

Upper River Eden

The eastern and central part of Tandridge lies within the upper catchment of the River Eden, with the Eden Brook and associated tributaries flowing south from Limpsfield and Hurst Green, and east from Horne and Lingfield, over the Surrey border and into Kent at Edenbridge.

There are several rain gauges located in the upper River Eden catchment. Two site records have been analysed as part of the Eastbourne Road, South Godstone Section 19 Flood Investigation Report to calculate indicative rainfall event return periods. The work is relevant to several of the Tandridge sub areas and thus information from this report is summarised in Table 3-2.

Table 3-2 Indicative Return Periods for the Winter 2013-14 rainfall in the Upper River Eden catchment

Rain Gauge	5-day Rainfall		8-day Rainfall	
	Rainfall Depth (mm)	Estimated Return Period	Rainfall Depth (mm)	Estimated Return Period
Felbridge	100.2	1 in 10	131	1 in 27
Godstone	78	1 in 3	102.8	1 in 7

In common with the upper catchment of the River Mole, much of the upper catchment of the River Eden overlies geology belonging to the Wealden Group which are typically very impermeable in nature, giving rise to a rapid river response to the rainfall events.

The Met Office reports that this was the wettest winter ever recorded. It is not necessarily appropriate to assess the return period of the flooding that occurred over the winter using data from individual rainfall events. Surface water ponding and stream/river levels remained high over multiple days, which meant that subsequent flooding was at least in part caused because water had not returned to normal levels.

Caterham Bourne

The Caterham Bourne is an ephemeral watercourse, meaning it flows intermittently usually after periods of heavy or prolonged rainfall, and is predominantly dry at other times. Historically, it is recorded to flow heavily approximately every 7 years, although smaller flows can be observed more frequently. When the level of groundwater rises and reaches ground level, water starts emerging on the surface. Water from these springs finds its way into existing ditches and drainages. The source location is reported to vary with three valley flow paths leading towards the Wapses Lodge roundabout on the A22 at the southern tip of Whyteleafe. The start of the designated main river is at Wapses lodge, where the three flow paths combine.

The route of the Bourne then flows in a North West direction through Whyteleafe and into Croydon, roughly following the course of the A22. Groundwater can also rise above underground structures such as existing culverts and sewers, and break surface at permeable points. Due to urban development, many parts of the Bourne have been culverted over the years with varying size pipes while some sections of the Bourne remain as open ditches. Not all culverts and ditches have the capacity to cope with large flow events such as the one experienced in the winter of 2013/2014.

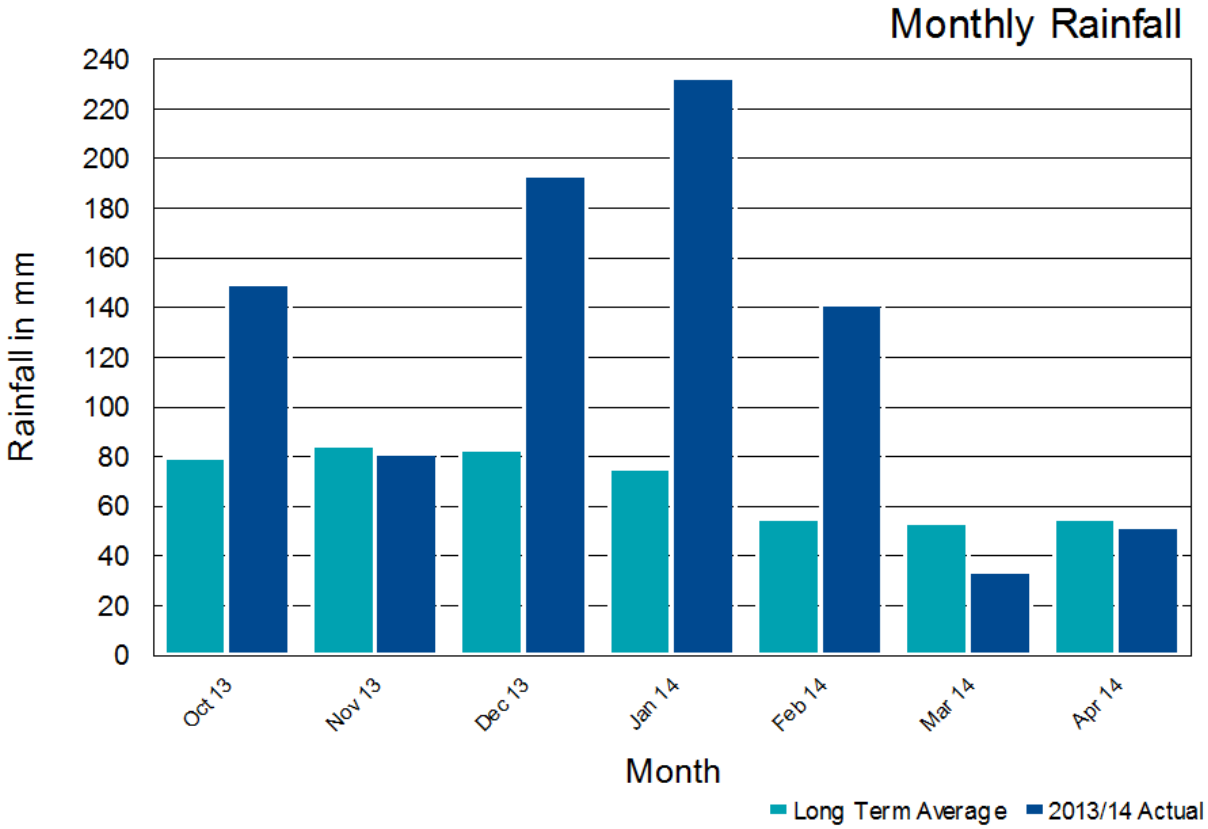

Figure 3-3 Rainfall records within Caterham Bourne catchment (source: Sutton and East Surrey Water).

Figure 3-3 shows the rainfall records within the Caterham Bourne catchment.

The graph shows that the catchment experienced significantly higher than average rainfall for a number of months which lead to the flooding of both properties and essential infrastructure. Records from the flood show the impact of the Caterham Bourne flooding as follows:

- A number of residential properties were affected by: internal, basement, front and rear garden flooding, sewage backing up in the WC, and sewage in the garden. During the flooding the Council was aware of four properties having to be evacuated and another eight properties were without WC facilities for over six weeks;
- 13 businesses either reported flooding or were impacted by the flooding, of these three commercial premises were vacated during the flooding;
- Along the course of the Caterham Bourne 1,086 homes suffered from power cuts;
- A temporary pedestrian bridge was constructed along the A22, this helped children in getting to school;
- Located just outside of the District in the London Borough of Croydon is Kenley Water Works which supplies water to more than 46,000 properties, a large number of these are located in Tandridge. The site was at risk of being overwhelmed by contaminated flood water; however, large scale pumps ran constantly to reduce the level of flood water.
- The A22 which is the main access into Croydon was shut for four weeks.
- Flooding of the railway line into Caterham also occurred.

4. Identification of Relevant Risk Management Authorities

There are a range of RMAs which together cover all sources of flooding.

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 that 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 and the EA have permissive powers to carry out maintenance works on them.

LLFAs are responsible for developing, maintaining and applying a strategy for local flood risk management in their areas. As part of this, the LLFA liaises regularly with the EA as well as the other RMAs to ensure that all sources of flooding in their area are being properly managed. They need to produce reports when there is a reported flood, and they have to keep a register of flood management assets. They also have lead responsibility for managing the risk of flooding from surface water, groundwater and Ordinary Watercourses. Ordinary Watercourses are rivers which are not designated as ‘Main Rivers’.

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

Internal Drainage Boards (IDB) are responsible for water level management in low lying areas. Not all areas require an IDB, and they currently cover approximately 10% of England. They work in partnership with other authorities and land owners to actively manage and reduce the risk of flooding. The Medway IDB covers part of the Tandridge district area.

Water and sewerage companies are responsible for managing the risks of flooding from drainage systems, including both their surface water only systems and combined sewer systems.

Highway Authorities are responsible for providing and managing highway drainage and roadside ditches, and must ensure that road projects do not increase flood risk.

Table 4-1 below summarises the RMAs responsible for the sites within this report. The ticks indicate which authorities have responsibility for which function. SCC is the LLFA. TW is the water company that has responsibility for all sources of sewer flooding across most of Tandridge while SWS has coverage over some areas in southern Tandridge.

Table 4-1 Risk Management Authorities

Flood Source	Environment Agency	Lead Local Flood Authority	Land Drainage Authority		Water Company	Highway Authority
		Surrey County Council		District or Borough Council	Thames Water and Southern Water	Surrey County Council
Main River	✓					
Surface Water		✓				✓
Surface Water (on or coming off the highway)						✓
Sewer flooding					✓	
Ordinary Watercourse			✓	✓		
Groundwater		✓				
Reservoirs	✓					

5. Strategic Actions and Flood Risk Management Functions

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 across Surrey and particularly in Tandridge District during the winter of 2013/14.

Environment Agency

The EA have a number of flood risk management functions, which include (but are not limited to); undertaking and maintaining flood mitigation works/defences, strategic responsibility for managing the risk of reservoir flooding, consenting and enforcement, the provision of strategic flood risk management plans, operation of flood alerts, flood warnings and flood risk management assets and designation of structures and features that affect flood risk. The relevant functions undertaken are listed below:

- Operated Flood Alert and Flood Warning service.
- Operated flood risk management assets during the flooding.
- Carried out flood risk mitigation works.

In addition, the EA carried out the following actions across the county:

- Participated in the Strategic and Tactical Command Groups once a major incident had been declared to respond to the flooding across Surrey.
- Cleared 860 blockages and storm damage incidents.
- Reported 1087 pollution incidents.
- 125 flood Ambassadors visited 95 locations.
- 70 flood data recorders sent to more than 100 locations.
- Supported (and are supporting) community groups to help develop their community flood/emergency plans.
- Sent out newsletters to inform residents of their site investigation works and are finalising plans for a regular community newsletter.
- Met with local people to discuss their ideas and are now studying these proposals in more detail.

Thames Water

TW 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.

No specific flood risk management functions have been identified as being directly relevant to the 2013/2014 flooding incident in Tandridge. However, this investigation has identified other relevant actions carried out by TW.

TW put in place winter arrangements for responding to winter weather conditions. This included triggers for the scaling up of resources and management for a range of foreseeable weather conditions. During the event their main focus was on maintaining customer services, on protecting

assets vital for the ongoing delivery of service and on ensuring that where there was service disruption they were able to resume it as soon as possible. To these ends TW carried out the following actions within Surrey:

- Physical protection measures – deployment of flood barriers and sandbags to TW sites (both water and wastewater).
- Regular (often daily) physical checks of unmanned sites to ensure that they were working and in workable condition.
- Optimisation of use of the sewerage network – where possible work such as investigations and sewer cleaning was carried out to ensure that sewers and pumping stations were working to optimum capacity.
- Increased the number of engineers and staff on the ground to investigate flooding reports: Network Engineers visited internally flooded properties where sewer flooding was the primary cause.
- Undertook wide scale clean ups of properties regardless of whether the cause was foul or river flooding.
- Provided a sewer flooding information leaflet for general distribution to properties affected and attended a number of local flood meetings.
- Provided support to Sutton and South East Surrey Water with regard to the event at Kenley Water Treatment Works (Croydon).

Surrey County Council

SCC, as LLFA, have flood risk management functions which include (but are not limited to): the provision of a Local Flood Risk Management Strategy (LFRMS), 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 Highways Authority and as an Emergency Responder (under the Land Drainage Act 1991 and the Civil Contingencies Act 2004 respectively) which may relate to flooding. SCC's relevant flood risk management functions undertaken are listed below:

- The LFRMS was published in December 2014.
- Some key drainage assets have been identified in Tandridge and added to the flooding asset register.
- Section 19 reports have been produced for the flooding experienced across the county in Winter 2013/14.

In addition SCC carried out the following activities across Surrey;

- SCC officers inspected flood affected roads, after which defect repairs were undertaken by SCC's contractors, Kier. Where extensive areas of carriageway were damaged by the flooding, they were assessed for inclusion into the Project 400 programme; a targeted programme to resurface and repair roads that were damaged by the Winter 2013/14 floods.
- All flood affected roads in Surrey were assessed for potential schemes which may be included in the Project 400 programme.
- Surrey cleansed and re-opened roads as quickly as possible after the flooding.
- Surrey Fire and Rescue Service (SFRS) pumped flood waters away to protect residents, property and infrastructure during the flooding.
- During the flooding SCC and TW were in discussions about the opportunity for joint working across the County.

- The Surrey Strategic and Tactical Coordination Groups met for a response meeting in advance of the February 2014 event to set up coordination between authorities.
- SCC not only provided sandbags to slow down the ingress of water into properties, but also recycled sandbags after the event.
- SCC staff attended resident engagement events after the flooding to hear their concerns.
- After the storms and flooding, SCC cleared trees, debris and carried out ditching works to enable the drainage systems to function normally again.
- SCC operated a call centre throughout the flooding which dealt with residents queries and have since hired a Community Resilience Officer to support communities in becoming more resilient to flooding amongst other issues.
- SCC administered the Repair and Renew Grant which provided up to £5000 for residents and businesses that were flooded in order to protect their property from flooding in the future.

Tandridge District Council

TDC have the following flood risk management functions; to designate structures and features that affect flood risk and they may also undertake works on ordinary watercourses to reduce flood risk, however this is a permissive power.

- TDC carried out an initial assessment into the flooding that took place at Mayes Close in Warlingham to assist the Local Lead Flood Authority in the finding a solution to the problem.
- The Council is represented on two flood alleviation projects that are currently being undertaken to reduce the risk of flooding along the Caterham Bourne in Whyteleafe and the Burstow Stream in Smallfield.

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.

6. Format of Subsequent Sections

The sites in this report have been grouped into sub areas based on location.

There are three sub areas in this report, all within the district of Tandridge.

Each sub area will be introduced and information relevant to the whole sub area presented. Responsible RMAs will be identified at sub group level, and their response to the flood event summarised.

Individual site information has predominantly come from SCC existing information (collated from a variety of sources) and the EA existing information. No site visits were undertaken as there are over 500 to report on in Surrey; however Borough and District Councils were consulted to collect any further information in relation to the flood events at the relevant sites. If further information is required in relation to any of the sites, requests should be submitted to SCC via flooding.enquiries@surreycc.gov.uk.

7. Sub Area: Burstow

7.1. Sub Area Definition

This sub area covers the area of Burstow and Shipley Bridge.

7.2. Location and Catchment Description

Burstow is located in the upper catchment of the River Mole and is at risk of flooding from the Burstow Stream (a tributary of the River Mole) and from surface water, as illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The bedrock geology in this area is the relatively impermeable mudstone of the Weald Clay Formation. The very north and also south-west of the sub area are underlain by superficial deposits of Alluvium and River Terrace Deposits which are associated with fluvial environments and can convey flood waters. The areas underlain by these superficial deposits have the potential to experience groundwater flooding at the surface.

Over winter 2013/14 the periods of prolonged rainfall led to the ground quickly becoming saturated, increasing rates of surface water runoff during subsequent rainfall events. This runoff regularly exceeded the capacity of drainage systems, both road-side ditches and pipes, leading to surface water ponding and overland flow and the flooding of roads and property.

The parts of the sub area around Burstow Stream are within the Flood Warning and/or Flood Alert Areas. These are areas for which the EA provides free flood warnings.

7.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC / TDC) and the LLFA (SCC).

7.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

Broadbridge Lane was closed between Perrylands Lane and Church Road on 17 January 2014.

Cross Lane was closed due to flooded ditches on 13 February 2014.

Antlands Lane and Redehall Road were also subject to temporary road closures.

SCC are undertaking an assessment of potential options to reduce flood risk in the Burstow.

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

TDC Distributed sandbags to residents during the flooding.

Section 5 provides additional details of TDC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

8. Sub Area: Caterham

8.1. Sub Area Definition

This sub area covers the area of Caterham and Caterham-on-the-Hill.

8.2. Location and Catchment Description

Caterham is located in the upper Catchment of the Caterham Bourne; a seasonal tributary of the River Wandle. The underlying chalk bedrock geology means that the area is at risk from groundwater flooding (particularly along Stafford Road and the east of the sub area), as well as being prone to localised surface water flooding, as identified on the online EA and British Geological Survey mapping. To the west of the sub area, there are superficial deposits of clay with flint, which are likely to be impermeable and therefore promote surface water runoff rather than infiltration.

The EA flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

During the winter of 2013/14 there were a number of instances of internal property flooding in the Caterham sub area.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

8.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

8.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

Since the flooding, SCC commissioned a study to investigate the surface water drainage system in Caterham-on-the-Hill from Queens Park to Coulsdon Common. This recently completed study included survey of the drainage assets and identification of possible drainage asset and flood risk management options.

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

A TDC officer attended flooded property in Park Road.

TDC wrote to residents in Park Road about the Repair and Renew Grant.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

9. Sub Area: Felbridge

9.1. Sub Area Definition

This sub area covers the area of Felbridge and Newchapel.

9.2. Location and Catchment Description

The Felbridge sub area is located in the upper catchment of the River Eden and is subject to river flooding from Felbridge Water and the Eden Brook, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The sub area is underlain by bedrock of the Upper Tunbridge Wells Sand formation (Sandstone and Siltstone) and superficial deposits of alluvium and head, which cross Copthorne Road near to Hedgecourt Lake. Although alluvium is associated with fluvial environments and can convey flood waters, there is limited potential across this sub area for groundwater flooding to occur.

During the winter of 2013/14 there were a number of instances of road closures in the Felbridge sub area.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

9.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

9.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

There are no details available on SCC's exercised flood risk management functions prior to, during and since the flood incident in this sub area.

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

There are no details available on TDC's exercised flood risk management functions prior to, during and since the flood incident in this sub area.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

10. Sub Area: Godstone & Blindley Heath

10.1. Sub Area Definition

This sub area covers the area of Blindley Heath, Godstone, South Godstone and Tandridge.

10.2. Location and Catchment Description

The Godstone and Blindley Heath sub area is located in the upper catchment of the River Eden and is subject to river flooding from Gibbs Brook, the Eden Brook and local tributaries, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The sub area is underlain by the Weald Clay Formation mudstones in the south and various sandstone formations in the north, with areas at risk of groundwater flooding, particularly at the interface of these different bedrock types. There are also superficial deposits of alluvium which run along the Hookstile Gully downstream of Eastbourne Road, the Ray Brook and the Gibbs Brook, which are associated with fluvial environments and can convey flood waters. There is the potential for groundwater flooding to occur at the surface along these watercourses as a result of the alluvium.

During the winter of 2013/14 there were a number of instances of road closures and internal property flooding in the Godstone & Blindley Heath sub area.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

10.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

10.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

On 19 and 20 October 2013 gullies were cleaned along Eastbourne Road from just north of South Godstone to 1km south of Blindley Heath.

Flooding on Godstone Road / Eastbourne Road was cleared on 17 December 2013.

Police reported flooding and SCC contractors visited Eastbourne Road. Subsequently a tanker was requested and signage put out on 1 January 2014

On 2 January 2014 a tanker pumped flood water from the junction of A22 and Byres Lane.

On 6 January 2014 SCC jetted pits and gullies at Eastbourne Road, leaving them free flowing.

Eastbourne Road was closed on 16 January 2014

As part of the LLFA Capital programme, SCC plan to increase the capacity of the highway culvert on Tandridge Lane (Crowhurst).

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

TDC distributed sandbags and assisted with the protection of some properties at risk from the flood water.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

11. Sub Area: Horne

11.1. Sub Area Definition

This sub area covers the area of Horne.

11.2. Location and Catchment Description

Horne is located in the upper catchment of the River Eden and is subject to river flooding from Ray Brook, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change. They are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The bedrock geology in this area is the relatively impermeable mudstone of the Weald Clay Formation. However there are superficial deposits of alluvium which run along the Ray Brook from which there is the potential to experience groundwater flooding at the surface.

Over winter 2013/14 the periods of prolonged rainfall led to the ground quickly becoming saturated, increasing rates of surface water runoff during subsequent rainfall events. This runoff exceeded the capacity of drainage systems (channels, road-side ditches and pipes), leading to surface water ponding and overland flow and the flooding of property in this sub area.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

11.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

11.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

No flood risk management functions relevant to SCC have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of SCC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

No flood risk management functions relevant to TDC have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of TDC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

12. Sub Area: Limpsfield & Oxted

12.1. Sub Area Definition

This sub area covers the area of Hurst Green, Limpsfield and Oxted.

12.2. Location and Catchment Description

The Limpsfield and Oxted sub area is located in the upper catchment of the River Eden and is subject to river flooding from the River Eden and the Crooked River, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The sub area is underlain by the Weald Clay Formation mudstones in the south and various sandstone formations in the north. There is limited potential for groundwater flooding to occur across the sub area.

During the winter of 2013/14 there were a number of instances of road closures and internal property flooding in the Limpsfield & Oxted sub area.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

12.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

12.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

17 January 2014, Clacket Lane was closed.

Section 5 provides additional details of SCC's borough-wide exercised Flood Risk Management Functions prior to, during and since the flood incident.

Tandridge District Council

No flood risk management functions relevant to TDC have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

13. Sub Area: Lingfield

13.1. Sub Area Definition

This sub area covers the area of Lingfield.

13.2. Location and Catchment Description

The Lingfield sub area is located in the upper catchment of the River Eden and is subject to river flooding from the Eden Brook and the Ray Brook, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The north of the sub area is underlain by the Wealden Group (clay) and to the south is the Upper Tunbridge Wells Sand formation (sandstones and siltstones). Superficial deposits of River Terrace Deposits and Alluvium broadly follow the paths of watercourses which cross the sub area, particularly to the east.

During the 2013/2014 winter flooding there were reports of sewer flooding, main river flooding and groundwater flooding in Lingfield. This resulted in a number of instances of road closures and internal property flooding in the Lingfield sub area.

The parts of the sub area closest to the main watercourses (in the north of the sub area) are within the Flood Warning and Flood Alert Areas. These are areas for which the EA provides free flood warnings.

13.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the EA, the Water Companies (TW and SWS), the LLFA (SCC), the Highway Authority (SCC) and the Land Drainage Authority (SCC/TDC).

13.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

On 17 January 2014, St. Piers Lane was closed.

On 17 January 2014 and 1 February 2014, Haxted Road was closed.

Starborough Road, St Piers Lane and Honeypot Lane were closed.

SCC have completed extensive refurbishment and improvements to the drainage system along Moor Lane, to the east of the Lingfield sub area, to alleviate flooding to nearby properties.

Environment Agency

No flood risk management functions relevant to the EA have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of EA's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

TDC reported that they made sandbags available to residents during the flooding.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Thames Water

No flood risk management functions relevant to TW have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of TW's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Southern Water

No flood risk management functions relevant to SWS have been identified as specific to the flood incident in this sub area.

14. Sub Area: Nutfield

14.1. Sub Area Definition

This sub area covers the area of Nutfield, Ridge Green and South Nutfield.

14.2. Location and Catchment Description

The Nutfield sub area is located in the upper catchment of the River Mole and is subject to river flooding from the Nutfield Brook, as well as surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The sub area is underlain by the Weald Clay Formation mudstones in the south and various sandstone formations in the north. There are superficial deposits of alluvium which run along the Nutfield Brook, which have the potential for groundwater flooding at the surface.

During the 2013/2014 winter flooding there were reports of potential sewer flooding and main river flooding in Nutfield. This resulted in a number of instances of road closures and internal property flooding in the Nutfield sub area.

The parts of the sub area closest to Nutfield Brook (in the south of the sub area) are within the Flood Warning and Flood Alert Areas. These are areas for which the EA provides free flood warnings.

14.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the EA, the Land Drainage Authority (SCC/TDC), the LLFA (SCC), the Highway Authority (SCC) and the Water Company (TW).

14.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

On 17 January 2014, Kings Cross Lane was closed.

SCC are preparing a scheme to improve the culvert and header walls for the Nutfield Brook which runs under Kings Cross Lane by Ketwin’s Woods. It is hoped that the scheme will be progressing late summer early autumn 2015.

Section 5 provides additional details of SCC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Environment Agency

No flood risk management functions relevant to the EA have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of EA's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

Sandbags were provided to those properties at risk from flooding in Mid Street.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Thames Water

No flood risk management functions relevant to TW have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of TW's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

15. Sub Area: Outwood

15.1. Sub Area Definition

This sub area covers the area of Outwood

15.2. Location and Catchment Description

The Outwood sub area is located in the upper catchment of the River Mole and is subject to localised surface water flooding. The areas at risk are illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The bedrock geology in this area is the relatively impermeable mudstone of the Weald Clay Formation.

Over winter 2013/14 the periods of prolonged rainfall led to the ground quickly becoming saturated, increasing rates of surface water runoff during subsequent rainfall events. This runoff may have exceeded the capacity of drainage systems (including the channels of the Salfords Stream tributary which conveys flows to the north of Outwood), leading to surface water ponding, overland flow and the flooding of property in this sub area. The British Geological Society also records local outcrops of sandstone and limestone in and around Outwood, with groundwater springs located at the interface of these different bedrock types. Groundwater emergence may therefore also have contributed to the flooding experienced over winter 2013/14.

The flooding in the Outwood sub area resulted in a number of instances of internal property flooding.

The sub area is not located within the EA Flood Warning or Flood Alert Areas.

15.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the Land Drainage Authority (SCC/TDC) and the LLFA (SCC).

15.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

No flood risk management functions relevant to SCC have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of SCC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

No flood risk management functions relevant to TDC have been identified as specific to the flood incident in this sub area.

Section 5 provides additional details of TDC’s wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

16. Sub Area: Smallfield

16.1. Sub Area Definition

This sub area covers the area of Smallfield.

16.2. Location and Catchment Description

Smallfield is located in the upper reaches of the Burstow Stream catchment and is at risk of river flooding from the upstream reach of the Weatherhill Stream. The Burstow Stream is a tributary of the River Mole. The topography and existing developed nature means that Smallfield also suffers from drainage issues associated with surface water flooding. This can be compounded by the fact that the Weatherhill Stream, the very upstream end of a designated Main River, is culverted through the village and is, in effect, a surface water sewer. The risk of river and surface water flooding posed to Smallfield is illustrated on the EA online flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

The underlying bedrock geology of the sub area is the Weald Clay (mudstone) formation. To the east of Smallfield's centre, surrounding the Burstow Stream are superficial River Terrace Deposits which have the potential to allow groundwater flooding at the surface.

During the winter of 2013/2014, Smallfield was subject to surface water flooding and foul sewer flooding. This resulted in internal property flooding and a number of road closures.

Some parts of the sub area are within the Flood Warning and Flood Alert Areas. These are areas for which the EA provides free flood warnings and can be found using the EA online mapping tool.

16.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the EA, the Land Drainage Authority (SCC/TDC), the LLFA (SCC), the Highway Authority (SCC), and the Water Company (TW).

16.4. Exercised Flood Risk Management Functions and Other Actions

Surrey County Council

On 3 January 2014, SCC investigated a surface water sewer on Redehall Road, and found what was believed to be a blockage causing the flooding, to actually be a collapsed pipe.

On 9-10 January 2014, SCC and Thames Water attended to the Wheelers Lane ditch and culvert system. The system was found to be blocked. The system was jetted with the aim to re-establish the surface water flow route from the Woodside Crescent pipes into the Wheelers Lane ditch. This was however only partially successful because the catchpit remained blocked.

On 17 January 2014, Wheelers Lane was closed.

On 19 January 2014, SCC jetted the sewer system Woodside Crescent northwards to clear the blockage and keep flood waters flowing away from Wheelers Lane. The Wheelers Lane sewer system was also jetted again.

Wheelers Lane was closed on 6 February 2014.

Plough Road was also subject to temporary road closures.

In April 2014, the balancing ponds and ditch systems along Broadbridge Lane were re-graded and cleared by SCC.

Weatherhill Stream at Weatherhill Common was cleared of dense vegetation by SCC and riparian owners, including the section at the confluence, just to the north of Smallfield Road near the culvert outlet. The culvert blockage was also cleared.

Ownership of the Wheelers Lane ditch is currently in question. The SCC legal team is working to resolve this.

SCC have carried out extensive jetting and cleaning of the highway drainage systems in Effingham Road and Redehall Road.

SCC will be investigating the surface water and foul water misconnection on Wheelers Lane and the sewer network along the footpath (between Weatherhill Road and Wheelers Lane) which appeared to be dry during and after the flooding. There may be an opportunity to increase the capacity of the sewer network.

SCC will be assessing the levels of the land on Weatherhill Common as after inspection, the drainage engineer felt that this may have contributed to the water not being able to flow away freely, in combination with the blockage and vegetation.

SCC are overseeing a programme of restoration works to the existing drainage network to provide Smallfield with a functioning drainage system. SCC are looking to work on behalf of some (elderly) riparian owners to put the drainage system back into a maintainable condition. In combination with the Parish Council, SCC are also planning a wider programme of riparian owner engagement so that they understand their maintenance responsibilities and maintain their drainage assets in the future. They are also reviewing their gully and ditch maintenance regimes.

The surface water system, chamber and responsibility of the network in the private road off Plough Road is due to be investigated by SCC following on from the sewer system backing up and flooding two properties in this area.

SCC in combination with the Parish Council are planning the following works:

- The culverts which traverse Redehall Road and Broadbridge Lane are to be cleared.
- The repair of the broken sewer mains on Redehall Road has been ordered by SCC.
- The ditches along Broadbridge Lane (from Perrylands to Wheelers Lane) are due to be piped as the road and pavement are falling away.
- SCC will be working with the riparian owners along the Wheelers Lane ditches to pipe the ditch system as the drainage engineer believes it to be ineffective (clay based, heavily vegetated with a restriction on the downstream end which allows water to pond there, at an unsafe depth). Defect repairs have also been scheduled for Wheelers Lane.
- The Parish Council, via the flood forum are raising public awareness and encouraging all property owners to report any flooding to all the relevant authorities.

As part of the Smallfield Flood Alleviation Scheme, SCC are undertaking an assessment of potential options to reduce flood risk in the Burstow.

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

On 24 December 2013, TDC officers visited Wheelers Lane to observe the flooding. Sandbags were provided to the Doctors Surgery and Centenary Halls.

TDC also cleared a number of trash screens and ditches in and around Smallfield

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Thames Water

Soon after Christmas, Thames Water tankers pumped four tankers worth of foul water from the sewer system in Woodside Crescent.

Thames Water carried out cleaning of the road on Woodside Crescent after the flooding.

On 9 July 2014, Thames Water located a root mass 3m downstream from Manhole (5102) along Wheelers Lane. A root cutting unit could not clear all the roots but the majority were cleared and flow restored. Existing pipes are butted ended and some slight displacements were recorded but these were not deemed to be causing a problem and so no action was taken.

Section 5 provides additional details of TW's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Environment Agency

The EA sent flood ambassadors on site to Smallfield in January 2014.

The EA had flood data recorders on site in Smallfield in January 2014.

The EA, working alongside the Parish Council have cleared, and will continue to clear blockages along the Burstow Stream.

The EA are planning a number of flood relief improvements in the Burstow Stream catchment area. A funding bid has been submitted and approved for initial investigations into both Burstow Stream catchment and Smallfield village Flood Alleviation Scheme. It is anticipated that the initial reports from these investigations will be available by March 2016.

Section 5 provides additional details of EA's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Others

The Flood Forum group are working with riparian owners, the EA and Thames Water to clarify/take forward the maintenance responsibilities for the Burstow Stream where it flows across to Weatherhill Common.

17. Sub Area: Warlingham

17.1. Sub Area Definition

This sub area covers the area of Warlingham, Whyteleafe and Woldingham. A separate Section 19 report has been published for the Caterham Bourne area specifically. Please refer to this separate report for further details regarding the flooding and actions of RMAs in these areas.

17.2. Location and Catchment Description

The Warlingham sub area is located in the upper Catchment of the Caterham Bourne; a seasonal tributary of the River Wandle. The underlying chalk bedrock geology means that the area is at risk from groundwater flooding, as well as being prone to localised surface water flooding, as identified on the online EA flood mapping.

The flood risk maps do not take into account climate change and are designed only to give an indication of flood risk to an area of land and are not sufficiently detailed to show whether an individual property is at risk of flooding.

Following heavy rainfall in December 2013 and January 2014 and the rise in groundwater levels, the Caterham Bourne flooded. It rises in Tandridge, south of Warlingham and caused flooding of roads and properties in both Surrey and the neighbouring London Borough of Croydon.

The flooding resulted in a number of instances of road closures and internal property flooding in the Smallfield sub area.

Some parts of the sub area, predominantly around Godstone Road, are within a EA Flood Alert Area. These are areas for which the EA provides free flood warnings and can be found using the EA online mapping tool.

17.3. Identification of Relevant RMAs

Following a range of consultation events during and since the floods, the relevant RMAs in this sub area have been identified as being the EA, the Land Drainage Authority (SCC/TDC), the LLFA (SCC) and the Highway Authority (SCC).

17.4. Exercised Flood Risk Management Functions and Other Actions

Environment Agency

The EA issued a groundwater flood alert on the 8 January 2014.

The EA Flood Ambassadors were on site in Whyteleafe and Kenley in January and February 2014.

The EA had flood data recorders on site in Whyteleafe and Kenley in January and February 2014.

The EA took part in Strategic Coordination Groups and Tactical Coordination Groups meetings.

The EA cleared blockages on Main Rivers that were fed by groundwater flows and provided specialist advice to LLFA and Sutton and East Surrey Water engineers. They also provided 17 pumps, more than 8km of pipes and 200m of temporary defences to help the LLFAs manage flood risk in the Caterham Bourne area.

Section 5 provides additional details of EA's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Surrey County Council

On 6 February 2014, the A22 (Godstone Road) was closed by SCC and the police.

Woldingham Road was closed by SCC.

SCC Highways are planning to construct four flood alleviation ponds near Whyteleafe.

As part of the Caterham Bourne Flood Alleviation Scheme, SCC are undertaking a detailed assessment of the catchment to better understand the mechanisms of flooding and develop option to reduce and manage the existing flood risk in Woldingham, Whyteleafe and Kenley.

Section 5 provides additional details of SCC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

Tandridge District Council

TDC officers investigated flooding on Godstone Road, Whyteleafe.

TDC provided sandbags to properties in Whyteleafe.

TDC identified vulnerable residents and assisted with the relocation of those affected by the flooding.

TDC communicated information to residents and businesses via various forms of media.

TDC commissioned a study into the flooding at Mayes Close to assist Surrey County Council in identifying a means to reducing the risk of flooding to properties.

Section 5 provides additional details of TDC's wider flood risk management functions and other relevant actions prior to, during and since the flood incident.

18. Conclusion

The objective of this report is to investigate which RMAs had relevant flood risk management functions during the flooding 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 should be noted that this duty to investigate does not guarantee that flooding problems will be resolved and cannot force others into action.

The report has identified that the EA and TW carried out actions in relation to the flooding experienced in Tandridge over winter 2013/14. It has also been established that SCC and TDC did not have any direct flood risk management functions in responding to the flood event, but strategic functions and other supportive actions were taken, which have been outlined in the report.

18.1. Causes

There were approximately 180 incidents of internal property flooding in Tandridge. The main cause of the widespread flooding across Surrey was the exceptional and unprecedented amount of rainfall that fell over the months of December, January and February 2013/14, which in turn resulted in major flooding from surface water, ordinary watercourse, sewer and groundwater sources.

18.2. Flood Data

While systems are in place to record instances of flooding on a day-to-day basis, it was found that the data format and specific details of flooding records were inconsistent across different organisations. For example, approaches that generically recorded properties as “affected by flooding” did not make clear whether the property was flooded internally. This caused issues when collating the data into a central database, reducing the level of accuracy for some specific flooding records.

LLFAs have a responsibility to manage the risk of groundwater flooding but due to the complex nature of flooding from this source, information on groundwater flood risk is very limited and appropriate only for strategic use and general consideration for specific sites. More information on groundwater flooding incidents and groundwater level monitoring will assist in improving general understanding of groundwater flood risk in Surrey.

The information held by SCC on highway drainage assets and their condition is very limited in many areas, which can make it more difficult to identify the sources and cause of flooding in some instances. Information for smaller watercourses (privately owned or otherwise) is also very limited in some areas.

18.3. Role of Local Communities

In addition to the functions and actions carried out by RMAs, there are many ways in which residents and communities can reduce flood risk. Local flood forums existed in Surrey prior to the winter 13/14 flood event but many more have been set up in the aftermath of this event. The role of RMAs in these local groups is instrumental in educating the public on flood risk and supporting them in implementing their own action plans and resilience measures. These groups also play a vital role in feeding back critical information on localised flooding issues to support the authorities in better understanding local flood risk and identifying potential solutions to mitigate this risk.

There are still widespread occurrences of riparian watercourses and ditches that are not maintained. Keeping all watercourses well maintained will not (in itself) prevent flooding from major flood events but the lack of maintenance of some riparian owned ditches was certainly a contributing factor on the impact of the flooding experienced from the winter 13/14 flood event.

18.4. Looking Forward

A vast amount of information on historic flooding was gathered as a result of the winter 13/14 flood event. This data will help highlight the areas most at risk of flooding in Surrey, enable the prioritisation of drainage maintenance works and support business cases when bidding for Government contributions towards major flood defence schemes.

18.5. Recommendations

Based on the findings of this Section 19 investigation, it is recommended that:

- All RMAs continue to improve their cooperation, coordination and communication with one another, particularly with regard to their flood risk management functions and during times of emergency.
- All RMAs continue to raise awareness of flood risk and increase the resilience of communities and businesses to flood risk, across Surrey.
- SCC and the EA further develop public awareness and understanding of riparian responsibilities, in order to improve the condition of watercourses across Surrey.
- All RMAs review their current processes for data collection during a flood event, giving consideration to the best practice guidance produced by SCC and the EA.
- All RMAs pass any records of future property flooding in Surrey to SCC for collation in a central database.
- SCC undertake studies where there is significant groundwater flooding to better understand the nature of the flooding and the levels of risk.
- All RMAs review the benefits of proposed flood schemes in the Six Year Programme of Flood and Coastal Erosion Risk Management Schemes and consider whether partnership contributions may be justified.
- SCC undertake detailed drainage surveys where asset information is limited or non-existent, prioritising areas at greatest risk of flooding.
- SCC formalise the process for investigating major flood events under the S19 duty and agree this process with the Surrey Flood Risk Partnership Board, to ensure efficient partnership working and data sharing for future investigations.

18.6. Actions and on-going work

As well as the Flood Risk Management Functions carried out in the sub areas mentioned in this report, SCC plan to carry out the following additional work within Tandridge District:

- SCC are constructing a deepbore soakaway and carrying out minor repairs on Farleigh Road, Warlingham.

19. Acknowledgements

Surrey County Council would like to thank the following organisations and groups for providing information and input into the Section 19 Flood Investigation Report:

- The Environment Agency
- Tandridge District Council
- Thames Water
- Atkins