

URS

Croydon Flood Investigations Jan-Mar 2014

Merstham Bourne Flood
Investigation: Final report

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1. INTRODUCTION

1.1 The Flood Event

The Merstham Bourne (also sometimes referred to as the Coulsdon Bourne) is an ephemeral watercourse situated in the south of the London Borough of Croydon. During February and March 2014, flooding associated with the Merstham Bourne was experienced in South Coulsdon. Railway infrastructure around South Coulsdon Station and gardens at a number of residential properties in Reddown Road, which back on to the London to Brighton main line railway, were flooded for several weeks. Flood risk in this location is associated with the permeable underlying geology through which groundwater can easily rise and cause the Bourne and other local springs to flow, in addition to the condition of ditches and culverts, through which the water must flow. The Bourne is not designated by the Environment Agency as a Main River and is therefore classed as an ordinary watercourse¹.

1.2 Why has this flood been investigated?

Croydon Council (CC) is the Lead Local Flood Authority (LLFA) for the area, and has a responsibility to record and report flood incidents, as detailed in Section 19 of Part 1 of the Flood and Water Management Act 2010 (FWMA).

FLOOD AND WATER MANAGEMENT ACT 2010

Part 1: Flood and Coastal Erosion Management

3. Supplemental powers and duties

19. Local authorities: investigations

(1) On becoming aware of a flood in its area, a lead local flood authority must, to the extent that it considers it necessary or appropriate, investigate:

- (a) which risk management authorities have relevant flood risk management functions, and
- (b) whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.

(2) Where an authority carries out an investigation under subsection (1) it must:

- (a) publish the results of its investigation, and
- (b) notify any relevant risk management authorities.

CC has developed a draft Flood Investigation Protocol which outlines the process that will be followed to determine the need for an investigation.

The requirement for an investigation is determined on a case-by-case basis, considering factors such as the source and impact of the flooding event, e.g. the number and type of receptors (homes, businesses and critical infrastructure) affected by the flooding event. The draft Protocol provides guidance to aid decision-making and threshold levels set out in this are used as a guide to determine when an investigation should be carried out. However, it should be noted that these remain under review. The key thresholds from the draft Protocol are listed

¹ An 'ordinary watercourse' is a watercourse that is not part of a main river and includes rivers, streams, 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.

in Table 1.1, along with where these were exceeded during the Merstham Bourne February – March 2014 flooding.

Table 1.1: Flood Investigation Protocol Threshold Exceedance for the Merstham Bourne February – March 2014 Flood Event	
Key thresholds	Threshold exceeded?
There has been a fatality or serious injury as a direct result of flooding.	No fatalities or serious injuries as a result of the flood event.
Depth greater than 0.10m over ground floor threshold of a residential property or more than 3 residential properties flooded.	No properties flooded over the threshold but numerous gardens were affected.
Flooding has prevented the operation of the critical infrastructure for more than 2 hours.	The railway line was flooded for 530 metres between Woodplace Lane and Star Bridge (Nethern Drive).
More than 3 commercial properties been affected by flooding or the flooding is deemed to have caused significant economic disruption.	NA
It is unclear which Risk Management Authority (RMA) is responsible or whether the appropriate duties have been carried out.	There are some disparities regarding ownership and maintenance responsibilities in this location.
The weight of public interest justifies the need for investigation (to be decided internally after review).	There are risks to residential properties and transport infrastructure if maintenance is not appropriately carried out.

Although this flood event is relatively small in extent, there is evidence to suggest lack of appropriate maintenance and unclear land ownership may have contributed to the flooding and be increasing the risk at this site. An investigation has therefore been carried out to establish a way forward for managing future flood risk in this location.

1.3 Aims and Objectives

This report aims to meet the requirements of Section 19 of the FWMA as well as provide a useful reference for the effective future management of this source of flooding in Croydon through;

- Providing details of the flooding incident,
- Undertaking analysis of the flood history of the area,
- Identifying the responsibilities of Risk Management Authorities (RMAs) and the actions which were carried out,
- Identifying successful response measures and lessons learned, and
- Recommending the next steps.

1.4 Data collection and review

Data relating to flood incidents and emergency response has been requested from the following organisations for input to this investigation;

- Croydon Council (CC)
- Network Rail (NR)
- The Environment Agency (EA)
- Thames Water Utilities Ltd (TWUL)

1.5 Duties and Responsibilities

1.5.1 Risk Management Authorities

Under the definition of Section 6(13) of the FWMA, the RMAs with responsibilities on this occasion were as follows:

- a) **Lead Local Flood Authority** – CC
- b) **Environment Agency**
- c) **Water Company** – TWUL,
- d) **Highways Authority** – CC

As significant landowners around the Bourne, responses were also carried out by:

- Network Rail (NR),

1.5.1.1 Croydon Council

As a LLFA, the [FWMA](#)² requires that CC lead the management of local flood risk from surface water, groundwater and ordinary watercourses within the London Borough of Croydon. Duties include investigation of significant flood events, maintaining a register of structure and features influencing flood risk and developing a Local Flood Risk Management Strategy for Croydon.

The FWMA outlines that LLFAs have powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it (FWMA Schedule 1, Section 1).

As a Highways Authority, the [Highways Act 1980](#)³ requires that CC ensure that highways are drained of surface water and where necessary maintain all drainage systems.

CC is a Category 1 Responder under the [Civil Contingencies Act 2004](#)⁴ and therefore has a responsibility, along with other organisations for developing emergency plans, contingency plans and business continuity plans to help reduce, control or ease the effects of an emergency.

² Flood and Water Management Act (2010) <http://www.legislation.gov.uk/ukpga/2010/29/contents>

³ Highways Act (1980) <http://www.legislation.gov.uk/ukpga/1980/66/contents>

⁴ Civil Contingencies Act (2004) <http://www.legislation.gov.uk/ukpga/2004/36/contents>

1.5.1.2 **Environment Agency**

The EA has a responsibility to provide a strategic overview for all flooding sources and coastal erosion. The EA take a risk based approach to flood risk management and have a number of roles and responsibilities including as a statutory consultee on flood risk throughout the planning process and regulation of third party works on main rivers.

The FWMA outlines that the EA has powers to designate structures and features that affect flooding in order to safeguard assets that are relied upon for flood risk management. Once a feature is designated, the owner must seek consent from the authority to alter, remove or replace it (FWMA Schedule 1, Section 1). The EA is also a Category 1 Responder under the [Civil Contingencies Act 2004](#).

1.5.1.3 **Thames Water**

Under the FWMA, TWUL is responsible for managing the risks of flooding from surface water, foul and/or combined sewer systems where the sewer flooding is wholly or partly caused by an increase in the volume of rainwater (including snow and other precipitations) entering or otherwise affecting the system.

TWUL has a duty to provide and maintain a system of public sewers so that the areas for which they are responsible are effectually drained (Water Industry Act, 1991⁵). Since the late 1970s, and with the publication of Sewers for Adoption⁶ in 1980, sewer systems have typically been designed and constructed to accommodate a rainfall event with a 1 in 30 probability of occurrence in any given year (3.3% AEP) or less. Therefore, rainfall events with a rainfall probability of greater than 3.3% AEP would be expected to result in surcharging of some of the sewer system.

TWUL is a Category 2 responder under the [Civil Contingencies Act 2004](#) and therefore has the responsibility to co-operate and share information with Category 1 responders (e.g. CC, Environment Agency) to inform multi-agency planning frameworks.

1.5.2 **Riparian Owners**

Riparian owners are those that own land or property adjacent to a watercourse. Riparian owners have a responsibility to maintain the bed and banks of the watercourse; this includes maintenance of any owned structures, such as trash screens or culverts.

Section 25 of the Land Drainage Act (1991)⁷ outlines that where the flow of a watercourse is obstructed; the riparian owner is responsible to resolve the condition. Section 28 of the Land Drainage Act (1991) outlines the responsibility of the riparian owner to undertake maintenance of their watercourse if it is impeding the flow of water.

Riparian owners must let water flow through their land without obstruction and must accept flood flows through their land. Riparian owners have no duty in common law to improve the drainage capacity of a watercourse. Further information can be found in the EA's document *Living on the Edge* (2012)⁸.

⁵ Water Industry Act (1991): <http://www.legislation.gov.uk/ukpga/1991/56>

⁶ The Sewers for Adoption guide was first issued in 1980 by WRc. Since then the document has become the standard for the design and construction of sewers to adoptable standards in England and Wales. It acts as a guide to assist developers in preparing their submission to a sewerage undertaker before they enter into an Adoption Agreement under Section 104 of the Water Industry Act 1991

⁷ Land Drainage Act (1991): <http://www.legislation.gov.uk/ukpga/1991/59/contents>

⁸ Environment Agency (2012) *Living on the edge – A guide to your rights and responsibilities of riverside ownership*. <http://www.environment-agency.gov.uk/homeandleisure/floods/31626.aspx>

1.5.2.1 Network Rail

Network Rail are significant landowners and where a watercourse flows through their land, they are bound by riparian ownership responsibility under the Land Drainage Act (1991) as discussed above, requiring unobstructed flow of a watercourse through the land and maintenance of associated structures such as culverts and trash screens.

1.5.3 Local Residents

Residents who are aware that they are at risk of flooding should take action to ensure that they and their properties are protected.

Residents should report flooding incidents or potential problems (such as blockages) to the LLFA or appropriate organisation if known.

2. BACKGROUND

The London Borough of Croydon is located within Greater London, and is one of the largest London Boroughs. It is bounded to the north by the London Boroughs of Merton and Lambeth, to the east by the London Borough of Bromley, to the west by the London Borough of Sutton and to the south by Surrey County.

2.1 The Catchment

The Merstham Bourne (also referred to as the Coulsdon Bourne) is a small ephemeral watercourse, meaning it flows intermittently usually after periods of heavy or prolonged rainfall, but is predominantly dry. It emerges above ground near Coulsdon South Station but the exact location of its source is not confirmed. Drainage maps held by CC suggest the route follows the line of the railway north from the border with Surrey, alongside the route of the A23 Brighton Road, although the Bourne is not documented on all maps so the record is currently incomplete. Figure 2.1 maps the approximate route based on current available information.

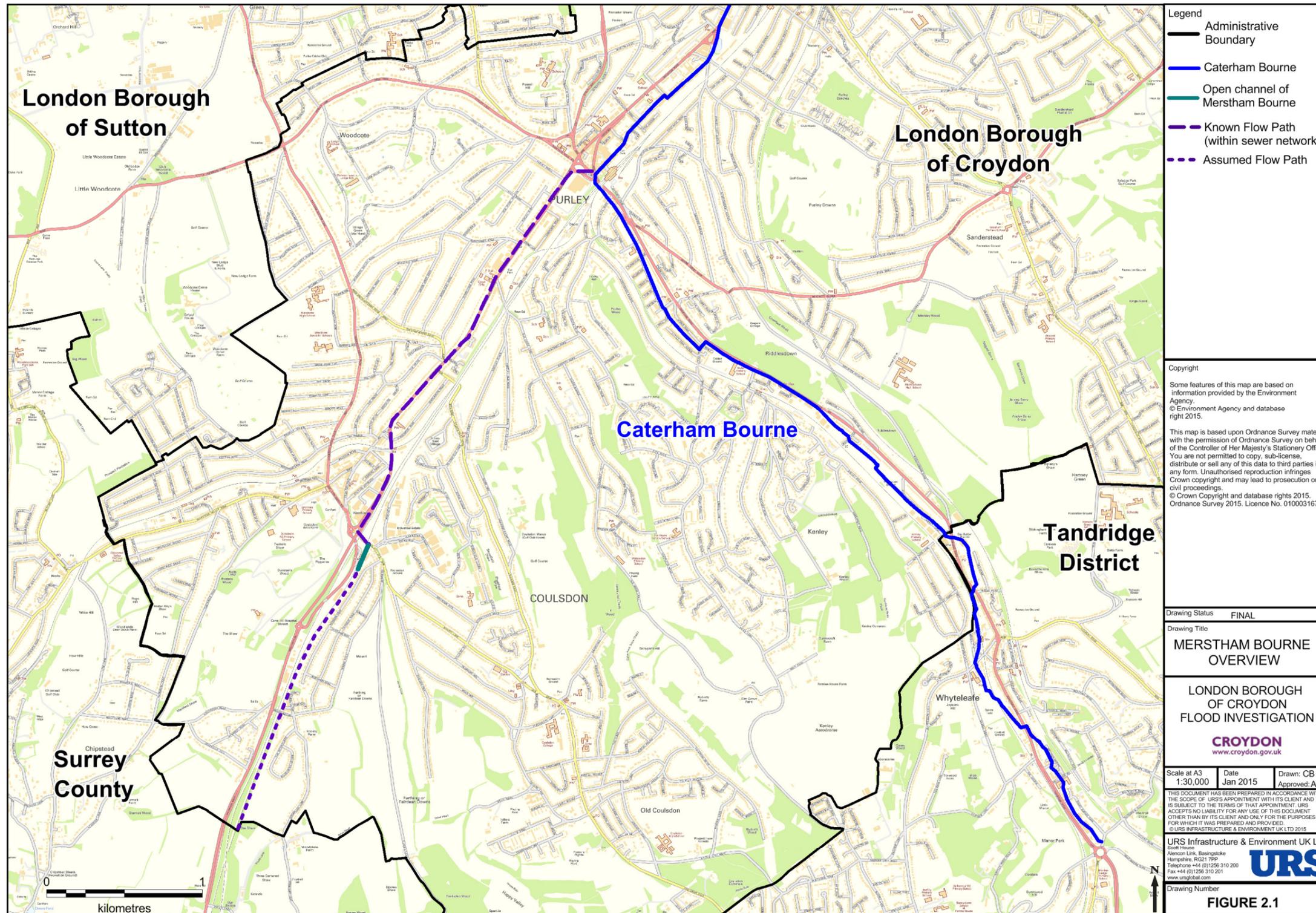
The Bourne flows in a north east direction and becomes an open ditch through a small section of land between the Brighton main line railway and the rear gardens of residential properties on Reddown Road. It then flows into a surface water drain under Marlpit Lane and is believed to flow into the surface water drainage network, following the A23 to Purley Cross, a distance of approximately 3km. At Purley Cross, the route joins that of the Caterham Bourne, another ephemeral watercourse, which follows the route of the A22 and usually flows concurrently. A separate investigation has been carried out with regards to flooding from the Caterham Bourne. This investigation will focus largely on the impacts around the open section of the Bourne near Coulsdon South Station. Further information on the affected area, and the focus of the investigation, is provided in Section 4.1.

2.1.1 *Topography and land use*

The topography of the Merstham Bourne catchment area is characterised by steep slopes and a valley south of Coulsdon. The Brighton Road (A23) and Brighton main line railway from Hooley through Coulsdon and on to Purley are located in the natural valley. This has the potential to exacerbate flooding due to fast runoff rates from the steep slopes and accumulation of runoff on the railway line.

The gardens at Reddown Road and South Coulsdon Station are located at the base of a small valley, approximately 84 metres Above Ordnance Datum (mAOD). The valley rises steeply to the south east up to 123 mAOD and north west up to 125 mAOD.

There is park land and rural areas to the south of the catchment area, near Hooley and Chipstead, and development is focused alongside the eastern side of the A23, in the valley.



2.1.2 **Geology and Soils**

According to British Geological Survey (BGS) 1:50,000 scale data, the area is underlain by undifferentiated chalk formations, including the Lewes Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation.

The Chalk formation is located at the bottom of the valley, along either side of the A23. Chalk is highly permeable and the EA Aquifer Designation maps⁹ indicate that the Merstham Bourne catchment overlies a 'Principal Bedrock' aquifer.

Superficial deposits of gravel, sand, silt and clay are located on the A23 and railway line in the valley itself. The location of flooding near Coulsdon South Station is underlain by these superficial deposits.

The permeability of the soils in the catchment area is very high, with free draining shallow lime-rich soil in the valleys and slightly acid loamy soils on the top of slopes¹⁰.

2.2 **History of flooding from the Merstham Bourne in Coulsdon**

Documented incidents of flooding from the Merstham Bourne, held by CC are minimal. This may be due to the fact that it usually rises at the same time as the Caterham Bourne, which runs alongside the A22 and tends to cause significantly more disruption and therefore diverts attention away from the Merstham Bourne.

The following records are held by CC regarding flooding at Reddown Road (table 2.1). Although associated observations do not attribute these incidents to the Bourne, records from the same dates exist of flooding from the Caterham Bourne indicating high groundwater conditions at these times.

Table 2.1: Historic records of flooding at Reddown Road held by Croydon Council	
Date	Notes recorded about incident
July 1976	Surface water flooding reported in garden of one property in Reddown Road due to 'blocked gullies'
August 1981	Surface water flooding reported at one property in Reddown Road

⁹ Environment Agency. 2014. What's in Your Backyard? 'Aquifer Designation' maps. Available at www.environment-agency.gov.uk/wiyby

¹⁰ National Soil Resources Institute. 2014. Soilscales. Cranfield University. Available at www.landis.org.uk/soilscales/

3. FLOOD MECHANISMS: FEBRUARY – MARCH 2014

3.1 Antecedent Conditions

December 2013 was the sixth wettest December on record across the UK, with the South London region receiving more than 200% of the average rainfall amount for December. This was followed by the wettest January recorded since 1910 in southern England¹¹. The EA reported this two-month period as the wettest on record in the Kent and the South London area. Figure 3.1 illustrates how the national rainfall from December 2013 to January 2014 compared to the average and Table 3.1 outlines rainfall measured in the Bourne catchment compared to average monthly readings before and after the flood event.

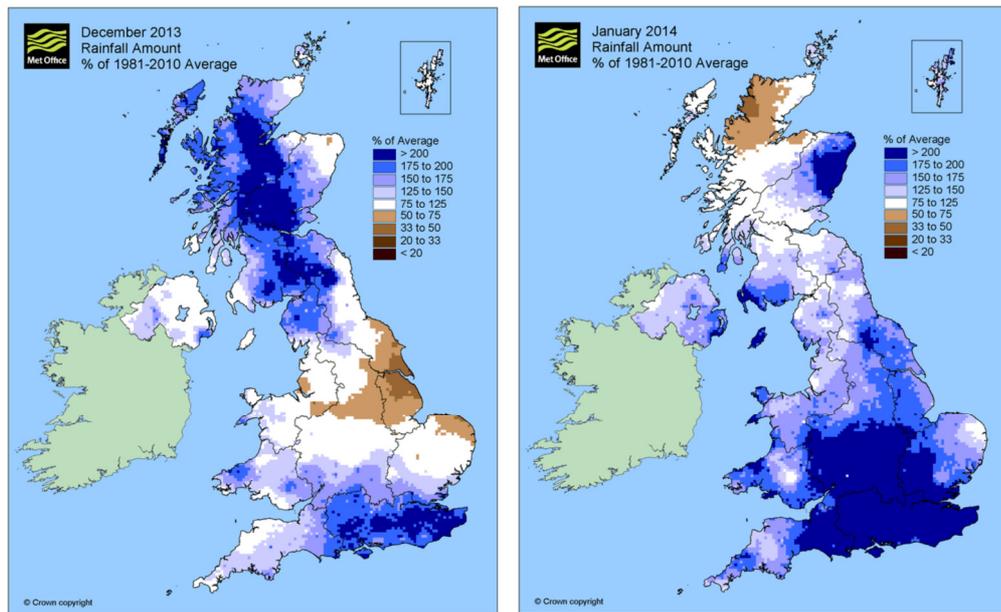


Figure 3.1: Rainfall for December 2013 and January 2014, showing the distribution of rainfall anomalies as a % of the long-term average from 1981-2010¹⁸

Table 3.1: Recorded Rainfall Data during Winter of 2013/14 from How Green Reservoir Gauge (TQ2829058150) compared to monthly average at Kenley climate station (Source: Environment Agency and Met Office)

Month	Total Rainfall (mm) recorded at How Green Reservoir Gauge	Met Office average monthly rainfall 1981-2010 at Kenley (mm) ¹²
December 2013	174.2	84.1
January 2014	238.8	80.3
February 2014	160.2	59.5
March 2014	38.8	57.9

¹¹ MET Office (2014) The Recent Storms and Floods in the UK. Available at <http://www.metoffice.gov.uk/research/news/2014/uk-storms-and-floods>

¹² MET Office (2014) <http://www.metoffice.gov.uk/public/weather/climate/gcpgggu1r>

3.2 Flood Warnings

The EA has a strategic overview for all sources of flooding including groundwater. They supply information in the form of monitored groundwater levels. There is currently no Groundwater Flood Alert service specific to the Merstham Bourne. Warnings are issued for the Caterham Bourne which usually flows concurrently and joins the Merstham Bourne at Purley Cross. A groundwater flood alert was issued for the Caterham Bourne on 8th January 2014

3.3 Monitored Groundwater Conditions

Weekly situation groundwater reports produced by the EA for the South London Boroughs include hydrographs illustrating the groundwater levels at EA groundwater observation boreholes (OBH). Figure 3.2 illustrates the rapid rise in groundwater in the Merstham Bourne area. The coloured section gives average data and shows how the groundwater normally behaves. The black line shows the rising levels experienced in early 2014 and the red dotted line shows the 2000/2001 groundwater levels, when severe flooding from groundwater previously occurred in parts of Croydon.

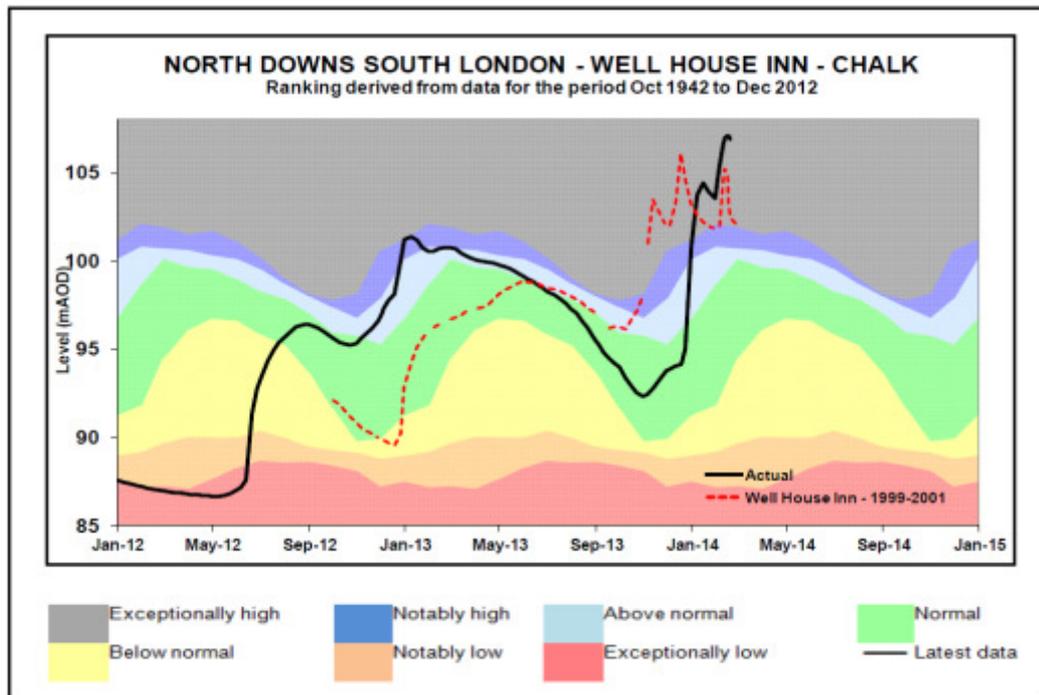


Figure 3.2: Hydrograph at the Well House Inn OBH indicating groundwater patterns in the Merstham Bourne area (Source: Environment Agency)

Figure 3.2 shows the groundwater level recorded at Well House Inn OBH, located South West of Coulsdon, and demonstrates the rapid rise in water levels from December 2013 to January 2014, followed by a brief drop in levels before continuing to rise in February 2014. The borehole indicates elevated groundwater levels remained high in March 2014.

3.4 Sources of Flooding

As noted above, exceptionally high rainfall in December 2013 and January 2014 caused groundwater to rise rapidly and this is the predominant source of flooding during this event. However further sources can contribute to the scale of flooding, particularly as the catchment becomes more urban. Table 3.2 breaks down some of the sources identified in the 2014 flood.

Table 3.2: Sources of Flooding		
Type	Description	Role in 2014 Floods
Groundwater	Groundwater flooding occurs as a result of water rising up from the underlying aquifer or from water flowing from springs. This tends to occur after much longer periods of sustained high rainfall and can be sporadic in both location and time often lasting longer than a fluvial or surface water flood.	<ul style="list-style-type: none"> The dominant source of flooding during this flood event following record rainfall in December 2013 and January 2014. Exceptionally high groundwater levels in the underlying chalk as a result of the heavy prolonged rainfall led to the emergence of springs causing bournes to flow in the London Borough of Croydon and Surrey.
Surface Water	Usually occurs when high intensity rainfall generates runoff which flows over the surface of the ground and ponds in low lying areas, before the runoff enters a watercourse or sewer.	<ul style="list-style-type: none"> Heavy and prolonged periods of rainfall led to surface water runoff putting pressure on the road drainage network. This was further exacerbated by the lack of infiltration due to already saturated soil caused by a combination of high groundwater levels and prolonged periods of rainfall.
Fluvial	Flooding resulting from water levels exceeding the bank level of a watercourse, because flow exceeds the capacity of the channel	<ul style="list-style-type: none"> The Merstham Bourne is an ordinary watercourse up to Marlpit Lane, where it then becomes part of the sewer network. Although it only flows at times of high groundwater, factors such as blocked trash screens or culverts can increase fluvial type flooding through bank overtopping. Residents of Reddown Road reported that lack of maintenance of the ditch and culvert led to wider flooding of the area.
Sewer Flooding	<p>Flooding from the sewer system may occur if:</p> <ul style="list-style-type: none"> (a) a heavy rainfall event exceeds the capacity of the sewer system / drainage system, (b) interaction with groundwater within the sewer system / drainage system, (c) the system becomes blocked by debris or sediment and/or, (d) the system surcharges due to high water levels in receiving watercourses. 	<ul style="list-style-type: none"> Foul flooding occurred in Marlpit Lane beyond the open section of the Bourne. Resident reports have indicated regular problems with sewer flood or odour in this location so flooding may not have been directly caused by flow in the Bourne. It is possible the flooding may have been exacerbated by groundwater incursion.

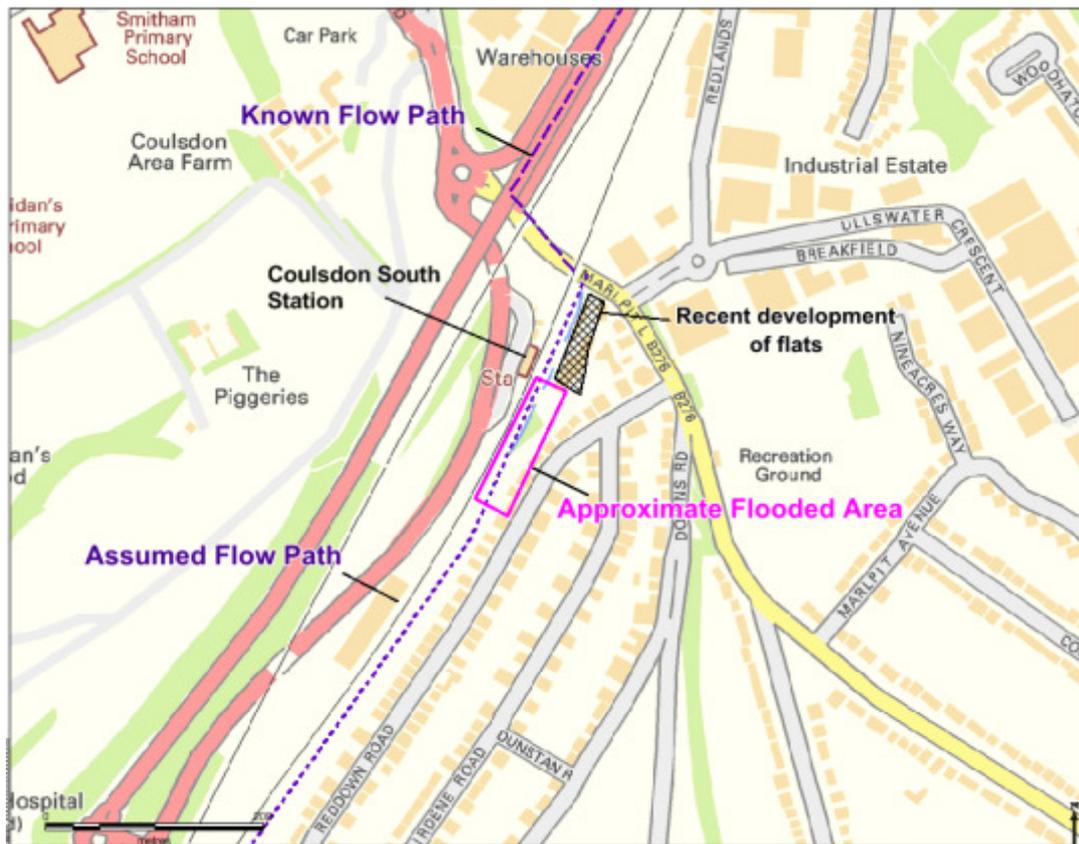
4. LOCATIONS OF FLOODING

4.1 Affected area

Residents of Reddown Road in Coulsdon, whose properties back on to Network Rail (NR) land near Coulsdon South Station reported to Croydon Council that they were experiencing flooding in their back gardens during February 2014. It is understood that water began flowing into the gardens of numbers 20, 20A and 18 Reddown Road on 13th February, which coincided with a heavy rainfall event.

Water was observed gushing out of the ground in one spot by the railway embankment attributed to damage or crack to the culvert through which the Merstham Bourne flows underground. Water flowed along the back of the gardens of No.s 16 and 8A before draining into an open section of the Bourne. Water was observed at depths of up to 30cm. Flood waters remained for a number of weeks, and were not fully receded till late March 2014.

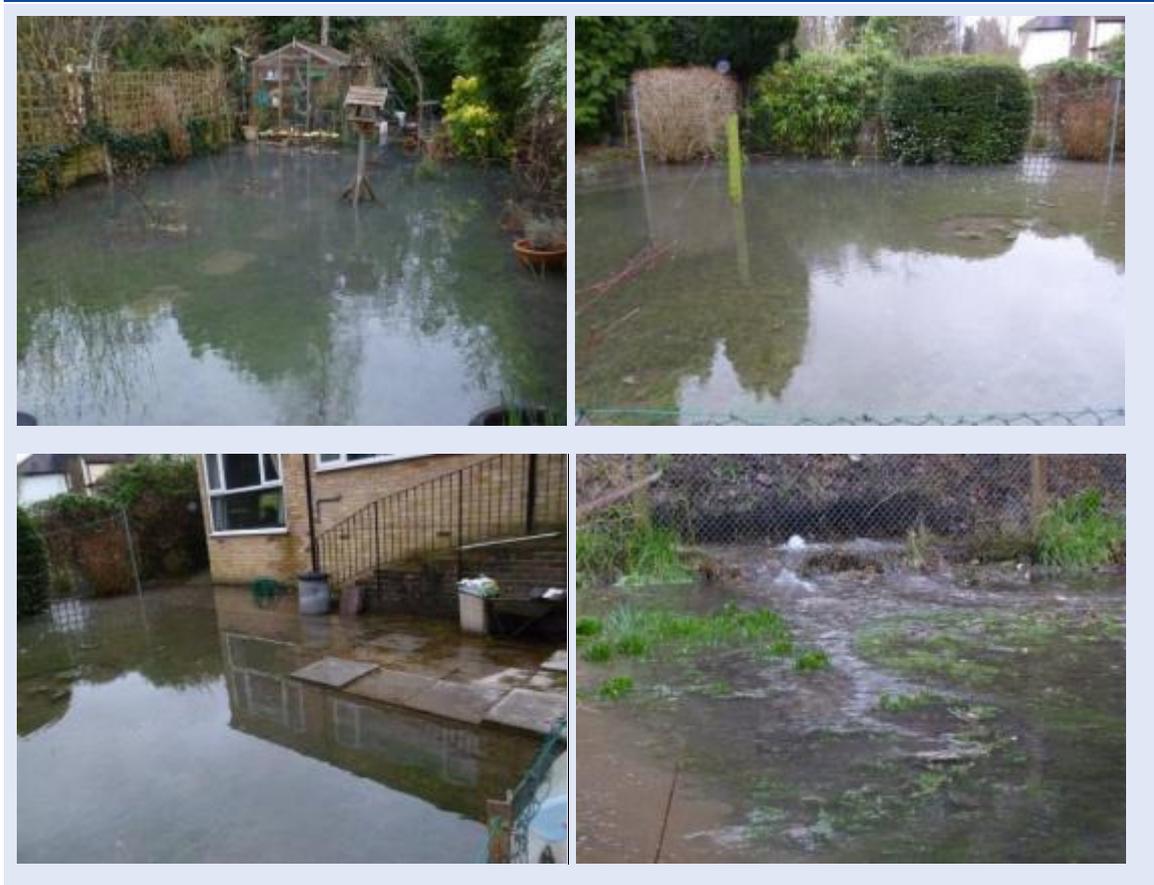
Photos of the flooded gardens taken by Croydon Council officers are included below in Box 4.1. The open ditch sections and culverts of the Merstham Bourne traverse NR land, which means NR has riparian ownership responsibilities (see Section 1.5.2). This is discussed further in Section 5 of this report.



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Figure 4-1: Approximate location of flooding in relation to the presumed route of the Merstham Bourne based on best available evidence.

Box 4.1: Photos of flooded gardens on Reddown Road (Source: Croydon Council, February 2014)



The EA attended the site around 19th February 2014 and noted that the water levels should be monitored as any rise in flood level may threaten ground floor flats which have been recently built on the footprint of a former garage (see **(Reproduced** from Ordnance Survey digital map data © Crown copyright [insert year of supply]. All rights reserved. Licence number 0100031673)

Figure 4-1). No flooding was recorded at these properties during the event.

In addition to the flooding of gardens in Reddown Road, NR has reported a number of issues related to the Bourne and groundwater springs either flooding or interrupting their infrastructure. Flooding of the railway line caused signals to trip, causing slow line speeds and disruption to travel. The following locations were impacted:

- A 530 metre length of railway was flooded between Woodplace Lane and Star Bridge (Nethern Drive) due to an overwhelmed culvert flowing north to Coulsdon South station, and,
- Flooding was experienced South of the Borough boundary near the north end of the Merstham Tunnel in Surrey.

Box 4.2 includes photographs provided by NR of flooding along the Merstham Bourne during February – March 2014.

Box 4.2: Photos of Merstham Bourne flooding (Source Network Rail, February - March 2014)



Merstham Bourne flowing between gardens of Reddown Road and the Railway embankment



Overwhelmed culvert at open section of Bourne near Coulsdon South Station



Flooding of the track from culvert running beneath the railway line

5. RISK MANAGEMENT AUTHORITY RESPONSE

As discussed in Section 1.5; CC is the LLFA and responsible for leading the management of local flood risk within the Borough, as well as coordinating the response from the other RMAs.

The RMAs with duties related to this flood event under FWMA were:

- Croydon Council (CC) as the Lead Local Flood Authority,
- Thames Water (TWUL) – responsible for the culvert in Marlpit lane where the bourne connects to the sewer and responsible for managing foul flooding in Marlpit Lane, and,
- The Environment Agency (EA) – Strategic overview of flood risk and groundwater monitoring.

Network Rail (NR) is the riparian owner of the sections of Merstham Bourne that flow on their land. Section 1.5.2 describes the responsibilities of riparian owners. A summary of responses by each authority during the flood event is summarised in Table 5.1.

5.1 Response of relevant authorities

Table 5.1: Flood response actions of relevant authorities	
Authority	Actions carried out during flood (brief summary)
Croydon Council	<ul style="list-style-type: none"> • Officers attended the scene to assess risk to residents. Observations were made that Network Rail had contractors onsite carrying out works. • EM (council contractor) were instructed to clear trash screens before and during flooding and deliver sandbags to affected properties. • Tankers were deployed to try and remove water at Marlpit Lane although this was deemed ineffective whilst the bourne continued to flow.
Environment Agency	<ul style="list-style-type: none"> • Monitored and provided information on groundwater levels, flows and rainfall. • Provided weekly updates to Croydon Council on groundwater levels in the catchment. • Attended site at Coulsdon South Station to ensure risk was being addressed.
Thames Water	<ul style="list-style-type: none"> • No specific operational issues recorded by TWUL and no specific works identified during this incident.
Network Rail	<ul style="list-style-type: none"> • Contractor at site on 19th February investigating solutions to damaged culvert (as recorded by the EA). • Work carried out on open ditch sections of watercourse to enlarge the capacity and provide extra storage. • A channel was provided above the culvert near Coulsdon South to help direct flow to the open ditch. • Pumps were engaged to pump water away from the railway line to an area where it could freely drain away. • Commenced investigation to confirm material, diameter and condition of part-lined 5 mile culvert following the railway lines.

5.2 Assessing RMA and other relevant authority response and lessons learnt

CC and the EA both attended the site of the flooding. There are no main watercourses at this site so the EA only have a strategic overview role in this instance. CC carried out their role as LLFA in monitoring the risk from groundwater and ordinary watercourses in this location. NR have principal responsibility for maintenance of the ditch and culvert as the route flows through their land. It has been confirmed that contractors working on behalf of NR attended the site to implement emergency works to the damaged culvert.

NR has since advised that they have carried out widening work to the open ditch and created an additional channel above the damaged culvert to direct water to the open ditch section of the Bourne. They are also carrying out an ongoing investigation on the condition and size of a culvert following the railway lines.

TWUL has advised they do not hold records of any operational issues or impact to the sewer network at this location. This may be due to sewer flooding generally affecting the highway rather than specific residential properties and therefore it does not create a record on the DG5 register¹³. It is assumed therefore that TWUL did not attend any incident of flooding in Marlpit Lane. It is not confirmed that sewer flooding at this location is directly connected to the flooding of the Merstham Bourne.

It is concluded that CC, NR and the EA carried out their appropriate response duties as required by FWMA and the Land Drainage Act 1991 in responding to the flooding from the Merstham Bourne. However, the incident highlighted a number of issues which should be addressed in ongoing flood risk management in the area;

- Residents reported lack of maintenance to the open ditch section of the Bourne prior to the flooding with presence of rubble and other debris blocking the channel. There is a need for NR to implement ongoing maintenance, not just reactionary measures.
- Communications between NR and CC need to improve in relation to flood remediation works. CC has the lead role in managing local flood risk and need to communicate to local residents how that risk is being managed.
- Identifying the route, sources and riparian responsibility for the full route of the Merstham Bourne.
- Further engagement with TWUL about this location to determine whether sewer condition or affiliated assets are influencing local flood risk.

¹³ Register which records instances of internal and external flooding of property from sewers as required by the regulator OFWAT.

6. NEXT STEPS**6.1 Summary of Findings**

The weather conditions from December to March 2014 saw an exceptional volume of water entering the catchments in the South of England. As a result, the flooding that ensued was of a much greater magnitude in some locations than may have been seen or recorded previously. Flooding from the Merstham Bourne in Coulsdon did not enter any residential properties although flooding in gardens up to 30cm came very close to properties and was considered to pose a serious potential risk. Flooding to the railway line caused signal failures and service disruption on the main London to Brighton Line.

Risk Management Authorities and NR, as riparian owner, carried out appropriate response activities to manage and respond to the flood. However, a number of issues were encountered which could be improved to manage the risk from the Bourne going forward.

This flood event has highlighted the need for an ongoing maintenance regime of the watercourse and better communication between NR and CC regarding flood management works and clarification of riparian owner responsibilities. It is also evident that there is incomplete understanding about the full route and source locations of the Merstham Bourne and how sewer infrastructure interacts with other sources of flooding such as groundwater incursion.

Actions have been proposed in Table 6.1 to build upon lessons learnt in this event and to improve understanding and management of flood risk from all local sources of flooding in this location.

6.2 Way Forward

Table 6.1: Next Steps for Local stakeholders			
ID	Action	Details	Authorities Involved
01	Liaison	Under Section 19 (2) of the FWMA, CC should publish the results of the flood investigation and notify any relevant RMAs, stakeholders and residents.	CC
02	Liaison	Communication channels between CC and NR regarding flood management should be addressed and improved including information sharing about the route of the Merstham Bourne and its assets.	CC, EA, NR
03	Investigation	CC should clarify ownership of the land the bourne flows through before entering a culvert under Marlpit Lane	CC
04	Investigation	An investigation is recommended to identify the route and sources of the Merstham Bourne, to support flood risk planning for the catchment	CC, NR
05	Liaison	CC should engage with NR regarding planned maintenance to their assets along route of the Merstham Bourne.	CC, NR
06	Recording	CC should follow up with residents that reported flooding to acquire additional details of flooding (consequences, damage caused etc.) and to provide advice as to property level protection measures.	CC, EA
07	Liaison	CC should work with the EA to provide local homeowners with information on flood resilience measures and groundwater flooding.	CC, EA
08	Liaison	CC Highways and TWUL should communicate more efficiently about flooding incidents, upgrades to the sewer network and planned improvements.	CC, TWUL
09	Maintenance / enforcement	CC should clarify pre-winter maintenance regime for the Bourne assets in agreement with NR (and TWUL if appropriate).	CC, TWUL, NR
10	Maintenance / enforcement	CC should undertake regular surveys of the Merstham Bourne to ensure the channel is being maintained as required.	CC, NR
11	Emergency management	When groundwater alerts are issued for the Caterham Bourne, preparations should also be implemented for Merstham Bourne.	CC, EA, NR