# 1 Appendix C: Understanding flood risk in St. Albans City and District

## 1.1 St. Albans City and District

The District covers an area of approximately 161km$^2$ and has a population of approximately 146,300[1]. The local authority district includes 20 wards with the highest densities located within the city of St. Albans. Other notable sized settlements are Harpenden, London Colney, Redbourn, Wheathamstead, Park Street, Chiswell Green and Bricket Wood. The district is similar to much of South West Hertfordshire, where outside of the large settlements are villages amongst agricultural land with small pockets of woodland.

## 1.2 Hydrology

The Principal watercourses (Appendix A) in the district are:

- The River Lee[2] that flows through Batford, Harpenden to the north of the district
- The River Ver located through the central band of the district flowing from north west to south south-east.
- River Colne located along the south-easterly boundary of the district where the River Ver confluences at Bricket Wood.

There are numerous tributaries of the River Colne in the upper catchment within St. Albans district. Beyond the district the Grand Union Canal connects with the Rivers Colne.

## 1.3 Topography

The district is relatively low-lying, with settlements of St. Albans and London Colney to the south east occupying the land. Higher elevations to the north west of the district including the Ver and Lee valleys are at the slopes of the Chilltern Hills. The highest elevations reach 145m AOD near Kinsbourne Green, with elevations decreasing in a south to south-east direction due to the presence of several river valleys in the district. Elevations reach as low as 60m AOD near Colney Street, where the River Ver flows under the M25 to the south of the district. The River Lee[3] flows across the north of the district through Harpenden and Wheathampstead. The Rivers Lee and Ver do not have extensive floodplains, due to the steep topography of their river valleys, however contribute to localised fluvial flooding.

The upper reaches of the River Colne occupy the lower lying, south eastern area of the district, passing through Colney Heath and London Colney. Due to its relatively flat topography and meandering course, the river forms the most significant area of floodplain within the district.

## 1.4 Geology and soils

The geological strata of a catchment can have an influencing factor in the mechanisms of water flow. The permeability of a sediment or bedrock will characterise how responsive to rainfall the catchment is. St. Albans City and District's bedrock consists primarily of White Chalk Subgroup with some areas made up of Lambeth Group (clay, silt, sand and gravel, particularly underlying St. Albans). The White Chalk Subgroup is the older of the two bedrocks, formed approximately



[1]Office for National Statistics (June 2017). *Population estimates for UK, England and Wales, Scotland and Northern Ireland: mid-2016*. Available at: https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/bulletibu/annualmidyearpopulationestimates/mid2016. Accessed on 08/03/2018.

[2] The watercourse is referred to as both the River Lea and River Lee.

66 to 100 million years ago in the Cretaceous period. The Lambeth Group bedrock was formed later between 56 to 66 million years ago in the Palaeogene Period.

Superficial Quaternary deposits are more variable with five distinct composites found within the district. Clay-with-flints Formation (diamicton) characterise the north to north-west of the district along the Lee Valley and higher elevations of the district. River Terrace deposits (undifferentiated) are located along the River Ver valley where sediment is mainly sand and gravel with fine silt and clay from overbank floods forming floodplain alluvium. The lower extents of the district are characterised by glacial deposits, with till (diamicton) underlaying the majority of the south where glacial moraines scoured the landscape. Superficial deposits of Glacial Sand and Gravel are centred around St. Albans towards London Colney. Alluvium deposits of clay, silt and sand form the southern region of the district along the Colne valley. These Cole valley deposits have been subject to extensive sand and gravel extraction over many decades. These works can have a varying impact on flood risk, depending on the usage of mineral extraction works. Voids created by extraction can provide additional storage during flood events, whereas infilled and capped excavation areas can reduce flood storage provision.

Geology information for the Borough can be viewed on the British Geological Society website.

The majority of the upper catchment of the district is formed of slightly acid loamy and clayey soils with impeded drainage. The soils of the Ver and Colne river catchments are freely draining, allowing surface water to drain down relatively quickly. However, they also have a naturally high seasonal groundwater level, and tend to retain water close to the surface during wetter months. Soils information can be viewed on the Soilscapes website.

## 1.5 Land use

The district has significant areas of open land and countryside outside the large urban settlements of Harpenden and St. Albans. The agricultural land is characterised by arable land with occasional fields of improved grassland and scattered woodlands. There is a variety of wetlands, woodlands and heath located along the Upper Colne, Upper Lee and River Ver Valleys.

Figure 1-1: Topography of St. Albans.

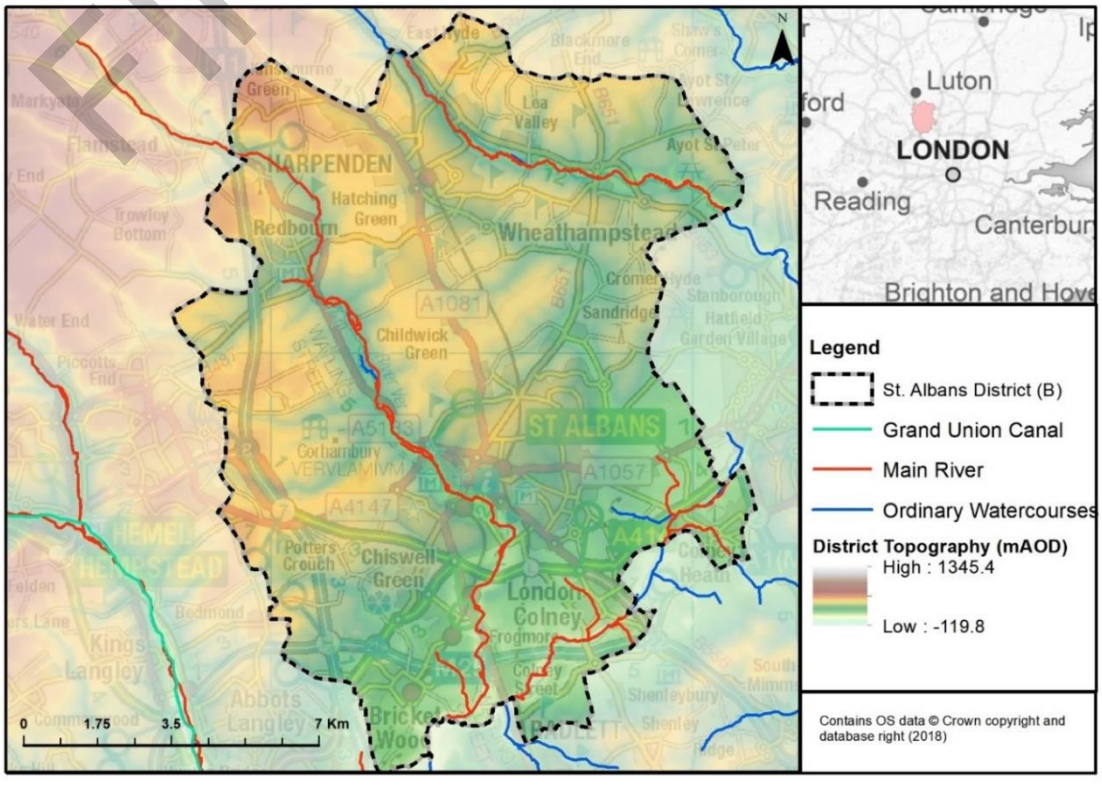


Figure 1-2: Bedrock geology of St. Albans

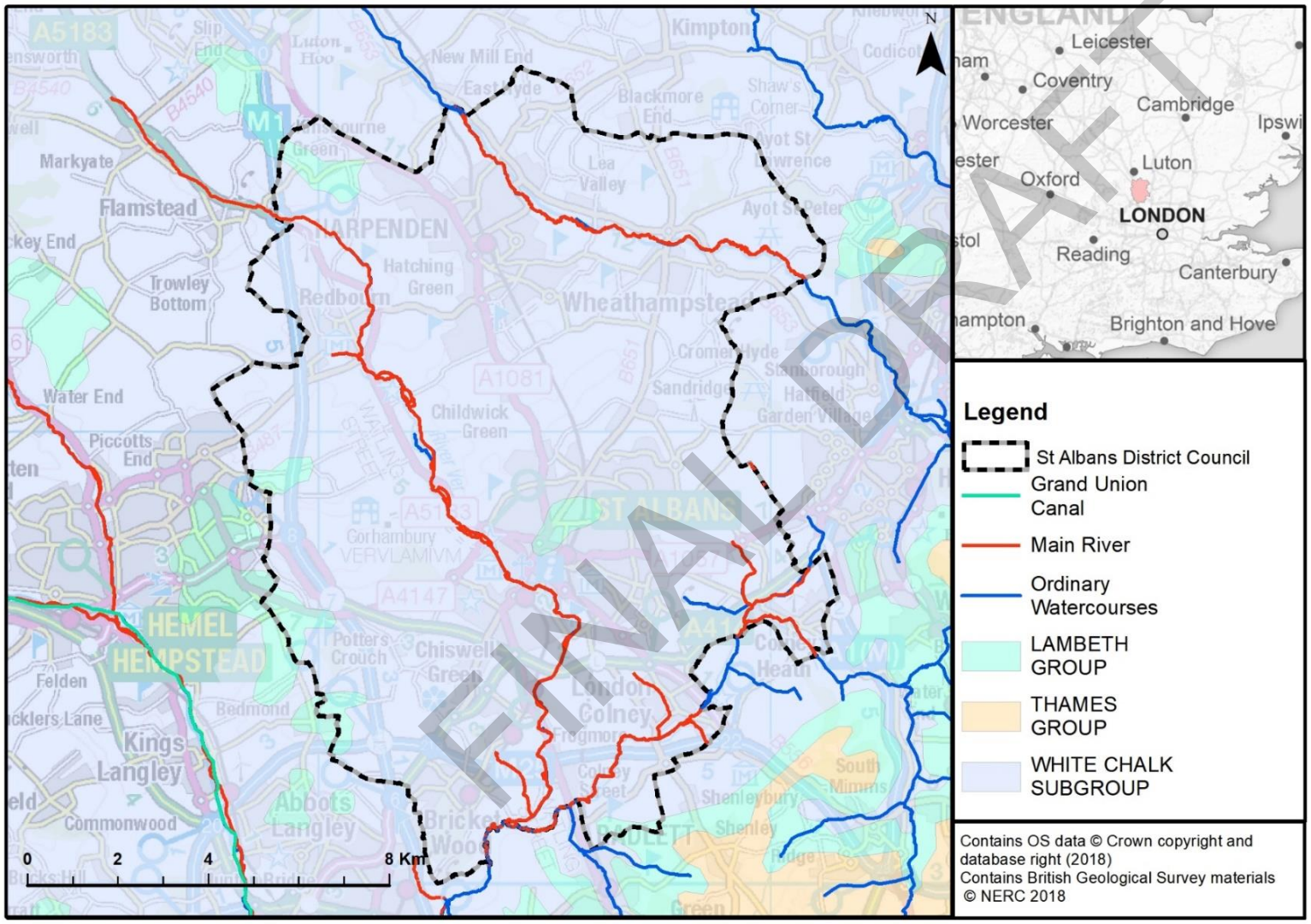
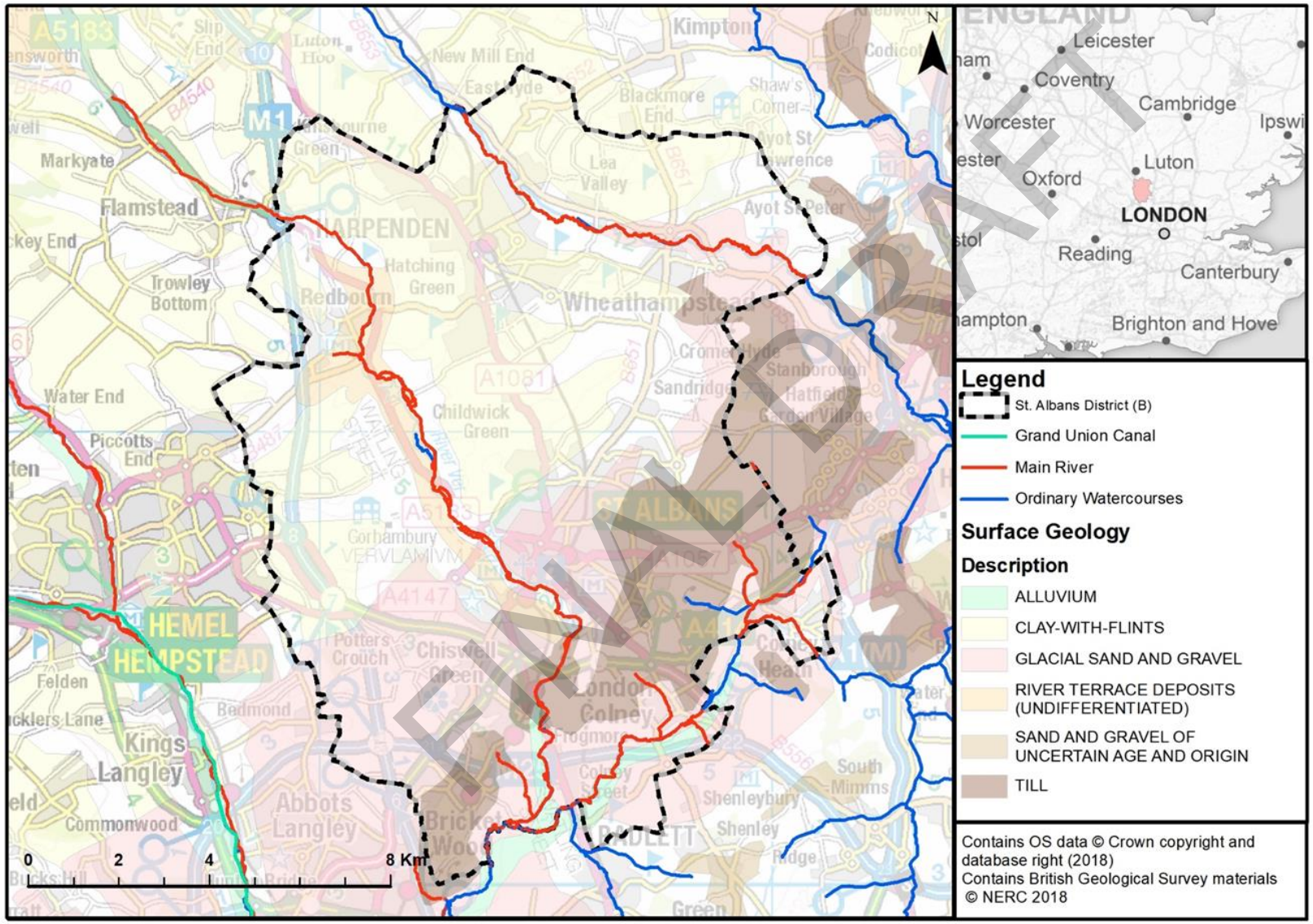


Figure 1-3: Surface geology of St. Albans



## 1.6 Flood history

There are many recorded flood incidents in the district. With the exception of groundwater flooding recorded in the city itself, the majority of incidents are concentrated in the surrounding settlements. In particular, relatively regular fluvial and surface water flooding has been recorded in Wheathampstead, Colney Heath, London Colney and Batford.

A summary of available flood incidents is provided in Table 1-1.

Table 1-1: Recorded flood incidents in St. Albans.

| Date | Settlement / location | Severity / description of incident |
|---|---|---|
| 1947, 1979, 1992, 1993 & 2000 | Park Lane, Colney Heath | Properties have long history of flooding. Flooding on average every 10 years. Six properties flooded during 1992 and 2000/2001 flood events. |
| 1947, 1979, 1992, 1993 & 2000 | St Mark's Close, Colney Heath | Properties have long history of flooding. Flooding on average every 10 years. One property flooded in 1992 and 2000/2001 flood events. |
| 1959, 1962, 1968, 1972, 1975, 1984, 1992, 1998 | Batford | Properties on the Lee Valley Industrial Estate, Lower Luton Road and Coldharbour Lane have history of flooding. Estimated Return Period ranging from 1 in 5 to 1 in 75 years (May, 1992). |
| 1968, 1978, 1979, 1984, 1987, 1992, 1998 | Wheathampstead | Village centre and shops (Station Road) around Mill culvert have a history of flooding. Varying return periods from 1 in 5 to 1 in 75-year events (May 1993). |
| September 1992 | Colne Gardens, London Colney | Properties flooded from the Colne. Long history of flooding. |
| September 1992 | Lowbell Lane, London Colney | Properties flooded from the Colne. Long history of flooding. |
| September 1992 | Waterside, London Colney | Properties flooded from the Colne. Long history of flooding. |
| September 1992 | Willowside, London Colney | Properties flooded from the Colne. Long history of flooding. |
| June 1993 & October 1993 | Redbournbury Lane, Redbourn | Culvert capacity exceedance upstream at Markyate. Resulted in three properties being flooded. |
| Winter 2000/2001 | Gaddesden Lane, Church End, Redbourn | Properties and Hemel Hempstead Road flooded as a result from groundwater rising. |

| | | |
|---|---|---|
| Winter 2000/2001 | High Street, Redbourn | Groundwater flooding. Continuous stream of water flowing through main town. High water levels of the River Ver. |
| Winter 2000/2001 | Sandridge and Marshalswick | A groundwater lake extended from north of Sandridge and rose to approximately 4.5m. Properties in Marshalswick were evacuated for six months. Estimated to be a 1 in 250 year AEP |
| December 2000 | Fishpool Street, St. Albans | Groundwater flooding |
| April 2001 | Beverly Gardens, St. Albans | Groundwater flooding |
| February 2006 | Harper Lane, St. Albans | Groundwater flooding |
| May 2007 | Wheathampstead | High Street, Mill Walk, Ash Grove and King Edward Place were flooded to various extents. |
| 27th May 2007 | Park Lane, Colney Heath | Four properties flooded and extensive external flooding to properties at Waterside and Lowbell Lane. |
| February 2009 | Rose Acre, Ridgedown & Snatchup; Redbourn | Extensive surface water flooding to 20 properties due to a series of heavy storms the ground in the catchment surrounding Redbourn was saturated. |
| Dec 2013, Feb 2014, Oct 2014, Jan 2015, Jan 2016 & Mar 2016 | Sandbridgebury Lane, St Albans | Road has a history of flooding, deeming it impassable on most occasions from surface water pooling. |
| February 2014 | Waterside, Water Mede, London Colney | Extensive flooding from the Colne to a number of roads and properties externally. |
| February 2014 | Leyton Road, Harpenden | Surface water runoff with 55mm of rain falling in two hours. Extensive surface water flooding lead to a number of properties along Leyton Road being flooded. |
| 7th February 2014 | Rose Acre & Ridgedown, Redbourn | 15 internal property flooding from surface water running down Lybury Lane. |
| July 2015 | Batford, Bush, Hall Lane, Harpenden | Properties flooded or affected due to the River Lee. |
| 16th July 2015 | High Street, Harpenden | At least 12 commercial properties flooded. |
| 16th July 2015 | Luton Road, Leyton Road, Bridge Court, Southdown Road & High Street; Harpenden | Over 15 properties flooded from surface water. |
| 16th July 2015 | Harness Way, Villiers Crescent, Newgate Close & Salisbury | Internal flooding to over 20 properties from surface |

| | | |
|---|---|---|
| | Avenue; St Albans | water due to heavy rainfall. |
| 16th July 2015 | High Street, Harpenden | Commercial and residential properties flooded |
| 16th July 2015 | Castle Road, Drakes Drive, Salisbury Avenue; Harpenden | Over 10 properties flooded internally from surface water |
| 16th September 2015 | Ladies Grove & Tennyson Road, St Albans | Properties flooded internally from surface water. |
| 23rd June 2016 | Newgate Close, Alexander Road & Station Road; St Albans | Internal properties flooded due to surface water. |
| Unknown | Marshalls Way, Marshalls Heath | Serious surface water flooding occurs regularly to properties along Marshalls Way. |
| Unknown | Briar Road, St Albans | 5 properties flooded internally from surface water. Flood flows from the Ridgeway to Briar Road and across Jersey Lane. |
| Unknown | Warwick Road, St Albans | 4 newly constructed properties flooded internally from surface water |

## 1.1 Flood Risk in St. Albans

### 1.1.1 Fluvial

The sources of fluvial flood risk in St. Albans are the River Lee in the north of the district, the Rivers Colne and Ver, and two tributaries of the Colne to the east, the Ellen and Butterwick Brooks. The fluvial floodplain of the Rivers Lee and Ver are tightly constrained by the steep topography of the Chiltern Hills dip slope, resulting in a very narrow extent of Flood Zone 2 and 3. The lower reaches of the River Colne are meandering and less constrained, resulting in a wider floodplain.

In the River Lee, small sections of north Batford and north east Wheathampstead are located within Flood Zone 2 and 3. East Redbourn and parts of southwest St. Albans are situated within the Flood Zones of the River Ver, with the Flood Zone extents becoming greater as the watercourse passes through St. Albans. The flood extents associated with the Rive Colne and its tributaries, the Ellen and Butterwick Brooks are more extensive, affecting eastern St. Albans, Colney Heath and Napsbury Park.

The extent of fluvial flood risk can be seen in Appendix A.

### 1.1.2 Surface Water

Surface water flood risk is largely confined within the valleys of the Main Rivers and ordinary watercourses of St. Albans District, particularly within the rural areas. There are many areas of surface water ponding, particularly in the upper catchments of the rural watercourses, identifying ponds or low points in the topography.

Within the main settlements, surface water flow paths are predicted to form on the impermeable surfaces with sufficient gradients. Within St. Albans city, surface water follows routes along the road network southwestwards into the River Ver, and eastwards into Butterwick Brook. Surface water flooding may is also predicted to occur in Harpenden during a 1 in 30-year rainfall event, where rainwater is channelled into a natural low point, possibly a dry valley, through the centre of the town.

The Midland Mainline railway embankment, running north-south through the centre of the district, as well as Redbourn Road, London Road, the North Orbital Road in St. Albans provide topographic barriers to flow. This results in a predicted backing up of

surface water on either side of the transport links. In reality, this risk will partially be managed by drainage beneath the railway and road network, which is not represented in detail in the RoFSW mapping.

Appendix A provides the surface water flood risk mapping for St. Albans.

### 1.1.3 Groundwater

Groundwater flood risk is concentrated in the floodplains of the Rivers Lee, Ver and Colne, as well as Butterwick and Ellen Brooks. Here, the chalk geology and gravel surface deposits can result in heightened groundwater levels at or just below the ground surface. The settlements identified as at highest risk of groundwater flooding are southern St. Albans, Marshalwick (St. Albans), Redbourn, Batford and Wheathampstead.

The groundwater flood risk map for St. Albans is provided in Appendix A.

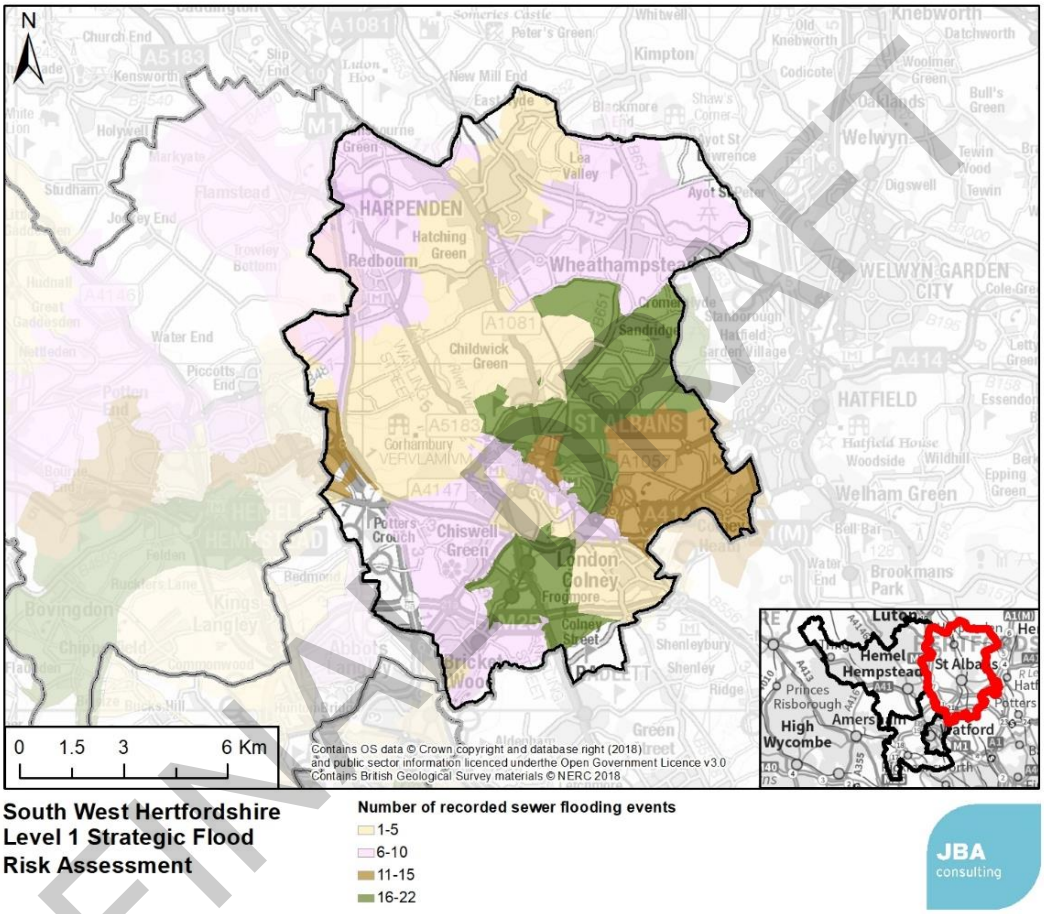
### 1.1.4 Sewers

Thames Water provided their sewer flooding register for the district which is detailed below in

Table **1-2** and Figure **1**-**4**. The largest number of incidents within a single postcode area is recorded in AL1, which covers St. Albans City. High numbers of incidents were also reported in AL2 and AL4, which also cover the city, but extend to London Colney, Sandridge and Wheathampstead.

The mechanism of flooding is not specified in the register, however the presence of fluvial, surface water and groundwater flood risk in these areas suggests an interaction with the sewer network, perhaps through ingress or restricted outfalls at high river levels.

Figure 1-4: Map of sewer flooding incidents recorded on Thames Water register




**South West Hertfordshire Level 1 Strategic Flood Risk Assessment**

**Number of recorded sewer flooding events**

- 1-5
- 6-10
- 11-15
- 16-22

Table 1-2: Thames Water sewer flooding register for St. Albans.

| Postcode Area | Locality | Internal property flooding | | | External property flooding | | | Total |
|---|---|---|---|---|---|---|---|---|
| | | 2 in past 10-years | 1 in past 10-years | 1 in past 20-years | 2 in past 10-years | 1 in past 10-years | 1 in past 20-years | |
| AL1 1 | St. Albans City | 0 | 1 | 3 | 0 | 1 | 5 | **10** |
| AL1 2 | | 0 | 0 | 1 | 0 | 0 | 4 | **5** |
| AL1 3 | | 0 | 2 | 5 | 0 | 3 | 3 | **13** |
| AL1 4 | | 0 | 0 | 4 | 2 | 6 | 5 | **17** |
| AL1 5 | | 0 | 2 | 3 | 2 | 3 | 6 | **16** |
| AL2 1 | St. Albans City, Bricket Wood, Colney Street, Frogmore, London Colney, Napsbury | 0 | 0 | 1 | 1 | 0 | 3 | **5** |
| AL2 2 | | 0 | 0 | 0 | 0 | 11 | 6 | **17** |
| AL2 3 | | 1 | 0 | 1 | 0 | 2 | 6 | **10** |
| AL3 4 | St. Albans City, Redbourn, Sandridge, Gorhambury, Childwickbury | 0 | 0 | 0 | 0 | 1 | 8 | **9** |
| AL3 5 | | 0 | 0 | 6 | 0 | 1 | 10 | **17** |
| AL3 6 | | 0 | 0 | 0 | 0 | 0 | 4 | **4** |
| AL3 7 | | 0 | 0 | 0 | 0 | 4 | 2 | **6** |
| AL4 0 | St. Albans City, London Colney, Jersey Farm, Sandridge, Wheathampstead, Marshalswick | 1 | 0 | 1 | 0 | 4 | 8 | **14** |
| AL4 8 | | 0 | 0 | 0 | 1 | 3 | 5 | **9** |
| AL4 9 | | 0 | 0 | 3 | 0 | 2 | 15 | **20** |
| AL5 1 | Harpenden, Kinsbourne Green | 0 | 0 | 4 | 0 | 0 | 2 | **6** |
| AL5 2 | | 0 | 0 | 1 | 0 | 0 | 0 | **1** |
| AL5 3 | | 0 | 0 | 5 | 0 | 0 | 2 | **7** |
| AL5 4 | | 0 | 0 | 0 | 0 | 0 | 1 | **1** |
| AL5 5 | | 0 | 1 | 0 | 0 | 1 | 1 | **3** |
| **TOTAL** | | **2** | **6** | **39** | **6** | **42** | **100** | **195** |

### 1.1.1 Canal

There are no canals within the district, and therefore there is no risk of canal flooding.

### 1.1.2 Reservoir

Parts of the district have a residual risk of flooding from water bodies classified as reservoirs (storing a volume of water greater than 25,000m$^3$). There are no designated reservoirs within the District, however national modelling predicts that, in the unlikely event of reservoir breach, exceedance flows from nearby reservoirs could be conveyed by the Rivers Ver, Lee and Colne, and the residual flood risk would be largely confined to the floodplains of these watercourses.

The nearest reservoirs which could contribute to this risk are Willow Lakes (wetlands created from former gravel working) near Colney Heath, Luton Hoo (ornamental lakes created as part of a man made historic parkland) to the north, and Cherrytree Reservoir (believed to provide attenuation for Hemel Hempstead drainage) in Dacorum, to the west.

However, it should be noted that reservoir safety is closely controlled by operators and regulators, and the likelihood of a flood event due to reservoir breach is low.