Public

West Sussex County Council
S19 FLOOD INVESTIGATIONS

Storm Ciarán, November 2023

UK0029462.4168

May 2025

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REPORT (ISSUE 1) PUBLIC

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WSP

Matrix House
Basing View
Basingstoke, Hampshire
RG21 4FF

Phone: +44 1256 318 800

WSP.com

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EXECUTIVE SUMMARY

In October and November 2023, several locations in the south of West Sussex were affected by flooding resulting from Storm Ciarán. WSP UK Ltd. was commissioned by West Sussex County Council, as the Lead Local Flood Authority (LLFA), to conduct a Section 19 Flood Investigation to investigate the flooding. The areas that experienced the most severe flooding, and therefore are investigated within this report, include Bognor Regis, Shripney, and Yapton.

WSP is aware of approximately 41 residential properties, 13 businesses, and 35 highways that experienced a form of flooding as a result of the 2023 flood event. Of these residential properties, approximately 12 properties experienced internal flooding and approximately 30 experienced external flooding. Flooding resulted from several sources, such as fluvial, sewer and surface water.

WSP has completed an investigation into the causes, mechanisms, consequences, and responses associated with the October/November 2023 flood event. This has involved discussions with Arun District Council officers, site visits to the flooded locations, analysis of hydrology data, consultation with risk management authorities, and the review of data gathered by Arun District Council, such as reports of flooding and photographic evidence.

The analysis of data from two nearby rainfall gauges, sourced from the Hydrology Data Explorer, indicated that Storm Ciarán did not have a significantly large return period but demonstrated that October 2023 was the wettest October on record. An analysis of groundwater levels and fluvial levels on the Aldingbourne Rife indicates that throughout October both levels rose and were considered very high prior to Storm Ciarán. This caused the ground to be heavily saturated and influenced the catchments' ability to absorb rainfall during Storm Ciarán, creating prime conditions for flooding.

The information obtained for this investigation has led to a series of recommendations being made to reduce the risk of a similar event happening in the future. These range from property flood resilience measures to consideration of flood alleviation schemes.

Contact name Mat Quinnell

Contact details +44 1256 318 800 | matthew.quinnell@wsp.com

1 INTRODUCTION

1.1 BACKGROUND

1.1.1. WSP has been commissioned by West Sussex County Council (WSCC) to conduct a Section 19 Flood Investigation following flooding which was reported in Bognor Regis, Shripney, and Yapton. The flooding happened following Storm Ciarán which occurred from the 1st until the 2nd of November and resulted in widespread flooding. The flooding led to road closures and internal and external property flooding to homes and businesses.

1.1.2. The locations under investigation are demonstrated in Figure 1-1 and Figure 1-2 and include:

- Bognor Regis
- Shripney
- Yapton

Figure 1-1 - Investigated Locations in West Sussex

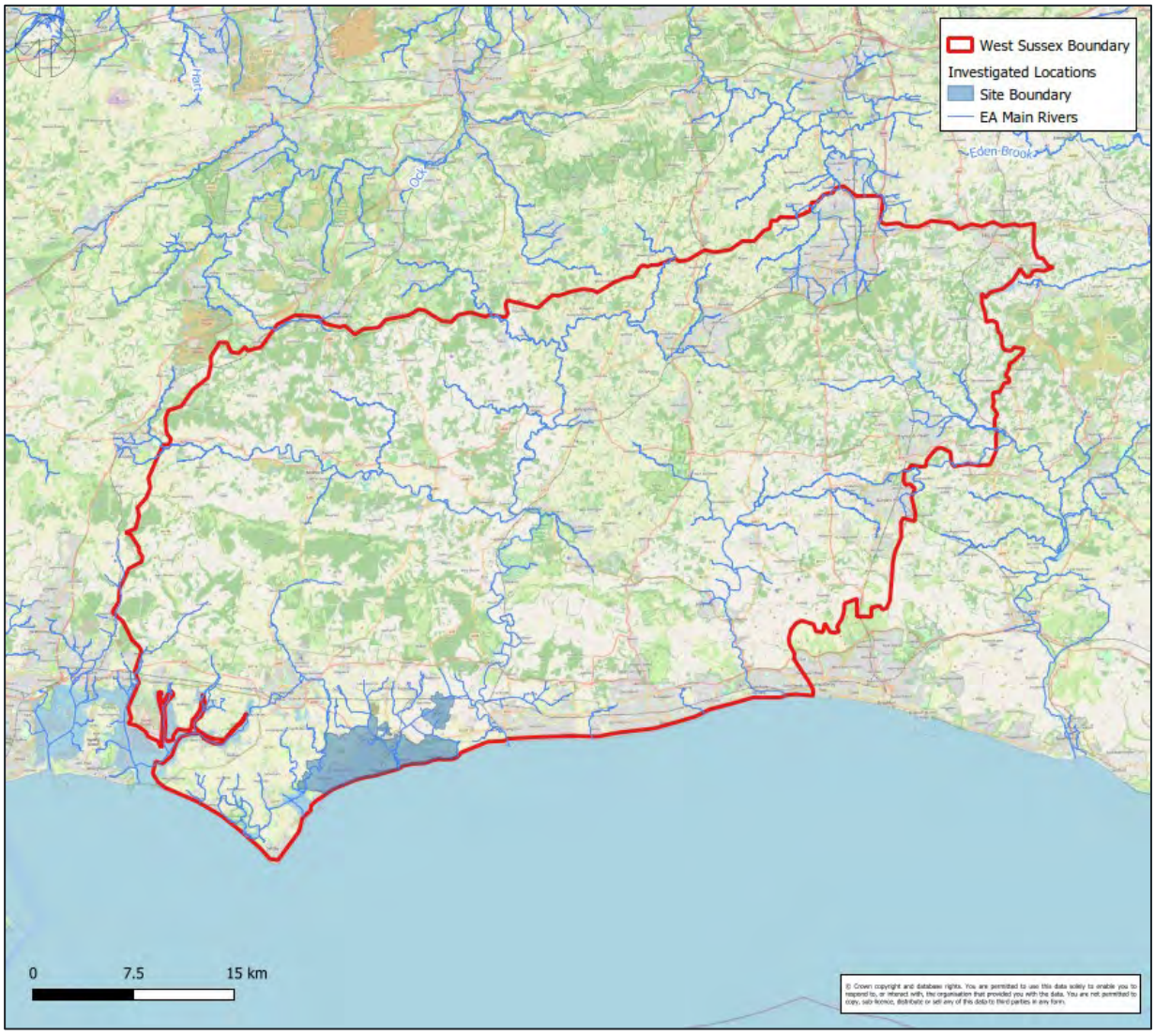
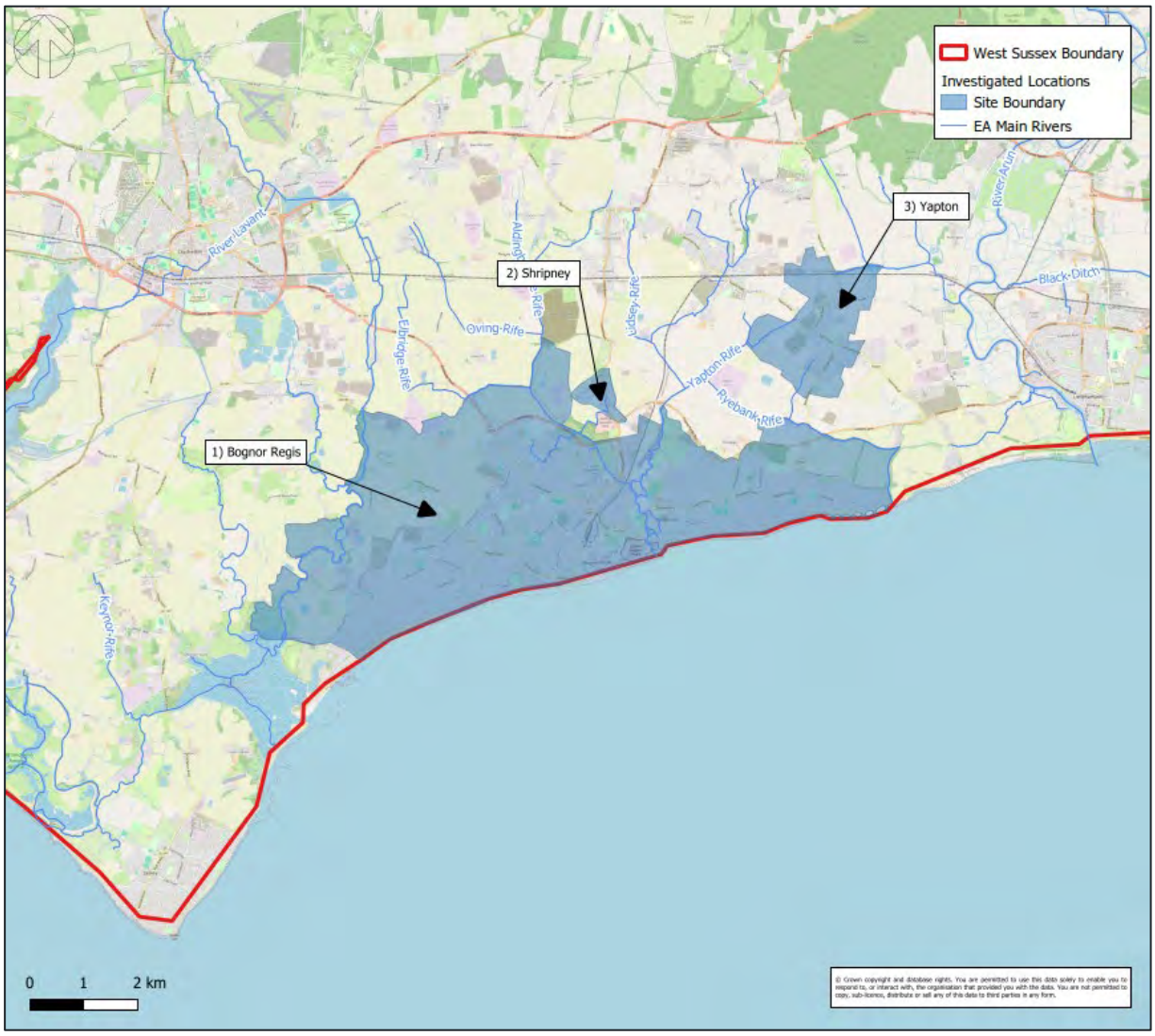


Figure 1-2 - Investigated Locations (Detailed)



**Refer to Table 1-1 for location details.*

1.1.3. West Sussex County Council have a responsibility under the Flood and Water Management Act 2010 (FWMA 2010) to undertake flooding investigations. Specifically, Section 19 states:

'*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.*'

1.1.4. Table 1-1 and the figures in Appendix A summarise the areas which have been reported to West Sussex County Council as experiencing flooding following Storm Ciarán.

Table 1-1 – Summary of Flooding in Each Investigated Location

No	Flood Location	Residential Properties Externally Flooded	Residential Properties Internally Flooded	Business Properties Flooded	Highway Flooding
1	Bognor Regis	~30	~8	12	27*
2	Shripney	0	~3	0	4*
3	Yapton	0	0	~1	4
	Total	**~30**	**~11**	**~13**	**35**

**A29 Shripney Road flooded in both Bognor Regis and Shripney.*

~ = approximately

1.2 REPORT REQUIREMENTS

1.2.1. West Sussex County Council's 2013 Local Flood Risk Management Strategy states that:

- *"The* [section 19] *investigation must set out which risk management authority should lead the review, establish the reasons for the flood, and whether the response was appropriate. If flooding has occurred to more than ten properties in one incident, then a full investigation will be triggered. Depending on the circumstances of smaller flooding events, an initial investigation may still be required for flooding of less than ten properties."*

1.2.2. Due to the scale of the 2023 flood event, the threshold for a full section 19 Flood Investigation was triggered.

1.3 SITE VISITS

1.3.1. WSP staff carried out site visits to each affected area on the following dates in the company of Arun District Council Drainage Officers:

- *Bognor Regis – 09/10/2024 & 10/10/2024*
- *Shripney – 09/10/2024*
- *Yapton – 16/10/2024*

1.3.2. Site visits were completed to assist in the identification and mapping of flooding sources, causes, flow routes, and consequences.

1.3.3. Photographs from these site visits and site investigation reports are provided in Appendix B.

1.4 LIMITATIONS

1.4.1. The information contained in this document has been complied for the benefit of West Sussex County Council officers and contractors, Arun District Council, Parish Councils, the Environment Agency, Southern Water, and the affected community.

1.4.2. It should be noted that much of the following record is dependent upon accounts of the flood events from District officers, and West Sussex County Council officers. Prior to taking any recommendations forward, a feasibility study should be undertaken to confirm the viability of any interventions.

1.4.3. It is also noted that an amount of time has passed since Storm Ciarán and the flood event such that some accounts of flooding may not be as accurate or specific as they would have been had the investigation been completed closer to the time. This may have also contributed to the lack of responses received to the flood questionnaire created by WSP. Furthermore, some properties may have chosen not to report if they were affected by flooding for privacy and insurance purposes.

2 FLOOD RISK MANAGEMENT ROLES AND RESPONSIBILITIES IN WEST SUSSEX

2.1 WEST SUSSEX COUNTY COUNCIL

2.1.1. Under the FWMA 2010, West Sussex County Council, as the Lead Local Flood Authority (LLFA):

- has a duty to coordinate the management of flood risk from local sources. This includes surface water, groundwater and ordinary watercourses;
- has a duty to investigate and publish reports on flood events (to the extent it considers necessary);
- is responsible for compiling and maintaining a register of structures and features that have a significant effect on flood risk; and
- has responsibility for consenting and enforcement works to and adjacent to ordinary watercourses for works that obstruct flow, or affect an obstruction to flow.

2.1.2. West Sussex County Council is also the Highway Authority and has the following powers and duties:

- maintain highways, including ensuring that highway drainage systems are clear and that blockages on the highway are cleared;
- deliver works that they consider necessary to protect the highway from flooding, either on the highway itself or on land which has been acquired by the Highway Authority in the exercising of highway acquisition powers; and
- divert parts of watercourses or carry out any other works on any form of watercourse if it is necessary for the construction, improvement or alteration of the highway or provides a new means of access to any premises from the highway.

2.1.3. The Council also has other related roles in planning and development control, public health and emergency planning.

2.1.4. West Sussex County Council have a Resilience and Emergencies Team that carries out statutory duties under the Civil Contingencies Act 2004. The team are members of the Sussex Resilience Forum (SRF) and under Part 1 of the Flood Plan, have the following roles and responsibilities:

Table 2-1 - West Sussex County Council Roles and Responsibilities within Sussex Flood Forum.

Pre-planning	• Contribute to applicable SRF emergency response plans as listed in Plan Concept section. • Manage own response plans. • May lead in development of surface water management plans. • Lead preliminary flood risk assessment.

Response During a Flood	• Alert voluntary organisations. • Maintain highway systems as appropriate. • Coordinate local authority response where more than one District / Borough is affected. • Initiate communication and activation of multi-agency. • Support rest centre arrangements. • Provide public heath advise as required.
Recovery / Post Event	• Lead recovery phase following widespread event. • Coordinate strategic level response where two or more Districts / Boroughs are affected. • Identify lessons to be addressed.

Source: Chichester District Council

2.2 ARUN DISTRICT COUNCIL

2.2.1. If a major flood event occurs in Arun, Arun District Council may be required to operate its Emergency Plan. Examples of what this may involve includes:

- working with the police, fire and rescue services, West Sussex County Council, Health organisations and the Environment Agency to co-ordinate responses;
- providing local advice to the public;
- setting up rest centres for people evacuated from their homes and arranging temporary shelters or accommodation.

2.2.2. Arun District Council, as the local authority, have land drainage byelaws which apply to works in, under or within 3m of an ordinary watercourse. The byelaws relate to the following:

- Main River and ordinary watercourse power,
- Roadside ditches,
- Riparian owners,
- Land drainage powers of Local Authorities,
- Enforcement action by Local Authorities,
- Environment Agency consent approvals,
- Biodiversity and ditch clearance, and
- Fences and access.

2.2.3. Refer to Arun District Council's byelaws for further information.

2.2.4. As a risk management authority, Arun District Council also have responsibilities under the FWMA (2010). Section 13 Co-operation and arrangements states that:

1) *'A relevant authority must co-operate with other relevant authorities in the exercise of their flood and coastal erosion risk management functions.*
2) *A relevant authority may share information with another relevant authority for the purpose of discharging its duty under subsection 1.*
3) *In subsection 1 and 2 relevant authority means –*
    a. *A risk management authority, and*
    b. *The Welsh Ministers.*
4) *A risk management authority may arrange for a flood risk management function to be exercised on its behalf by –*

a. *Another risk management authority, or*
b. *A navigation authority.'*

2.3 ENVIRONMENT AGENCY

2.3.1. The Environment Agency has a duty to provide a national strategic overview of flooding. The Environment Agency is also responsible for managing flood risk from Main Rivers, reservoirs, estuaries and the sea.

2.3.2. The Environment Agency has a key role in providing flood warnings to the public and in protecting and improving the natural environment.

2.3.3. The Environment Agency has permissive powers to reduce flood risk by undertaking work on Main Rivers and flood defence structures.

2.4 SOUTHERN WATER

2.4.1. Southern Water has responsibility for the public foul and surface water sewer systems in its ownership. Southern Water is also responsible for treating sewage from its foul network and to empty and dispose of the contents of their sewers. The Water Company has a general duty (under Section 94 of the Water Industry Act 1991) to provide, extend and improve public sewer systems, ensuring the areas they serve are 'effectually drained'.

2.4.2. Southern Water must also maintain a register of flooding from sewers. The register records information which is used to apply for investment funds from Ofwat to undertake improvements or repairs to the foul and surface water networks. Investment is agreed with Ofwat on a five-year cycle referred to as Asset Management Periods (AMP). The current AMP runs from 2020-2025.

2.5 RIPARIAN OWNERS

2.5.1. Landowners are known as a 'Riparian Owner' if there is a watercourse within or adjacent to the property boundary. A watercourse can be any stream or water flowing in a defined channel or through an underground pipe or culvert. Riparian owners have a responsibility to maintain the bed and banks of any watercourse within or adjacent to their property, in most cases even if that watercourse is adjacent to a highway, and to ensure there are no obstructions to the natural flow of water.

2.6 PROPERTY OWNERS

2.6.1. Responsibility for protecting property from flooding lies in the first instance with the property owner. Property owners whose home or business premises are in areas known to be at risk of flooding should consider making their own flood defence preparations. Property owners also have a common law duty to mitigate their losses during a flood event, but without increasing the damage to neighbouring properties.

3 HYDROLOGY

3.1.1. Storm Ciarán was a severe storm for the time of year with strong gusts of 89 – 91mph across the south coast. Storm Ciarán also brought heavy rainfall which, in addition to persistent wet weather throughout October is likely to have been a factor in the cause of flooding across the study area. According to the nearest rain gauges (Bognor rain gauge and the Westergate rain gauge), it was the wettest October on record.

3.1.2. Further to this, the fluvial water level (closest fluvial gauge at Bognor) and the water table (closest groundwater level gauge at Lagness) rose throughout October. The fluvial water level and the groundwater table were considered very high when Storm Ciarán occurred.

3.1.3. Detailed analysis of the gauge data is shown in Appendix C. The analysis indicates that the recorded rainfall that fell in the month leading up to Storm Ciarán meant that the ground was heavily saturated which influenced catchments' ability to absorb rainfall and exacerbated the impact of Storm Ciarán rainfall event.

4 FLOOD INVESTIGATION

4.1.1. The following sections of the Flood Investigation Report (FIR) provide an assessment of the information received for the areas that experienced flooding; a review of the sources of flooding; the impact on the local area; and the response and / or actions preceding, during and following the flood events by the relevant flood risk management authorities.

4.1.2. Following the flood events, consultation with local residents, in the form of a questionnaire, was undertaken. A summary of the resident's responses is provided in Appendix D.

4.1.3. Consultation was also undertaken with flood risk management authorities (RMA) including the Environment Agency, Southern Water, Arun District Council, and West Sussex County Council. Refer to Appendix E for copies of correspondence with these RMAs.

5 BOGNOR REGIS

5.1 INTRODUCTION & PREVIOUS FLOODING

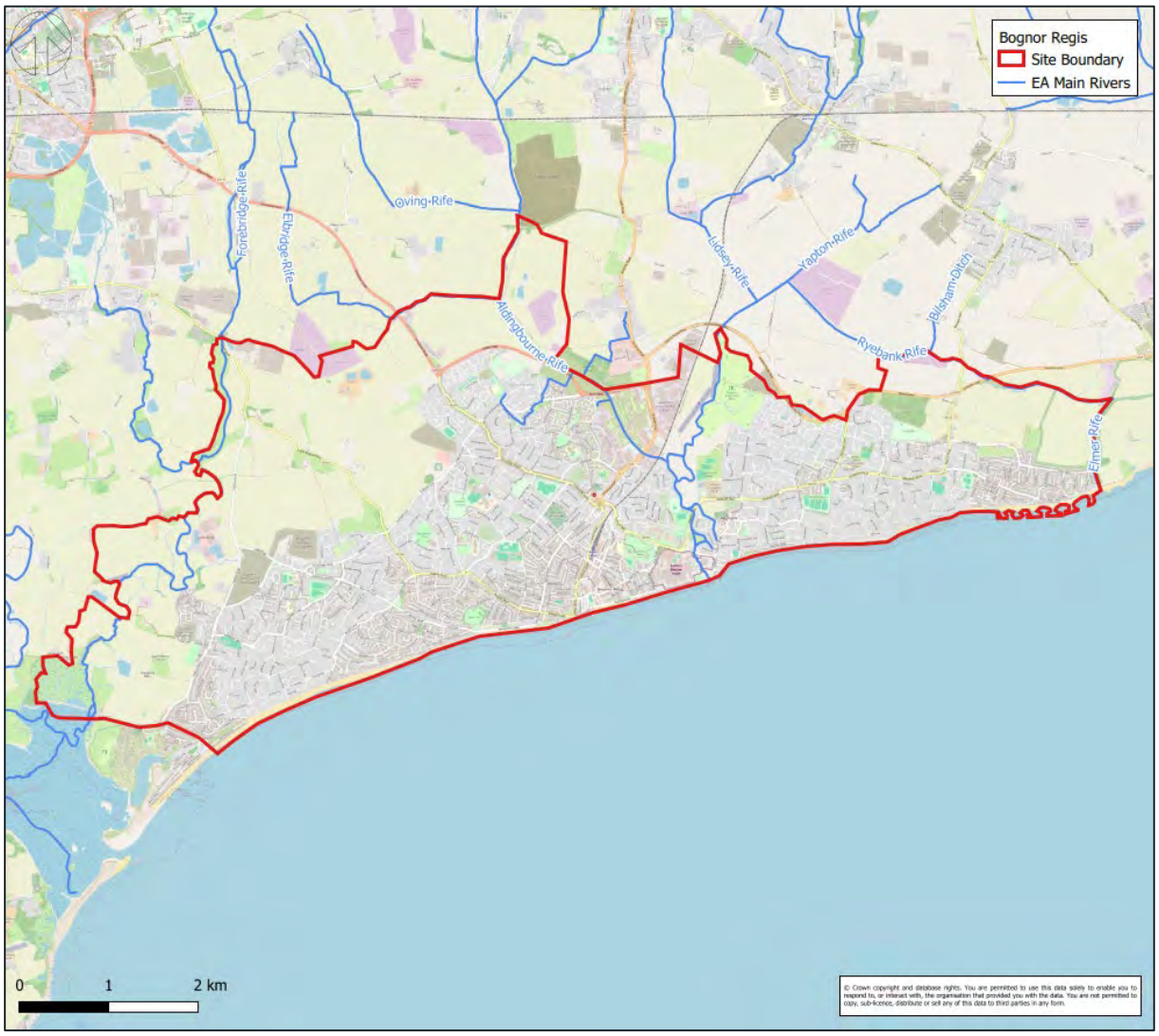
5.1.1. Bognor Regis is located in the south-west of West Sussex and is part of Arun District Council. Refer to Figure 5-1 below. Specifically, the following areas within Bognor Regis were affected by flooding during the 2023 flood event:

- Aldwick – SZ 91218 98874
- Bersted – SU 93648 00402
- Elmer – SU 98555 00124
- Felpham – SU 95722 00180
- Middleton-on-Sea – SU 97801 00303
- Pagham – SZ 88596 97519
- Rose Green – SZ 90483 99067

5.1.2. Bognor Regis is a coastal town and contains a network of ordinary watercourses (ditches and culverts) and Main Rivers such as Aldingbourne Rife and Lidsey Rife. Road drainage is present across the town in the form of ditches, pipes, and gullies.

5.1.3. Previous flooding occurred across Bognor Regis during the June 2012 flood event, during which similar areas were affected. During the 2012 event, approximately 367 properties were affected across Bognor Regis. Similar to the 2023 flood event, sources of flooding included fluvial, sewer, and surface water. Historic flood outlines are mapped within Appendix F.1.

Figure 5-1 - Bognor Regis Location Map



5.2 2023 FLOODING

Aldwick

5.2.1. WSP is aware of approximately four properties in Aldwick that experienced external flooding during the 2023 flood event. One property on Aldwick Road experienced external fluvial flooding, possibly due to a partial blockage in the ordinary watercourse. One property on Colt's Bay experienced external flooding from both surface water and fluvial sources. One property on Fish Lane experienced external fluvial flooding, possibly due to a capacity issue in the ordinary watercourse. One property on Lincoln Avenue experienced external surface water flooding.

5.2.2. It was reported that highway flooding occurred across Aldwick Road, Barrack Lane (refer to Figure 5-2), Colt's Bay, Kingsway, and Queensway (Craigweil Private Estate) as shown in Appendix A.1. WSP is aware of road closures on Aldwick Road and Colt's Bay during Storm Ciarán. Property flooding may also have occurred across Craigweil Private Estate; however, this has not been reported to WSP (refer to Appendix E.1).

Figure 5-2 - Flooding at Barrack Lane

(Source: Arun District Council)

Bersted

5.2.3. During the 2023 flood event, it is understood that flooding began on approximately the 27th of October 2023. One of the first reports of flooding in Bognor Regis was of the inundation of Bognor Regis Tesco Superstore carpark, as shown in Figure 5-3. It is noted that this carpark is designed to flood due to a requirement of the planning approval. The car park is located west of the Aldingbourne Rife and was inundated with fluvial floodwater when the Aldingbourne Rife came out of bank. Further rainfall during Storm Ciarán on the 1st and 2nd of November caused more flooding and came close to flooding the store internally. As a result, the Tesco Superstore was closed.

5.2.4. To the east of the Aldingbourne Rife an SSE electricity substation is located along the A29 Shripney Road. It is understood that the substation came close to flooding from approximately the 29th of October 2023 onwards. WSP is not aware of any permanent flood resilience measures that are in place to protect the substation from flooding; however, it was reported that temporary barriers and pumps were used to prevent fluvial inundation during the event. It is understood this was supported by West Sussex County Council.

5.2.5. It was reported that fluvial floodwater also affected parts of the A29 itself, specifically between Orchard Way and Sack Lane, but it was not significant enough to cause a road closure in Bognor Regis.

5.2.6. Approximately 10 industrial and commercial properties along the east side of Durban Road were reported to have experienced internal fluvial flooding because of the Aldingbourne Rife coming out of bank. Dates of the property flooding have not been confirmed for all units; however, it is believed that it began on approximately the 3rd of November 2023.

5.2.7. It is understood that the flooding that occurred along Durban Road caused significant financial losses. It was reported that some properties along the road may have also been affected by internal groundwater flooding.

5.2.8. From the review of drone images and reports of flooding to Arun District Council, it is understood that Riverside Caravan Park, which is situated to the east of the Aldingbourne Rife, flooded from approximately the 27th of October 2023 onwards (refer to Figure 5-3). However, the extent and severity of flooding to the park has not been confirmed by the Park's operators.

5.2.9. Addison Way experienced sewer and fluvial highway flooding from North Bersted Ditch, beginning on approximately the 3rd of November 2023. Highway flooding on Rowan Way was also reported because of fluvial water surcharging through gullies, similarly to Addison Way. Consultation with Bersted County Councillors has confirmed that the pumping station for Addison Way had lost power and therefore Southern Water were tankering the system. Approximately five properties along Addison Way experienced internal flooding and approximately 20 properties experienced external flooding. Oak Close, Oak Grove, and Hazel Road may also have flooded from surface water from the 29th of October 2023 onwards although this has not been specifically confirmed.

5.2.10. It was reported that floodwaters remained for a prolonged period across October and November.

Figure 5-3 - Flooding at Tesco & Riverside Caravan Park, Bersted (07/11/2023)

(Source: Arun District Council)

Elmer

5.2.11. It was reported that one property along Arundel Way was affected by surface water flooding on approximately the 28th of October 2023. However, the extent to which the property was affected has not been confirmed.

5.2.12. Ancton Lane experienced flooding of the highway from a mixture of fluvial, sewer, and surface water sources. However, no properties were affected due to them being situated at a higher level than the affected section of road.

5.2.13. Ancton Lodge Lane, Lodge Close, and Willow Brook (refer to Figure 5-4) each experienced flooding of the highway from fluvial sources. However, potentially due to mitigation works completed since the 2012 flood event, flooding during the 2023 event was not considered to be as significant.

5.2.14. An area of Elmer Road and Manor Way experienced surface water highway flooding, as shown in Appendix A.1.

5.2.15. Following consultation with Southern Water, it is understood that The Hard experienced flooding of the highway from sewer sources. In addition to this, one property reported experiencing external flooding from sewer sources because of a surcharging manhole.

Figure 5-4 - Flooding at Willow Brook (30/10/2023)

(Source: Arun District Council)

Felpham

5.2.16. It was reported that one property on The Loop experienced external flooding from fluvial sources. Furthermore, highway flooding occurred in the topographical low points of Limmer Lane.

Middleton-on-Sea

5.2.17. It was reported that Sea Lane and Sea Way both experienced sewer and highway flooding in topographical low points. Floodwaters came close to property threshold levels, risking internal flooding to properties, specifically along Sea Way.

5.2.18. One property along Crossways experienced internal flooding on approximately the 2nd of November 2023; however, the source of flooding was not reported.

5.2.19. During the 2023 flood event, Southdean Drive experienced surface water flooding of the highway; however, the extent and date of this flooding is unknown. On approximately the 7th of November 2023, one property along Southdean Drive is thought to have experienced internal flooding from surface water sources; however, this has not been confirmed (refer to Appendix E.1).

Pagham

5.2.20. During the 2023 flood event, Church Lane was closed due to surface water and fluvial flooding of the highway. This created an access constraint for local residents. It was reported that one property along Church Lane experienced internal and external flooding from surface water sources. Furthermore, one property experienced external flooding from surface water sources. It is believed another property may have experienced surface water flooding of the garage, as detailed in Appendix E.1. Consultation with Church Farm Holiday Park has confirmed that the site experienced minor flooding of the highway at the entrance to the site; however, the rest of the park was not affected by flooding.

5.2.21. It was reported that approximately one property along Spinnaker View could not use their wastewater facilities due to a surcharging foul sewer. It is not known if the surcharging sewer caused external or internal flooding to any properties.

5.2.22. It is understood that approximately two properties along Pagham Road may have experienced surface water flooding during the 2023 flood event (refer to Appendix E.1); however, the extent of this flooding is unknown. Pagham Road was inundated with surface water flooding.

Rose Green

5.2.23. A mixture of surface water and fluvial highway flooding was reported to have occurred along Sefter Road as shown in Appendix A.1. Flooding issues are considered to have commenced on approximately the 24th of October 2023; however, it is unknown how long the highway was flooded for.

5.3 CAUSES

5.3.1. Several factors contributed to the flooding that occurred in Bognor Regis across October and November 2023. Sources of flooding varied according to location but included fluvial, sewer, and surface water.

Storm Ciarán

5.3.2. Storm Ciarán was the 3rd Met Office named storm of the 2023/24 storm season and occurred on the 1st and 2nd of November 2023. The storm caused a period of heavy rainfall and strong winds. Storm Ciarán came after Storm Agnes on the 28th and 29th of September and Storm Babet on the 18th to the 21st of October.

5.3.3. These storms elevated groundwater levels and created saturated catchments for prolonged periods of time in areas across West Sussex. This may have contributed to groundwater infiltration into the sewer network across Bognor Regis and therefore surcharging of manholes leading to highway flooding. The saturated ground also decreased soil infiltration potential which thereby increased overland flooding. Furthermore, exceptional rainfall during the storms caused some ordinary watercourses and main rivers, such as the Aldingbourne Rife, to exceed their capacity causing fluvial flooding.

5.3.4. Whilst the volume of water in the catchments are believed to be the main cause of flooding in Bognor Regis, several other factors were noted during WSP's site visit, which may have had an influence on the severity and / or consequence of flooding. Further investigation is recommended to determine the level of influence they may have had on the 2023 flood event.

Sea Outfalls

5.3.5. During WSP's site visit to Bognor Regis, it was reported that surface water sewers across the town drain to several sea outfalls. WSP were able to view one of these outfalls, the Aldingbourne Rife outfall, which is located at grid reference SZ 94775 99128, at low tide (refer to Figure 5-5). It is understood that this outfall is gravity fed until it is surcharged by high tides at which time it is pumped. The other outfalls are only gravity fed.

5.3.6. WSP noted that the Aldingbourne Rife outfall showed signed of damage and movement of individual box culvert sections (refer to Figure 5-6). However, flows were still able to discharge to sea. The other surface water outfalls, which are located further to the west of the Aldingbourne Rife outfall, are reportedly blocked by shingle because of longshore drift. This reduces the flow that can discharge to the sea and may have caused water to back up the drainage system and surcharge from highway gullies and manholes during the 2023 flood event.

Figure 5-5 – Aldingbourne Rife Sea Outfall (16/10/2024)

Figure 5-6 - Aldingbourne Rife Sea Outfall (note displaced culvert sections) (16/10/2024)

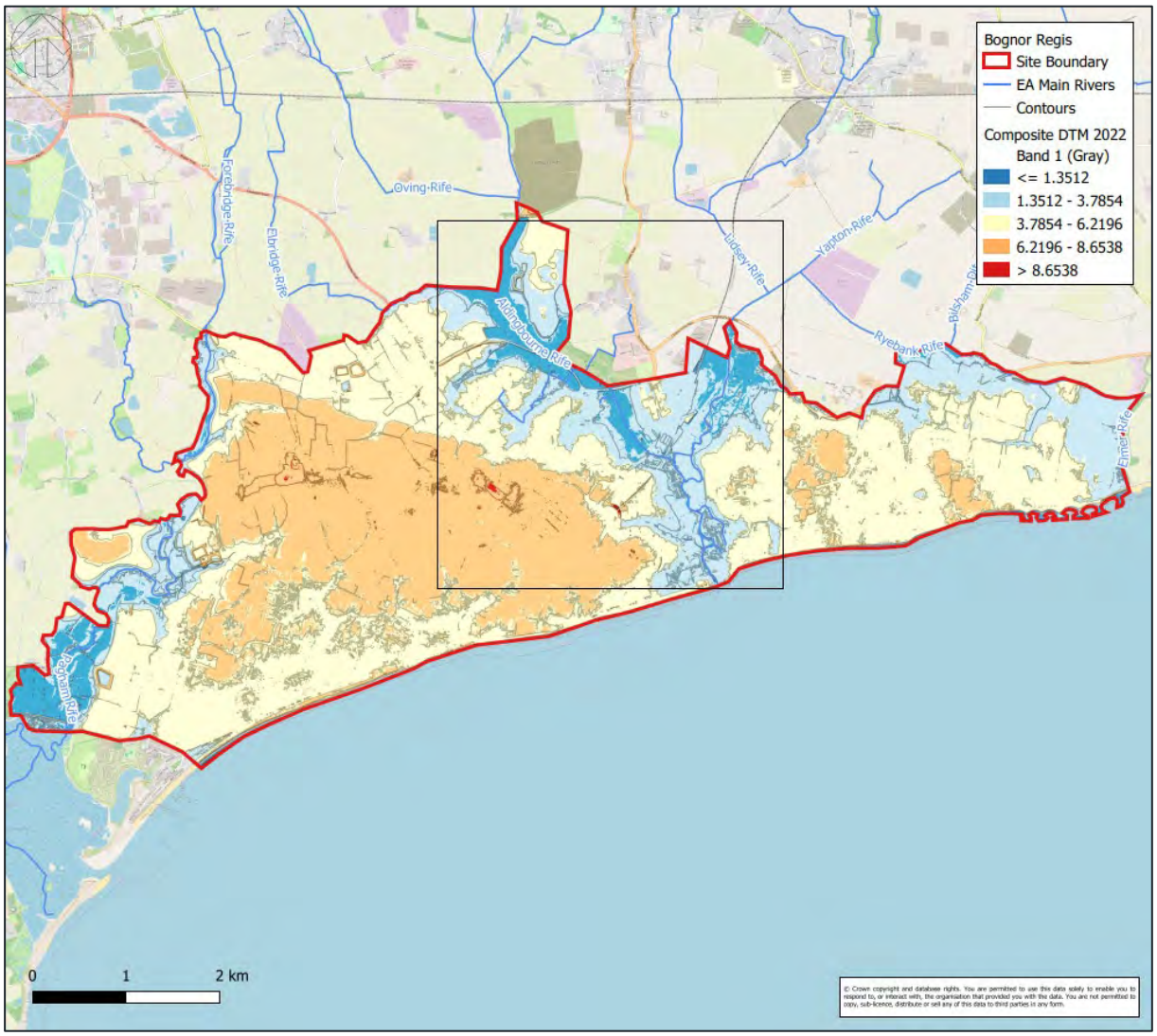
Rife System

5.3.7. During WSP's site visit to the Bersted area of Bognor Regis, it was reported that the Aldingbourne Rife experiences a lack of maintenance. It was noted that access is limited along part of the rife (to the rear of Tesco for example) which is likely to contribute to the lack of maintenance. When maintenance is carried out, such as reed cutting, these cuttings are sometimes left along the bank of the rife and eventually fall back into the channel, as observed during WSP's site visit. This may have reduced storage capacity and conveyance in the channel during the 2023 flood event.

Topography & Geology

5.3.8. Whilst the general fall of the Aldingbourne Rife is to the south and its sea outfall, Arun District Council's drainage officer commented that bed levels do not appear to fall consistently as the rife gets closer to the sea outfall. A review of LiDAR data indicates that floodplain levels are lower in upstream stretches of the rife, as shown in Figure 5-7. This "bucket" effect may have contributed to the high volume of water in the rife system, specifically in Bersted, and therefore the flooding experienced in 2023. It may have also contributed to the length of time flooding occurred for, due to floodwater being unable to move downstream and discharge to sea.

Figure 5-7 - Bognor Regis Topographic Map



5.3.9. It is also noted from BGS mapping that, areas in the west of Bognor Regis, including Aldwick, Rose Green, and Pagham, are situated on clay bedrock, whereas areas in the east and north of Bognor Regis, such as Bersted, Elmer, Felpham, and Middleton-on-Sea are situated on chalk. The clay geology may have contributed to drainage issues and perched water during the 2023 flood event due to its poor infiltration characteristics.

5.4 FLOOD DEFENCES/ASSETS

5.4.1. Excluding coastal defences WSP is not aware of any flood defences in the area that benefit Bognor Regis.

5.5 RISK MANAGEMENT AUTHORITIES

Arun District Council

5.5.1. Consultation with Arun District Council has confirmed that members of the risk management authority attended the affected areas across Bognor Regis in response to the 2023 flood event.

Furthermore, Arun District Council has been working with local communities since the event, including the establishment of Arun Flood Forum, to identify means to increase flood resilience.

Environment Agency

5.5.2. Flooding during Storm Ciarán was reported to the Environment Agency and in response the Environment Agency engaged with local authorities and communities on several different incidents, specifically in the Aldingbourne catchment. Furthermore, the Environment Agency has also taken part in the Arun Flood Forum to provide advice and support to those affected by flooding.

5.5.3. During the 2023 flood event, the Environment Agency confirmed that they also deployed two contingency pumps at Felpham to provide resilience in case the existing pumps at the Aldingbourne Rife sea outfall went out of operation or the power supply was impacted.

5.5.4. The following flood alerts were in place during the 2023 flood event:

- Aldingbourne and Barnham Rifes – In force: 25/10/2023 06:43 until 27/11/2023 16:11
- Selsey Bill to Elmer – In force: 27/10/2023 23:43 until 03/11/2023 17:37

5.5.5. The following flood warnings were in place during the 2023 event:

- Bersted on the Aldingbourne Rife – In force: 28/10/2023 03:13 until 19/11/2023 10:50
- Felpham on the Aldingbourne Rife – In force: 02/11/2023 03:58 until 11/11/2023 11:27

5.5.6. Consultation with the Environment Agency has confirmed that there were no specific issues or constraints associated with the watercourses across Bognor Regis. However, it was noted that Aldingbourne Rife catchment is very low lying, meaning floodwater takes time to drain out to sea following any large rainfall event.

Southern Water

5.5.7. A request for information was sent to Southern Water and a response was received stating they do not hold the information we requested.

5.5.8. Following further consultation with a Southern Water engineer, it is understood that reports of overflowing manholes and highway flooding in The Hard, Elmer were received during the 2023 flood event. In response, Southern Water deployed tankers to relieve pressure on the sewer system.

West Sussex County Council

5.5.9. Apart from commissioning WSP to carry out this s19 Flood Investigation, West Sussex County Council has confirmed that their team attended sites where highway flooding was reported.

5.5.10. West Sussex County Council also has an active community fund called Operation Watershed which exists to provide grants to communities to reduce the risks and impacts of flooding.

5.6 RECOMMENDATIONS

5.6.1. Refer to Appendix G for a summary of the following.

Local Residents / Business Owners

5.6.2. Residents should report any highway drainage issues to West Sussex County Council and any sewer issues to Southern Water as soon as they become apparent. For further information on flooding, residents should refer to the following link: Flooding, Drainage and Gullies.

5.6.3. Residents and business owners affected by flooding may benefit from property flood resilience measures, such as flood doors / gates, waterproof airbricks, non-return valves that can be fitted to drains, and placing electrical socks at appropriate heights above floor levels.

Environment Agency

5.6.4. The Environment Agency could educate riparian owners on their responsibilities and encourage regular maintenance of local ditches. Additionally, opportunities to improve the capacity of Aldingbourne Rife, such as clearing channels of debris and vegetation (e.g. reed cuttings), could be identified. If a maintenance schedule is in place, the Environment Agency could review it, and where appropriate, increase the frequency of inspections.

5.6.5. There may also be potential for a flood alleviation scheme along the Aldingbourne Rife which could be further investigated and communicated with West Sussex County Council. The floodplain to the north of the A259 could be utilised for floodplain storage during time of high flows, to reduce the rife from coming out of bank in Bersted. This would require further investigation to ensure flood risk is not increased elsewhere.

5.6.6. The Environment Agency could also work with Arun District Council and West Sussex County Council to investigate the possibility of installing strategically located pumps along the Aldingbourne Rife. These pumps could be utilised during flood events and high flows to reduce water storage upstream of the sea outfall and decrease flood risk to Bersted. This would also require further investigation to ensure flood risk is not increased elsewhere.

5.6.7. The Environment Agency could also investigate the condition of the Aldingbourne Rife sea outfall and upstream culvert, and carry out any necessary remedial works to ensure fluvial flows have a clear passage to discharge to sea.

Riparian Owners

5.6.8. Riparian owners across Bognor Regis should ensure that ordinary watercourses and Main rivers are well maintained and allow the free passage of water during flood events.

Southern Water

5.6.9. Southern Water could carry out a full CCTV survey to investigate the capacity and condition of the sewer network in Bognor Regis, specifically in areas affected by flooding in 2023, such as Elmer.

5.6.10. Recognising the significant costs associated with upgrading sewerage assets, it is recommended that potential remedial works are identified and prioritised for maximum benefit. Potential works could include the relining of the sewer network using new technologies, to prevent groundwater infiltration, and the sealing of manholes to prevent surcharging and surface water inundation.

SSE

5.6.11. SSE could consider the implementation of flood resilience measures to improve the resilience of infrastructure sited in areas known to be at risk from flooding during subsequent storm events.

West Sussex County Council

5.6.12. West Sussex County Council could consider promoting the uptake of flood wardens across Bognor Regis with support from Arun District Council. Flood wardens could then provide education and communication to local residents and business owners on the following:

- How to monitor river levels and flows.

- How to sign up to the Environment Agency flood alerts and warnings.
- How to report concerns to the relevant flood risk management authorities.
- Guidance on effective property flood resilience.
- What to do and when, in preparation for a flood.
- Where to find support following a flood event.

5.6.13. It is acknowledged that the design standard of existing highway drainage is likely to be lower than the rainfall event recorded and that it will also not be designed to cope with fluvial floodwaters. However, it is recommended that West Sussex County Council could review the current highway drainage maintenance schedule and, where appropriate, increase the frequency of inspections. Alternatively, the affected assets in Bognor Regis could be marked as a priority, and arrangements could be made for pre-emptive inspections on receipt of forecasts of heavy rain.

5.6.14. During WSP's site visit, it was reported that plans are in place to carry out drainage improvement works from the west end of Summer Lane to the north of Millfarm Estate / Honeysuckle Drive. These plans could be finalised and implemented to increase resilience during future flood events.

Environment Agency, West Sussex County Council, Arun District Council & Southern Water

5.6.15. A final recommendation is that the Environment Agency, West Sussex County Council, Arun District Council, and Southern Water could form a multi-agency partnership to develop and agree a strategy and Action Plan; identifying actions and measures that will best protect Bognor Regis from similar events in the future.

5.6.16. This could seek to confirm the ownership of each sea outfall and support the preparation of maintenance schedules to ensure regular clearance, specifically on receipt of heavy rainfall. Furthermore, the agreed owner of each outfall could consider construction works to extend the outfalls out past the shingle to avoid blockages from beach sediment.

5.6.17. Furthermore, the risk management authorities could work with private estates across Bognor Regis to conduct drainage improvements and implement maintenance schedules where required to reduce impacts of flooding in future storm events.

5.7 SUMMARY

5.7.1. The flooding in Bognor Regis generally occurred in areas categorised as a high surface water flood risk as highlight on the Environment Agency's Long Term Flood Maps (refer to Appendix F.1). Flooding in Bersted generally occurred in areas categorised as Flood Zone 3 as indicated on the Environment Agency's flood map for planning (refer to Appendix F.1).

5.7.2. Table 5-1 summaries the flooding experienced in Bognor Regis during the 2023 flood event. Refer to Appendix A.1 which details the locations of the flooded areas.

Table 5-1 – Summary of Flooding in Bognor Regis

Location	Total No. of Properties Affected	Source of Flooding	Residential Properties Internally Flooded	Residential Properties Externally Flooded	Business Properties Flooded	Highway Flooding
Aldwick	~4	Fluvial & Surface Water	0	~4	0	5
Bersted	~25	Fluvial & Surface Water	~5	~20	12	7
Elmer	~1	Fluvial, Sewer & Surface Water	0	~1	0	7
Felpham	1	Fluvial & Surface Water	0	1	0	2
Middleton-on-Sea	~2	Sewer & Surface Water	~2	0	0	3
Pagham	~5	Surface Water	1	~4	0	2
Rose Green	0	Fluvial & Surface Water	0	0	0	1
Total	**~38**	**Fluvial, Sewer & Surface Water**	**~8**	**~30**	**12**	**27**

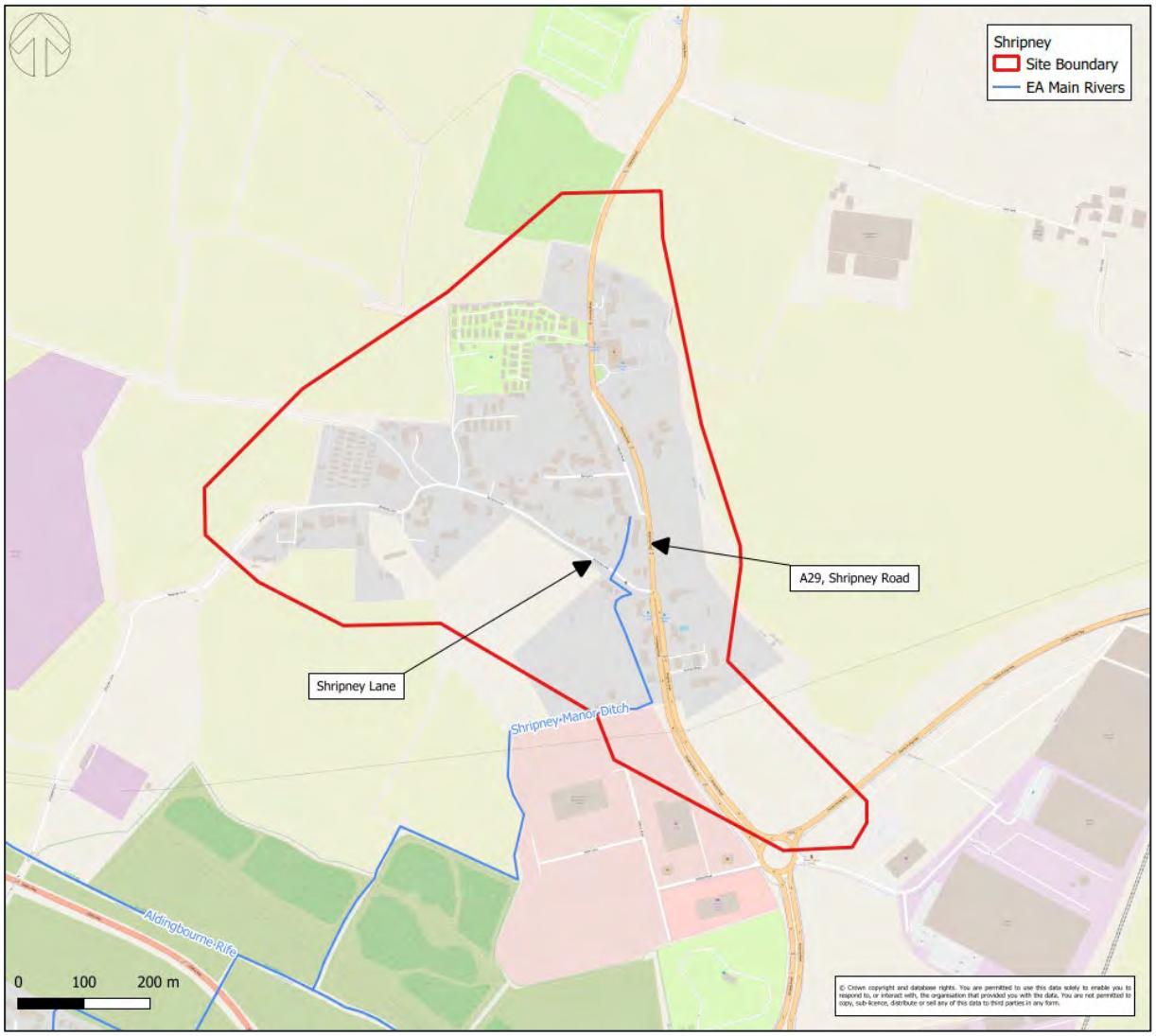
5.7.3. West Sussex County Council, the Environment Agency, and Southern Water had flood management responsibilities related to this event due to the sources and assets involved. West Sussex County Council and Arun District Council attended during the flooding to monitor the situation. Following the flood event, the Environment Agency engaged with local authorities and communities and has taken part in the Arun Flood Forum to provide advice and support to those affected by flooding. Southern Water communicated with residents at The Hard and used a tanker to relieve sewer flooding. Recommendations have been identified to help manage the impact of any future flood events.

6 SHRIPNEY

6.1.1. Shripney is located in the south-west of West Sussex and is part of Arun District Council. The village is situated north of Bognor Regis and includes Shripney Manor Ditch which flows into Aldingbourne Rife at Bersted. Refer to Figure 6-1 below. Road drainage is present across the village in the form of ditches, pipes, and gullies.

6.1.2. Previous flooding occurred in Shripney during the June 2012 flood event, during which similar areas were affected. During the 2012 event, approximately two properties were affected. Historic flood outlines are mapped within Appendix F.2.

Figure 6-1 - Shripney Location Map



6.2 2023 FLOODING

6.2.1. The A29, Shripney Road, experienced fluvial flooding between Orchard Way and Sack Lane, as shown in Figure 6-2. In Shripney, it is understood that Shripney Manor Ditch came out of bank, flooding Shripney Lane and causing water to back up the highway drainage system and surcharge

onto the A29, Shripney Road. As a result, a road closure was put in place. It is also believed that Barn Lane was affected by flooding; however, the date and extent of the flooding are unknown.

6.2.2. During the 2023 flood event, approximately two properties reported internal flooding on Shripney Lane, and one property reported internal flooding on Shripney Road. The source of this flooding is thought to have been a combination of fluvial and surface water.

Figure 6-2 - Flooding on the A29, Shripney Road (07/11/2023)

(Source: Arun District Council)

6.3 CAUSES

6.3.1. Several factors contributed to the flooding that occurred in Shripney across October and November 2023. Sources of flooding included fluvial and surface water.

Storm Ciarán

6.3.2. Storm Ciarán was the 3rd Met Office named storm of the 2023/24 storm season and occurred on the 1st and 2nd of November 2023. The storm caused a period of heavy rainfall and strong winds. Storm Ciarán came after Storm Agnes on the 28th and 29th of September and Storm Babet on the 18th to the 21st of October.

6.3.3. These storms elevated groundwater levels and created saturated catchments for prolonged periods of time in areas across West Sussex. This may have contributed to groundwater infiltration into the sewer network across Shripney, potentially contributing to surcharging of manholes leading to highway flooding.

6.3.4. The saturated ground also decreased soil infiltration potential leading to increased surface water runoff. Furthermore, exceptional rainfall during the storms caused Shripney Manor Ditch to exceed its capacity, causing fluvial flooding.

6.3.5. Whilst the volumes of water in the catchments are believed to be the main cause of flooding in Shripney, other factors were noted during WSP's site visit, which may have had an influence on the severity or consequence of flooding. Some of these factors are potentially long term and complex. Further investigation is recommended to determine the level of influence they may have had on the 2023 flood event.

Highway Drainage

6.3.6. During WSP's site visit to Shripney, it was reported that the highway drainage system may have been silted up and affected by tree root intrusion, with highway gullies partially blocked during the 2023 flood event. This may have contributed to the extent of highway flooding experienced. It was also reported that West Sussex County Council has since carried out highway drainage improvements.

Shripney Manor Ditch

6.3.7. It was also reported that when levels in Shripney Manor Ditch are high, water backs up highway drainage and surcharges onto the road, as indicated in Figure 6-3.

Figure 6-3 - Flooding on Shripney Road and Shripney Lane (07/11/2023)

(Source: Arun District Council)

6.4 FLOOD DEFENCES/ASSETS

6.4.1. WSP is not aware of any flood defences in the area that benefit Shripney.

6.5 RISK MANAGEMENT AUTHORITIES

Arun District Council

6.5.1. Arun District Council conducted site visits to affected areas and established the Arun Flood Forum.

Environment Agency

6.5.2. Flooding during Storm Ciarán was reported to the Environment Agency and in response the Environment Agency engaged with local authorities and communities on several different incidents. Furthermore, the Environment Agency has also taken part in the Arun Flood Forum to provide advice and support to those affected by flooding.

6.5.3. The following flood alert was in place during the 2023 flood event:

- Aldingbourne and Barnham Rifes – In force: 25/10/2023 06:43 until 27/11/2023 16:11

6.5.4. Consultation with the Environment Agency has confirmed that there were no specific issues or constraints associated with Shripney Manor Ditch. However, it was noted that Aldingbourne Rife catchment is very low lying, meaning floodwater takes a long time to drain out to sea following any large rainfall event.

Southern Water

6.5.5. A request for information was sent to Southern Water, and a response was received stating they do not hold the information we requested.

West Sussex County Council

6.5.6. Apart from commissioning WSP to carry out this s19 Flood Investigation, West Sussex County Council has confirmed that their team attended sites where highway flooding was reported.

6.5.7. West Sussex County Council also has an active community fund called Operation Watershed which exists to provide grants to communities to reduce the risks and impacts of flooding.

6.6 RECOMMENDATIONS

6.6.1. Refer to Appendix G for a summary of the following.

Local Residents

6.6.2. Residents should report any highway drainage issues to West Sussex County Council and any sewer issues to Southern Water as soon as they become apparent. For further information on flooding, residents should refer to the following link: Flooding, Drainage and Gullies.

6.6.3. Residents and business owners affected by flooding may benefit from property flood resilience measures, such as flood doors / gates, waterproof airbricks, non-return valves that can be fitted to drains, and placing electrical socks at appropriate heights above floor levels.

6.6.4. Landowners could consider the strategic construction of ditches, specifically where fields border highways, to intercept runoff and prevent it running onto highways. This could be supported by Arun District Council.

Environment Agency

6.6.5. Opportunities to improve the capacity of Shripney Manor Ditch, such as clearing the channel of debris and vegetation, could be identified. If a maintenance schedule is in place, the Environment Agency could review it, and where appropriate, increase the frequency of inspections.

6.6.6. There may also be potential for a flood alleviation scheme along Aldingbourne Rife which could be further investigated and communicated with West Sussex County Council. The floodplain to the north of the A259 could be utilised for floodplain storage during time of high flows. This may reduce fluvial water from the Aldingbourne Rife from backing up Shripney Manor Ditch and causing fluvial flooding in Shripney. However, this would require further investigation and modelling to ensure the scheme would benefit Shripney and not increase flood risk elsewhere.

Riparian Owners

6.6.7. Riparian owners across Shripney should ensure that ordinary watercourses and Main rivers are well maintained and allow the free passage of water during flood events. Furthermore, Arun District Council and West Sussex County Council could provide support in identifying opportunities for ditch improvements across Shripney.

6.6.8. Landowners and riparian owners could also consider channel diversion when it would benefit flood risk and water storage capacity across Shripney.

West Sussex County Council

6.6.9. West Sussex County Council could consider promoting the uptake of flood wardens across Shripney with support from Arun District Council. Flood wardens could then provide education and communication to residents and business owners on the following:

- How to monitor river levels and flows.
- How to sign up to the Environment Agency flood alerts and warnings.
- How to report concerns to the relevant flood risk management authorities.
- Guidance on effective property flood resilience.
- What to do and when, in preparation for a flood.
- Where to find support following a flood event.

6.6.10. It is acknowledged that the design standard of existing highway drainage is likely to be lower than the rainfall event recorded and that it will also not be designed to cope with fluvial floodwaters. It is also noted that since the 2023 flood event, West Sussex County Council has conducted highway improvement works as referred to above.

6.6.11. However, it is recommended that West Sussex County Council could review the current highway drainage maintenance schedule and, where appropriate, increase the frequency of inspections. Highway assets in flood risk areas within Shripney could also be marked as a priority, and arrangements could be made for pre-emptive inspections on receipt of forecasts of heavy rain.

6.6.12. West Sussex County Council could consider the addition of flap valves on highway drainage outfalls to avoid fluvial water from backing up the system and flooding the highway.

6.7 SUMMARY

6.7.1. Some flooding in Shripney occurred in areas categorised as Flood Zone 2 and Flood Zone 3 as indicated on the Environment Agency's flood map for planning (refer to Appendix F.2). However,

flooding also occurred in areas categorised as Flood Zone 1 and low and medium surface water flood risk as highlighted on the Environment Agency's Long Term Flood Maps (refer to Appendix F.2).

6.7.2. Table 6-1 summaries the flooding experienced in Shripney during the 2023 flood event. Refer to Appendix A.2 which details the locations of the flooded areas.

Table 6-1 – Summary of Flooding in Shripney

Total No. of Properties Affected	Source of Flooding	Residential Properties Internally Flooded	Residential Properties Externally Flooded	Business Properties Flooded	Highway Flooding
~3	Fluvial & Surface Water	~3	0	0	4

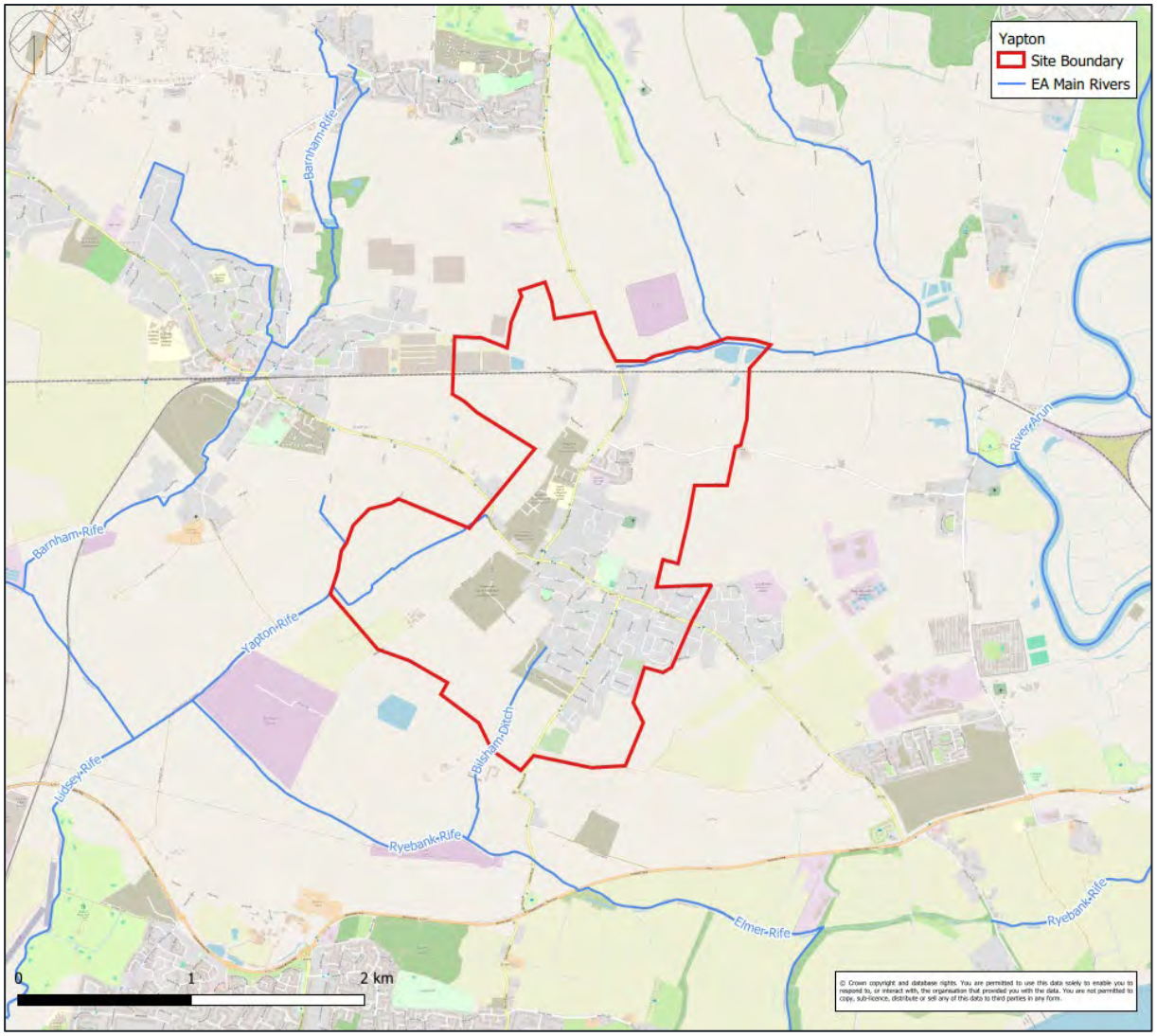
6.7.3. West Sussex County Council and the Environment Agency had flood management responsibilities related to this event due to the source and assets involved. West Sussex County Council and Arun District Council attended during the flooding to monitor the situation. Following the flood event, the Environment Agency engaged with local authorities and communities and has taken part in the Arun Flood Forum to provide advice and support to those affected by flooding. Recommendations have been identified to help manage the impact of any future flood events.

7 YAPTON

7.1.1. Yapton is located in the south-west of West Sussex and is a part of Arun District Council. The village is situated north-east of Bognor Regis and neighbours Barnham. Watercourses in Yapton include Yapton Rife and Bilsham Ditch, which both flow into the Lidsey Rife at Shripney. Refer to Figure 7-1 below. Road drainage is present across the village in the form of ditches, pipes, and gullies.

7.1.2. WSP is not aware of any significant historic flooding in Yapton however Appendix F.3 includes plans showing recurring highway flooding issues.

Figure 7-1 - Yapton Location Map



7.2 2023 FLOODING

7.2.1. During the 2023 flood event, Yapton experienced highway flooding but no reports of property flooding were received. Hoe Lane experienced flooding from surface water and fluvial flooding sources on approximately the 25th of October 2023. North End Road and Yapton Road both experienced flooding from surface water. Drove Lane experienced flooding from fluvial sources on

approximately the 2nd of November 2023. This flooding is also believed to have affected Drove Lane Farm.

7.3 CAUSES

7.3.1. Storm Ciarán was the 3rd Met Office named storm of the 2023/24 storm season and occurred on the 1st and 2nd of November 2023. The storm caused a period of heavy rainfall and strong winds. Storm Ciarán came after Storm Agnes on the 28th and 29th of September and Storm Babet on the 18th to the 21st of October.

7.3.2. These storms elevated groundwater levels and created saturated catchments for prolonged periods of time in areas across West Sussex. This may have contributed to groundwater infiltration into the sewer network across Yapton, which contributed to surcharging of manholes leading to highway flooding. The saturated ground also decreased soil infiltration potential leading to increased surface water runoff.

7.3.3. The extreme volume of water within the catchment is believed to have been the main contributing factor to flooding in Yapton. However, it is also noted that highway drainage may have become silted due to runoff from agricultural fields, therefore reducing the capacity of the network to transport floodwater away from the area.

7.4 FLOOD DEFENCES/ASSETS

7.4.1. WSP is not aware of any flood defences in the area that benefit Yapton.

7.5 RISK MANAGEMENT AUTHORITIES

Arun District Council

7.5.1. Arun District Council conducted site visits to affected areas and established the Arun Flood Forum.

Environment Agency

7.5.2. Flooding during Storm Ciarán was reported to the Environment Agency and in response the Environment Agency engaged with local authorities and communities on several different incidents. Furthermore, the Environment Agency has also taken part in the Arun Flood Forum to provide advice and support to those affected by flooding.

7.5.3. The following flood alert was in place during the 2023 flood event:

- Aldingbourne and Barnham Rifes – In force: 25/10/2023 06:43 until 27/11/2023 16:11

7.5.4. Consultation with the Environment Agency has confirmed that there were no specific issues or constraints associated with Yapton Rife or Bilsham Ditch. Therefore, there are no plans to carry out any improvement works.

Southern Water

7.5.5. A request for information was sent to Southern Water, and a response was received stating they do not hold the information we requested.

West Sussex County Council

7.5.6. Apart from commissioning WSP to carry out this s19 Flood Investigation, West Sussex County Council has confirmed that their team attended sites where highway flooding was reported.

7.5.7. West Sussex County Council also has an active community fund called Operation Watershed which exists to provide grants to communities to reduce the risks and impacts of flooding.

7.6 RECOMMENDATIONS

7.6.1. Refer to Appendix G for a summary of the following.

Local Residents

7.6.2. Residents should report any highway drainage issues to West Sussex County Council as they become apparent. For further information on flooding, residents should refer to the following link: Flooding, Drainage and Gullies.

7.6.3. Landowners could consider the implementation of ditches, specifically where fields border highways, to intercept runoff and store surface water runoff during subsequent storm events. This will also reduce silt build up in highway drainage and could be supported by Arun District Council.

Riparian Owners

7.6.4. Riparian owners across Yapton should ensure that ditches and ordinary watercourses are well maintained and allow the free passage of water during flood events. Furthermore, Arun District Council and West Sussex County Council could support in identifying opportunities for ditch improvements across Yapton.

West Sussex County Council

7.6.5. West Sussex County Council could consider promoting the uptake of flood wardens across Yapton with support from Arun District Council. Flood wardens could then provide education and communication to local residents and business owners on the following:

- How to monitor river levels and flows.
- How to sign up to the Environment Agency flood alerts and warnings.
- How to report concerns to the relevant flood risk management authorities.
- Guidance on effective property flood resilience.
- What to do and when, in preparation for a flood.
- Where to find support following a flood event.

7.6.6. West Sussex County Council could conduct a CCTV survey of affected highway drainage across Yapton and carry out any necessary remedial measures, such as clearing silt and blockages from the system following the flood event.

7.6.7. It is acknowledged that the design standard of existing highway drainage is likely to be lower than the rainfall event recorded and that it will also not be designed to cope with fluvial floodwaters. However, it is recommended that West Sussex County Council could review the current highway drainage maintenance schedule and, where appropriate, increase the frequency of inspections. Assets sited in areas at risk of flooding could be marked as a priority, and arrangements could be made for pre-emptive inspections on receipt of forecasts of heavy rain.

7.7 SUMMARY

7.7.1. Flooding in Yapton generally occurred in areas categorised a high surface water flood risk as highlight on the Environment Agency's Long Term Flood Maps (refer to Appendix F.3).

7.7.2. Table 7-1 summaries the flooding experienced in Yapton during the 2023 flood event. Refer to Appendix A.3 which details the locations of the flooded areas.

Table 7-1 – Summary of Flooding in Yapton

Total No. of Properties Affected	Source of Flooding	Residential Properties Internally Flooded	Residential Properties Externally Flooded	Business Properties Flooded	Highway Flooding
0	Fluvial & Surface Water	0	0	~1	4

7.7.3. West Sussex County Council and the Environment Agency had flood management responsibilities related to this event due to the sources and assets involved. West Sussex County Council and Arun District Council attended during the flooding to monitor the situation. Following the flood event, the Environment Agency engaged with local authorities and communities and has taken part in the Arun Flood Forum to provide advice and support to those affected by flooding. Recommendations have been identified to help manage the impact of any future flood events.

8 CONCLUSIONS

8.1.1. WSP was commissioned by West Sussex County Council to conduct a Section 19 Flood Investigation following flooding which was reported in Bognor Regis, Shripney, and Yapton. West Sussex County Council has a responsibility under the Flood and Water Management Act 2010 (FWMA 2010) to undertake flooding investigations. Specifically, Section 19 states that:

'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.'

8.1.2. The flooding occurred across October and November 2023 following Storm Ciarán and areas of West Sussex remained inundated for varying lengths of time. The flooding led to road closures, and internal and external flooding to residential and commercial properties.

8.1.3. This report identifies the various Risk Management Agencies that have roles and responsibilities associated with flood risk and summarises the activities carried out by those agencies at the time of, and following the flood.

8.1.4. The report also includes the findings of an analysis of data from two nearby rainfall gauges, sourced from the Hydrology Data Explorer. The analysis demonstrated that October 2023 was the wettest October on record. An analysis of groundwater levels and fluvial levels on the Aldingbourne Rife, indicates that throughout October both levels rose and were considered very high prior to Storm Ciarán. These conditions caused the ground to be heavily saturated and influenced the catchments' ability to absorb rainfall during Storm Ciarán therefore causing flooding.

8.1.5. Site visits were undertaken by WSP and representatives of Arun District Council, and members of the public were consulted for details of what happened at both locations during the flood.

8.1.6. Causes of the flooding across each location has been determined with the key cause appearing to be heavy rainfall falling on an already saturated catchment.

8.1.7. A series of recommendations have been made for local residents and business owners, the Environment Agency, and West Sussex County Council and Arun District Council to consider, to reduce the risk of a similar event occurring again.

Appendix A

2023 FLOODED AREAS

Appendix A.1

BOGNOR REGIS

Bersted (Bognor Regis)
Site Boundary
Flooded Areas
Flow Routes
EA Main Rivers

Shripney Manor Ditch
North Bersted Ditch
Addison Way
Rowan Way
Ash Grove
Aldingbourne Rife
Oak Grove, Oak Close & Hazel Road
Durban Road
Tesco Superstore
Riverside Caravan Park
Lidsey Rife

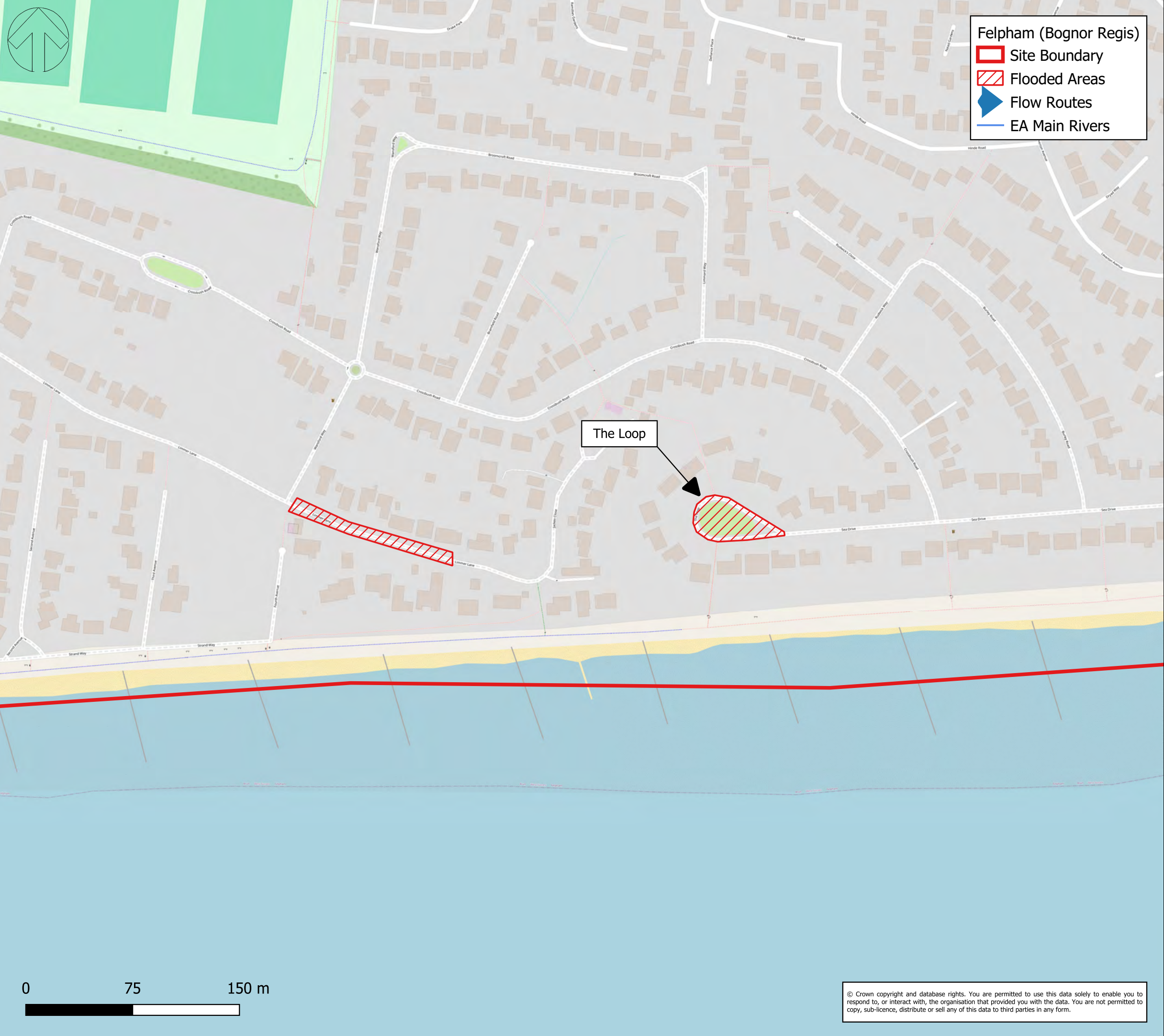
0 100 200 m

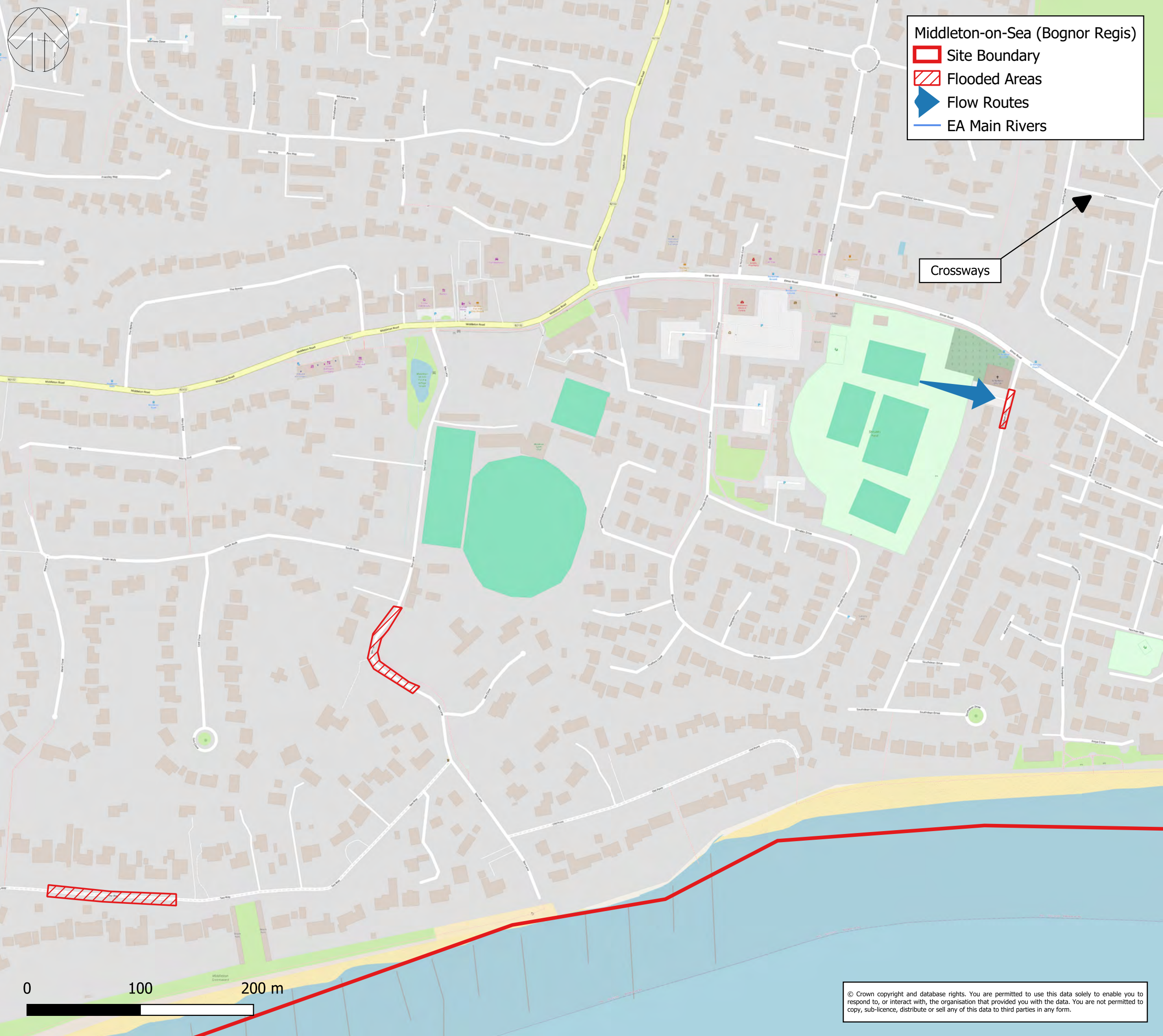
Elmer (Bognor Regis)
Site Boundary
Flooded Areas
Flow Routes
EA Main Rivers

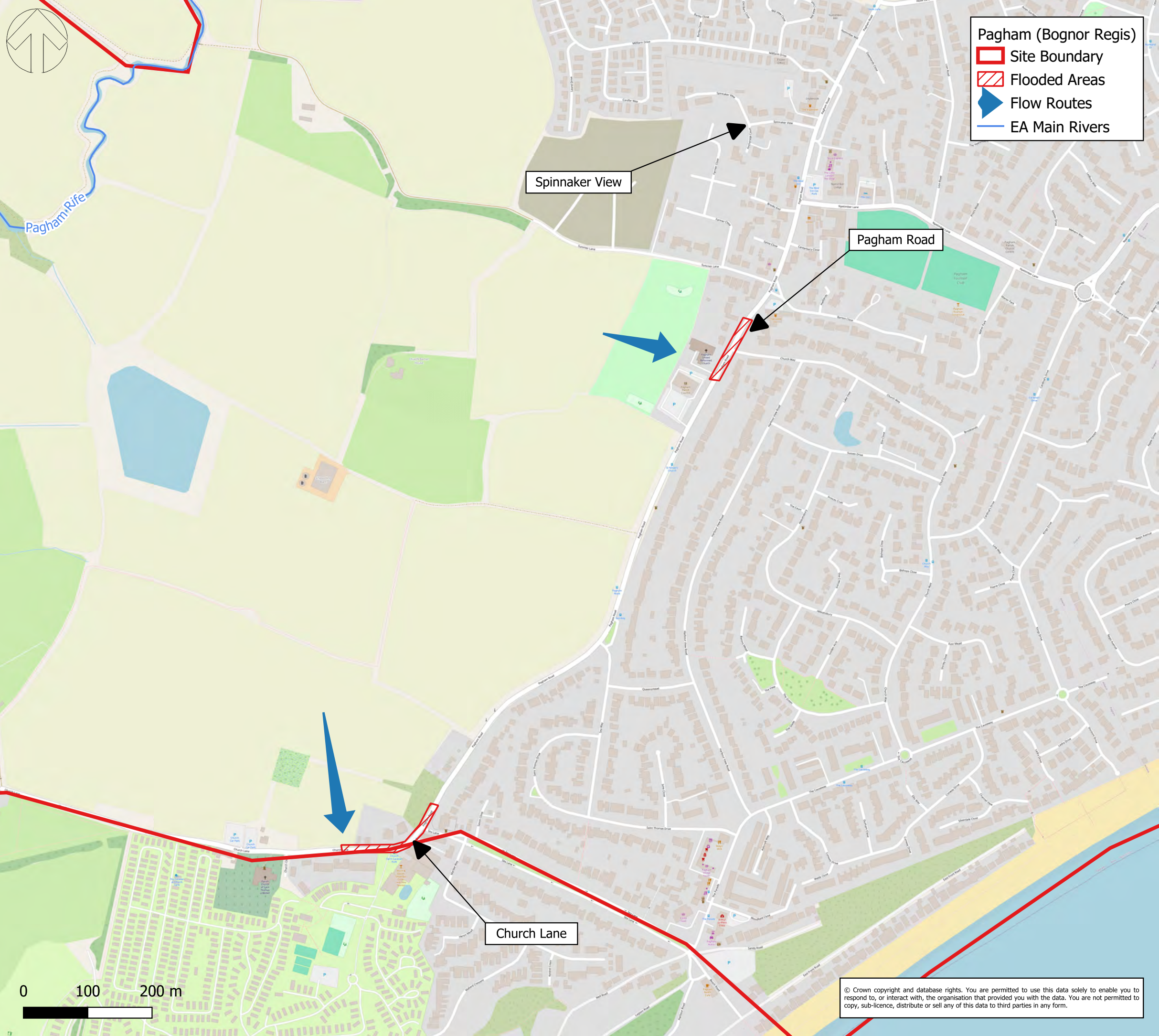
Arundel Way

Elmer Rife

0 100 200 m





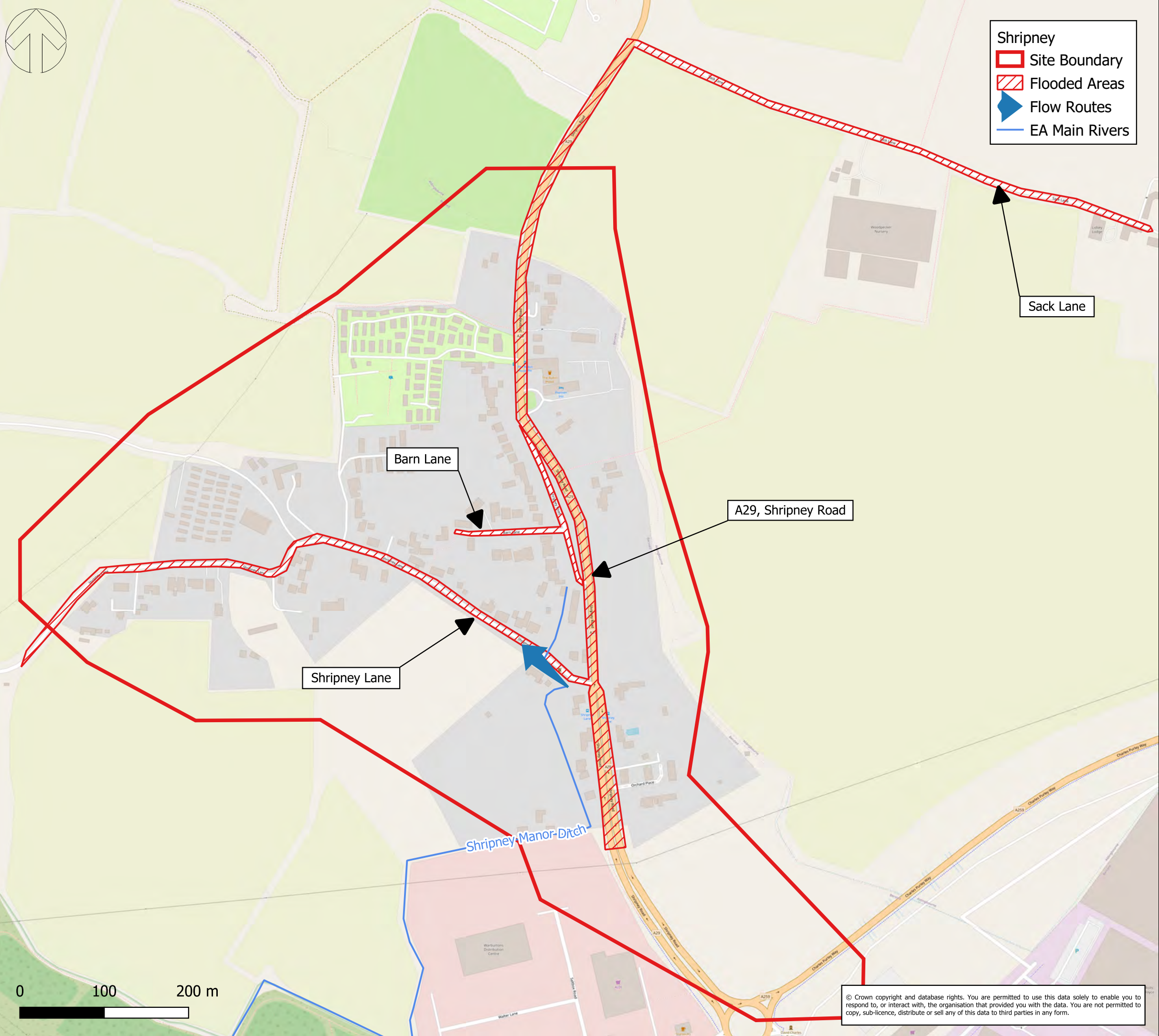


Rose Green (Bognor Regis)
Site Boundary
Flooded Areas
Flow Routes
EA Main Rivers

0 100 200 m

Appendix A.2

SHRIPNEY



Appendix A.3

YAPTON

Yapton

Site Boundary

Flooded Areas

Flow Routes

EA Main Rivers

Barnham Rife

Yapton Rife

Bilsham Ditch

0 250 500 m

Hoe Lane, Flansham

0 100 200 m

Appendix B

PHOTOS

Appendix B.1

BOGNOR REGIS

Photo 1 – Flooding at Barrack Lane, Aldwick, Bognor Regis

Photo 2 – Flooding at Fish Lane, Aldwick, Bognor Regis taken October 2023

Photo 3 – Flooding at Fish Lane, Aldwick, Bognor Regis October 2023

Photo 4 – Flooding at Addison Way, Bersted, Bognor Regis

Photo 5 – Flooding at Addison Way, Bersted, Bognor Regis

Photo 6 – Flooding at Bersted, Bognor Regis

Photo 7 – Flooding at Bersted, Bognor Regis taken 07/11/2023

Photo 8 – Flooding at Riverside Caravan Park, Bersted, Bognor Regis taken 07/11/2023

Photo 9 – Flooding at Tesco, Bersted, Bognor Regis taken 07/11/2023

Photo 10 – Flooding at Shripney Road Power Station, Bersted, Bognor Regis taken 07/11/2023

Photo 11 – Flooding at Willow Brook, Elmer, Bognor Regis taken 30/10/2023

Appendix B.2

SHRIPNEY

Photo 1 – Flooding on the A29 Shripney Road, Shripney taken 07/11/2023

Photo 2 – Flooding on the A29 Shripney Road, Shripney taken 07/11/2023

Appendix B.3

YAPTON

Photo 1 – Flooding at Drove Lane, Yapton

Photo 2 – Flooding at Drove Lane, Yapton

Photo 3 – Flooding at Drove Lane, Yapton

Photo 4 – Flooding at Drove Lane, Yapton

Appendix C

HYDROLOGY ANALYSIS

TECHNICAL NOTE 1

DATE:	01 December 2024	**CONFIDENTIALITY:**	Public
SUBJECT:	Storm Ciarán Overview		
PROJECT:	West Sussex County Council s19 Investigation	**AUTHOR:**	L. Mealey
CHECKED:	L. Davey	**APPROVED:**	M. Quinnell

STORM CIARÁN OVERVIEW

Storm Ciarán was a severe storm for the time of year with strong gusts of 89 – 91mph across the south coast. The storm was also in an area of exceptionally deep low pressure; England's lowest November pressure on record was recorded along parts of the south coast during the time of the storm. Storm Ciarán also brought significant heavy rainfall on top of persistent wet weather throughout October.

This section assesses the rainfall, the fluvial water levels and groundwater levels associated with Storm Ciarán that occurred between the 1st – 2nd November 2023. In West Sussex it affected several areas across Bognor Regis, along with villages to the north of Bognor Regis, including Barnham, Shripney, and Yapton.

RAINFALL ANALYSIS

Available Rainfall Gauging Stations

The rainfall has been assessed from two different gauges from the Hydrology Data Explorer[1]:

- Bognor[2] (xy: 492097, 098851): located in Bognor Regis, approximately 1.5kms to the west of the centre of Bognor Regis; and,
- Westergate[3] (xy: 493940, 106825): located approximately 2.75kms north-west of West Barnham.

See Figure 1 for the location of the rain gauges.

[1] Defra's Hydrology Data Explorer
[2] Defra's Hydrology Explorer: Bognor
[3] Defra's Hydrology Explorer: Westergate

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Figure 1 - Location of the gauges used for analysis.

No other rain gauges were considered to be appropriate to use for this assessment due to the significant distance of the rain gauges from the affected areas (see Appendix A for the affected areas).

Storm Ciarán Rainfall

A review of the rain gauge data confirmed heavy rainfall was recorded both on the day of Storm Ciarán and on the preceding day of the event. From 09:00 31st October – 09:00 2nd November, 38.4mm of rainfall was recorded for the Bognor rain gauge (see Figure 2). Similarly, 40.58mm of rainfall was recorded for the same time period for the Westergate rain gauge (see Figure 3).

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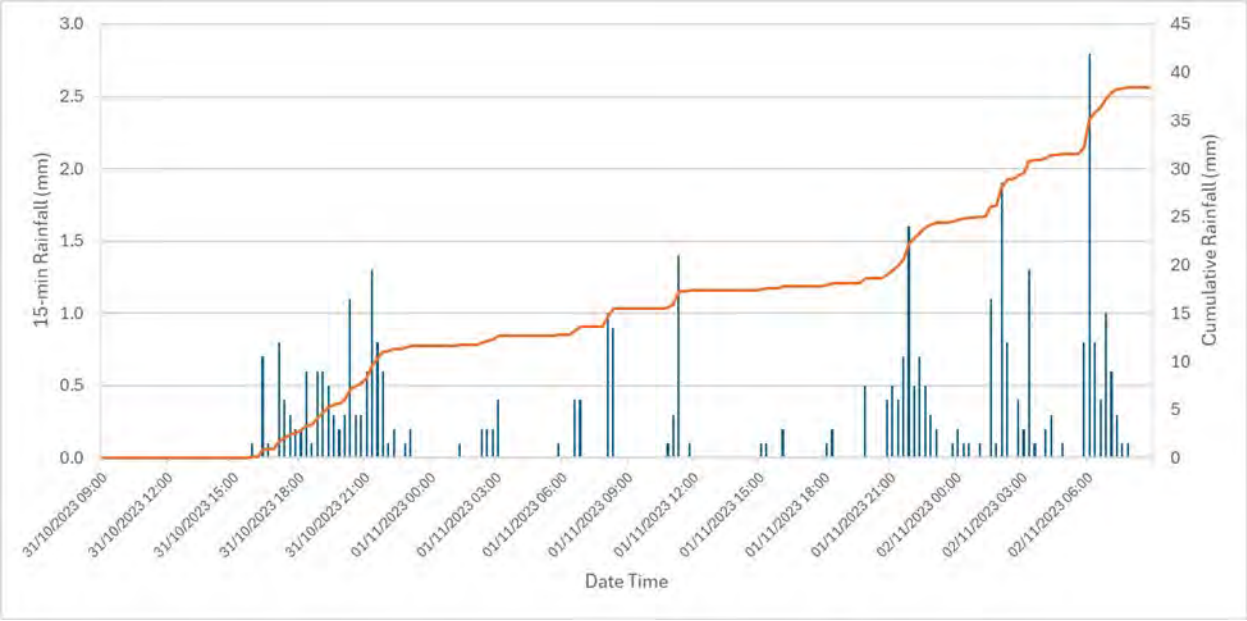

Figure 2 - Recorded rainfall from the Bognor gauge between 09:00 31st October – 09:00 2nd November 2023. The blue bars represent rainfall depth at a 15-min timestep, and the orange line represents the cumulative rainfall for the total duration.

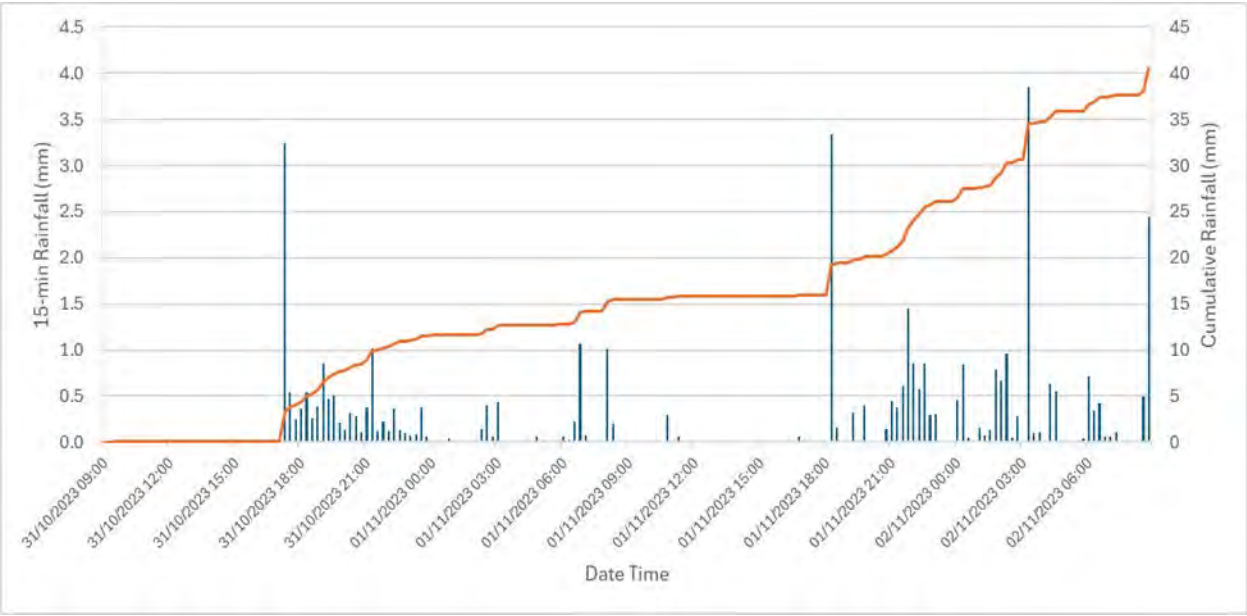

Figure 3 – Recorded rainfall from the Westergate gauge between 09:00 31st October – 09:00 2nd November 2023. The blue bars represent rainfall depth at a 15-min timestep, and the orange line represents the cumulative rainfall for the total duration.

Both rain gauges were considered to be within an appropriate distance of the affected areas and both gauges recorded similar amounts of rainfall for the time periods of interest (see Figure 4). Therefore, the

two rain gauges were considered representative of the rainfall across the region and indicate that the rainfall event was unlikely to be highly localised. No further rainfall data types were acquired.

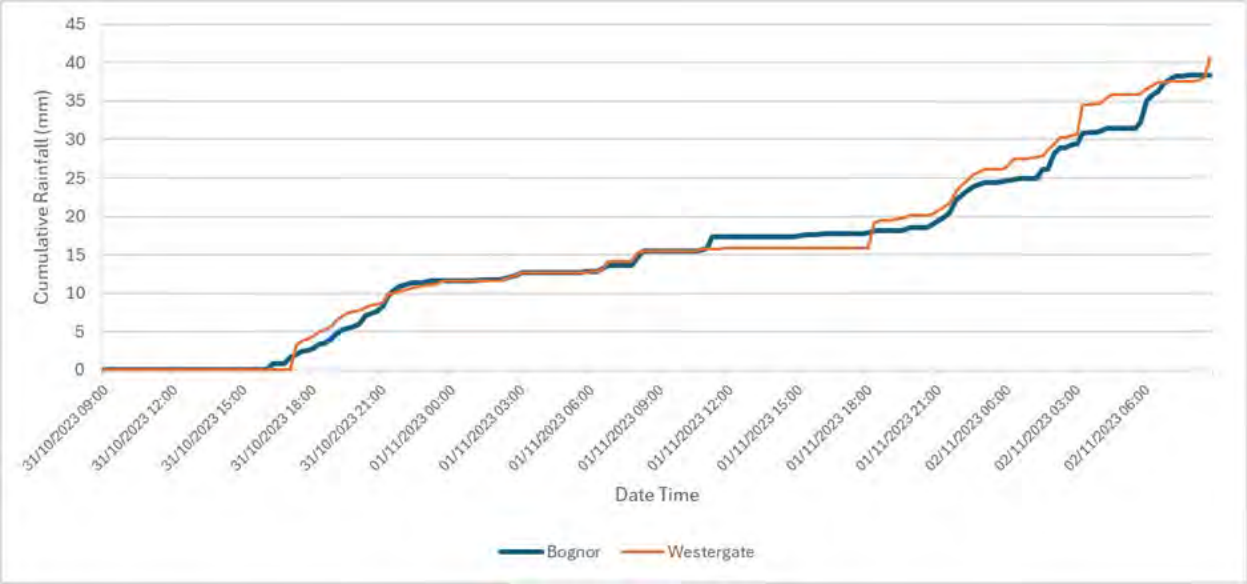

Figure 4 - Comparison of the rainfall recorded by the Bognor rain gauge and the Westergate rain gauge between 09:00 31st October - 09:00 2nd November 2023.

Antecedent Conditions

Although high rainfall occurred on the 1st – 2nd November, due to the length of the storm this does not result in a high rarity event and thus does not fully justify the flooding impact experienced. The 1st of November (which represents 09:00 1st November – 09:00 2nd November) was the 59th highest day of rainfall recorded from the Bognor rain gauge (records go back to July 2009) and the 57th highest from the Westergate rain gauge (records go back to November 1999). However, the region experienced high rainfall leading up to the day of the storm with October being the wettest month on record for the Bognor and Westergate gauges (Bognor experienced almost twice as much rainfall as the next wettest October on record). Figure 5 and Figure 6 presents the rainfall in October 2023 in comparison to the rainfall for every other October recorded for the Bognor and the Westergate gauges respectively.

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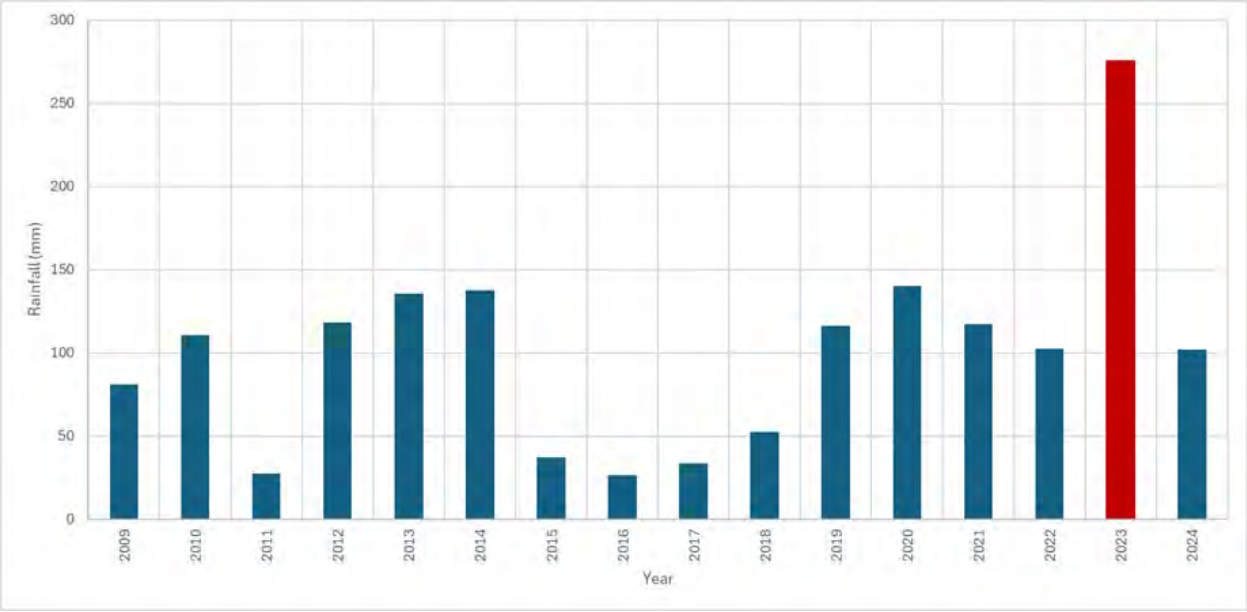

Figure 5 - Total rainfall recorded by the Bognor rain gauge in every recorded October (2009 to 2024). The red bar represents October 2023, the month prior to Storm Ciarán.

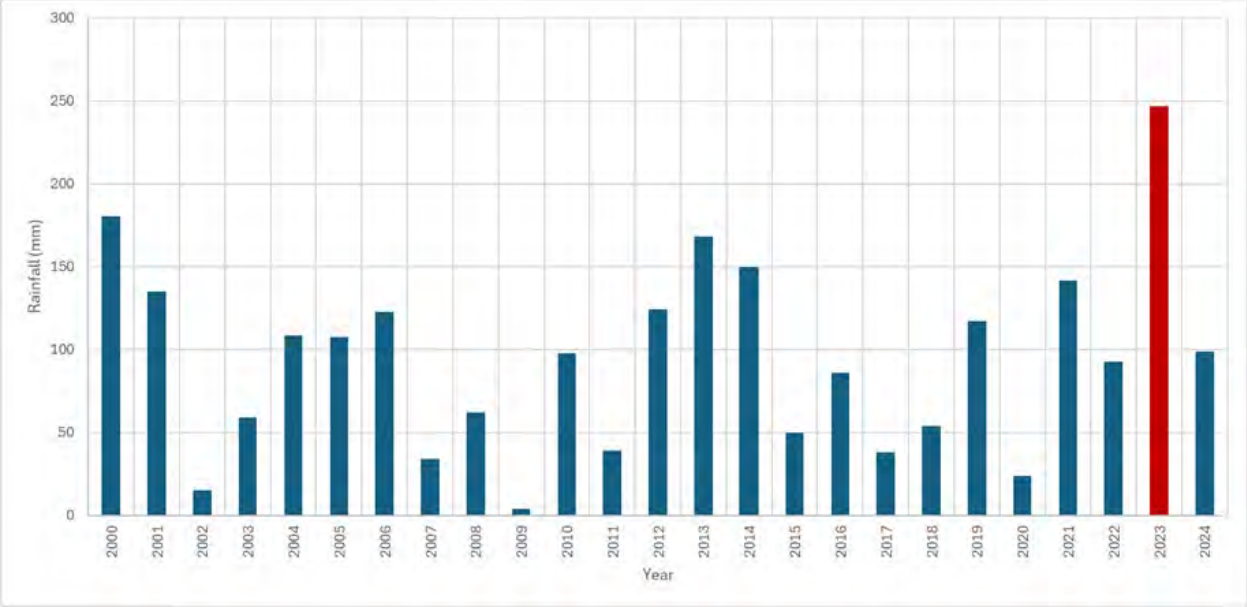

Figure 6 - Total rainfall recorded by the Westergate rain gauge in every recorded October (2000 to 2024). The red bar represents October 2023, the month prior to Storm Ciarán.

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Fluvial Water Level Analysis

Fluvial water level data, where available, from the Hydrology Data Explorer[1] was reviewed. The Bognor[4] gauge (xy: 493976 , 100612) was assessed which is located on the Aldingbourne Rife. No other fluvial gauge stations were considered appropriate for this assessment.

The high fluvial water level shown in Figure 7 corresponds with the periods of high rainfall across October 2023. The fluvial water level recorded by the gauge rose slightly from the 11th of October, before rising again considerably from the 18th of October up to almost 1.5mAOD during Storm Ciarán. The points of increase in fluvial water level indicated coincide with heavy rainfall recorded from the Bognor and Westergate gauges.

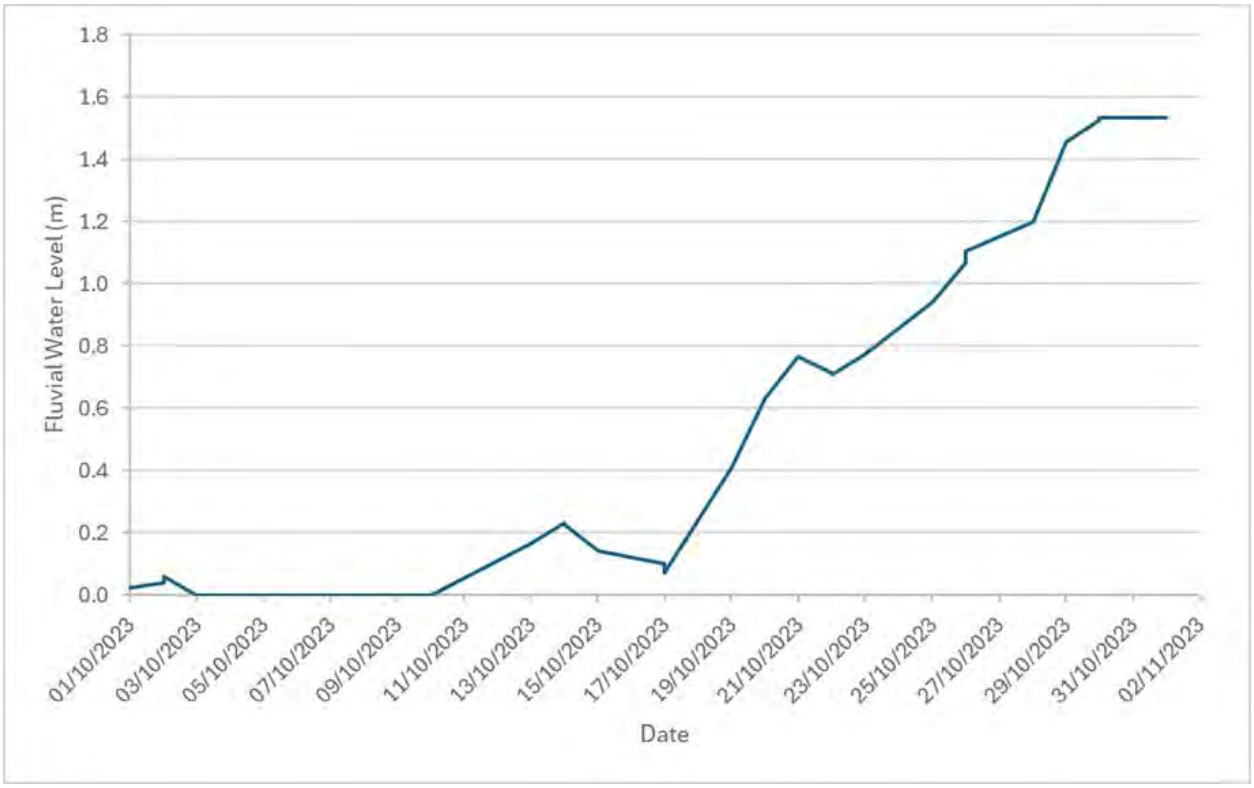

Figure 7 - Recorded water level (m) between 01/10/23 – 02/11/23 on the Bognor gauge located on the Aldingbourne Rife.

The wet antecedent conditions led to the high fluvial water levels and therefore exacerbated the impact of Storm Ciarán.

[4] Defra's Hydrology Explorer: Bognor

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Geology and Groundwater Analysis

A review of British Geological Survey (BGS) geology and Soilscape mapping indicate that the region is made up of river terrace superficial deposits[5] with the soil largely classified as Soilscape 22 'loamy soils with naturally high groundwater'[6]. The BFIHOST19[7] value at the Bognor and Westergate rain gauges is 0.682 and 0.645 respectively, which similarly indicates the high permeability of the ground and thus the potential to retain water which could result in a high water table.

Due to the wet antecedent conditions in October, the ground was considered highly saturated prior to Storm Ciarán[8] (as shown Figure 5 and Figure 6). This is likely to result in a reduction in infiltration capacity and thus an increase in runoff.

To further support this, the groundwater levels have been assessed from the Hydrology Data Explorer[1]. The only suitable groundwater level gauge in the area was Lagness[9] (xy: 490092, 101373). Figure 1 shows the location of the groundwater level gauge.

The groundwater levels at the Lagness gauge (Figure 8) shows that the groundwater level rose above normal levels from the 12th of October, with groundwater levels at approximately 3.5mAOD prior to this date, rising to almost 5.5mAOD immediately prior to Storm Ciarán. The points of increase in groundwater level indicated coincide with heavy rainfall recorded from the Bognor and Westergate gauges on the 11th of October and again from the 18th of October when rainfall consistently occurs from this date up until Storm Ciarán.

[5] BGS Lexicon of Named Rock Units: Result Details - River Terrace Deposits (Undifferentiated)
[6] LandIS: Soilscapes
[7] BFIHOST19 is the estimate of the baseflow index (BFI) based on the Hydrology of Soil Types (HOST) classification. BFIHOST provides a measures of catchment responsiveness. FEH Catchment Descriptors
[8] Met Office: Past Weather Events - Storm Ciarán
[9] Defra's Hydrology Data Explorer: Lagness

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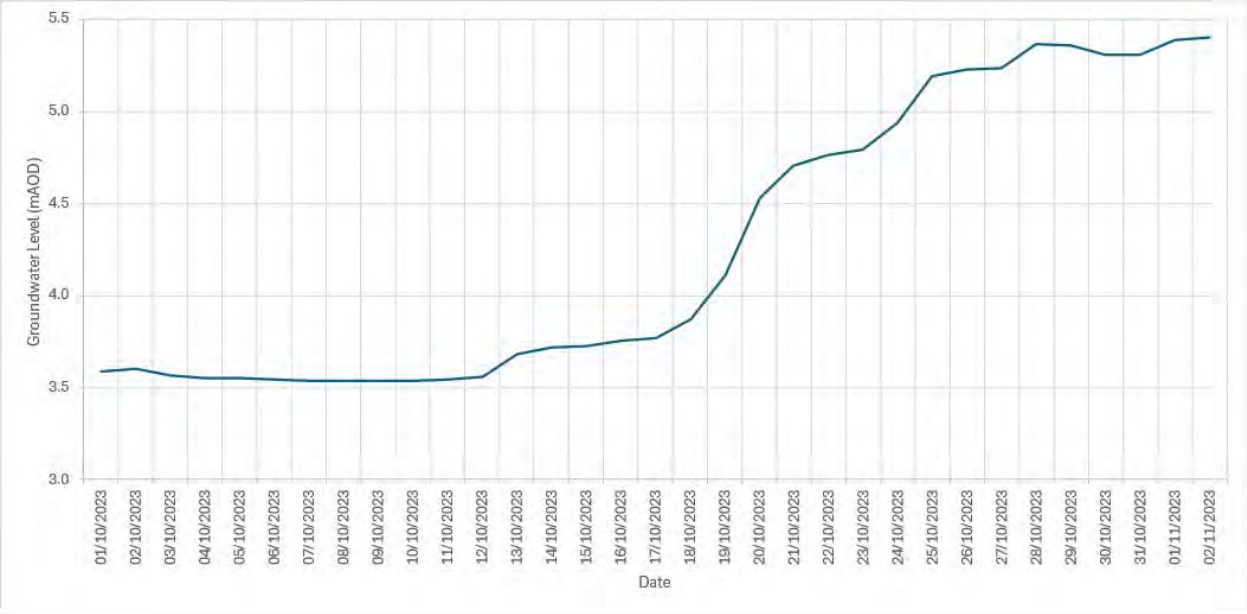

Figure 8 - Groundwater levels recorded by the Lagness groundwater level gauge during October 2023 until the 2nd of November 2023.

This confirms that the ground was heavily saturated prior to the storm. It is therefore highly likely that the antecedent conditions exacerbated the impact of Storm Ciarán.

Appendix D

QUESTIONNAIRE RESPONSES

QUESTION	RESPONSE
Please provide your address, if happy to do so.	Sunningdale Gardens
What is your local council?	Arun District Council
During which storm were you affected by flooding? **(Please note: If affected by both storms, please fill out this questionnaire once for each storm event)**	Storm Kathleen - April 2024
Was your property affected by flooding? If so, was it internal or external flooding?	No.
Where/which direction did the floodwater come from? Can you say approximately how fast the water was flowing?	The aldingbourne rife
Do you know of any partial or full road closures put in place as a result of the flooding? If yes, please provide details of road names and closure dates if possible.	A29 at Shripney
Did you notice any water flowing out of sewer or highway drainage manholes? If yes, please provide details of where and what sewer.	Yes, in addison way opposite
Are you aware of any issues that may have made the flooding worse?	Southern water's failure to line the drains in the area despite two drain surveys showing leakage. The environment agency's failure to properly dredge the rife. Seemingly inadequate pump capacity at the Felpham outflow.
Was any support (evacuation, sandbags, portaloos, etc.) provided by the relevant authorities during or after the event(s)?	In addison way
Can you provide any information of any actions taken by the relevant risk management authorities (West Sussex County Council, Arun District Council, Chichester District Council, Southern Water, Environment Agency, Canal and River Trust, Fire Brigade, etc.)?	Pumping in addison way
Are there any other relevant comments you can provide about the flooding?	Despite a lot of talking and posturing over the years very little gets done. I have numerous newspaper articles collected over the years with promises that have come to nothing. But there are ever more houses and industry adding to the problem. I would write a lot more if you had supplied a computer link rather than a stupid qr code.

Appendix E

CONSULTATION CORRESPONDENCE

Appendix E.1

ARUN DISTRICT COUNCIL

abcd

ADC / CDC Flooding Event Record

Date:_____

Date	Time	Contact	Parish	Primary Location	Secondary Location	Type of Flooding	Extent of Flooding	Comments
23.10.23	-	[redacted]	Aldwick	Barrack Lane		Surface Water/Fluvial	Highway & property	Internal flooding unconfirmed. Sea outfall blocked with beach shingle
24.10.23	-	[redacted]	Felpham	[redacted]The Loop		Fluvial	Garden	Historic issue that have been working with the private estate on.
24.10.23	-	-	Pagham	Sefter Road		Surface Water/Fluvial	Highway	Blocked gully/ineffective road drainage
25.10.23	-	[redacted]	Yapton	Hoe Lane, Flansham		Surface Water/Fluvial	Highway	Known historic issue - awaitng further investigation by WSCC/ADC
25.10.23	-	[redacted]	Aldwick	Kingway/Queensway		Surface Water/Fluvial	Highway & property?	Private estate brought in pumps Historic known issue - awaiting further investigation by private estate with ADC support
25.10.23	-	-	Aldwick	Aldwick Road (by duckpond)		Surface Water/Fluvial	Highway	Capacity of watercourse assumed to be reason
?	-	-	Yapton	North End Road		Surface Water	Highway	Junction with Main Road Historic issue - inadequate highway drainage
?	-	-	Yapton	Yapton Road/Main Road		Surface Water/Fluvial/Pluvial/Sewerage	Highway & fields	On double bend by property called West View. Historic issue
?	-	[redacted]	Pagham	Church Lane		Surface Water/Fluvial/Pluvial/Sewerage	Highway & Properties	[redacted]- Garden flooding and property protected by sandbags preventing water entering inside [redacted]- Garden and Internal flooding - water cam e in through floors, front door and sewerage through shower tray. [redacted]Garage flooded?
?	-	[redacted]	Pagham	[redacted] Spinnaker View		Sewerage	-	Unusable sanitation due to surcharged foul sewer
?	-	[redacted]	Aldwick	[redacted] Aldwick Road		Fluvial	Garden	Watercourse partially blocked
?	-	-	Pagham	[redacted] Pagham Road		Pluvial	Gardens + internal?	Ongoing case linked to development site
?	-	[redacted]	Aldwick	Lincoln Avenue		Pluvial	Gardens	Ongoing case linked to development site
27.10.23	-	-	Bersted	Riverside Mobile Home Park, Shripney Road		Fluvial	Large extents of park Internal?	Flood plain of Aldingborne Rife Park Evacuated
27.10.23	-	-	Bognor	Tesco, Shripney Road		Fluvial	Car park	Designed to flood as per planning permission
28.10.23	-	-	Climping	Ferry Road area		Tidal	Fields. Other?	Sea broke through at climping seafront
28.10.23	-	Emergency Co-ordinator	East Preston	Normandy Lane (No.?)		Groundwater?	Garden	
28.10.23	-	Emergency Co-ordinator	Elmer	[redacted] Arundel Way		Surface Water?	?	
28.10.23	-	[redacted]	Middleton	Sea Way		Surface Water/Fluvial/Sewerage	Road/Driveway (Threatening to enter property)	
?	-	-	Middleton	Willowbrook	Lodge Close/Ancton Lodge Lane	Fluvial	Highway	Full extent of flooding unknown Suspected issues with culvert
?	-	-	Bersted/Bognor/ Shripney	A29 between Orchard Way & Sack Lane		Surface Water/Fluvial/Pluvial	Highway	
29.10.23	-	Emergency Co-ordinator	Bognor	Elec Sub Station, Shripney Road		Fluvial	Internal	
29.10.23	-	Emergency Co-ordinator	East Preston	[redacted] Roundstone Drive		Surface Water	?	
?	-	[redacted]	East Preston	[redacted] Roundstone Drive		Surface Water	Highway	Unusable sanitation due to surcharged foul sewer
29.10.23	-	Emergency Co-ordinator	Bognor	Oak Close, Oak Grove, Hazel Road		Surface Water?	Highway?	
30.10.23	-	Emergency Co-ordinator	Lyminster	Thornlea Caravan Park, Lyminster Road		?	Highway?	
30.10.23	-	Emergency Co-ordinator	Wick	Cottages (unknown location)		?	?	Threatening to enter property
30.10.23	-	Emergency Co-ordinator	Arundel	Malthouse Close		Fluvial	?	Hole in river wall
?	-	[redacted]	Middleton	Manor Way/Elmer Road		Surface Water/Sewerage?	Highway	Issues with beach soakaway/capacity?
?	-	-	Middleton	Southdean Drive		Surface Water	Highway	Historic issue
7.11.23	-	Emergency Co-ordinator	Middleton	[redacted] Southdean Drive		Surface Water	Internal?	
28.10.23	-	-	Ferring	Beehive Lane [redacted]	Little Paddocks, Chalet Road, Henry Road	Fluvial/Surface Water	Highway, gardens & internal??	Historic land drainge issues
?	-	[redacted]	East Preston	Angmering on Sea Estate		Fluvial/Surface Water	Highway/Gardens	Full extent unknown
?	-	-	Felpham	Limmer Lane		Fluvial/Surface Water	Highway	Historic land drainge + Public surface water sewer issues. Associated with bunker system to sea outfall + storage ditch
?	-	[redacted]	Arundel	Crown Yard Carpark, River Road		Surface water	Highway/Carpark	Threatening to enter shops
?	-	-	Aldwick	[redacted] Fish Lane		Fluvial	Garden	Watercourse capacity issue?
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
?	-	Emergency Co-ordinator	Bognor	[redacted], Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted], Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
?	-	[redacted]	Bognor	[redacted] Durban Road		Fluvial	Internal	
3.11.23	-	Emergency Co-ordinator	Bognor	[redacted] Durban Road		Fluvial	Internal	
13.11.23	-	?	Bognor	[redacted]), Byfield Place		?	Internal	
?	-	-	Pagham	Church Farm Holiday Park, Church Lane		Surface Water/Fluvial//Sewerage	Extent Unknown	
2.11.23	-	[redacted]	Barnham	[redacted] Marshall Close		Sewerage/Fluvial?	Internal	Coming up through floors
2.11.23	-	[redacted]	Barnham	Orchard Way		Fluvial	Highway?	Main river in hedge end wood overflowing?
2.11.23	-	[redacted]	Yapton	Drove Lane		Fluvial	Highway/farm yard	Rifes full and systems upstream backed up
2.11.23	-	-	Climping	[redacted], Church Lane		Pluvial	Garden/threatening to enter property	
2.11.23	-	[redacted]	East Preston	[redacted]The Drive		Sewerage/Fluvial/Surface Water	Garden/under floorboards	Blocked sea outfall not helping matters Run off from road entering garden Sewers surcharged Ray Cooper involved re; investigation
?	-	[redacted]	East Preston	[redacted] Seaview Avenue		Fluvial/Surface Water	Garden	
5.11.23	-	[redacted]	Bersted	Poplars Caravan Park, Shripney Road	Riverside Caravan Park	Sewerage/Fluvial/ Surface Water	Gardens & garages internally	Flood plain of Aldingborne Rife
5.11.23	-	[redacted]	Eastergate	[redacted] Eastegate Lane		Pluvial/Surface Water	Garden & causing overloading of sewerage system	

ADC / CDC Flooding Event Record

Date:_____

?	-	[redacted]	East Preston	Vermont Drive [redacted]) + Sewaves Close & Homelands Avenue		Surface Water/Fluvial?	Highway/gardens/cellar	May be linked to blocked sea outfall at South Strand?
?	-	Kingston Parish Council	Kingston	Kingston Lane (Just south of Elm Avenue)		Surface Water/Fluvial?	Highway	
?	-	[redacted]	Aldwick	[redacted] Colts Bay		Surface Water/Fluvial	Garden	Due to blocked sea outfall, etc
3.11.23 5.11.23	-	Emergency Co-ordinator	Bersted	[redacted]Addison Way		Surface Water/Fluvial?	Highway	
2.11.23	-	Emergency Co-ordinator	Middleton	[redacted] Crossways		?	Internal	
6.11.23	-	Emergency Co-ordinator	Shripney	[redacted], Shripney Road		Surface Water/Fluvial?	Internal	
6.11.23	-	Emergency Co-ordinator	Shripney	[redacted], Shripney Lane		Surface Water/Fluvial?	Internal	
6.11.23	-	Emergency Co-ordinator	Shripney	[redacted], Shripney Lane		Surface Water/Fluvial?	Internal (Conservatory)	
7.11.23	-	Emergency Co-ordinator	Bognor	[redacted], West Street/High Street		?	?	
?	-	WSCC Councillor/WSCC Highways	Flansham	[redacted], Worms Lane		Fluvial	Garden/Access	
?	-	Elmer Sands Estate Ltd	Elmer	Elmer Sands Estate		Sewerage/Fluvial/ Surface Water	Gardens/Drives/Roads	Includes The Hard ([redacted]), [redacted] Ancton Way, Acton Way/Elm Drive
?.12.23		[redacted]	Shripney	A29 Shripney Road/Lidsey Road		Sewerage/Fluvial/ Surface Water	Highway	Road closed
?		[redacted]	Shripney	Barn Lane		Sewerage/Fluvial/ Surface Water	?	
MANY INCIDENTS OF HIGHWAY FLOODING NOT RECORDED HERE								

Appendix E.2

ENVIRONMENT AGENCY

[redacted]

From: SSD Enquiries <SSDEnquiries@environment-agency.gov.uk>
Sent: 02 September 2024 16:19
To: [redacted]
Subject: SSD370808DP: 240802/JH02 West Sussex s19 Flood Investigation Enquiry

Dear [redacted],

Thank you for your enquiry.

We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004. We have logged this under the reference SSD370808DP, please quote this for any further correspondence about this topic.

Please see our responses to your queries below.

Due to the size of your request, we have tried to answer your queries whilst mainly focussing in on speci fic rivers that had more notable instances of flooding and engagement, rather than all the catchments that were initially listed. However, if there is any further information on these events that you feel we may have missed, or that you have additional questions about, please do just let us know.

Please could the Environment Agency provide the following information, where available:

1. **Details of any flood defences in the area that might influence flooding at the site / surrounding area.**
   DEFRA Data Services Platform is a system that allows bodies such as West Sussex County Council to access various datasets, including those relating to our flood defences. This information can be accessed using the following link: AIMS Spatial Flood Defences (inc. standardised attributes)
2. **Details of river flows during the above dates, specifically for the above listed watercourses where relevant at each site.**
   Due to the technical teams workload we have not yet received a response to this question. We will be in contact with you again shortly as soon as we have this data available to share.
3. **Details of fluvial flood return periods for the above storms.**
   This is not information that we hold for the rivers listed above, for any of the above named storms.
4. **Details of any flood warnings in place during the above dates.**
   Please see the below Flood Alerts/Warnings issued for the period of Storm Ciaran:

Message Name	Message Type	Issued	Removed
Aldingbourne and Barnham Rifes	Flood Alert	25/10/2023 06:43	27/11/2023 16:11
Climping Seafront	Flood Alert	26/10/2023 22:29	04/11/2023 17:22
Lower Arun	Flood Alert	27/10/2023 18:13	07/11/2023 16:36
Climping	Flood Warning	27/10/2023 23:42	03/11/2023 17:39
Tidal areas of Littlehampton Rope Walk	Flood Alert	27/10/2023 23:42	03/11/2023 17:29
Selsey Bill to Elmer	Flood Alert	27/10/2023 23:43	03/11/2023 17:37
Arundel on the River Arun	Flood Warning	27/10/2023 23:43	07/11/2023 16:31
Bersted on the Aldingbourne Rife	Flood Warning	28/10/2023 03:13	19/11/2023 10:50
Black Ditch	Flood Alert	29/10/2023 02:13	07/11/2023 16:36
Felpham on the Aldingbourne Rife	Flood Warning	02/11/2023 03:58	11/11/2023 11:27

Please see the below Flood Alerts/Warnings issued for the periods of Storm Kathleen (6-7 April 2024) and Storm Pierrick (9 April 2024):

Message Name	Message Type	Issued	Removed
Climping seafront	Flood Alert	06/04/2024 11:15	13/04/2024 11:33
Thorney Island to Bracklesham	Flood Alert	07/04/2024 13:42	13/04/2024 11:33
Coastal areas of Medmerry	Flood Alert	08/04/2024 13:05	13/04/2024 11:33
Selsey Bill to Elmer	Flood Alert	08/04/2024 13:05	09/04/2024 15:40
Lower Arun	Flood Alert	08/04/2024 13:05	09/04/2024 15:40
Tidal areas of Littlehampton Rope Walk	Flood Alert	08/04/2024 13:43	13/04/2024 11:33
Climping	Flood Warning	08/04/2024 13:45	10/04/2024 17:27
Littlehampton Rope Walk	Flood Warning	08/04/2024 13:45	10/04/2024 16:47
East Wittering and Bracklesham coast	Flood Warning	09/04/2024 11:11	10/04/2024 16:51
Medmerry	Flood Warning	09/04/2024 11:15	10/04/2024 16:40

5. **Details of any historic flooding associated with the above watercourses.**
   You can also download historical flood event records from the Defra Data Services Platform, using the following link: https://environment.data.gov.uk/dataset/8c75e700-d465-11e4-8b5b-f0def148f590

Furthermore, please could the Environment Agency answer the following questions:

1. **Was the flooding that occurred during Storms Ciaran and Kathleen reported to the Environment Agency? If the answer to the above question is yes, how did the Environment Agency respond to the incidents?** *We were informed of flooding during both Storm Ciarán and Kathleen. We engaged with local authorities around a number of different incidents on both of these occasions. For example, during April 2024 we engaged with the community of Rope Walk in Littlehampton following the collapse of part of a sea wall at this site, before taking part in an in-person meeting on 10th May 2024 to discuss future proposed changes to the line of defence in that community.*

   We also engaged with communities and public bodies around flooding that occurred in the days surrounding Storm Ciarán in the Aldingbourne catchment. The Environment Agency has since taken part in the Arun Flood Forum and provided advice and support to members of the community. During the flooding event we also deployed two contingency pumps at Felpham to provide resilience if our existing pumps were to go out of operation or the power supply were to be impacted.

   If you would like any further details on our response to either of these events, in respect of any other watercourses, please let do us know. However, we cannot be certain that all flooding that occurred across West Sussex during these events was reported to us.

3. **Are there any known issues / constraints associated with the rivers listed above in terms of capacity?** *We do not have any awareness of issues or constraints in terms of capacity, for any of the above-named rivers, in relation to Storms Ciaran or Kathleen. However, the Aldingbourne Rife has a particular set of issues relating to it being a very low-lying catchment. The flat nature of this area means that flood water takes a long time to drain out to sea, following any large rainfall event.*

4. **Are there any plans to carry out improvement works to the rivers within the local vicinity?**
   The Environment Agency actively monitor weather radars and our operational staff proactively clear debris screens in order to help keep rivers flowing freely. We also have a regular maintenance schedule for our

Operations team across Sussex, which we carry out using the permissive powers we have to maintain watercourses designated as Main Rivers.

You can view further information regarding our planned maintenance activities and capital schemes using the Asset Management Service, which can be accessed using the following link: Asset Information and Maintenance Programme (data.gov.uk)

Please refer to the Open Government Licence which explains the permitted use of this information.

Rights of appeal: If you are not satisfied you can contact us within 2 calendar months to ask for our decision to be reviewed. We shall review our response to your request and give you our decision in writing within 40 working days.

If you are still not satisfied following this, you can raise a concern with the Information Commissioner, who is the statutory regulator for Freedom of Information and the Environmental Information Regulations.The contact details are:
Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF
Tel: 303 123 1113
Website: http://ico.org.uk

Kind regards,

Dorah Phiri
Customers & Engagement Team
Solent and South Downs Area
Environment Agency | Guildbourne House, Chatsworth Road, Worthing, West Sussex, BN11 1LD
ssdenquiries@environment-agency.gov.uk
National Customer Contact Centre : 03708 506 506

From: [redacted]
Sent: Thursday, August 1, 2024 11:12 AM
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Cc: [redacted]
Subject: 240802/JH02 West Sussex s19 Flood Investigation Enquiry

Dear Sir / Madam,

We have been instructed by our client, West Sussex County Council, to carry out an investigation of flooding that occurred at the below sites during Storms Ciaran and Kathleen:

Storm Ciaran, November 2023:

- **Yapton** (*Ryebank Rife, Yapton Rife, Bilsham Ditch*)
- **Bognor Regis** (*Aldingbourne Rife, Lidsey Rife, North Bersted Ditch*)
- **Shripney** (*Shripney Manor Ditch*)

- **Littlehampton** (*River Arun, Black Ditch, Eels Springs Ditch, Wick Farm Ditch, Ryebank Rife, Rope Walk Ditch, Rustington Stream*)

Storm Kathleen, April 2024:

- **Earnley** (*Easton Rife and Branch, Earnley Rife*)
- **Bracklesham** (*Earnley Rife*)
- **Littlehampton** (*see above*)

We are writing to request the Environment Agency provide any flood defence data and information with respect to the above sites.

Please could the Environment Agency provide the following information, where available:

1. Details of any flood defences in the area that might influence flooding at the site / surrounding area.
2. Details of river flows during the above dates, specifically for the above listed watercourses where relevant at each site.
3. Details of fluvial flood return periods for the above storms.
4. Details of any flood warnings in place during the above dates.
5. Details of any historic flooding associated with the above watercourses.

Furthermore, please could the Environment Agency answer the following questions:

1. Was the flooding that occurred during Storms Ciaran and Kathleen reported to the Environment Agency?
2. If the answer to the above question is yes, how did the Environment Agency respond to the incidents?
3. Are there any known issues / constraints associated with the rivers listed above in terms of capacity?
4. Are there any plans to carry out improvement works to the rivers within the local vicinity?

We trust the above is clear, however, should you have any queries or require any further information from WSP to be able to answer the above queries, please do not hesitate to get in contact.

Kind regards,

[redacted]
Graduate Consultant – Water Risk Management
BSc (Hons)
She/her

WSP in the UK
Matrix House, Basing View
Basingstoke
RG21 4FF

Appendix E.3

SOUTHERN WATER

from Southern Water

[redacted]

Date

2nd September 2024

Contact

Tel 0330 303 0368

Dear [redacted]

The Environmental Information Regulations 2004
Request for Information
EIR reference 2823

Thank you for your request for information which we received on 2nd August 2024. We have dealt with your request under The Environmental Information Regulations 2004 (EIR 2004). This letter provides the response to your request, as follows:

We have been instructed by our client, West Sussex County Council, to carry out an investigation of flooding that occurred at the below sites during Storms Ciaran and Kathleen:

Storm Ciaran, November 2023:

- ***Yapton*** *(Ryebank Rife, Yapton Rife, Bilsham Ditch)*
- ***Bognor Regis*** *(Aldingbourne Rife, Lidsey Rife, North Bersted Ditch)*
- ***Shripney*** *(Shripney Manor Ditch)*
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Storm Kathleen, April 2024:

- ***Earnley*** *(Easton Rife and Branch, Earnley Rife)*
- ***Bracklesham*** *(Earnley Rife)*
- ***Littlehampton*** *(see above)*

We can confirm that Southern Water does not hold information of the type you have requested as follows:

Under the Regulations Southern Water does not have to provide you with a copy of this information if one of the exceptions in the Regulations applies. In this case Southern Water considers that the exception Regulation 12(4)(a) of the EIR applies as we do not hold the information you have requested. Therefore, we are unable to provide you with this information.

To clarify, Southern Water are not responsible for the management of these assets. The responsibilty of the above assets is the the Environment Agency (EA) and any enquiry relating to them should be directed to the EA.

We are entitled to make a reasonable charge for information provided under the Regulations. Details of our charging scheme can be found on our website: https://www.southernwater.co.uk/water-for-life/protecting-the-environment/environmental-information. In this case we have decided to waive our charge.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within forty working days of the date of receipt of this response and should be addressed to Head of Legal, Southern Water Services Ltd, Southern House, Yeoman Road, Worthing, West Sussex BN13 3NX or you can email EIR.Internal.Review@southernwater.co.uk.

If you are dissatisfied with the outcome of the internal review, you can apply, without charge, to the Information Commissioner, who will consider whether Southern Water has complied with its obligations under the Regulations, and can require Southern Water to remedy any problems. You can find out more about how to do this, and about the Regulations in general, on the Information Commissioner's website at: www.ico.org.uk. Complaints to the Information Commissioner can be made via the "report a concern" section of the Information Commissioner's website.

Please do not hesitate to contact us if you have any queries.

Yours sincerely

EIR Officer

[redacted]

From: Richey, Phil <Phil.Richey@southernwater.co.uk>
Sent: 27 November 2024 09:07
To: [redacted]
Cc:
Subject: RE: WSCC s19 Investigation

Good morning [redacted],

A lot of the flooding issues where happening prior to Storm Ciaran due to the wet weather that started in August. The previous Storm Badet seemed to cause more issues.

In terms of The Hard ,the issues relate to overloading of the pump station which can be effected by prolonged wet weather and very high water table. When the WPS becomes overloaded during prolonged wet weather, Tankers are used to assist in draining the wet well.

We don't normally have internal flooding along The Hard ,its mainly overflowing manholes either in the road or in gardens at the lower points.

The recorded history for the storm periods in 2023 is actually very little.

24/10/23 - [redacted] – report of overflowing MH at front of property and in road. Checked and found sewers and high level WPS
24/10/23 - [redacted]
28/10/23 - [redacted] – report of MH in road overflowing. Checked and found sewers and WPS high level.
28/10/23 - [redacted] Checking that Tankers are still assisng WPS (they were)
05/11/23 – [redacted] – General enquiry relating to flooding at The Hard
– Report of noise at WPS (alarm) Checked out and found site working & alarm reset.
The above are all the reports from customers which only relate to some external flooding which was addressed by putting Tankers on the WPS to assist. The next reports from The Hard were in Feb/2024.

Hope this is of assistance.

Regards

Philip Richey
County Sewerage Engineer -Sussex.

From: [redacted]
Sent: Tuesday, November 26, 2024 4:37 PM
To: Richey, Phil <Phil.Richey@southernwater.co.uk>
Cc: [redacted]
Subject: WSCC s19 Investigation

Good afternoon Phil,

We have been instructed by our client West Sussex County Council to conduct a flood investigation into the flooding experienced across Bognor Regis after Storm Ciaran in November 2023. Paul Cann from Arun District Council gave me your details in the hope that you may be able to provide some further information. Specifically, we are wondering if you're able to confirm if properties in The Hard, Elmer (PO22 6JS) were flooded internally and if so, approximately how many properties were affected.

Many thanks,

[redacted]
Graduate Consultant – Water Risk Management
BSc (Hons)
She/her

WSP in the UK
Matrix House, Basing View
Basingstoke
RG21 4FF

Appendix F

ENVIRONMENT AGENCY FLOOD MAPS

Appendix F.1

BOGNOR REGIS

Site Location

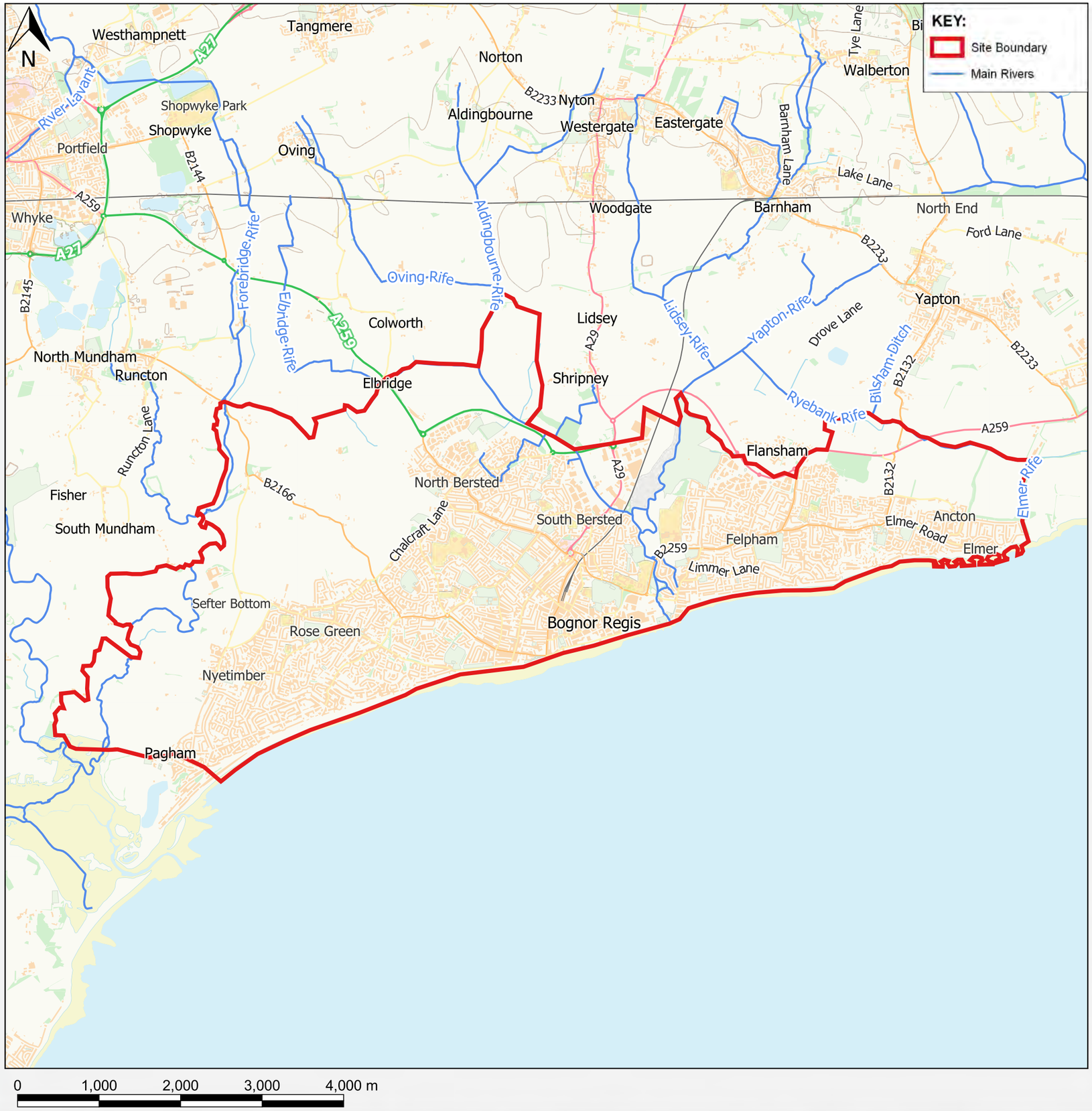
2

CLOSEST MAIN RIVER

Ryebank Rife

DISTANCE BETWEEN SITE AND CLOSEST MAIN RIVER

0m

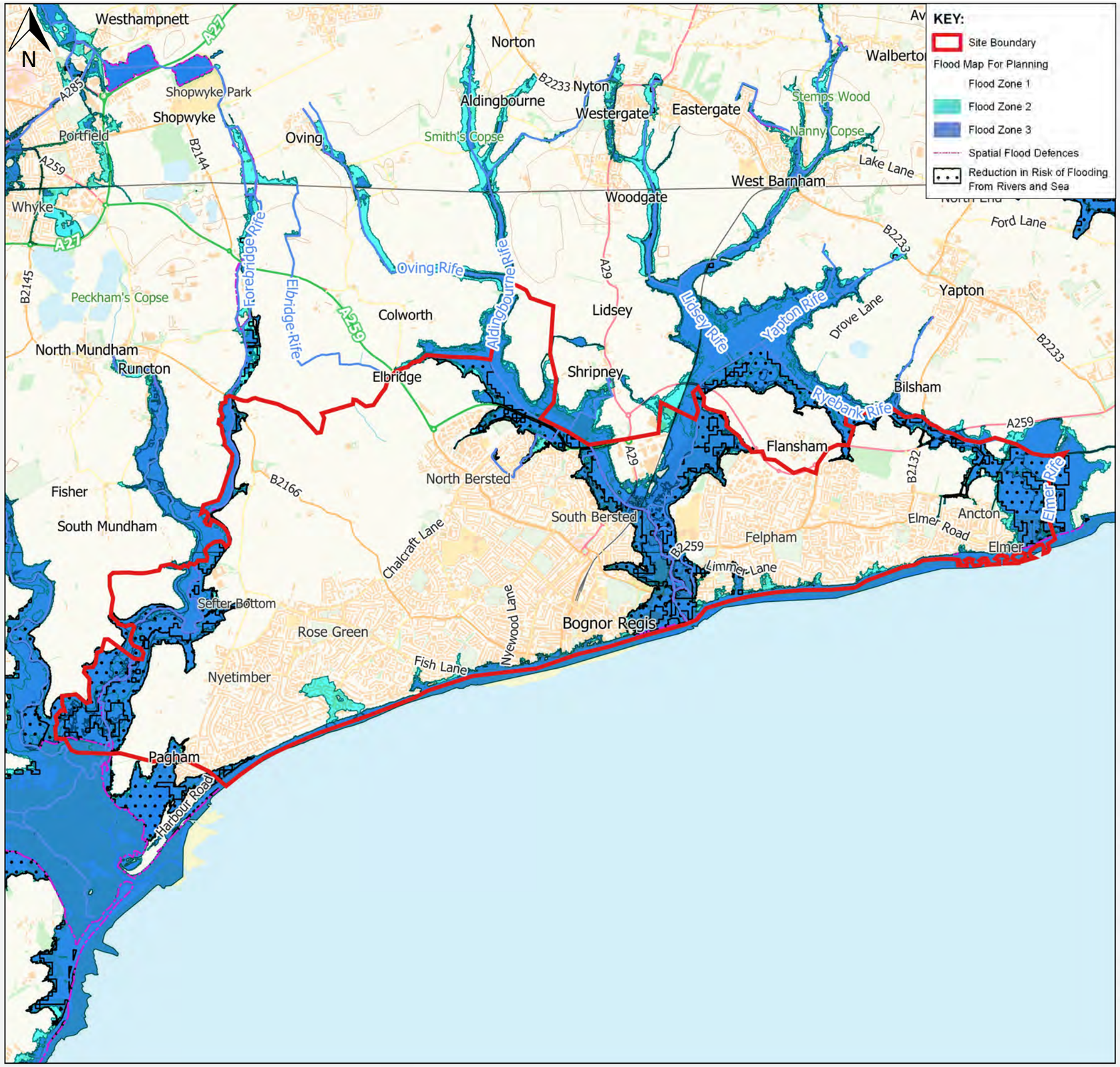


Flood Map for Planning

Flood zone maps are modelled using local and national river and sea data. This information provides an indication of the likelihood of flooding and is intended for planning use only.

- **Flood Zone 1 -** Land having a less than 1 in 1,000 annual probability (0.1% AEP) of river or sea flooding - all land outside Zones 2 and 3).
- **Flood Zone 2 -** Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0% AEP) of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability (0.1% - 0.5% AEP) of sea flooding.
- **Flood Zone 3 -** Land having a 1 in 100 or greater annual probability (>1.0% AEP) of river flooding; or Land having a 1 in 200 or greater annual probability (>0.5% AEP) of sea flooding.

Reduction in Risk of Flooding from Rivers and Sea due to Defences -Reduction in Risk of Flooding from Rivers and Sea due to Defences is a spatial dataset that indicates where areas have reduced flood risk from rivers and sea due to the presence of flood defences. The dataset has been created to help initiate conversations about the impact our flood defences have on the risk of flooding from the rivers and sea,and as a prompt to find out more about the flood defences in a particular area of interest. It does not replace any local, more detailed information.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

Risk of Flooding from Rivers and Sea

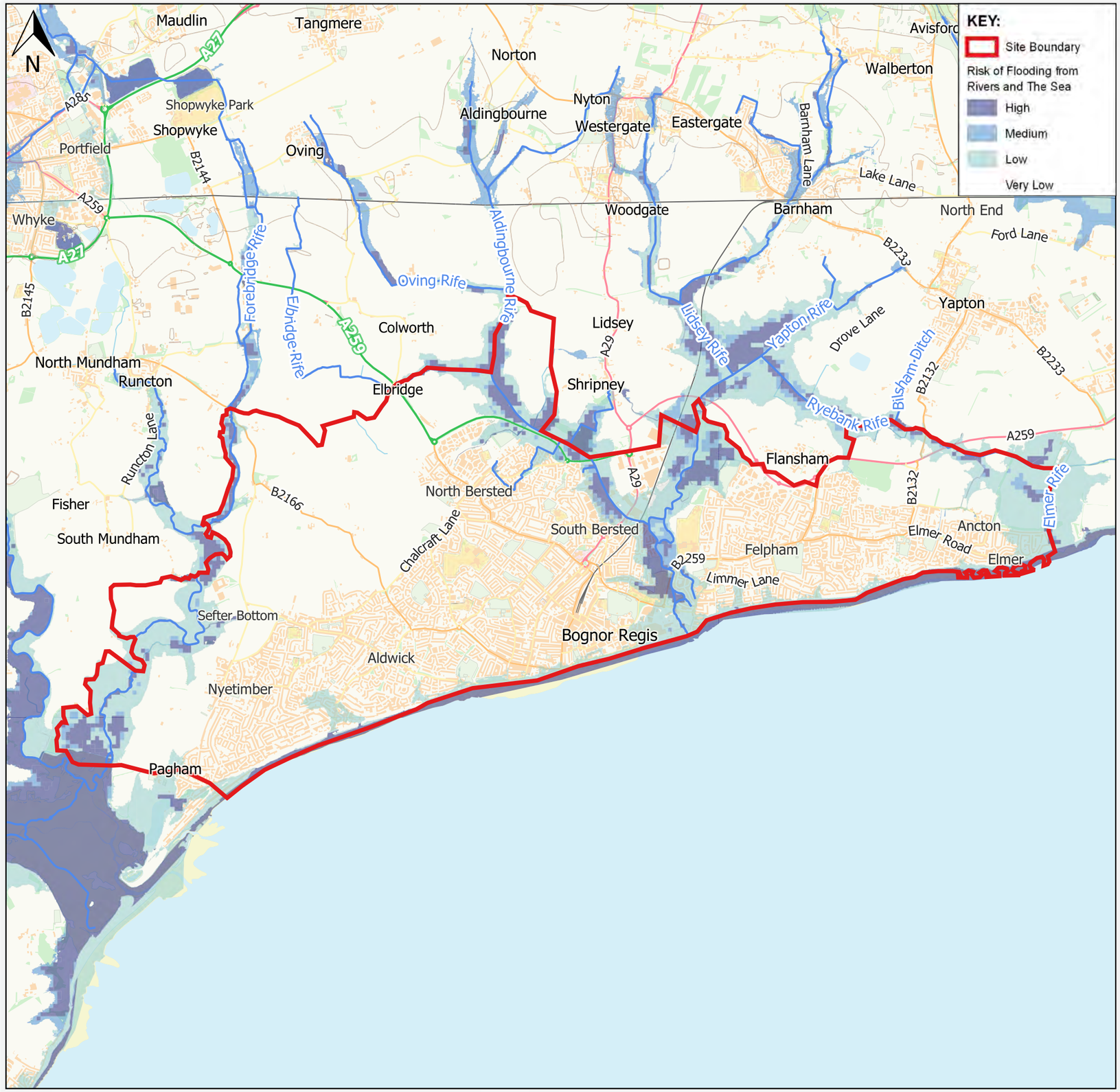
This map takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

High Risk - Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from rivers or the sea.

Medium Risk - Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from rivers or the sea.

Low Risk - Land having between a 1 in 100 and a 1 in 1000 annual probability (0.1% - 1.0%) of flooding from rivers or the sea.

Very Low Risk - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from rivers or the sea.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

Risk of Flooding from Surface Water

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

High Risk - Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from surface water.

Medium Risk - Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from surface water.

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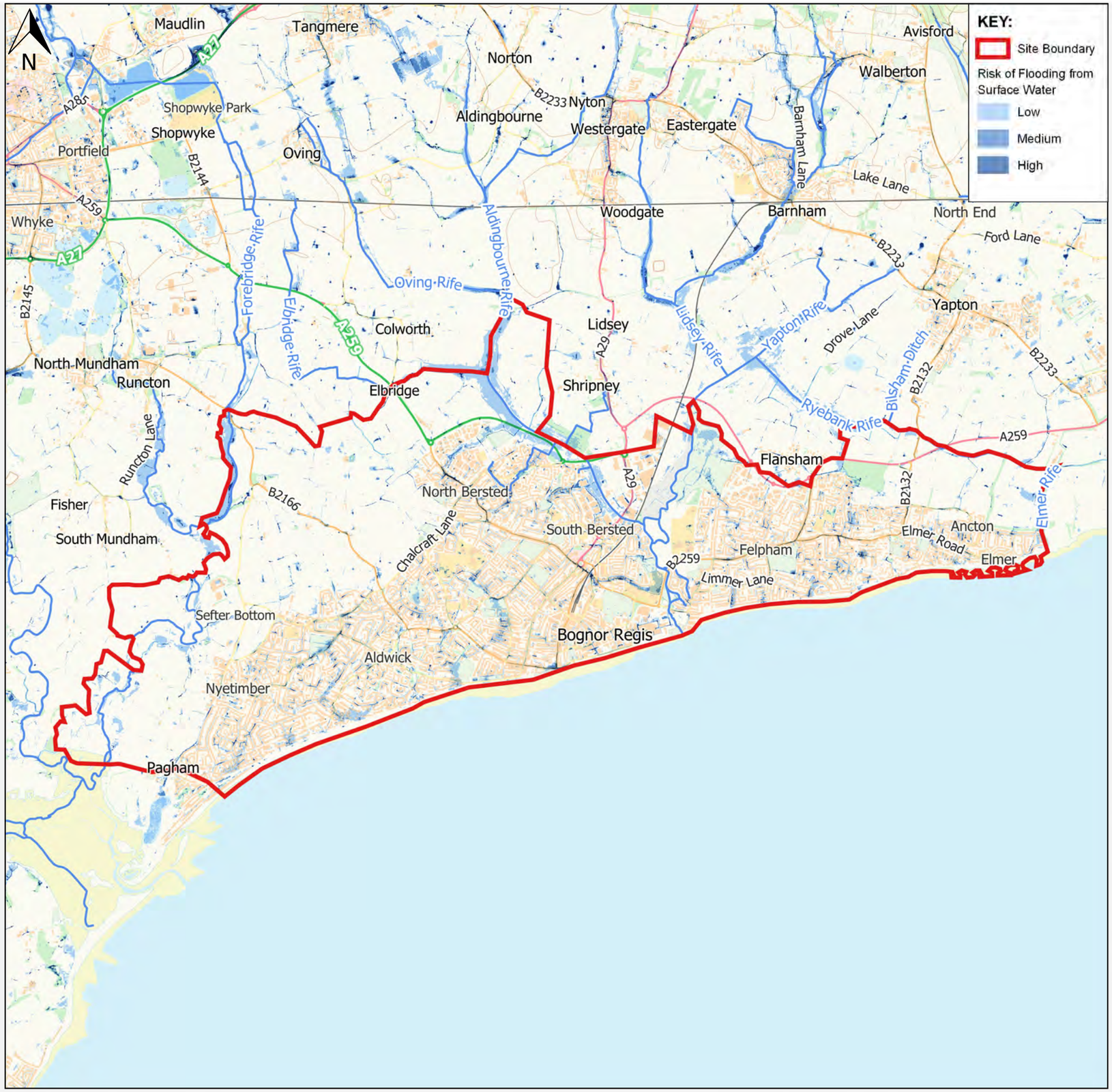


This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

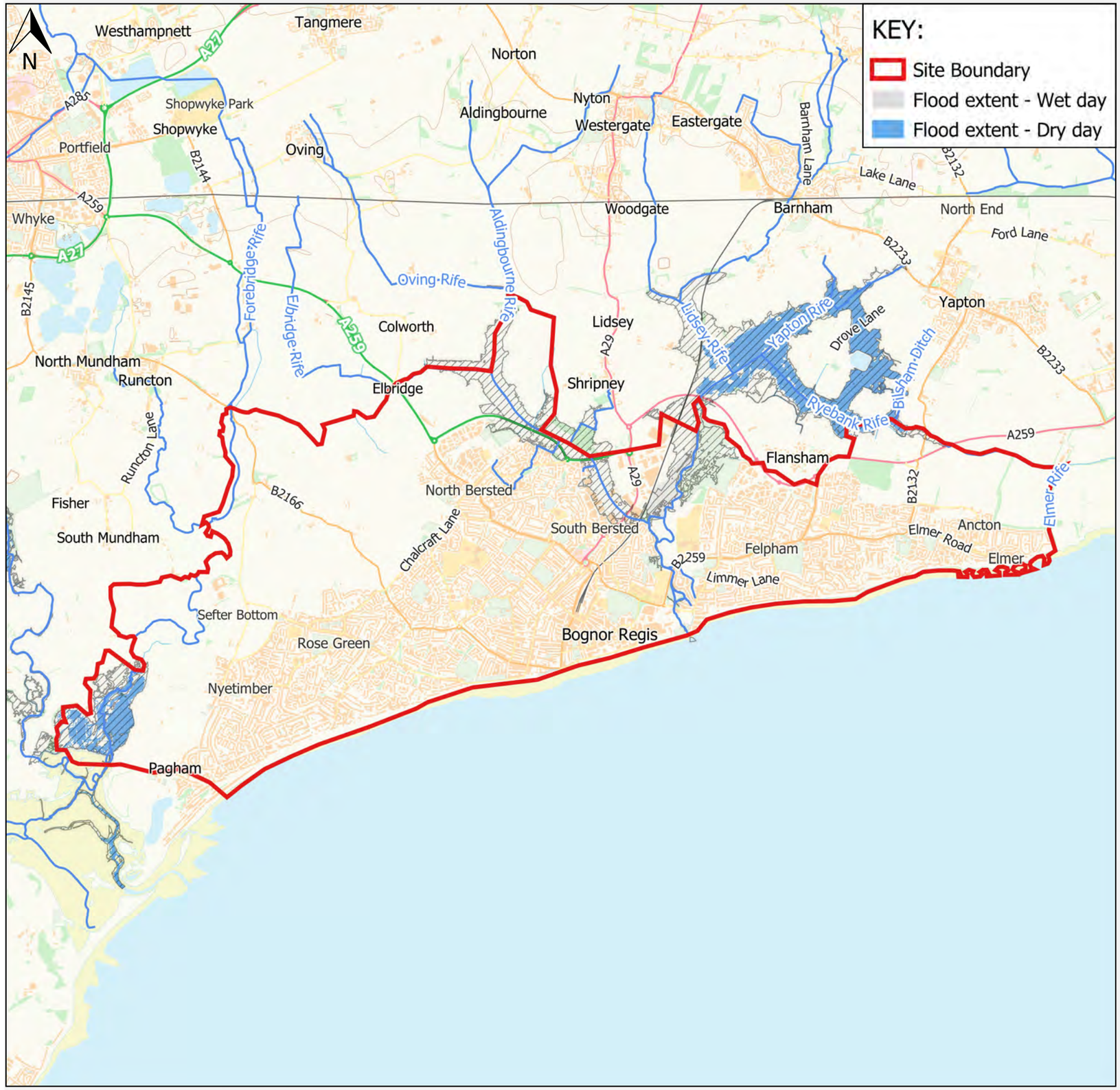
Risk of Flooding from Reservoirs

The Risk of Flooding from Reservoirs (wet day) layer shows the individual flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a "wet day" when local rivers had already overflowed their banks.

It represents a prediction of a credible worst-case scenario, however it's unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding.

The Risk of Flooding from Reservoirs (dry day) shows flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels.

These national datasets are "indicative" not "definitive". Definitive information can only be provided by individual local authorities and you should refer directly to their information for all purposes that require the most up to date and complete dataset.



This data is indicative only and reference should always be made to the legal documentation. It should be noted that amendments to the datasets are made frequently and that the information may change.

Previous Flooding

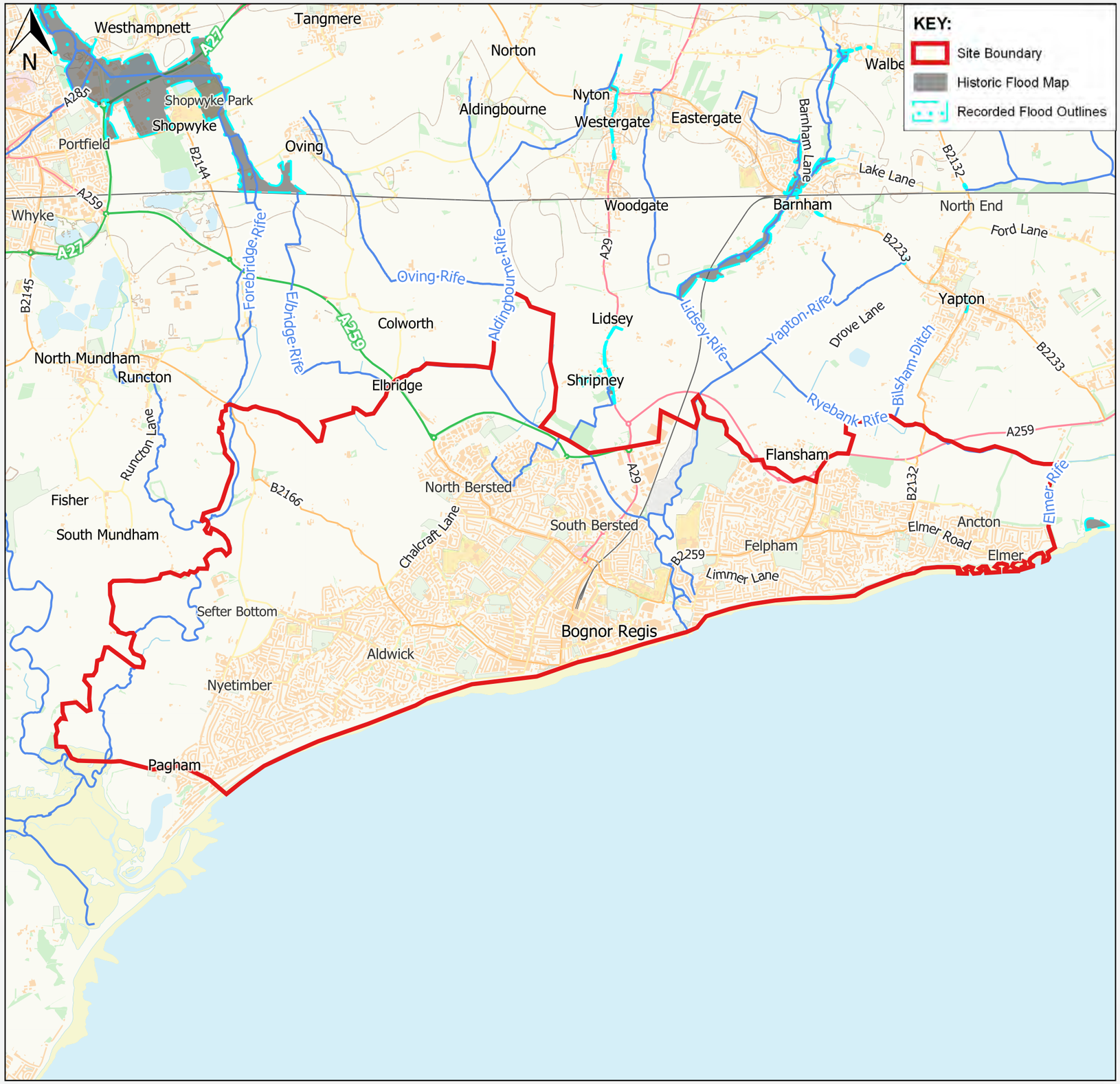
RECORDED FLOOD OUTLINES

Recorded Flood Outlines shows all records of historic flooding from rivers, the sea, groundwater and surface water. The absence of coverage by Recorded Flood Outlines for an area does not mean that the area has never flooded, only that there are currently no records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. The Recorded Flood Outlines take into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. Any flood extents shown do not necessarily indicate that properties were flooded internally.

HISTORIC FLOOD MAP

The Historic Flooding shows the maximum extent of individual Recorded Flood Outlines from river, the sea and groundwater springs that meet a set criteria. It shows areas of land that has previously been subject to flooding. This excludes flooding from surface water, except in areas where it is impossible to determine whether the source is fluvial or surface water, but the dominant source is fluvial. If an area is not covered by the Historic Flood Map it does not mean that the area has never flooded, only that the EA do not currently have records of flooding in this area that meet the criteria for inclusion. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. Outlines that don't meet these criteria are stored in the Recorded Flood Outlines dataset. The Historic Flood Map takes into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It will include flood extents that may have been affected by overtopping, breaches or blockages. Flooding is shown to the land and does not necessarily indicate that properties were flooded internally.

If an area is not covered by these layers, it does not mean that the area has never flooded, only that there are not currently records of flooding in the area.



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Flood Alert and Warning Areas

FLOOD ALERT AREAS

Flood Alert Areas are areas where it is possible for flooding to occur from rivers, sea and in some location's groundwater. A single Flood Alert Area may cover the floodplain within the Flood Warning Service Limit of multiple catchments of similar characteristics containing a number of Flood Warning Areas. A Flood Alert Area may also match that of a corresponding Flood Warning Area and warn for the possibility of flooding in that area. In some coastal locations a Flood Alert may be issued for spray or overtopping and be defined by a stretch of coastline. Practical and administrative factors may also influence the exact extent of a Flood Alert Area. A Flood Alert is issued to warn people of the possibility of flooding and encourage them to be alert stay vigilant and make early / low impact preparations for flooding. Flood Alerts are issued earlier than Flood Warnings to provide advance notice of the possibility of flooding and may be issued when there is less confidence that flooding will occur in a Food Warning Area.

FLOOD WARNING AREAS

Flood Warning Areas are areas where flooding is expected to occur and where a Flood Warning Service is provided. Areas generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater. Specifically, Flood Warning Areas define locations within the Flood Warning Service Limit that represent a discrete community at risk of flooding. The purpose of Flood Warnings is to alert people that flooding is expected, and they should take action to protect themselves and their property. Flood Warnings are issued when flooding is expected to occur, Severe Flood Warnings are issued to similar areas when there is a danger to life or widespread disruption is expected.

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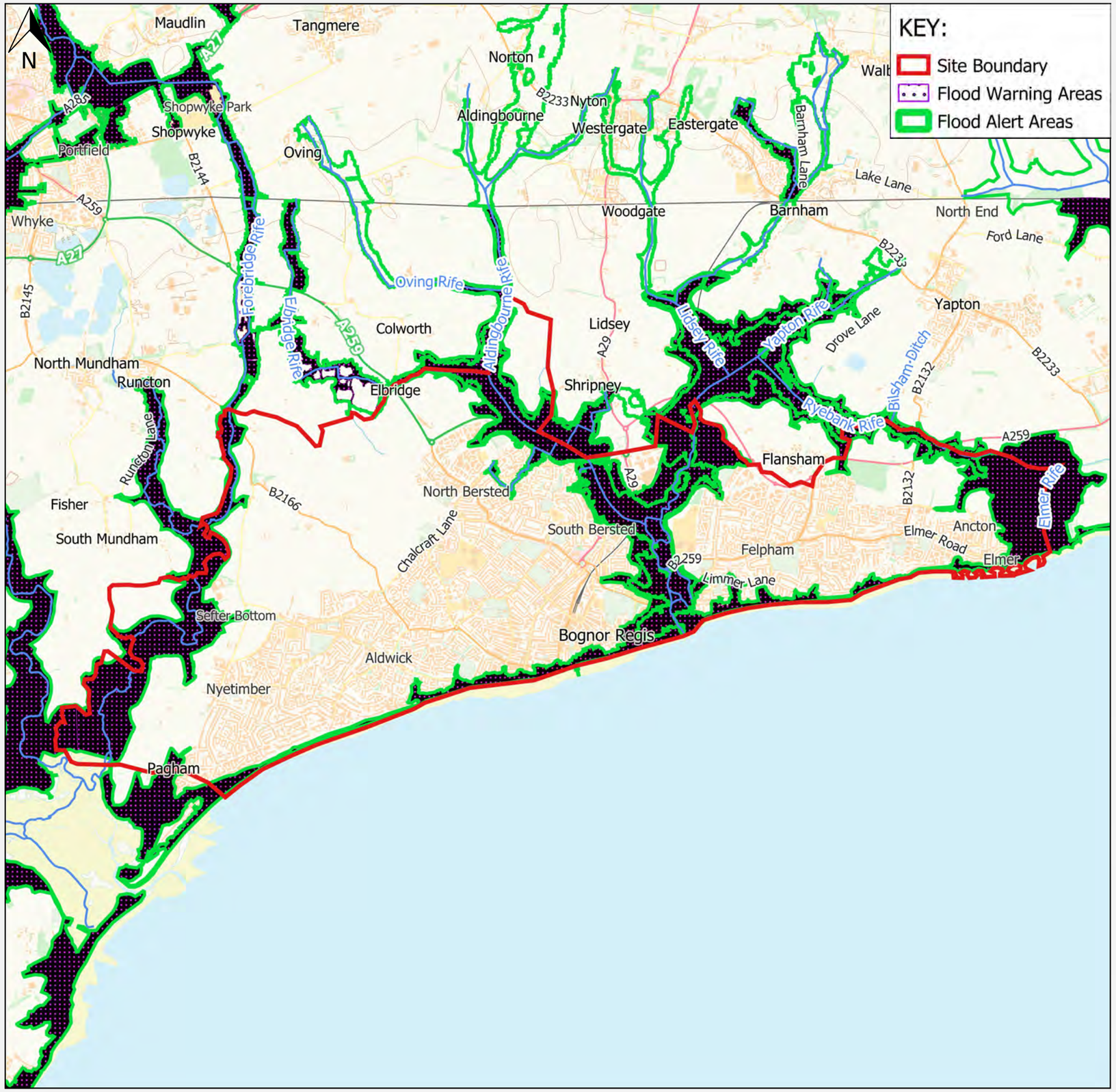

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Appendix F.2

SHRIPNEY

Site Location

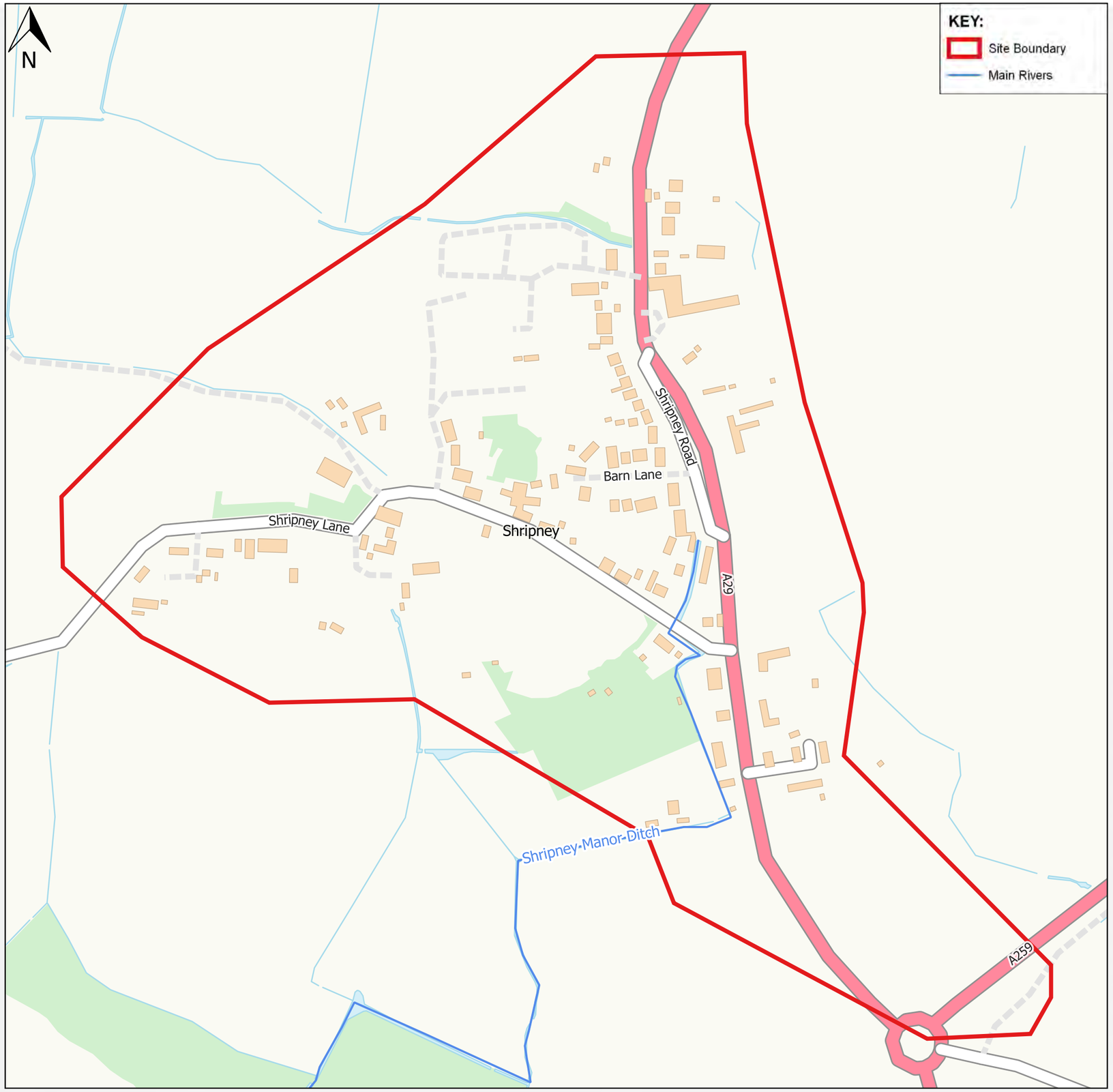
2

CLOSEST MAIN RIVER

Shripney Manor Ditch

DISTANCE BETWEEN SITE AND CLOSEST MAIN RIVER

0m



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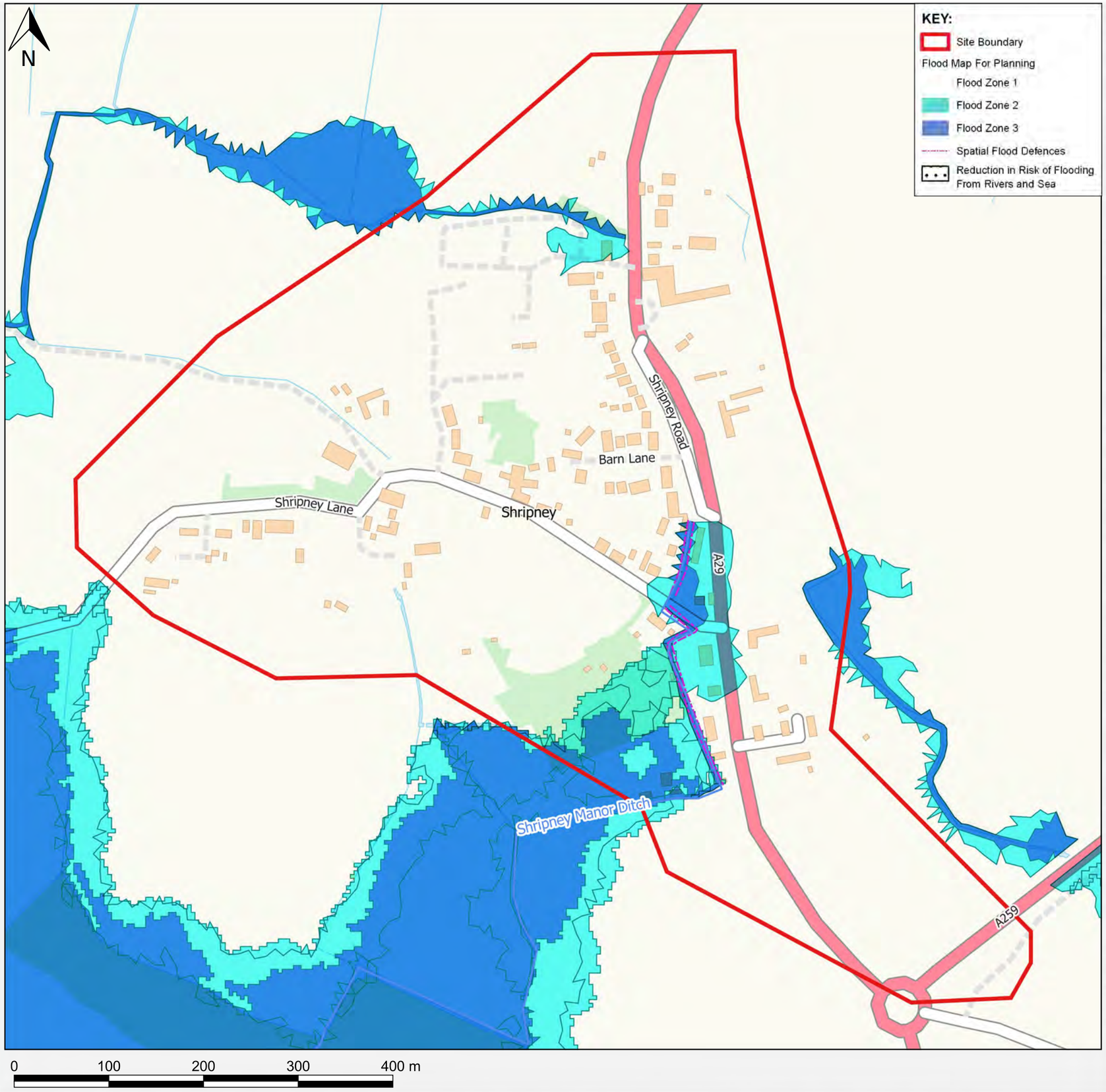

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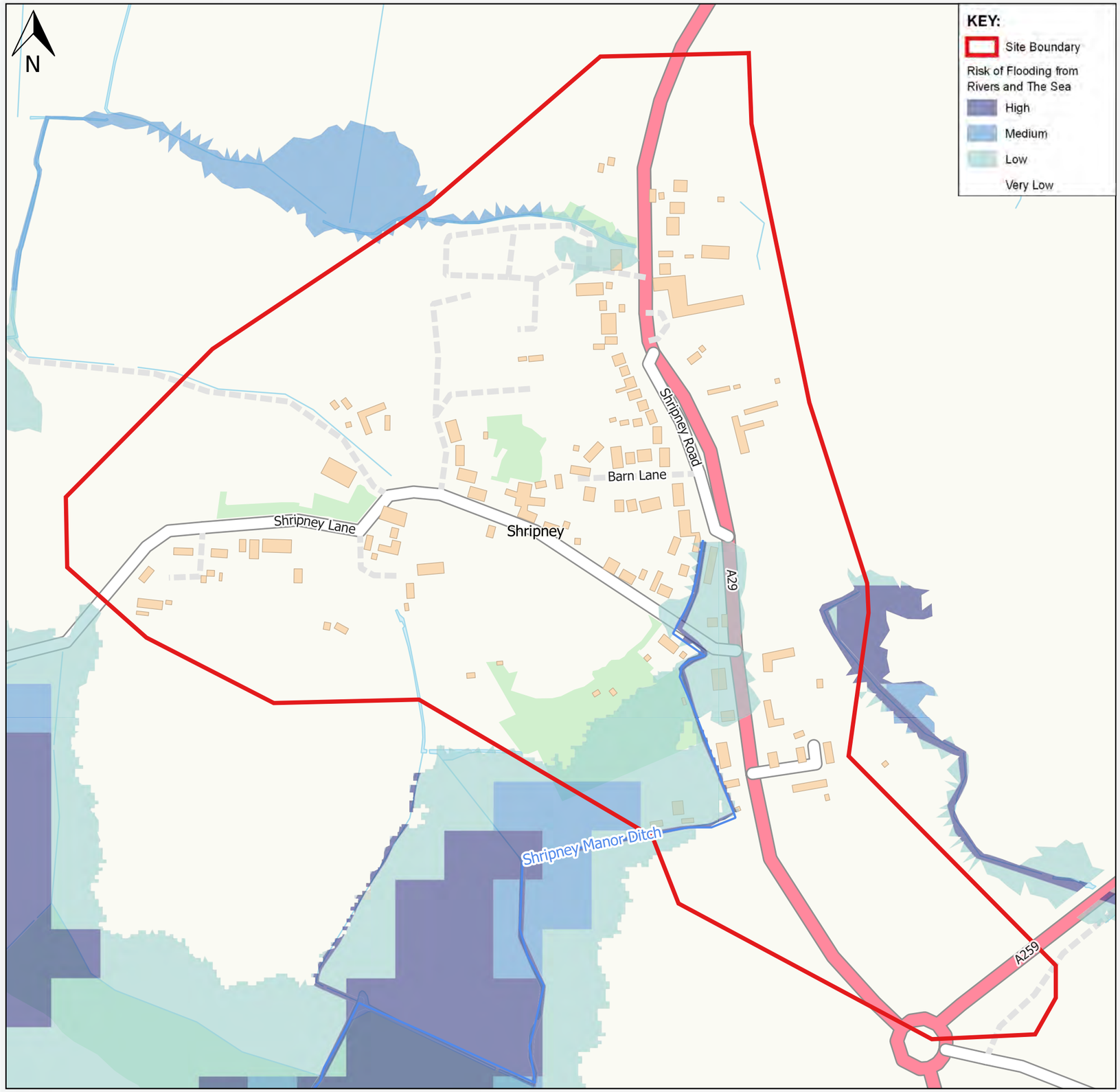

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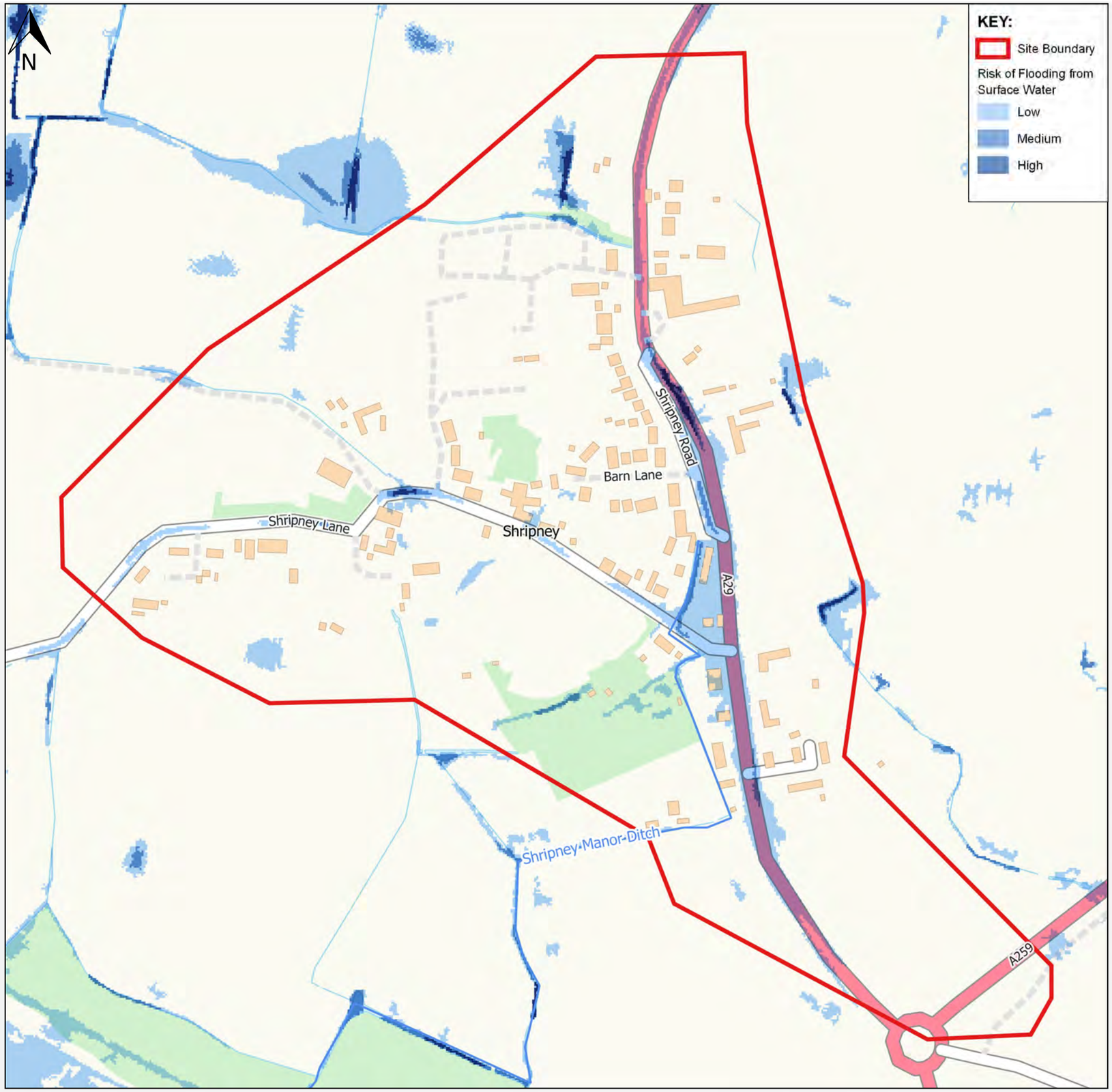

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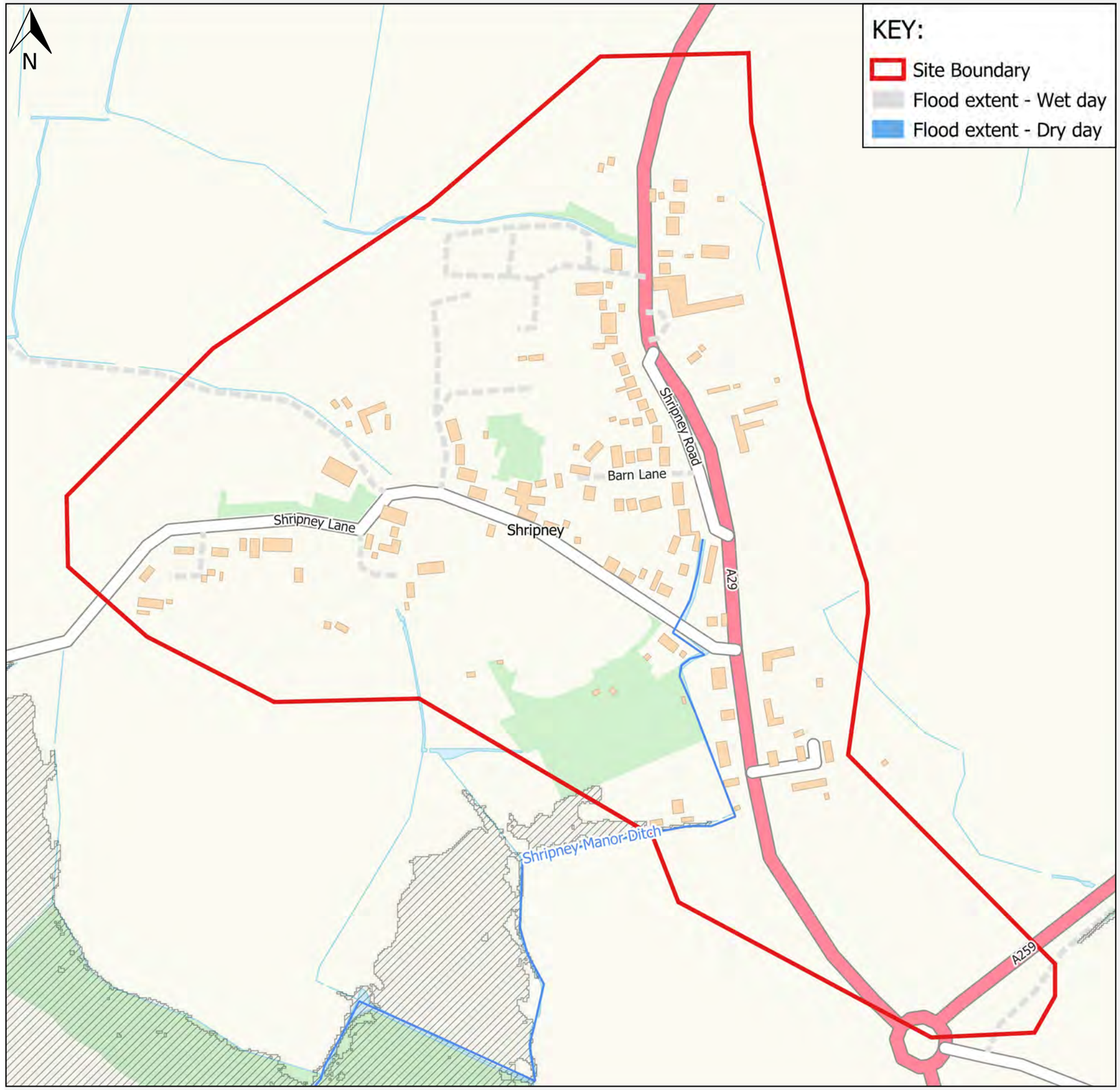

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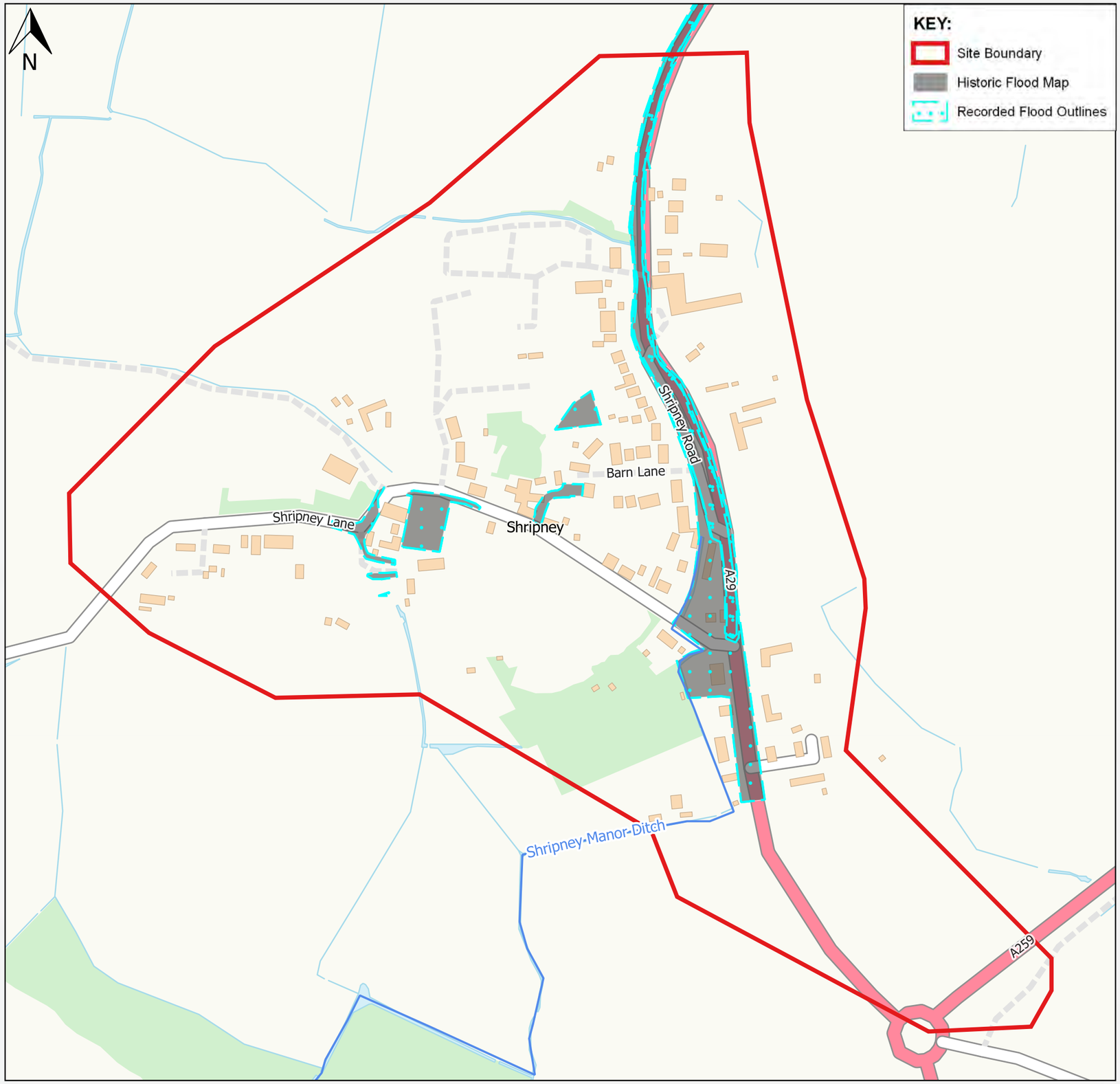

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Flood Alert and Warning Areas

FLOOD ALERT AREAS

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FLOOD WARNING AREAS

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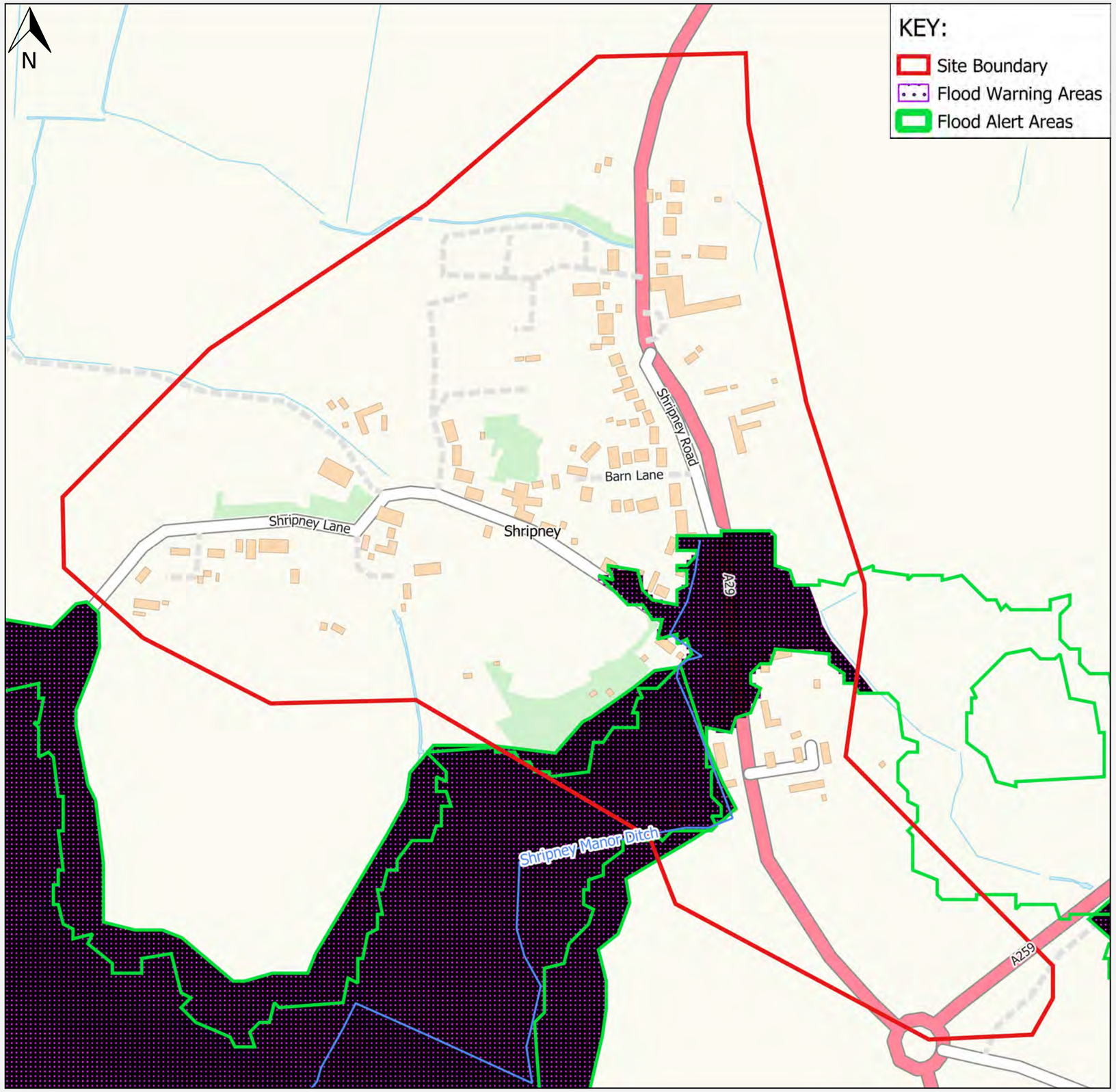

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Appendix F.3

YAPTON

Site Location

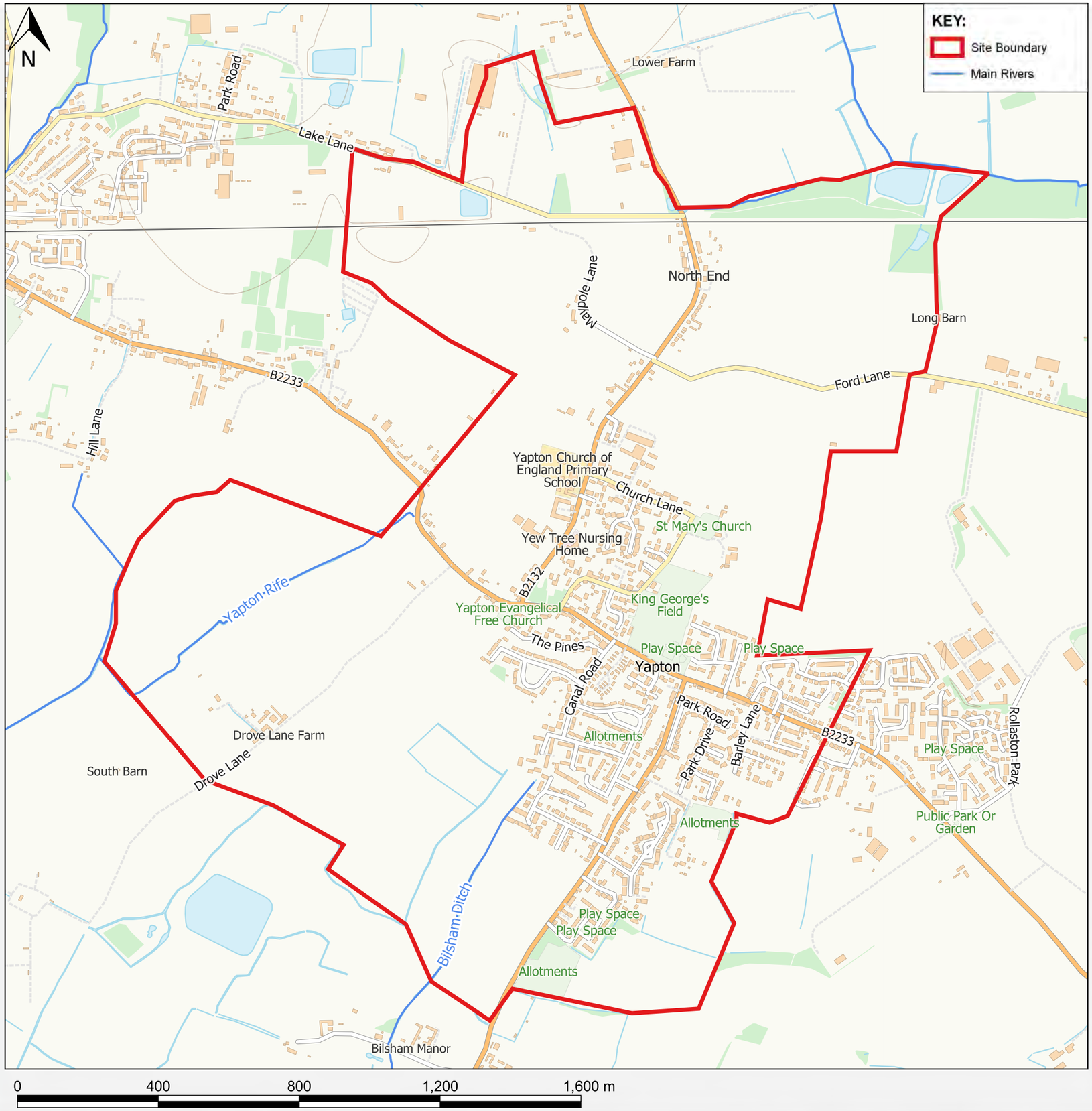
2

CLOSEST MAIN RIVER

Bilsham Ditch

DISTANCE BETWEEN SITE AND CLOSEST MAIN RIVER

0m

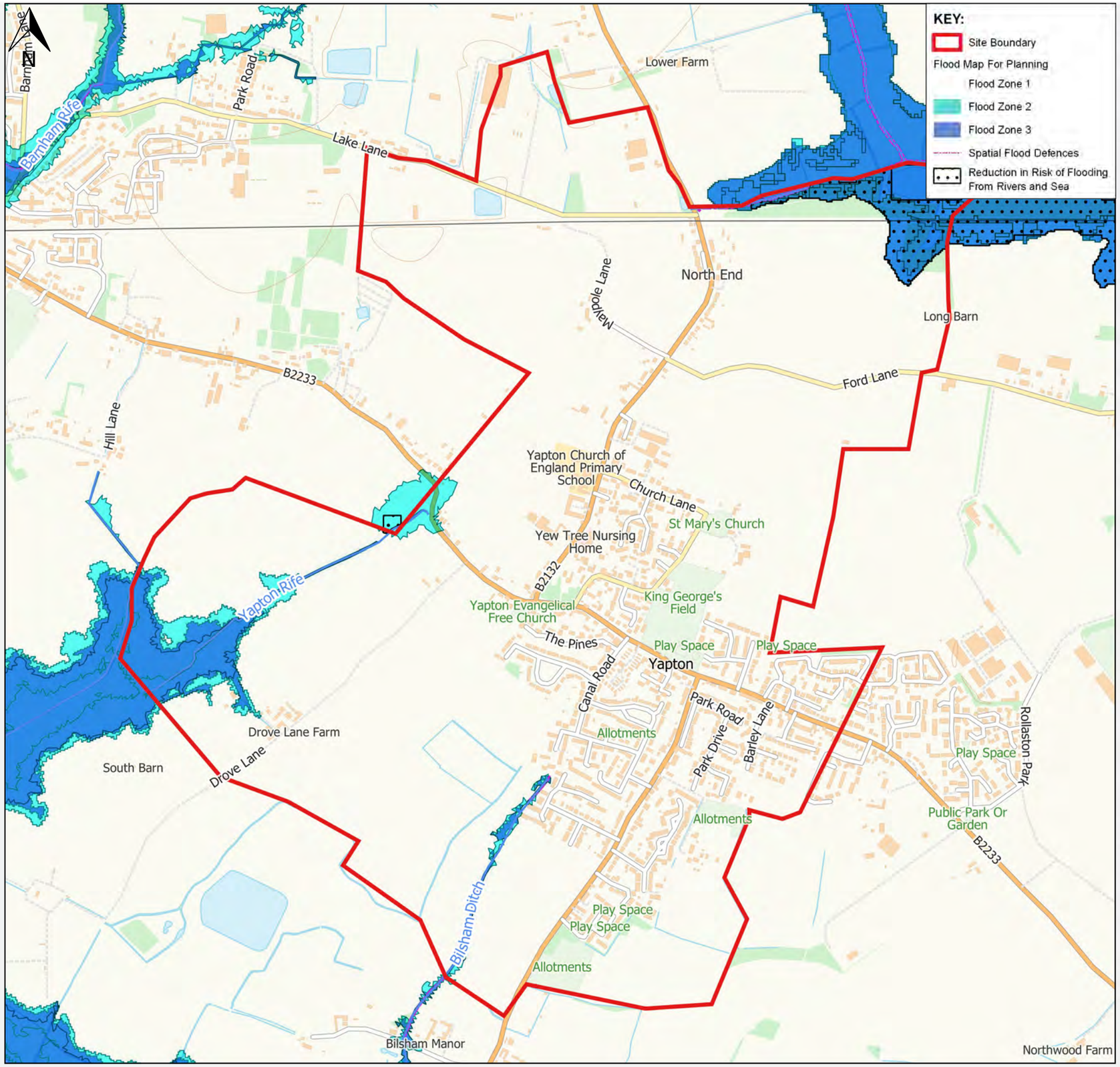


Flood Map for Planning

Flood zone maps are modelled using local and national river and sea data. This information provides an indication of the likelihood of flooding and is intended for planning use only.

- **Flood Zone 1 -** Land having a less than 1 in 1,000 annual probability (0.1% AEP) of river or sea flooding - all land outside Zones 2 and 3).
- **Flood Zone 2 -** Land having between a 1 in 100 and 1 in 1,000 annual probability (0.1% - 1.0% AEP) of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability (0.1% - 0.5% AEP) of sea flooding.
- **Flood Zone 3 -** Land having a 1 in 100 or greater annual probability (>1.0% AEP) of river flooding; or Land having a 1 in 200 or greater annual probability (>0.5% AEP) of sea flooding.

Reduction in Risk of Flooding from Rivers and Sea due to Defences -Reduction in Risk of Flooding from Rivers and Sea due to Defences is a spatial dataset that indicates where areas have reduced flood risk from rivers and sea due to the presence of flood defences. The dataset has been created to help initiate conversations about the impact our flood defences have on the risk of flooding from the rivers and sea,and as a prompt to find out more about the flood defences in a particular area of interest. It does not replace any local, more detailed information.



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Risk of Flooding from Rivers and Sea

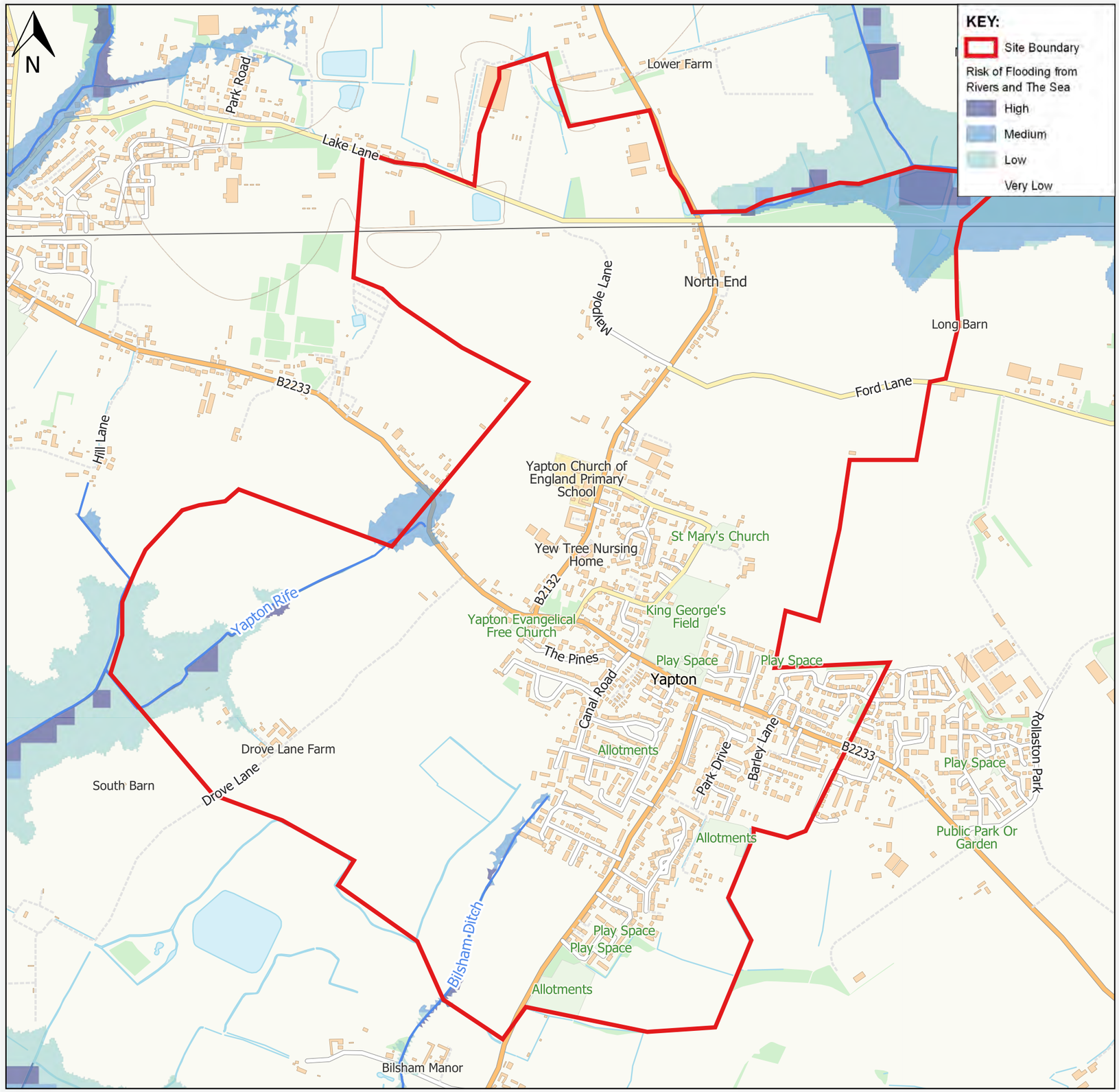
This map takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

High Risk - Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from rivers or the sea.

Medium Risk - Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from rivers or the sea.

Low Risk - Land having between a 1 in 100 and a 1 in 1000 annual probability (0.1% - 1.0%) of flooding from rivers or the sea.

Very Low Risk - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from rivers or the sea.



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Risk of Flooding from Surface Water

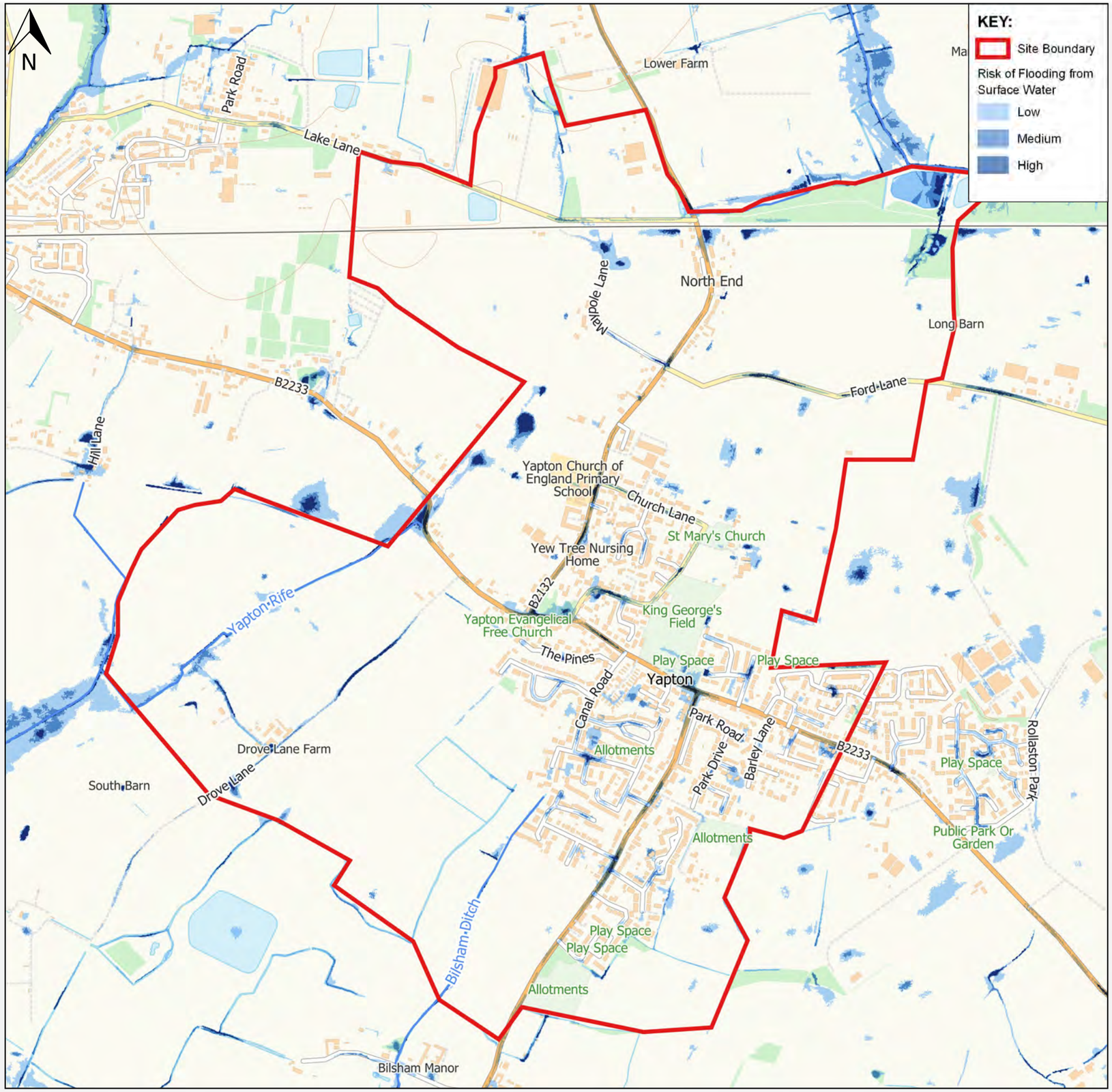
Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

High Risk - Land having a 1 in 30 or greater annual probability (>3.3% AEP) of flooding from surface water.

Medium Risk - Land having between a 1 in 30 and a 1 in 100 annual probability (1.0% - 3.3%) of flooding from surface water.

Low Risk - Land having between a 1 in 100 and a 1 in 1000 annual probability (0.1% - 1.0%) of flooding from surface water.

Very Low Risk - Land having a less than 1 in 1,000 annual probability (0.1% AEP) of flooding from surface water.



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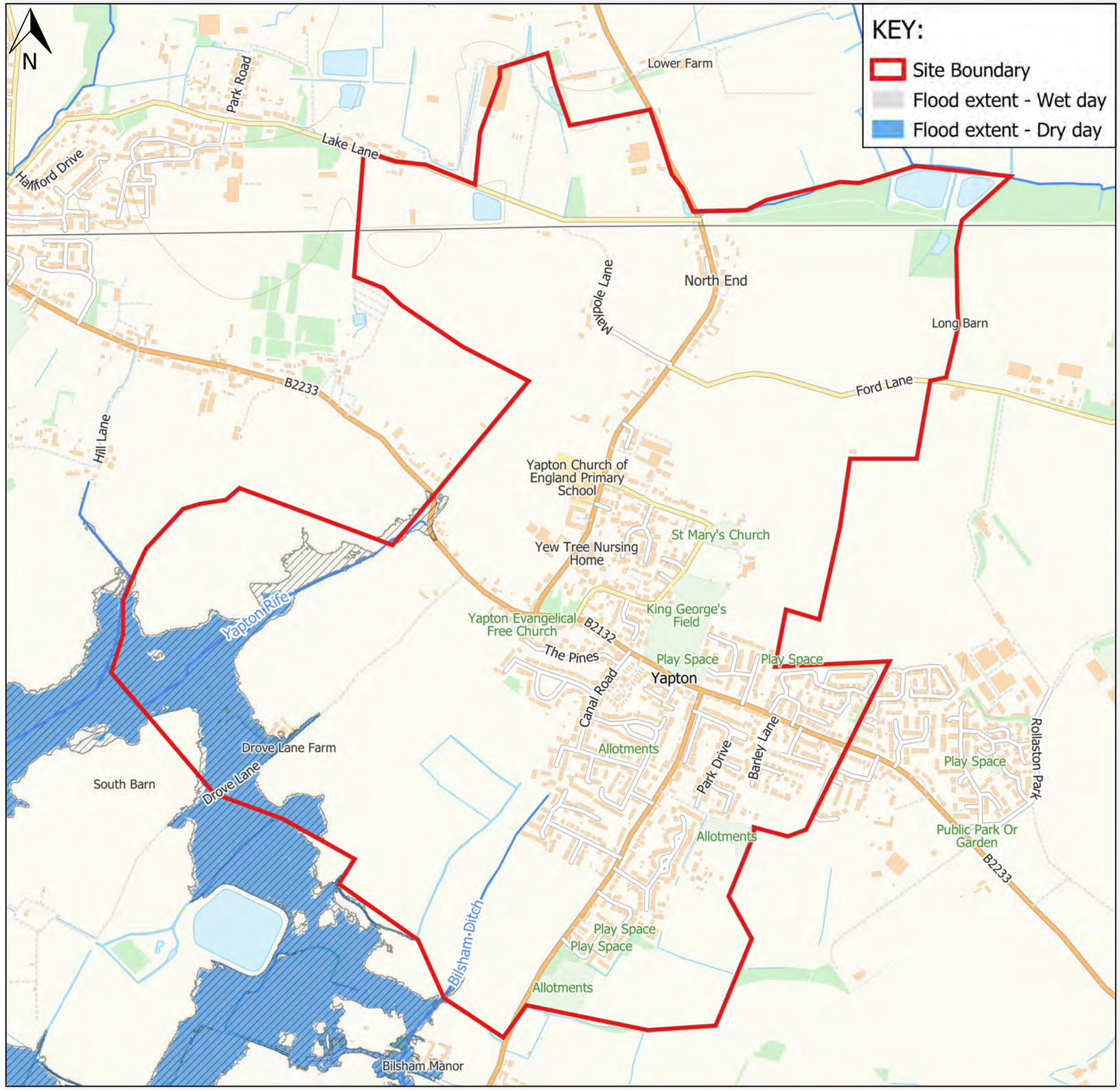
Risk of Flooding from Reservoirs

The Risk of Flooding from Reservoirs (wet day) layer shows the individual flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a "wet day" when local rivers had already overflowed their banks.

It represents a prediction of a credible worst-case scenario, however it's unlikely that any actual flood would be this large. The data gives no indication of likelihood or probability of reservoir flooding.

The Risk of Flooding from Reservoirs (dry day) shows flood extents for all large raised reservoirs in the event that they were to fail and release the water held on a "dry day" when local rivers are at normal levels.

These national datasets are "indicative" not "definitive". Definitive information can only be provided by individual local authorities and you should refer directly to their information for all purposes that require the most up to date and complete dataset.



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Previous Flooding

RECORDED FLOOD OUTLINES
Recorded Flood Outlines shows all records of historic flooding from rivers, the sea, groundwater and surface water. The absence of coverage by Recorded Flood Outlines for an area does not mean that the area has never flooded, only that there are currently no records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood or not flood under different circumstances. The Recorded Flood Outlines take into account the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It includes flood extents that may have been affected by overtopping, breaches or blockages. Any flood extents shown do not necessarily indicate that properties were flooded internally.

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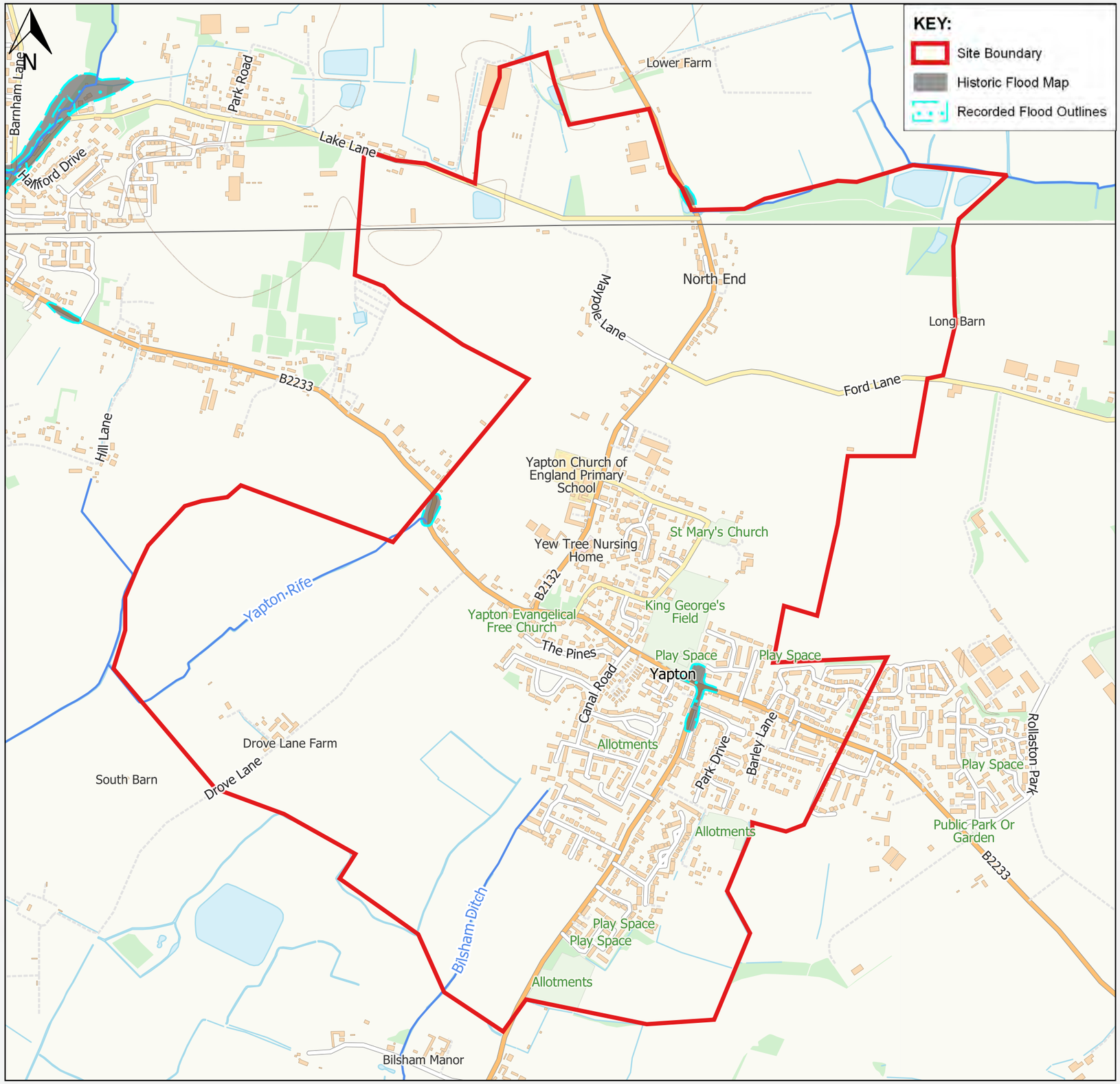

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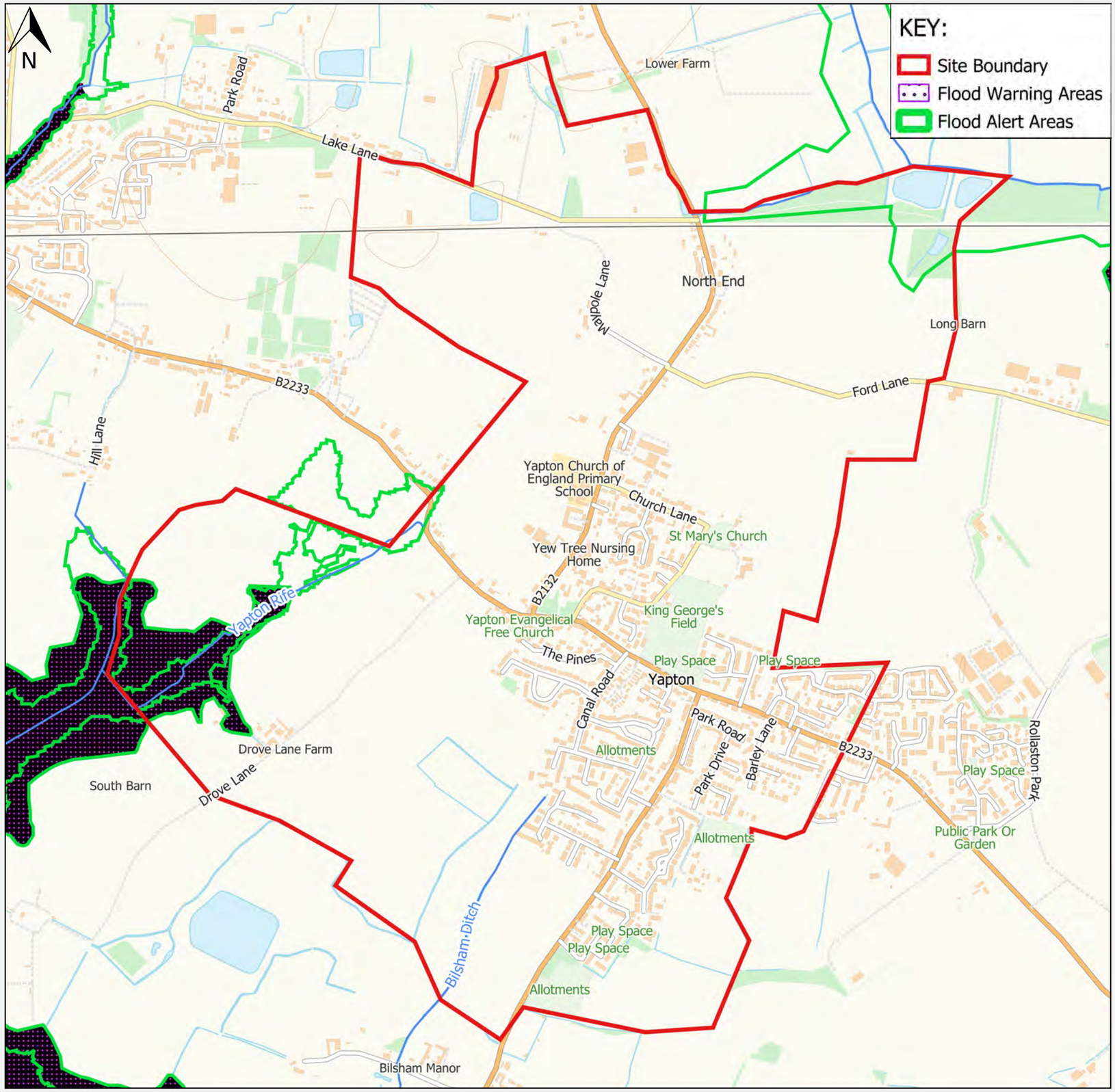

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Appendix G

RECOMMENDATIONS SUMMARY

Local Residents/Business Owners

Recommendations / Location	Bognor Regis	Shripney	Yapton
Implementation of property level resistance, e.g. flood doors, non-return valves, raised electrical sockets, use of sump pumps, tanking etc.	✓	✓	✓
Highway drainage issues should be reported to West Sussex County Council and any sewer issues to Southern Water as soon as they become apparent.	✓	✓	✓

Environment Agency

Recommendations / Location	Bognor Regis	Shripney	Yapton
Educate riparian owners on their responsibilities and encourage regular maintenance of local ditches.	✓	✓	
Potential for implementation of flood alleviation scheme.	✓	✓	
Consider the strategic installation of pumps for utilisation during flood events and high flows.	✓		
Investigate sea outfalls and carry out any necessary remedial works.	✓		
Improve ditch capacity by clearing channels of debris and vegetation.	✓	✓	
Review and update ditch maintenance schedules.	✓	✓	

Riparian Owners

Recommendations / Location	Bognor Regis	Shripney	Yapton
Ensure ditches and ordinary watercourses are well maintained.	✓	✓	✓

Landowners

Recommendations / Location	Bognor Regis	Shripney	Yapton
Support channel diversion when it would benefit flood risk and water storage capacity.		✓	
Consider the implementation of ditches – particularly on the borders of highways.		✓	✓

Southern Water

Recommendations / Location	Bognor Regis	Shripney	Yapton
CCTV survey/investigation of the capacity and condition of the sewer network.	✓		
Remedial works including the relining of the sewer network using new technologies, to prevent groundwater infiltration, and the sealing of manholes to prevent surcharging.	✓		

SSE

Recommendations / Location	Bognor Regis	Shripney	Yapton
Consider the implementation of flood resilience measures to improve the resilience of substations to flooding.	✓		

West Sussex County Council (WSCC)

Recommendations / Location	Bognor Regis	Shripney	Yapton
Assign flood wardens within the investigated location.	✓	✓	✓
Review and update highway drainage maintenance schedule.	✓	✓	✓
Update of grip maintenance schedule.	✓	✓	
Finalise and implement improvement works to increase resilience during future flood events.	✓		
Installation of flap valves on highway drainage outfalls.		✓	
CCTV survey/investigation of highway drainage and remedial works.			✓

Arun District Council, Environment Agency, Southern Water & West Sussex County Council

Recommendations / Location	Bognor Regis	Shripney	Yapton
Improved communication across all relevant risk management authorities.	✓	✓	✓
Prepare maintenance schedules to ensure regular clearance of sea outfalls.	✓		
Work with private estates to conduct drainage improvements and implement maintenance schedules.	✓		

wsp

wsp.com