

Local Case Study

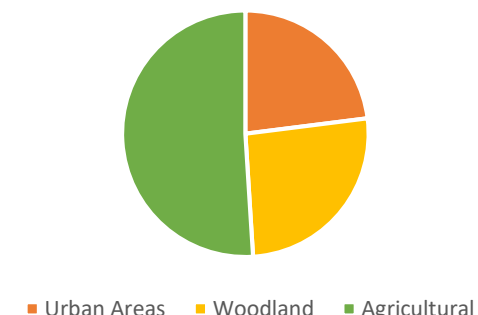
River Mole, Surrey



Source	Baldhorns Copse
- location	Rusper, Horsham, West Sussex
- coordinates	51°7'30"N 0°16'26"W
- elevation	105 m (344 ft)
Mouth	River Thames
- location	East Molesey, Elmbridge, Surrey
- elevation	6 m (20 ft)
Length	80 km (50 mi)
Relief Difference (fall)	99 m
Basin size	512 km ² (198 sq mi)

Regime & Rainfall:

Catchment Land Usage / Makeup



All time high – 23rd December 2013 during the storm season.

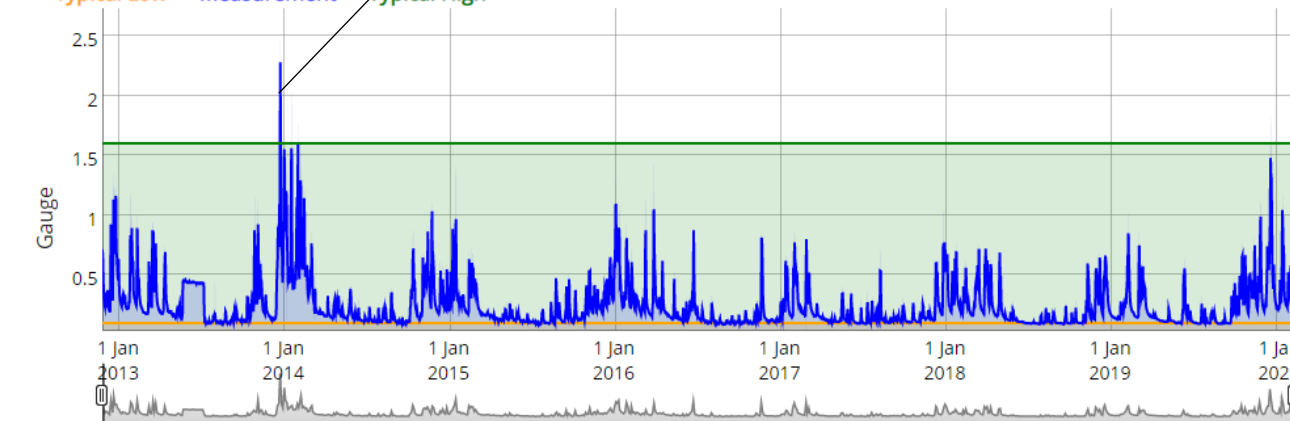
Average Gauge Measurement of 0.4 m

Noticeable peaks during annual late autumn, winter and early spring seasons, after prominent storm events.

Recently, the consistency of values have been relatively stable, but the 2019/2020 season has seen significant increases in typical high values, especially as an example of Storms Atiyah, Brendan and Ciara, doubling averages.

Long Term

— Typical Low — Measurement — Typical High



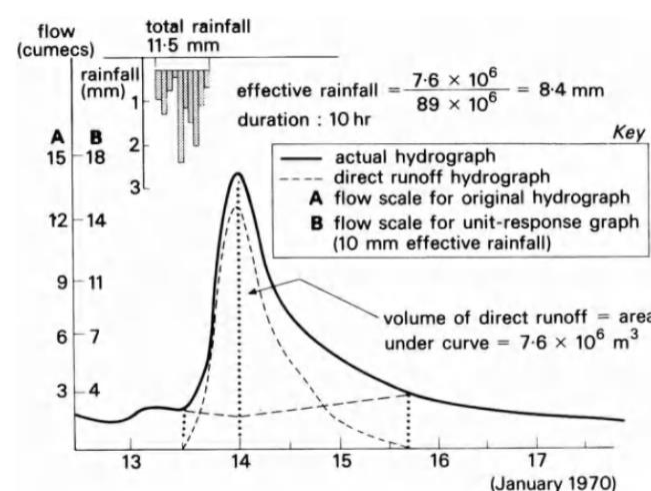
Abstraction from the Mole:

NOTE: In the UK, over 20 cubic m per day of abstracted water requires a license.

Groundwater abstraction accounts for 72% of all licensed abstractions in the Mole Catchment. The majority of these groundwater abstractions are from the Chalk aquifer

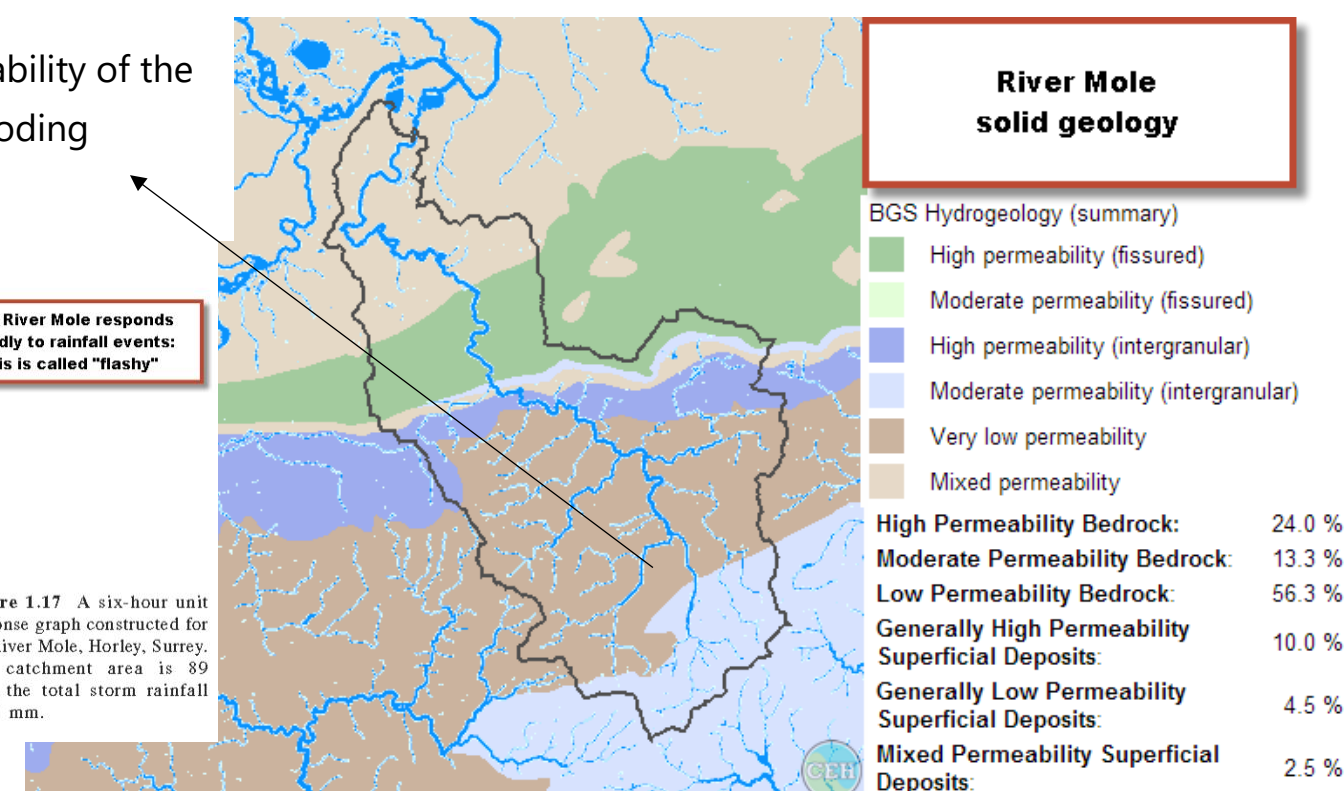
The needs of public water supply accounts for 77% of licensed water abstracted in the Mole catchment, almost all abstraction for public water supply is from the Chalk, with a smaller proportion being from the Lower Greensand. Golf course irrigation also accounts for a significant volume of the water licensed for abstraction in the catchment. Abstractions are also licensed for a variety of industrial uses such as manufacturing processes and mineral extraction, although most of these are from surface water sources.

THINK! How does the permeability of the land around the river affect its flooding likelihood?



The River Mole responds rapidly to rainfall events: this is called "flashy"

Figure 1.17 A six-hour unit response graph constructed for the River Mole, Horley, Surrey. The catchment area is 89 km², the total storm rainfall 11.5 mm.



Flooding Events:

The River Mole is usually quite consistent but, like most rivers, it has rare moments of significant flooding. Planning, developers and residents should take these rare, but arguably increasingly frequent, extreme events into consideration.

Flood Management:

Further downstream in the Lower Mole there are hard engineering structures designed to reduce flooding such as weirs and bank defences at Molesey, built after the 1:200 year floods of 1968 and upgraded since.

Gatwick is investing in an £8 million Gatwick Stream Flood Attenuation Scheme and working closely with the Environment Agency to reduce flood risk

The Upper Mole Flood Alleviation Scheme is a £15 million Environment Agency project designed to reduce flooding along the River Mole, in particular in urban areas in the upper reaches prone to flooding such as Crawley, Horley and Gatwick airport. Various schemes are being built to attenuate the flood peak in the upper reaches including upgrading of the flood retention reservoir at Clay Lake and the construction of a higher dam wall at Tilgate Lake.

Contributory Factors:

Blocked drains: blocked drains and culverts are a local cause of flooding, albeit one requiring the rainfall to make it evident. Anecdotal evidence suggests that blocked drains caused much of the flooding in Smallfield, near Horley, during the 2013 December/Jan storms.

Changing land use: Land use goes beyond the distinction of simply urban or rural. In common with other SE catchments, the Mole basin has expanding land uses such as golf courses, industrial parks like Manor Royal and numerous airport car parks.

Urban growth: the growth of towns like Crawley, Horsham and Horley and the expansion of Gatwick airport terminals has increased surface runoff by expanding impermeable surfaces that allows precipitation to transfer to the river more rapidly. 23% of the River Mole Drainage Basin is urbanised, which is quite low, but quickly expanding.

Effects of 2013/14 Flooding:

- Gatwick airport: power failure** from flooding causing delays with luggage handling (see below for more on airport flood vulnerability) on Christmas Eve; 100 flights delayed or cancelled; thousands of travellers were left stranded or abandoned as rail connections were disrupted as well.
- Power cuts across the county** e.g. 100 homes in Merstham and Sidlow left without power for 3 days. UK Power Networks raised compensation from £27 to £75 for customers without power for 48-60 hrs.
- Burford Bridge hotel, Dorking and Ye Olde Six Bells in Horley : amongst other commercial properties were submerged by flooding and closed for extended periods. Guests had to be evacuated.
- Damage to planes in Redhill aerodrome** from wind and floods (71 mph winds measured on N Downs, Kenley)
- Numerous roads and rail links were affected** including two closures of the A24 at Mickleham, A217, A23 around Horley and Salfords and downstream in Leatherhead due to severe flooding. Landslide caused embankment to collapse Dorking to Horsham railway line: limited service and month to repair.
- Landslide caused embankment to collapse** on the Dorking to Horsham railway line: limited service and month to repair
- Flooding of hundreds of residential properties**

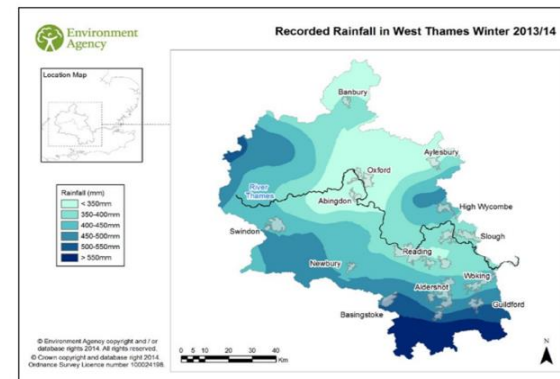
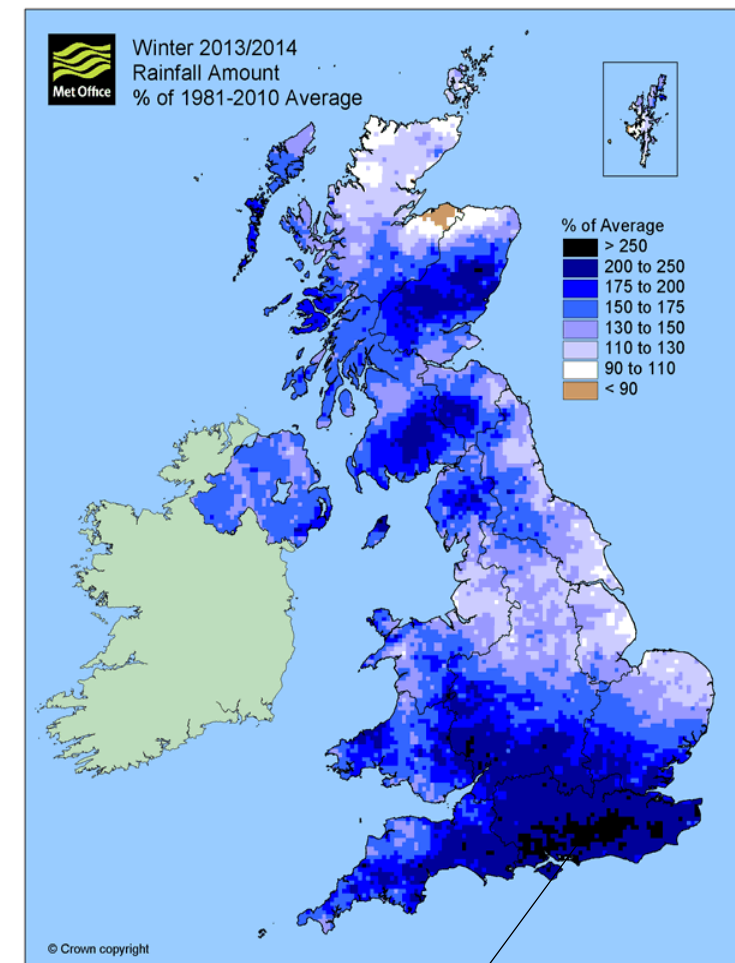
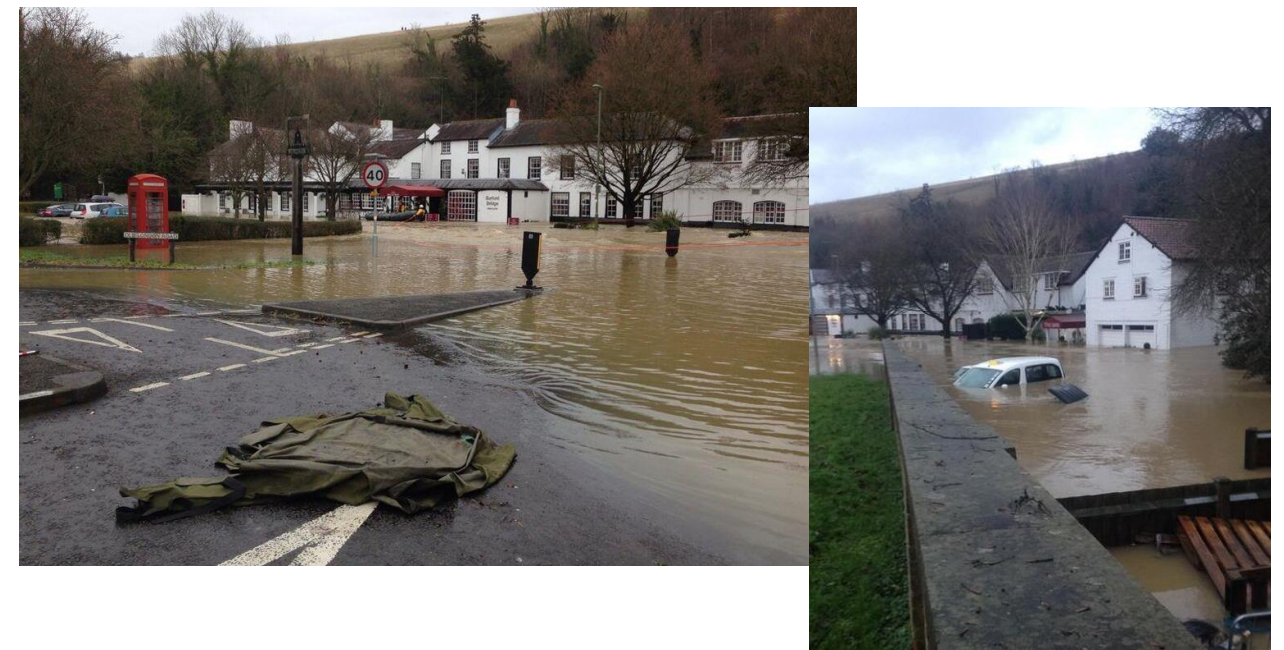


Figure 3-1 Recorded Rainfall in the Environment Agency West Thames Region 2013-14



Between 200 & >250 & increases against 1981-2010 averages.



Winter 2013/14 Floods