Newport Section 19 Flood Investigation

Final Report

August 2024

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Contract

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This report describes work commissioned by Isle of Wight Council, by an instruction dated 7 February 2024. Isle of Wight Council's representative for the contract was James Brewer. Bethan Griffiths and Timea Faber of JBA Consulting carried out this work.

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Acknowledgement

We would like to thank the Isle of Wight Council, Island Roads, Southern Water and the Environment Agency for their input and support. We would also like to thank the wider community for their contributions to the investigation.

Executive Summary

Background of the Section 19

Following flooding in Newport on 25 October 2023, the Isle of Wight Council (IWC) as the Lead Local Flood Authority (LLFA) is undertaking a formal flood investigation under Section 19 of the Flood and Water Management Act 2010. It is statutory requirement for LLFAs to investigate flooding to the extent that it considers it necessary or appropriate.

Newport is the County town of the Isle of Wight and is located at the centre of the island. Newport is situated at the head of the Medina Estuary and the confluence of multiple watercourses draining into estuary. The town is surrounded by woodland and agricultural land.

The flooding that occurred in Newport caused internal flooding to at least 56 properties and fulfils the criteria for a Section 19 investigation to be required. IWC has appointed JBA Consulting to undertake this investigation on its behalf.

As part of the Section 19 investigation, analysis of the community survey distributed by IWC was undertaken to gain further understanding of impacts on local stakeholders in Newport, including residents, community representatives and other Risk Management Authorities.

Overview of approach

In this study, the flood catchment characteristics and sources of flood risk in the Newport site are identified, supported by data collected on the site visit in February 2024, to provide a basis of understanding. The site visit also provided the basis for a condition assessment of assets across the area. Desk-based analysis of the response to the flooding on 25 October is outlined. Source-pathway-receptor analysis is undertaken for three key flood hotspots in Newport, with contextual flood summaries for five further key areas in Newport. To conclude the study, a series of options were graded using a Multi-Criteria Analysis, which generated a short-list of recommendations to mitigate future flood risk in Newport.

Key findings

Hydrological analysis of the rainfall event on 25 October 2023 estimated the event to have been between a 1 in 28 and 1 in 38 year event, which can be expressed as a storm event with approximately a 2.8% to 3.8% chance of occurring in any given year.

Investigation of the event on 25 October 2023 found the cause of flooding across Newport to be a combined impact of fluvial, surface water and sewer sources, partnered with steep topography and heavy urbanisation.

A multi-criteria analysis identified the following options as the highest rated (score >12), and the most suitable options to prioritise for delivery:

Recommendation	Organisation (s) responsible	Multi-criteria analysis score	Timescale
Improve mapping of Flood Zones and Watercourses	Environment Agency	13	<1 year
Develop a Community Flood Plan	IWC	15	<1 year
Provide community training and exercising of the new Community Flood Plan	Isle of Wight Council (Highways)	13	<1 year
Investigate condition and capacity of culvert under Arthur Moody Close and watercourse at Ash Lane	IWC / Southern Water/ developer	12	< 1 year
Forest Hills - investigate opportunities for Nature Based Solutions and SuDS retrofit if the land remains undeveloped	IWC/ landowners	16	1 – 3 years
Forest Hills - design surface water drainage in accordance with SuDS SPD and manage off site flood risk appropriately, if the site is developed	IWC/ developer	16	< 1 year
Sustainable drainage systems	IWC	14	1 – 3 years
Enhanced monitoring of assets and removal of obstructions	Environment Agency	13	1 – 3 years

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Abbreviations

AEP	Annual Exceedance Probability
AMAX	Annual Maximum
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
CC	Carbon Calculator
CCTV	Closed Circuit Television
DEFRA	Department of the Environment, Food and Rural Affairs (formerly MAFF)
DTM	Digital Terrain Model
DWMP	Drainage and Wastewater Management Plan
EA	Environment Agency
FEH	Flood Estimation Handbook
FFL	Finished Floor Level
FMfP	Flood Map For Planning
FRA	Flood Risk Assessment
FSR	Flood Studies Report
LiDAR	Light Detection And Ranging
LLFA	Lead Local Flood Authority
LRF	Local Resilience Forum
MAFF	Ministry of Agriculture Food and Fisheries (now part of Defra)
NGR	National Grid Reference
NRFA	National River Flow Archive
PFI	Private Finance Initiative
PFR	Property Flood Resilience
PPS25	Planning Policy Statement 25
SFRA	Strategic Flood Risk Assessment
WFD	Water Framework Directive
WWTW	Waste Water Treatment Works

1 Introduction

1.1 Background to investigation

Following flooding in Newport on 25th October 2023, Isle of Wight Council (IWC) as the Lead Local Flood Authority (LLFA) is undertaking a formal flood investigation under Section 19 of the Flood and Water Management Act 2010.

It is a statutory requirement for LLFAs to investigate flooding to the extent that it considers it necessary or appropriate. Isle of Wight Council has outlined its criteria for undertaking a Section 19 investigation in its Flood Investigation Protocol[1] 2015:

- *Where there is ambiguity surrounding the source or responsibility of a flood incident;*
- *Where internal flooding of one property has been experienced on more than one occasion; OR*
- *Where internal flooding of a group of properties has been experienced during a single flood incident; OR*
- *Where flooding resulted in disruption of one or more items of critical infrastructure; OR*
- *Where a single flood incident resulted in flooding that affects vulnerable individuals; OR*
- *Where there is risk to life as a result of flooding.*

The flooding that occurred in October caused internal flooding to at least 56 properties in Newport and fulfils these criteria. IWC has appointed JBA Consulting to undertake this investigation on its behalf.

1.2 Investigation extent

Newport is the Isle of Wight's County town, situated in the central region of the island. The town is surrounded by woodland and agricultural land. The River Medina is a tidal estuary and main river that flows through the east of the town centre, flowing northwards before discharging into the Solent at Cowes. Other main rivers flowing through Newport include the Lukely Brook, Gunville Stream and Pan Stream, which all discharge into the Medina River.

1 Flood Investigation Protocol - https://iwc.iow.gov.uk/azservices/documents/2821-Flood-Investigation-Protocol-March-2015.pdf

1.3 Data collection

A wide range of data has been collected and assessed to inform the Section 19 investigation. This has been used to generate an understanding of the causes of flooding in Newport and to establish the context of the area. This includes the following:

- Open source data from GOV.UK, such as LiDAR, hydrogeological and flood warning data.
- Photographs from the site visit, showing flood sources, pathways and receptors
- Rainfall data
- Resident's questionnaires
- Information from authorities on drainage infrastructure, such as highways and water companies
- Reports of flooding from emergency services, Southern Water and Island Roads
- Other data such as photographs, newspaper articles and notes from the event and site visit

1.4 Stakeholder engagement

During a site visit on 26 and 27 February 2024, we engaged with stakeholders in each location, including residents, community representatives and Council members.

The objectives of engagement were to:

- Gather facts, opinions and data to aid the understanding of the investigation.
- Enable the involvement and buy-in of the community in the investigation.
- Provide more technical debrief with Council members.

A list of key stakeholders and how we engaged with them is given in Table 1-1. The engagement terminology is taken from Environment Agency's 'Working with Others' (2013) methodology:

- Inform - provide information
- Consult - receive, listen, understand and feedback
- Involve - decide together
- Collaborate - act together
- Empower - support independent action

Table 1-1: Key stakeholders

Role	Organisation	How to engage	Type of engagement
Residents	N/A	Consult	Site visit, online questionnaire, correspondence
Parish/Town Council	Newport & Carisbrooke Community Council	Consult	Invitation to contribute, correspondence, public engagement meetings
Water and Sewerage Company (WASC)	Southern Water	Involve	Invitation to contribute, correspondence, data provision
Highways Authority	Isle of Wight Council / Island Roads	Involve	Invitation to contribute, correspondence, data provision
LLFA	Isle of Wight Council	Involve	Invitation to contribute, correspondence, online survey distribution, site visit, data provision
Environment Agency	Environment Agency	Involve	Correspondence, data provision
Council Members	Isle of Wight Council	Consult	Invitation to contribute, site visit

2 Catchment characteristics

2.1 Topography

The Newport study area is relatively low lying, with elevations ranging between 5m and 95m AOD (Figure **2-1**) The topography of the area has a valley-like structure, with higher elevations to the east and west associated with chalk downland and the lowest elevations aligned with the path of the River Medina and its tributaries. There is a general downwards slope towards the tidal estuary, where the river Medina takes the formation of a ria.

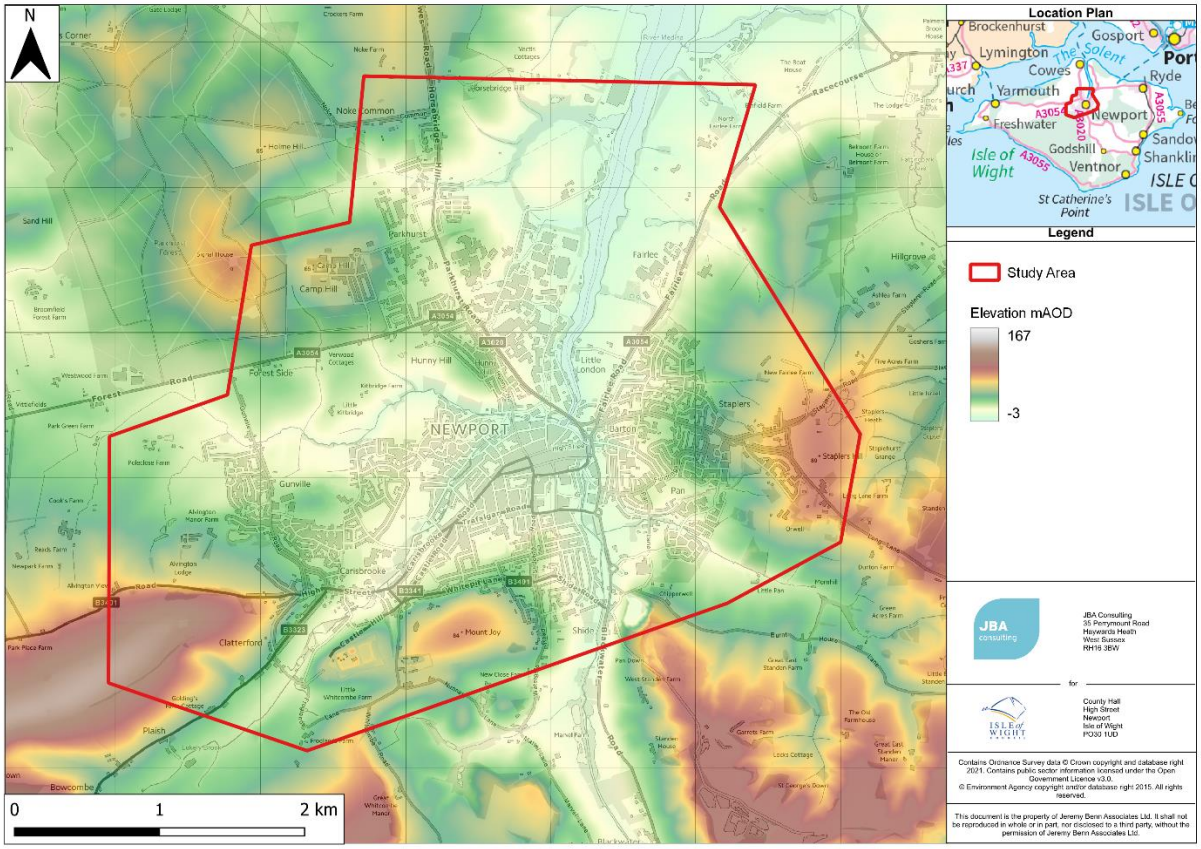

Figure 2-1 Topography of Newport (shown using 1m LiDAR DTM)

2.2 Geology and soils

British Geological Survey (BGS) 50K mapping[2] shows the Newport study area to be underlain with chalk bedrock to the south, which is highly permeable, and mudstone and siltstone bedrock proximal to the main rivers, which is of low permeability and variable porosity. The superficial geology following the course of the main rivers are unconsolidated deposits consisting of sand, clay and gravel. Moving south from central Newport, superficial deposits become more clay dominant and less

2 BGS GeoIndex - https://mapapps2.bgs.ac.uk/geoindex/home.html

permeable. The soils in the area, defined by the LandIS Soilscapes Viewer[3], are generally slowly permeable, slightly acidic and loamy and clayey in characteristic.

There is a diverse range of superficial deposits and soils, and therefore it is likely that permeability would be variable across the Newport study area. Areas with chalk bedrock and lime rich soils will be permeable, whilst other areas with clay soils and mudstone bedrocks will be impermeable and lower in porosity.

2.3 Drainage system and river network

2.3.1 River Networks

Rivers in England are designated as ‘main rivers’ or ‘ordinary watercourses. Flood risk from main rivers is managed by the EA. Flood risk from ordinary watercourses is managed by the LLFA (Isle of Wight Council). Maintenance for both main rivers and ordinary watercourses falls to individual riparian landowners. However, the LLFA has a responsibility to ensure that riparian owners are undertaking the necessary responsibilities under the Land Drainage Act 1991. Newport has several main rivers running through it (Figure **2**-**2**). The River Medina is a tidal estuary which flows north through Newport and discharges into the Solent at Cowes. The Gunville Stream discharges into the Lukely Brook at Towngate Pond, which then flows 0.39km eastwards to join the River Medina at Newport Quay. To the east of central Newport, the Pan Stream and Staplers Stream flow into the River Medina.

3 LandIS Soilscapes - https://www.landis.org.uk/soilscapes/

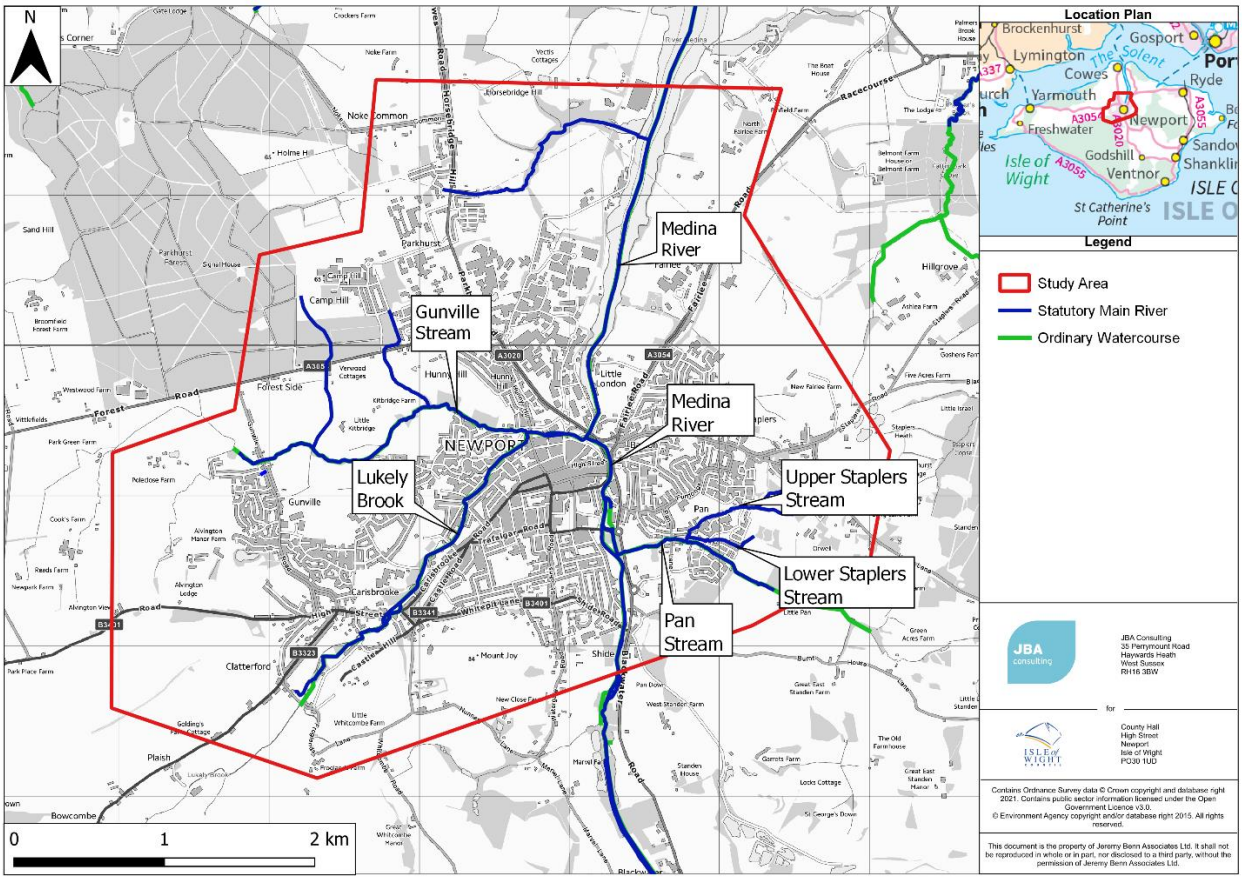

Figure 2-2 Main Rivers and Ordinary Watercourses in Newport

2.3.2 Drainage and Wastewater Management

Wastewater in Newport is managed by Southern Water. Newport falls under Sandown New WWTW (Wastewater Treatment Works) sewer catchment. The sewage network consists of gravity and rising mains (pumped) sewers. Treated sewage is discharged via long outfall to the English Channel. Sewer networks in the centre of Newport are mainly combined (foul and surface water in the same sewers). Further afield from Newport town centre, these become separate foul and surface water sewers.

The highways drainage network across the Isle of Wight is managed by Island Roads, under contract from IWC.

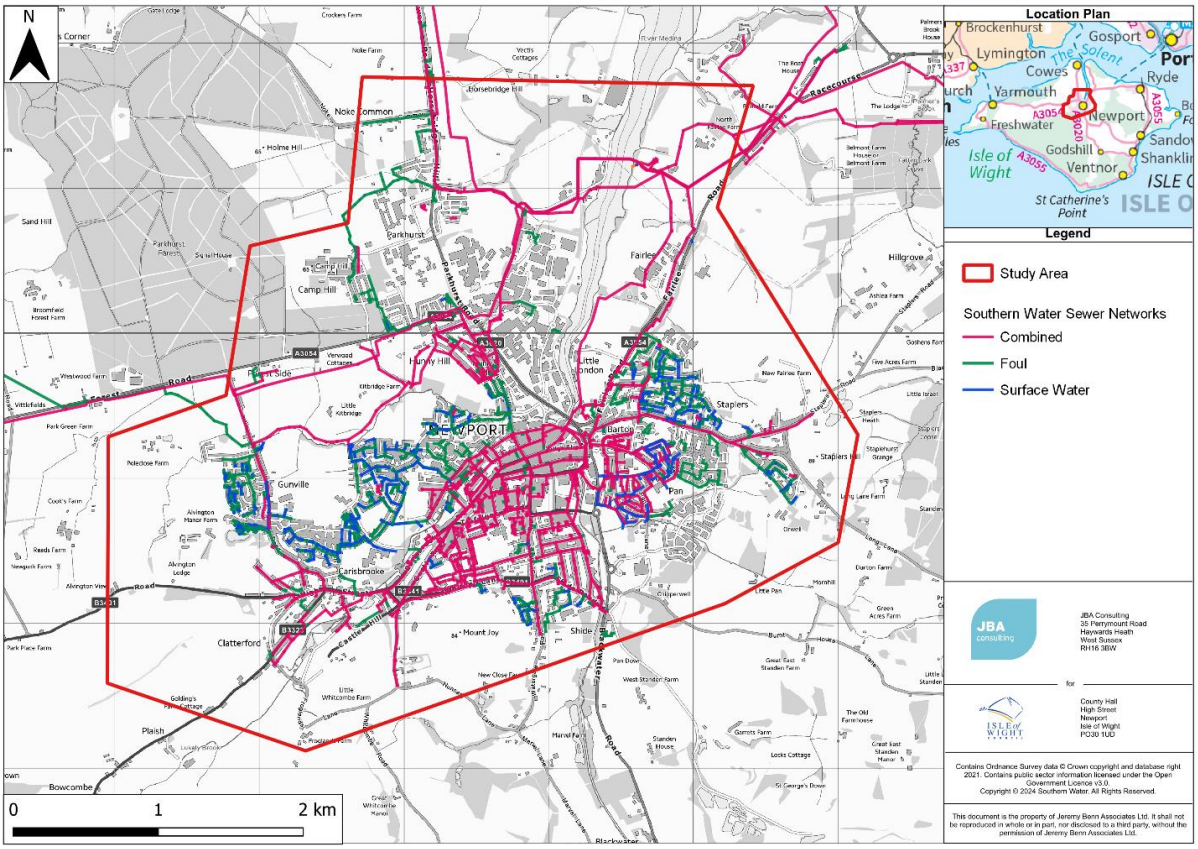

Figure 2-3 Southern Water's sewer networks in Newport

3 Long-Term Flood Risk Information

3.1 Risk of flooding from rivers and the sea

The Environment Agency's Flood Zone data, shown in Figure 3-1, defines areas at risk of flooding from fluvial and tidal sources, also referred to as the Flood Maps for Planning (FMfP). Areas in Flood Zone 2 have a 0.1% to 1% chance of flooding from fluvial sources in any given year and 0.5% to 0.1% chance of flooding from the sea in any given year. Flood Zone 3 has a greater than 1% chance of flooding from fluvial sources in any given year, and greater than 0.5% chance of flooding from tidal sources in any given year.

In the Newport study area, the risk of flooding from rivers and sea is mostly confined to the course of the river Medina and its tributaries, the majority of which is situated in Flood Zone 3. It should be noted that these Flood Zones represent undefended flood risk scenarios and therefore do not factor in existing flood defences.

The tide can have direct impact on fluvial flooding. When high fluvial discharge coincides with high tide, it can inhibit the discharge from a river estuary, also known as 'tidal locking'. The restriction of free flow can cause river levels to rise upstream, resulting in fluvial flooding.

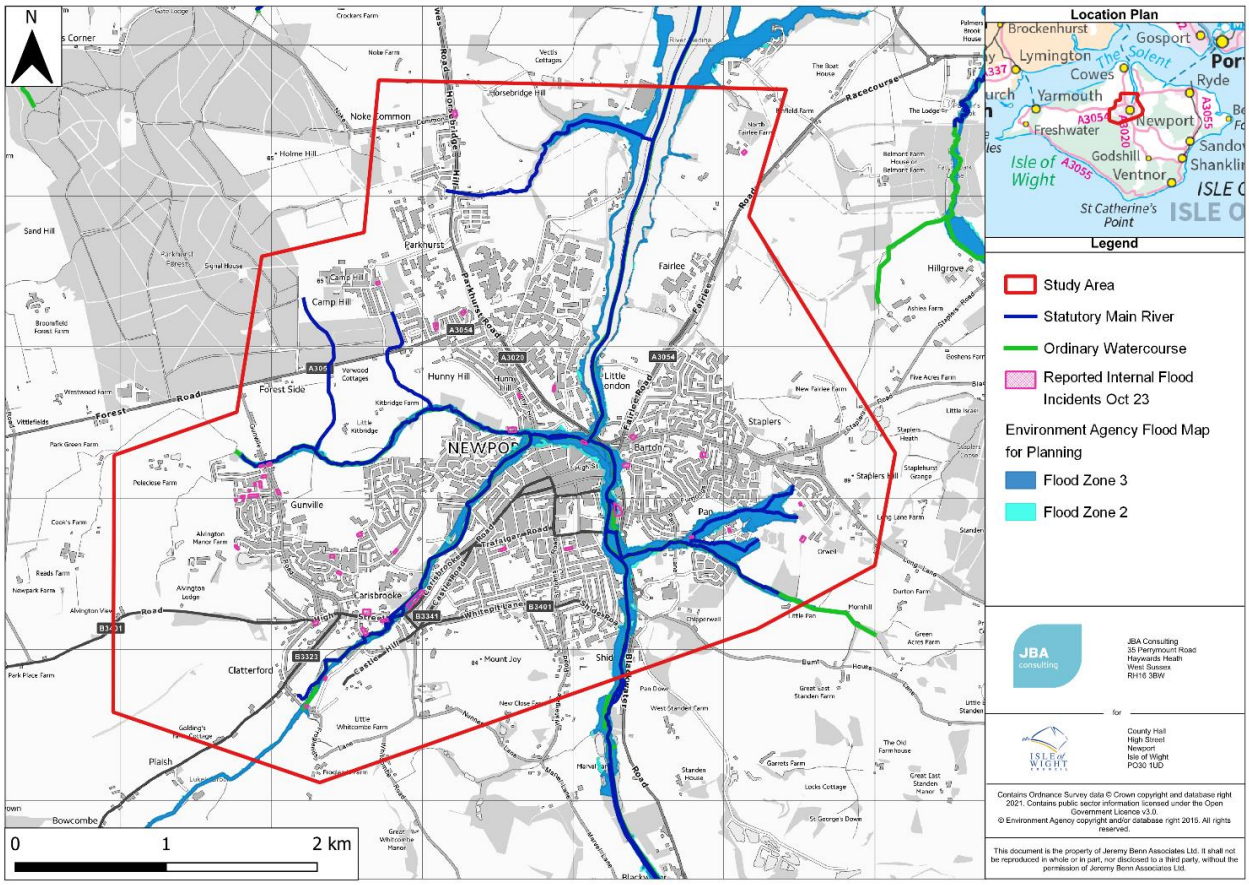

Figure 3-1 Environment Agency Flood Map for Planning

3.2 Risk of flooding from surface water

Surface water runoff ('pluvial' flooding) is caused by intense short periods of rainfall. It often occurs where the natural or artificial drainage systems are unable to cope with the excess volume of water. Pluvial flooding is heavily linked to poor drainage and sewer flooding.

The Risk of Flooding from Surface Water (RoFSW) data, published by the Environment Agency, shows a national scale risk of flooding from surface water runoff. The map in Figure 3-2 shows the areas at risk of flooding following rainfall events, with the following chance of occurrence in any given year:

- High risk – greater than 3.3% chance of flooding
- Medium risk – between 3.3% and 1.0% chance of flooding
- Low risk – between a 1.0% and 0.1% chance of flooding

The highest risk of flooding from surface water in the Newport area occurs near the watercourses, for rainfall events with greater than 3.33% chance of occurring annually. The RoFSW mapping identifies the natural depressions in the land to identify potential surface water flow pathways.

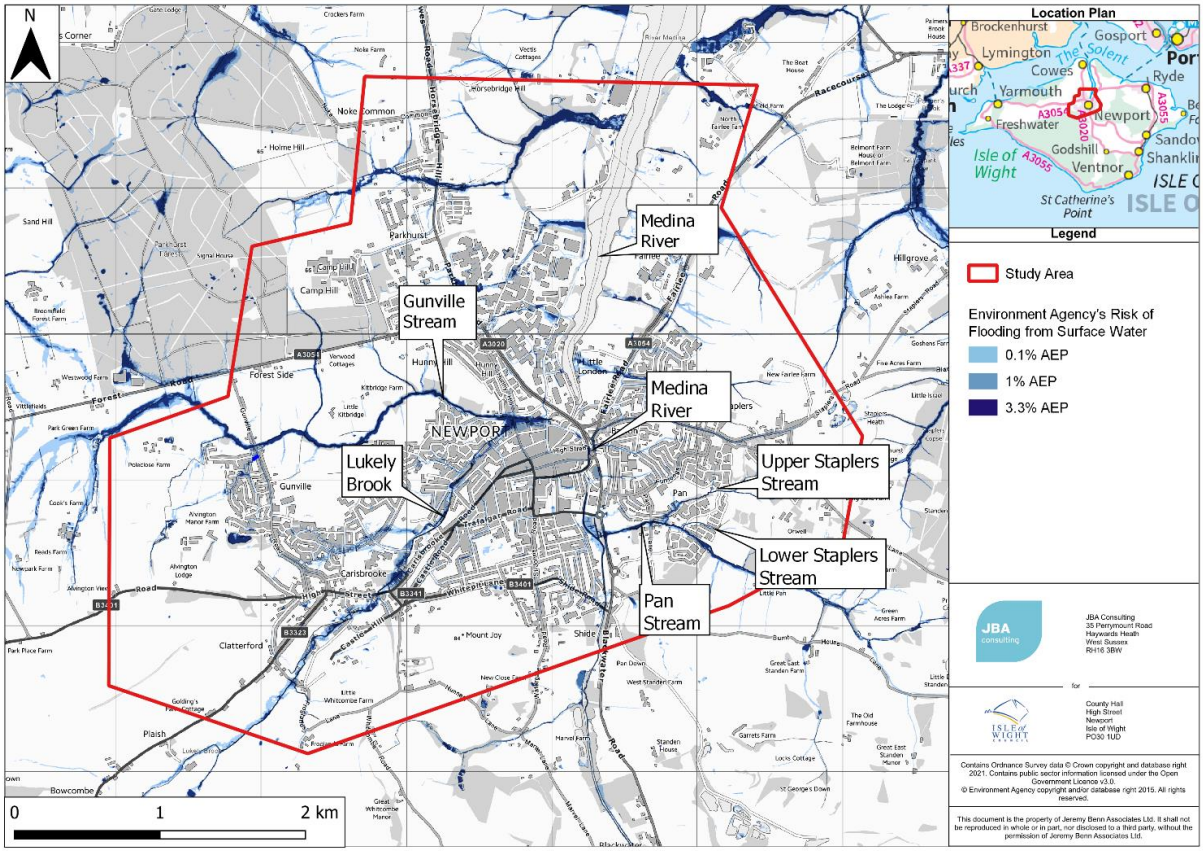

Figure 3-2 Risk of Flooding from Surface Water in the 3.3%, 1% and 0.1% AEP events.

3.3 Groundwater flooding

Flooding from groundwater occurs when the water table within the underlying rock or soil rises above ground level or interacts with properties or infrastructure below ground level, such as basements.

Figure 3-3 shows the JBA 5m Groundwater Flood Map, which shows the likelihood of groundwater emergence across the Newport study area during a rainfall event with a 1% chance of occurring each year. This map indicates that groundwater levels may be higher to the south of the study area, which coincides with boundary between the chalk and less permeable clay geology. The shallowest groundwater, with depths of 0m to 0.025m is associated with superficial deposits along the Lukely Brook and the River Medina. However, during periods of intense and prolonged rainfall, there is likely to be considerable pressure on the natural drainage of this land, which may cause some overland flow.

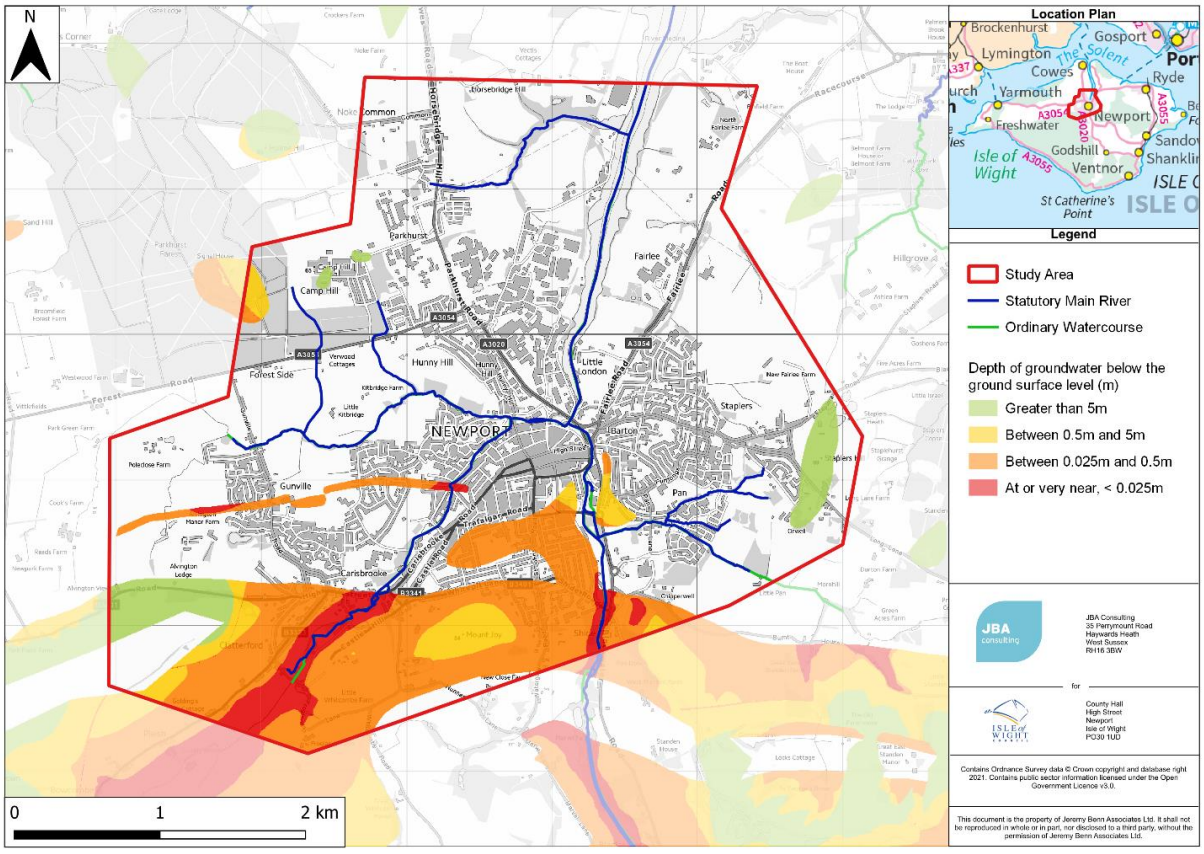

Figure 3-3 JBA 5m Groundwater Flood Map

3.4 Sewer flooding

Flooding from sewers can occur under a series of circumstances: the sewer system may fail, there may be blockages in the drainage pipes, or the sewer system may lack capacity to carry the necessary sewage. Southern Water's Drainage Water Management Plan identifies long-term approach to drainage issues. Alongside the DWMP, Southern Water released regional Baseline Risk and Vulnerability Assessment (BRAVA) risk maps, which indicate the key issues surrounding drainage and wastewater. For the Sandown New WWTW Catchment, the following issues related to flood risk:

- Sewer Collapse (Very Significant risk)
- Risk of Sewer Flooding in a 1 in 50 year storm (Very Significant risk)
- Internal Sewer Flooding (Moderately Significant risk)

3.5 Flood history

The Isle of Wight Level 1 SFRA[4] (2018) identifies a series of flood events that have occurred along the River Medina; the flood events occurred in 1934, 1951, 1960/61 (150 properties) 1993,1999 and 2000/01. The Environment Agency's Historic Flood Map, shown in Figure 3-4, highlights that the flooding of 1993 occurred at the confluence of the Gunville Stream and the Lukely Brook at Towngate Pond. The leading cause of the flooding in 2000/01 was fluvial and tidal locking. Flooding of the Lukely Brook occurred in 2013 which led to a Section 19 investigation to be undertaken in 2014.

4 Isle of Wight SFRA - https://www.iow.gov.uk/azservices/documents/2981-Draft-Isle-of-Wight-Level-1-SFRA-2Part1.pdf

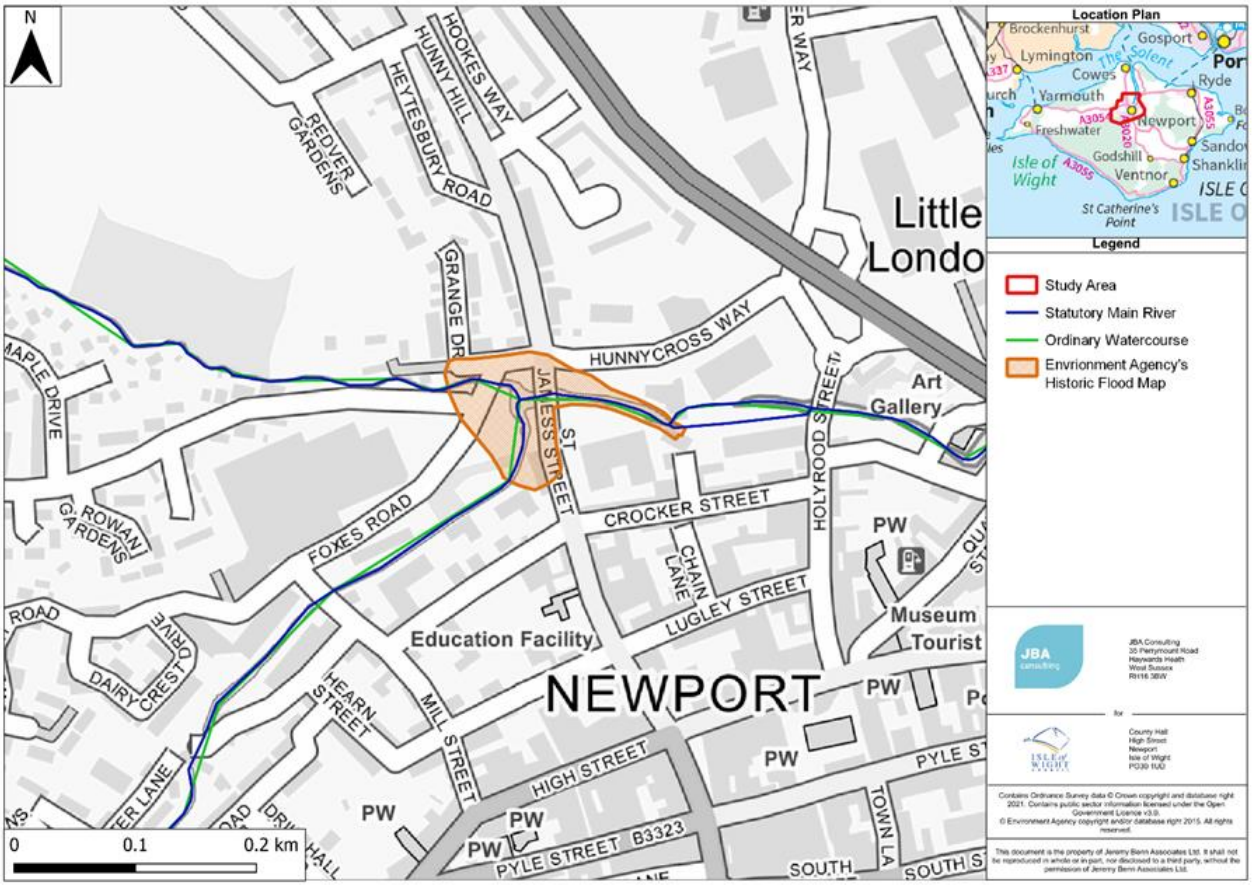

Figure 3-4 Environment Agency's Historic Flood Map

4 Flood Risk Management

4.1 Flood risk management roles and responsibilities

Flood risk in England is managed by a range of different Risk Management Authorities (RMAs). The Flood and Water Management Act places a duty on all flood risk management authorities to co-operate with each other. The act also provides Lead Local Flood Authorities and the Environment Agency with a power to request information required in connection with their flood risk management functions.

4.1.1 Environment Agency

The Environment Agency is sponsored by the Government's Department for Environment, Food & Rural Affairs (DEFRA), and is tasked with the protection and conservation of the water environment in England, the natural beauty of rivers and wetlands and the wildlife that lives there.

The Environment Agency's responsibilities include water quality and resources; fisheries; conservation and ecology; and operational responsibility for managing the risk of flooding from main rivers (usually large streams and rivers), reservoirs, estuaries and the sea.

As outlined in the National Flood and Coastal Erosion Risk Management Strategy[5], the EA holds a strategic overview role for all sources of flooding and coastal erosion in England. The EA are also responsible for informing government policy, constructing and maintaining flood defences and natural flood management measures, issuing flood warning and alert services and sourcing and providing flood risk data.

4.1.2 Lead Local Flood Authority (LLFA)

LLFAs are the upper tier of unitary authority responsible for managing the risk of flooding from surface water, groundwater (water which is below the water table under the ground) and ordinary watercourses (non-main rivers) and lead on community recovery. The LLFA is also responsible for developing, maintaining and applying a strategy for local flood risk management in their area and for maintaining a register of flood risk assets.

IWC is the LLFA for Newport.

4.1.3 Water and Sewerage Company

Water and sewerage companies are responsible for managing the risks of flooding from surface water and foul or combined public sewer systems providing drainage from buildings and open spaces.

Southern Water is the Water and Sewerage company for Newport.

5 National Risk Management Strategy - https://assets.publishing.service.gov.uk/media/5f6b6da6e90e076c182d508d/023_15482_Environment_agency_digitalAW_Strategy.pdf

4.1.4 Highway Authority

The Highway Authority for Newport is IWC, who are responsible for the policy-making and overall oversight of highway management and ensure that Island Roads deliver services in line with standards. Island Roads operate under the Private Finance Initiative (PFI) partnership agreement to deliver services for highways. Island Roads are responsible for road maintenance and management of streetlights, pavements, bridges and other related infrastructural improvements and ensuring that road projects do not increase flood risk.

4.1.5 Riparian landowners

Riparian landowners who own land or property next to a river, stream or ditch, (including where this runs through a pipe or culvert), have rights and responsibilities over the management of the land, including: a responsibility to let water flow through the land without any obstruction, pollution or diversion which affects the rights of others; keeping banks clear of anything that could cause an obstruction and increase flood risk; maintaining the bed and banks of the watercourse; and keeping structures clear of debris. There is more information on these rights and responsibilities in the Environment Agency guidance. 'Owning a watercourse'.

4.1.6 Local residents

Local residents should find out about any flood risk in the area, sign up for the Environment Agency's free flood warnings and make a written plan of how they will respond to a flood situation. Business owners should also make a flood plan for their business. There are measures that can be taken to reduce the amount of damage caused by flooding and properties at risk should be insured. Local residents can find out if their property is at risk, prepare for flooding, get help during a flood and get help after a flood. It is the responsibility of individual property owners to ensure that their property is defended from flood risk, this responsibility does not lie with the local authority or LLFA.

4.2 Emergency responsibilities

The emergency responsibilities of different organisations are outlined in Table 4-1 below. Please note that Parish and Town Councils do not have a legal obligation to respond to emergencies. Whatever service they provide is voluntary and unique to each Parish or Town Council.

Table 4-1 Roles and responsibilities in an emergency, during and after a flood event[6]

Local Authorities (County and District)
Coordinate emergency support within their own functions Deal with emergencies on 'non main rivers' Coordinate emergency support from the voluntary sector Liaise with central and regional government departments Liaise with essential service providers Open rest centres Manage the local transport and traffic networks Mobilise trained emergency social workers Provide emergency assistance Deal with environmental health issues, such as contamination and pollution Coordinate the recovery process Manage public health issues and provide advice and management of public health Provide support and advice to individuals Assist with business continuity

Police Force	Utility Providers
Save life Coordination and communication between emergency services and organisations providing support Coordinate the preparation and dissemination	Attend emergencies relating to their services putting life at risk Assess and manage risk of service failure Assist with recovery process, that is, water utilities manage public health considerations

Fire and Rescue Service
Save life rescuing people and animals Carry out other specialist work, including flood rescue services Where appropriate, assist people where the use of fire service personnel and equipment is relevant

Ambulance Service	Utility Providers
Save life Provide treatment, stabilisation and care at the scene	Attend emergencies relating to their services putting life at risk Assess and manage risk of service failure Assist with recovery process, that, water utilities manage public health considerations

6 https://www.local.gov.uk/topics/severe-weather/flooding/emergency-planning/roles-and-responsibilities

Voluntary Services
Support rest centres Provide practical and emotional support to those affected Support transport and communication Provide administration Provide telephone helpline support

Environment Agency
Support the Emergency Services and other partners Provide information to the public on what they can do before, during and after a flood event Issue flood warnings and ensure systems display current flooding information Receive and record details of flooding and related information Operate water level control structures within its jurisdiction and in line with permissive powers Collect flood event data Participate in flood exercises Respond to pollution incidents and regulate the disposal of wastes generated Assist with the recovery process, for example, by advising on the disposal of silt, attending flood surgeries

4.2.1 Local Resilience Forum (LRF)

Local Resilience Forums (LRFs) are multi-agency partnerships made up of representatives from local public services, including the emergency services, local authorities, the NHS, the Environment Agency and others. These agencies are known as Category 1 Responders, as defined by the Civil Contingencies Act.

LRFs are supported by organisations, known as Category 2 responders, such as the Highways Agency and public utility companies. They have a responsibility to co-operate with Category 1 organisations and to share relevant information with the LRF. The geographical area the forums cover is based on police areas.

The Local Resilience Forum is not a legal entity, nor does a Forum have powers to direct its members. Nevertheless, the Civil Contingencies and the Regulations provide that emergency responders, through the Forum, have a collective responsibility to plan, prepare and communicate for emergencies in a multi-agency environment.

The Local Resilience Forum for Newport is the Hampshire and Isle of Wight Local Resilience Forum (HIWLRF). The HIWLRF has identified coastal flooding, fluvial flooding and surface water flooding as very high risk. Therefore, the HIWLRF has a Multi-Agency Flood Response Plan that provides the framework for the multi-agency response to a flooding incident and details the roles and responsibilities of each agency, as well as the estimated time of onset for flooding, the number of properties at risk, vulnerable receptors and safe evacuation points. THE HIWLRF also work with communities at risk to create Community Emergency Action Plans.

4.2.2 Flood warning service

The areas surrounding the River Medina and Lukely Brook are situated in the Environment Agency's Flood Warning Zone. This service provides communication of flood alerts and warnings via phone, text, or email to anyone registered online through the government website. Flood warning and alerts are based on constant monitoring and forecasting of flooding from rivers and sea. Figure 4-1 and Figure 4-2 indicate the locations of the flood alert and warning areas that cover the Newport study area.

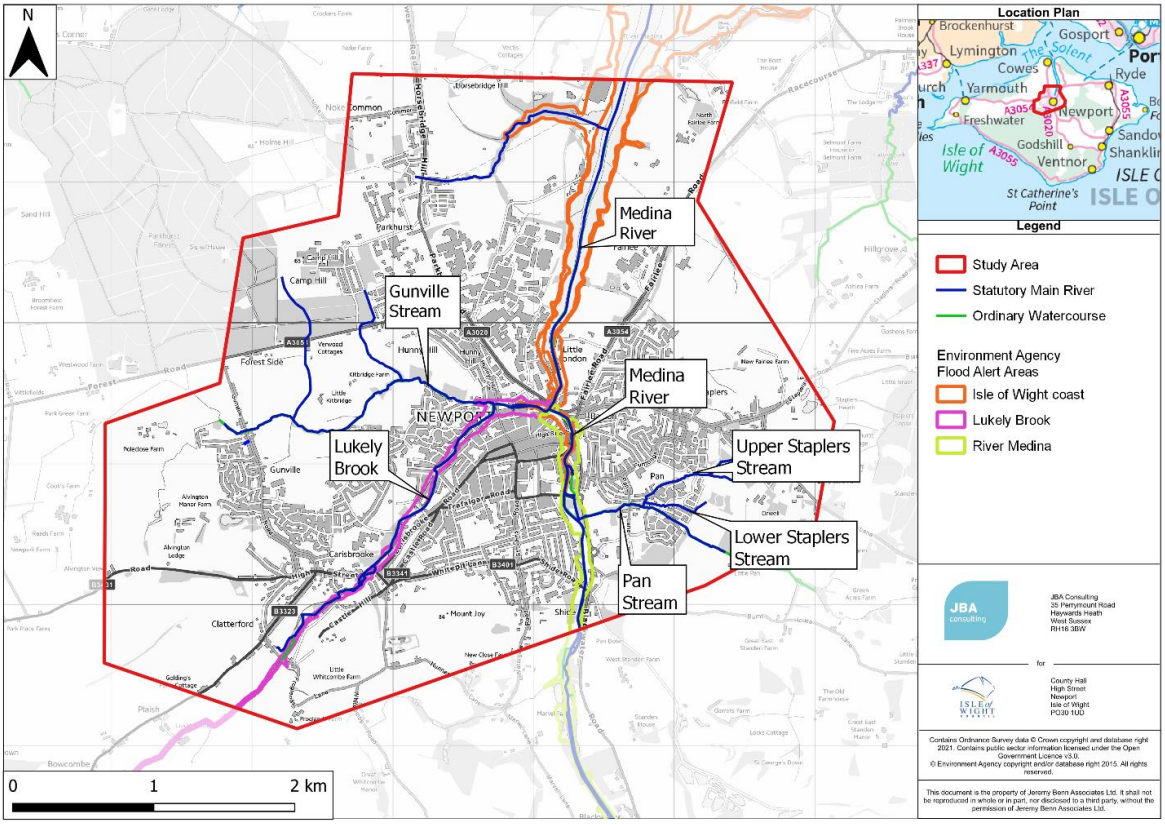

Figure 4-1 Environment Agency's Flood Alert areas

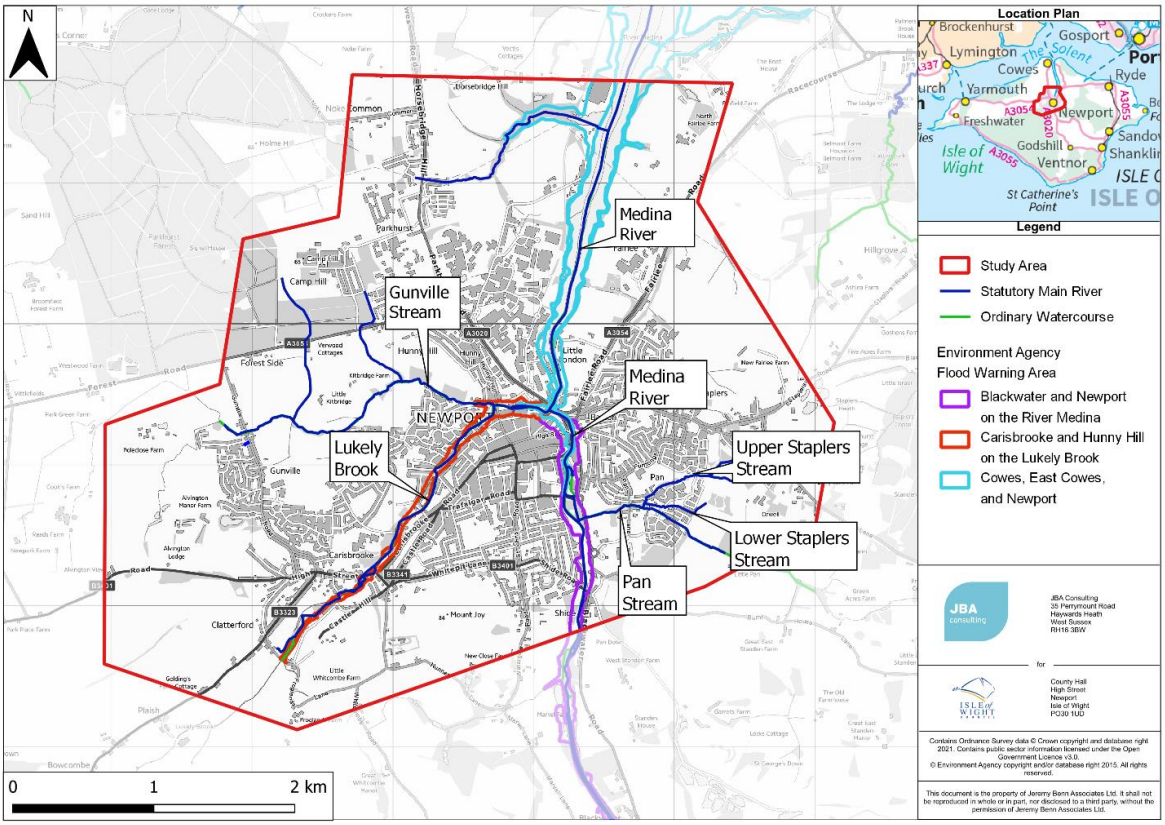

Figure 4-2 Environment Agency Flood Warning areas.

4.2.3 Community flood plans

There is currently no Community Action Plan or Community Emergency Plan for Newport. However, it is understood that there was a team of community volunteers who helped to unblock drains and clear roads during the October 2023 flooding, which was arranged and communicated via Facebook.

4.2.4 Maintenance

Maintenance is a crucial part of managing flood risk, with landowners, the IWC and EA involved in the maintenance of watercourses, drains and smaller infrastructures. This responsibility is outlined in Table 4-1.

The legal responsibility for maintenance of the river lies with the riparian landowners (as set out in Section 2.3.1) rather than the Environment Agency or any other authority. The Environment Agency has powers to work on main rivers (including The Medina River and Lukely Brook) to manage flood risk. These powers are permissive, which means they are not a duty. The EA's powers allow them to carry out a variety of works to maintain main river channels, assets and structures in order to manage or reduce flood risk to people and property, and to safeguard the health and safety of staff and other river users.

Nationally, the Environment Agency's maintenance works can include weed and grass cutting by hand/machine, channel maintenance, obstruction removal, vermin control, tree/bush work, defence repair, flood reservoir work, structure maintenance and some works to improve habitat and biodiversity. Their maintenance work may include de-silting or dredging where this is proven to be the most cost-effective way of managing flood risk to people and property, without causing a deterioration of the water body as defined through the Water Framework Directive (WFD).

The Environment Agency undertakes an annual visual inspection of any structures and defences through Newport that have a Flood Risk Management purpose. Any obstructions to flow, such as fallen trees or blockages are flagged and reported to the riparian landowner, where known. Grass control is carried out on various high flow cuts and flood berms. Further intermittent works may be carried out where there is a justified need and funding available. The Environment Agency may respond to reports of blockages and obstructions and carry out patrols of specific locations during flood events, where resources are available.

Island Roads has an annual programme of drain and gully cleansing for roads on the Isle of Wight. Additionally, if a flood warning is issued by the Environment Agency, the Emergency Management team at IWC will request Island Roads to deliver sandbags at additional drop locations, two being the Carisbrooke High Street Car Park and the Lugley Street Car Park in Newport.

5 Hydrological Analysis

5.1 Conditions at the time

The rain gauge at Carisbrooke shows that there was rainfall throughout the night of the 24 October 2023, starting at approximately 19:30. This rainfall continued until 10:30 on 25 October 2023. Rainfall intensity peaked between 04:30 and 05:30, with approximately 12.2mm of rain falling within this period. As there was only a single gauge that was local to Newport, the return period value was assessed against all other rain gauges on the island, as a sensitivity check. Data indicates that the rainfall intensity was greatest to the southeast of the island, particularly in Ryde and Brading. This data also indicates the storm was more intense on the east of the island and reduced in intensity moving westwards.

5.2 Rainfall return period estimation

Rain gauge data provided by the Environment Agency has been used to estimate the return period of the storm event on the 25 October 2023. The closest gauge to the Newport area is situated in Carisbrooke. The Flood Estimation Handbook (FEH) web service was used to purchase point descriptors for Newport, allowing the storm return period to be calculated.

The storm event that affected Newport on 25 October 2023 was likely to be between a 1 in 28 and a 1 in 38 year event which can be expressed as a storm event with approximately a 2.8% to 3.8% probability of occurring in any given year.

5.3 Fluvial flow estimate

Gauged data at the Carisbrooke fluvial flow gauge (NGR: SZ 49106 88617) provided by the Environment Agency has been used to derive a fluvial flow estimate for the event on the 25 October 2023, as well as an estimated return period for this event.

The Environment Agency provided gauged flow data for the Carisbrooke gauge (Figure 5-1) in both 15-minute and daily temporal resolutions. 15-minute gauged flow data was provided from 7 October 1979 to 1 November 2023, a record spanning 44 years. The Carisbrooke gauge is listed on the National River Flow Archive[7] (NRFA), but it is not part of the peak flow data set (gauge number 101003). The flow record may be subject to some uncertainties, due to upstream abstraction and the influence of the water mill immediately downstream. It is, however, noted that measurements have improved in accuracy since the installation of a fish pass. As a result, the quality of the data at the Carisbrooke gauge was thought to be sufficient for the purpose of this study.

7 National River Flow Archive: https://nrfa.ceh.ac.uk/data/search

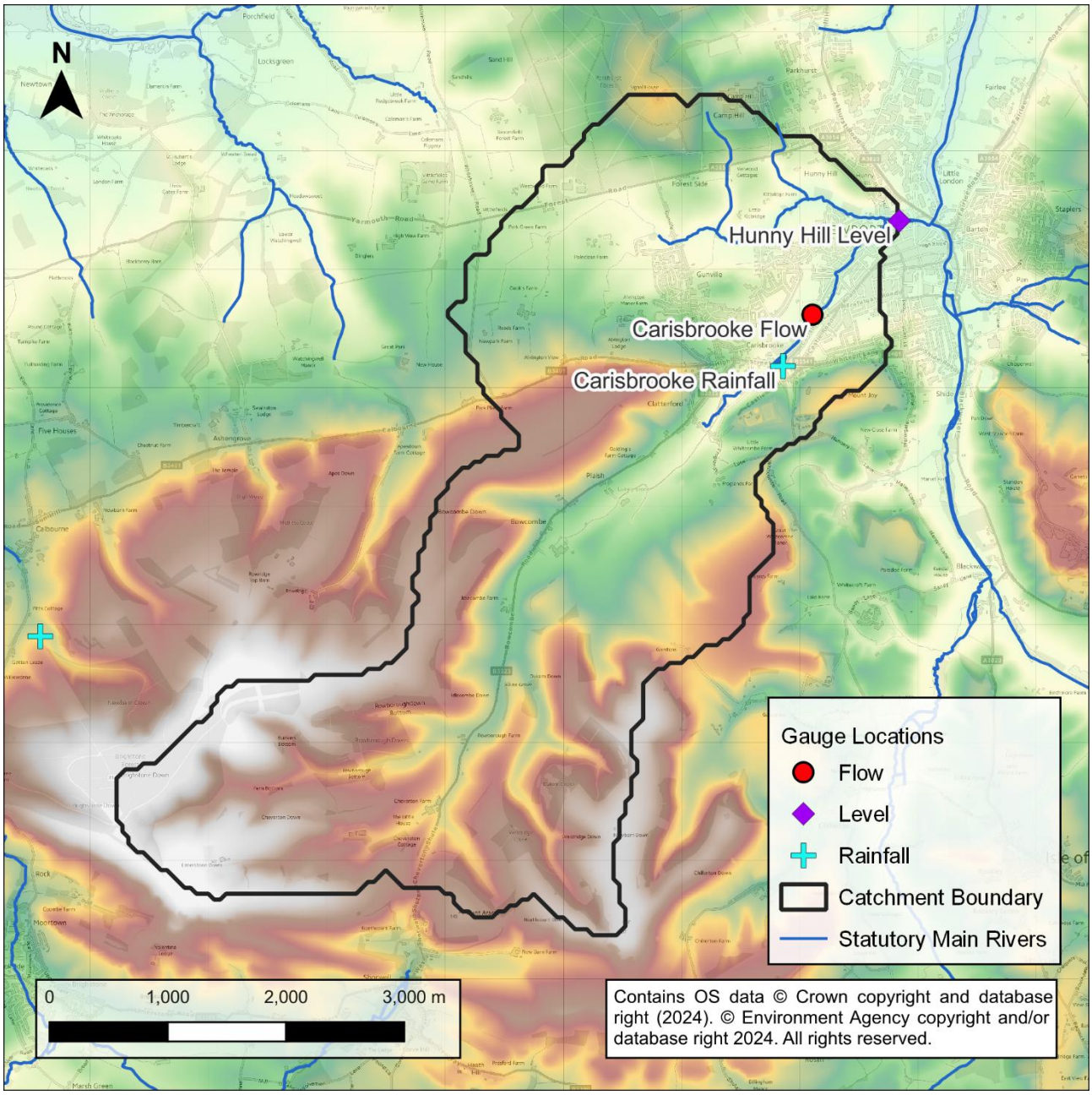

Figure 5-1 Gauge locations in the Lukely Brook catchment

A flood frequency curve was used to compare the peak flow on 25 October 2023, to the 44-year annual Maximum record (AMAX). The observed peak flow on the 25 October 2023 was measured at 08:15 at 2:22m^3/s, which is the third highest measured peak flow on record (AMAX3). Based on the growth curve derived, a flood frequency curve was plotted. It can be estimated, from this flood frequency curve, that peak flow at the Carisbrooke Mill gauge measured between a 1 in 20 and 1 in 50-year event during the 25 October 2023 event.

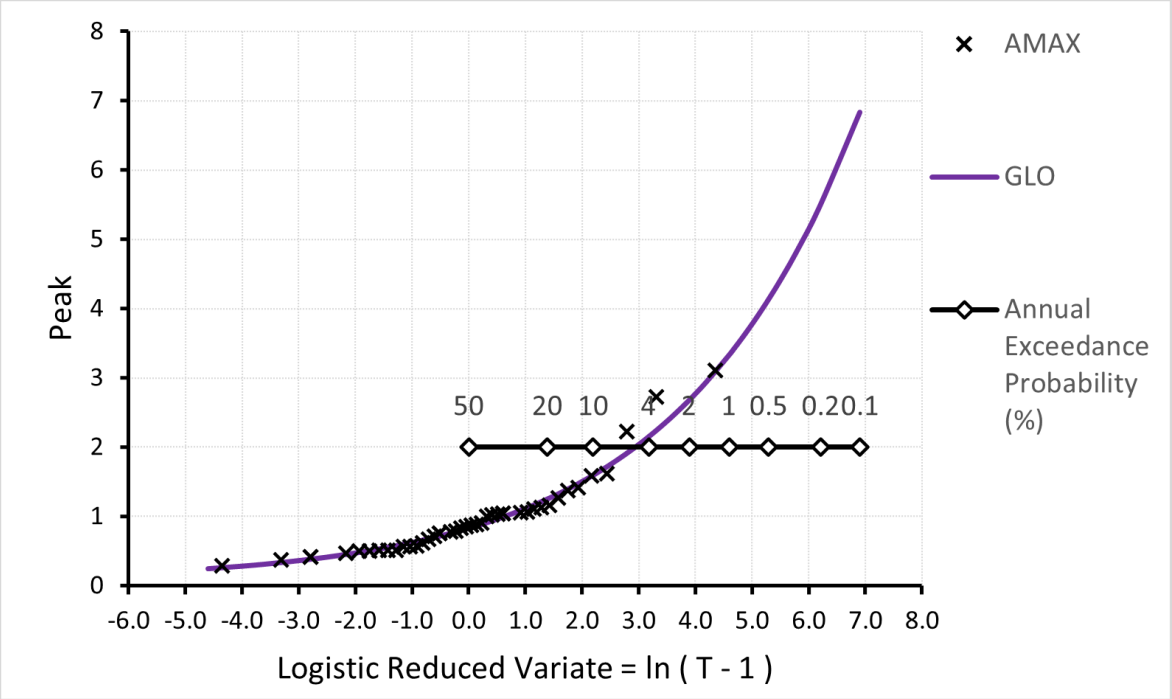

Figure 5-2 Statistical Single Site flood frequency growth curve developed from data from the Carisbrooke flow gauging station.

Table 5-1 Peak flow estimates at the Carisbrooke Mill gauge. Peak flow is measured in m3/s for the AEP (%) events

	50%	20%	10%	5%	3.3%	2%	1.3%	1%	0.5%	0.1%
Peak Flow	0.8	1.2	106	2.0	2.3	2.7	3.0	3.3	4.1	6.8

5.4 Tide Locking

Tidal locking occurs when high tides prevent rivers from freely draining towards the sea. This phenomenon was evident on 25 October 2023, as shown in Figure 5-3, where peak river levels coincided with a high tide, likely leading to tidal locking in downstream areas of Newport's main rivers. Such conditions can exacerbate flooding impacts by raising river levels and obstructing sewer outfalls.

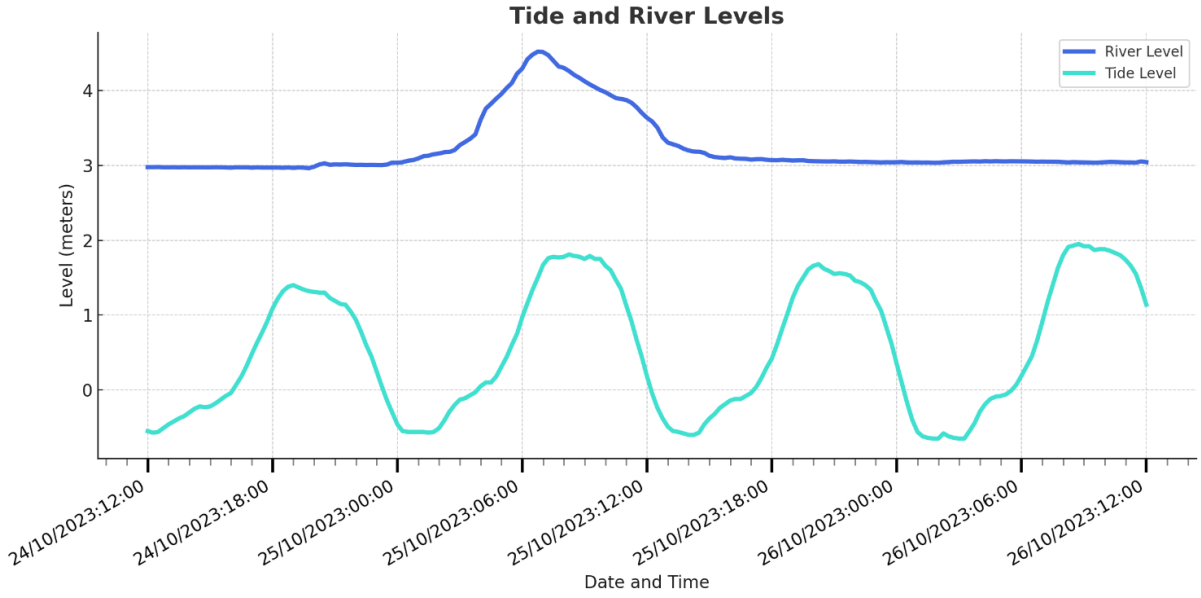

Figure 5-3 Line graph showing tide and river levels in Newport

5.5 Summary

Data from the Flood Estimation Handbook indicates that the event in this report began at approximately 19:30 on 24 October 2023, and carried on to 10:30 on 25 October 2023. The greatest rainfall intensity occurred between 04:30 and 05:30, where Carisbrooke rain gauge recorded 12.2mm of rain within the hour. This peak rainfall intensity aligns with the general response in the community survey, where residents highlighted the storm event starting at 05:00 on 25 October. The FEH data determined the storm to be between 1 in 28 year and 1 in 38 year storm (or between 2.8% and 3.8% AEP event). There was a relatively rapid response of the catchment to surface water flows, which can be explained by the steep, urbanised characteristics of the catchment and impeded drainage of the soils and underlying geology. Fluvial flow was estimated to be between a 1 in 20 and 1 in 50 year event on the 25 October 2023.

6 Incident Response

The Met Office issued weather warnings corresponding with the period of flooding. These warnings were as follows:

- 24th October 2023 18:00 to 25th October 2023 10:00 – Yellow Warning: Rain
- 25th October 2023 06:13 to 10:00 – Amber Warning: Rain
- 26th October 2023 0400 to 12:00 – Yellow Warning - Rain

These warnings triggered a response within the Environment Agency to send out Flood Warnings to the following zones on 25 October 2023: Lukely Brook at 04:43, Carisbrooke and Hunnyhill on the Lukely Brook at 05:13 and River Medina at 07:28.

The emergency services were overwhelmed with calls on the morning of the 25 October 2023 concerning the flooding and their physical response was therefore limited and attended to, based on degree of vulnerability. Emergency Services provided advice, as appropriate, telling residents to protect their houses and obtain sandbags if safe to do so.

These flood warnings triggered response from the council, emergency services and highways maintenance. On the direction of the Emergency Management Duty Officer at IWC, Island Roads assisted in the clearance of highways and drains, and ensured sandbags were available from Carisbrooke High Street Car Park and Lugley Street Car Park. It has been reported that the stock of sandbags at these sites was insufficient.

The Environment Agency also responded to the flooding on 25 October, with their first response involving clearing out the debris screen at Hunny Hill, plus sluice gates were operated at St Cross Mill. Correspondence with the Environment Agency indicates that following this event, the removal of reeds will form part of the annual maintenance schedule.

The outline of the emergency response to the flooding of the 25 October 2023 is outlined in Table 6-1.

Table 6-1 Emergency response to the flood event of 25 October 2023

Authority	Time	Action
Environment Agency	25 October 2023 04:43-07:28	Flood Warning sent out to Lukely Brook, Carisbrooke and Hunny Hill on the Lukely Brook and River Medina.
Hampshire & Isle of Wight, Fire and Rescue Service	25 October 2023 Gunville area: Four calls received between 05:15 and 06:02 Alvington Manor View: One call received at 05:12 Castle Street, Carisbrooke: One call received at 07:40 Carisbrooke High Street: Three calls received between 09:06 and 10:53.	Flood rescue began, prioritised on a risk basis.
Environment Agency	25 October 2023 05:00-08:00	Cleared the debris screen at Hunny Hill to reduce flood risk.
Island Roads	25 October 2023 05:00-09:00	Sandbags were requested by the IWC Emergency Management Duty Office at 05:18 and made available at the following locations: • Carisbrooke High Street, Car Park • Lugley Street, Car Park, Newport Island Roads were also using gulley tankers and road sweepers and dealing with fallen trees.
Environment Agency	25 October 2023 onwards	Debris screen on Gunville Stream removed Willow log blocking the Gunville Stream removed Reeds surrounding Towngate Pond removed Sluice gates operated at the St Cross Mill

Authority	Time	Action
Island Roads	26 October 2023	Residents called out Island Roads following the flood on 25 October, who were unable to respond. It is understood that an Island Roads employee was able to attend the site the following day to unblock the drain.
Southern Water	26 October 2023 09:20 onwards	• Bottled water delivered to customers, including the vulnerable and those in care homes • Planned bottled station locations • 12 tankers distributed across the island to help support the recovery of supply
Local Authority	29 October 2023 All day	Hub for help, guidance and information set up at Ambassadors Snooker Hall, Gunville (Newport).

7 Source-pathway-receptor analysis

The Source-Pathway-Receptor model is a concept that can provide an understanding of all aspects of flood hazard. It breaks down each flood incident into the following three elements:

- Source – Origin of flood water.
- Pathway – a route or means by which a receptor can be affected by flooding.
- Receptor – something that can be adversely affected by flooding (e.g. Property, people, infrastructure)

JBA compiled information from multiple sources regarding flood extent in Newport during the 25 October 2023 flooding event. Community surveys and flood grant data was compiled to generate maps which indicated flood patterns. This data indicated that flooding was widespread across Newport on 25 October 2023 with some more localised instances in flooding.

Heatmap analysis, shown in Figure 7-1, was undertaken to determine areas which were more severely impacted by the flooding and where Source-Pathway-Receptor mapping would be required to understand the flood mechanisms. This was based on the number of properties (residential and commercial) that experienced internal flooding on 25 October.

This analysis identified three main areas which were most severely impacted by the flooding:

- Gunville – 22 reported internal incidents
- Alvington Manor View – 5 reported internal incidents
- Carisbrooke High Street – 9 reported internal incidents

These additional areas of interest were identified as requiring further analysis:

- Garden Way, Pan Stream
- Mill Court, Furlongs
- Hunny Hill Aquatics, Vicarage Road and Towngate Pond
- Camp Hill
- Caesars Road

There were several other, more localised flood incidents on 25 October in Newport, though source-pathway-receptor models have not been produced for these areas. In most of these incidents, there were fewer reports of internal flooding and consequently this provided insufficient information to determine the flood mechanisms to produce detailed mapping. A summary of these flowpaths is found in Section 7.4.

The purpose of the Source-Pathway-Receptor assessment was to build a conceptual model of the flooding that occurred, in order to identify appropriate recommendations. Photographs, news articles and CCTV footage from the event has been used alongside these models for reference.

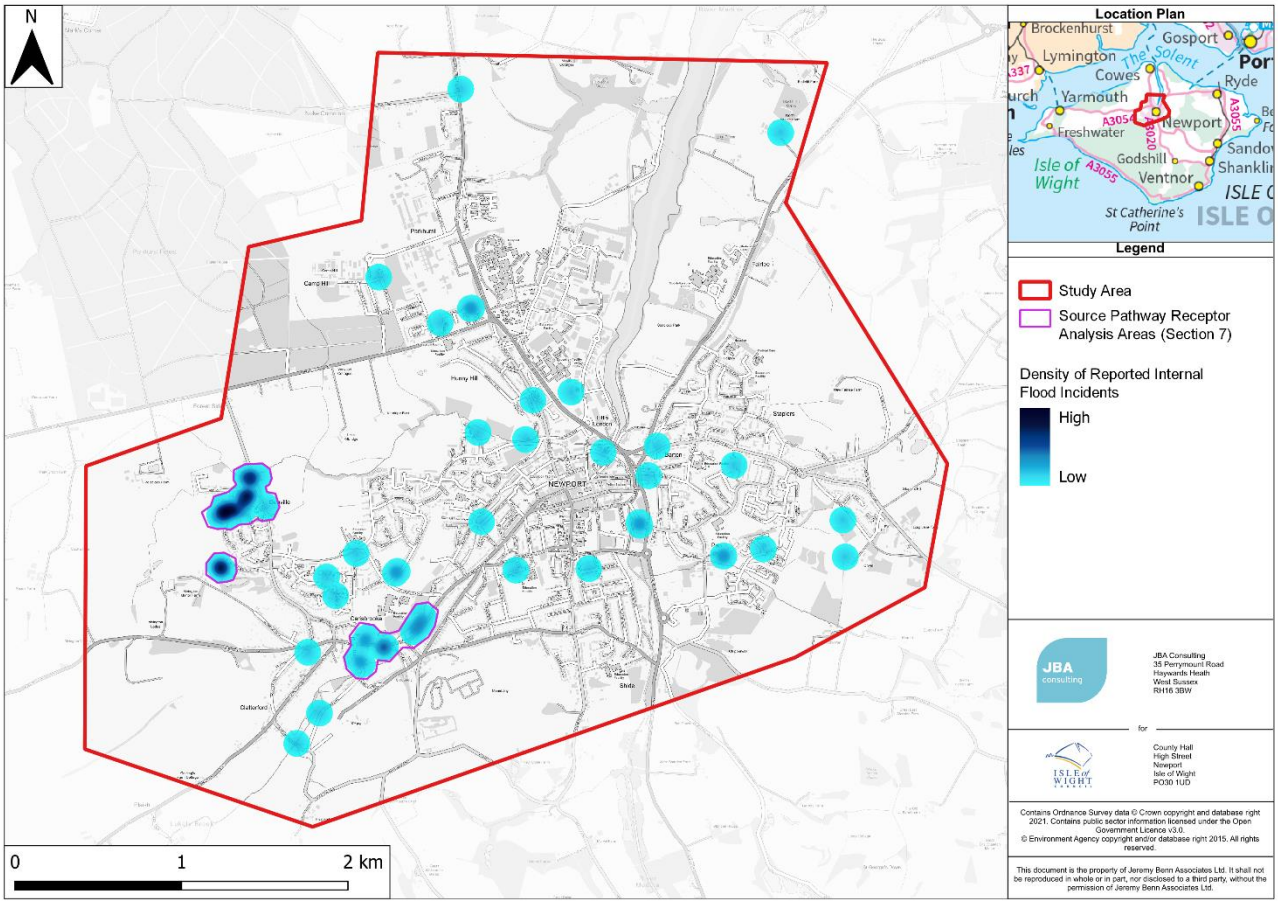

Figure 7-1 Heatmap of reported internal property flooding in Newport

7.1 Location – Gunville

7.1.1 Source

Responses to the community response survey indicate that the source of the flooding was primarily surface water runoff originating from the fields to the west of Forest Hills. Insufficient surface water drainage systems are understood to have increased the overland flow of the surface water. The community survey responses indicate that flooding on Broadwood Lane occurred from 04:00 on 25 October, aligning with the Emergency Services data which records a call from a property on Broadwood Lane coming in at 05:15 on 25 October. One survey response indicated that the flooding was exacerbated by blocked drains on Broadwood Lane.

The Gunville Stream is known to have caused localised flooding. At least five properties on Ash Lane experienced internal flooding during the 25 October event. Video evidence shows the Gunville Stream to be fast flowing and to have exceeded its channel capacity on 25 October.

7.1.2 Pathway

Surface water flood risk mapping indicates that the flow pathways align closely with the topography of the land, which slopes downwards towards the northeast direction, as shown in Figure 7-2. Elevation at the top of Forest Hills is 24.11mAOD, whereas elevations at the bottom of Ash Lane are 19.67mAOD. The lower elevations in the area are found near the Gunville Road bridge. The RoFSW mapping indicates the pathway follows Forest Hills, Broadwood Lane and Park Close; then travelling via direct route through property gardens to rejoin with the Gunville Stream. Following the site visit, an unmarked ordinary watercourse was discovered flowing through the garden of a property at the eastern end of Ash Lane, becoming culverted and flowing below Gunville Road before discharging into the Gunville Stream.

The community survey responses included reference to the following:

- Water pooled between Arthur Moody Drive and Park Close, inundating large parts of Broadwood Lane
- Water pooled at the junction of Broadwood Lane and Forest Hills
- Water was flowing downslope towards Park Close and Gunville Road
- Water levels along Broadwood Lane were said to have dropped within 30 minutes following clearance of highway drains, receiving surface water runoff.

The Environment Agency's FMfP shows that the land surrounding the Gunville Stream channel is situated in Flood Zone 3. This indicates that the land close to the Gunville Stream is at high probability of flooding. As river levels are heightened during periods of intense rainfall, this can subsequently increase river levels, causing water to exceed bank capacity.

A ditch exists along the south of the field bordering Forest Hills, which conveys surface water flows from above fields down towards the culvert shown in Figure 7-7and Figure 7-8. It is presumed that the channel continues to receive surface runoff from all fields above, providing a land drainage function. A channel was dug to intercept runoff along the eastern boundary of the field. However, water was recorded to flood the properties at the top of Broadwood Lane, that back onto the field and this ditch. Consequently, an opening was formed at the top of Forest Hills with the intention of diverting water towards sewer networks. Following this alteration, surface water was known to flow, at high velocity, eastwards down Forest Hills, flowing down Broadwood Lane to Park Close.

7.1.3 Receptor

Residential properties on Forest Hills, Broadwood Lane, Park Close and Ash Lane are known to have experienced internal flooding during the event. The properties that flooded were mostly within surface water flow paths with the exception of those on Ash Lane which would have flooded from the Gunville Stream. Residents in the area provided photos of the extent of internal damage, which indicated internal flood depths of up to 450mm.

Flooding in this area has had detrimental effects on the residents and their wellbeing. The community response survey, distributed by the IWC, outlined some of the physical and mental impacts the flooding had on residents in the area. Residents on Broadwood Lane highlighted damage to property and belongings. Without vehicles, some residents were unable to get to their place of work and consequently had to take emergency leave. Residents from Broadwood Lane and Park Close highlighted the impact of flooding on their mental health, referencing the fear and anxiety they have surrounding severe weather. Property damage and loss of belongings also generated a financial concern to many residents, as insurance companies took longer to pay out. Concerns were raised surrounding the health implications of the October flooding as resident on Forest Hills highlighted the presence of faecal matter and loo roll in their gardens, following the blockage to drains.

Site investigations carried out on the 27 February 2024 found that the Ash Lane properties backing onto the Gunville Stream remained uninhabited due to flood water damage. Large electrical appliances remained at the properties, with clear indication of flood damage.

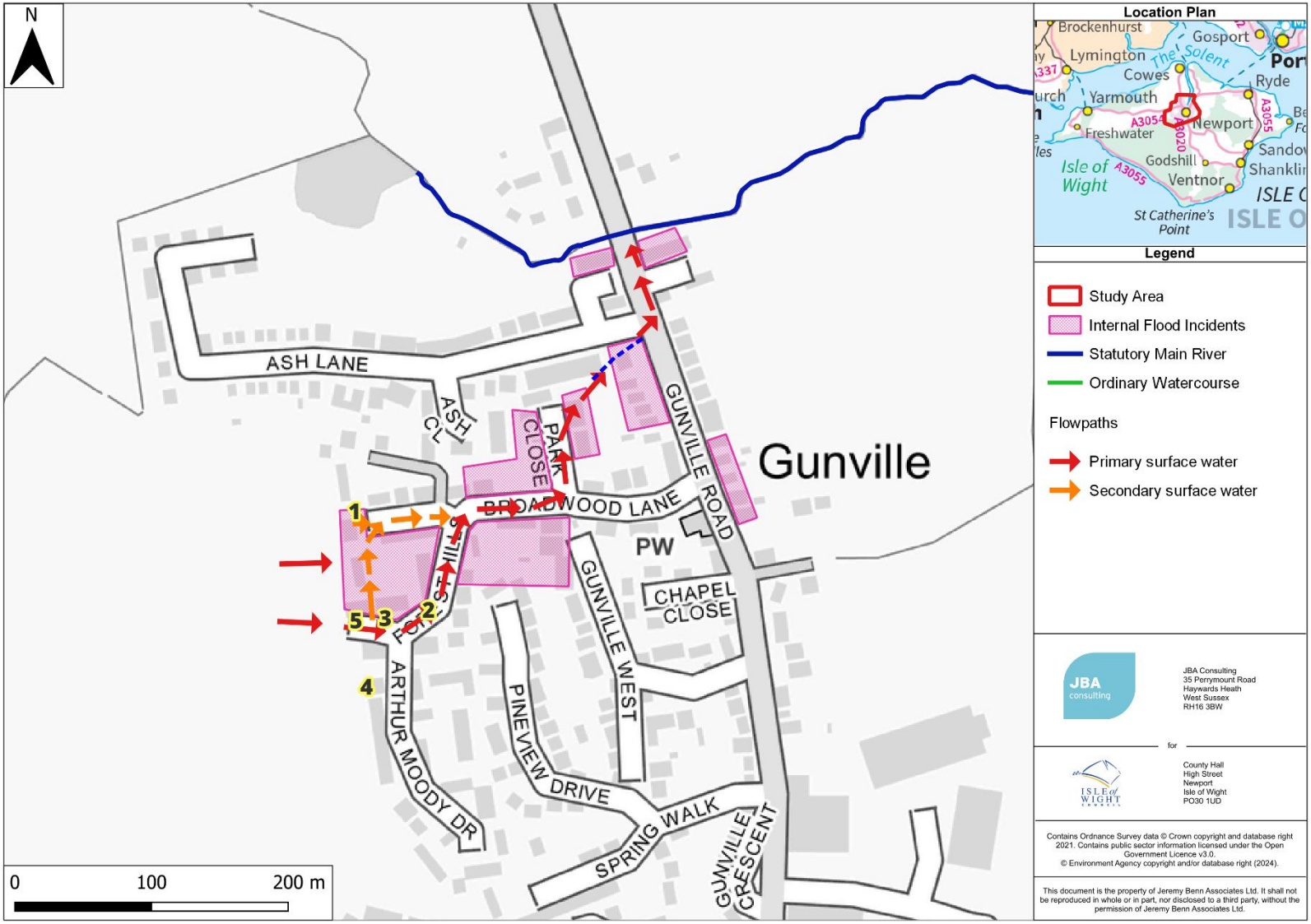

Figure 7-2 Source Pathway Receptor mapping for Gunville study area

Figure 7-4 Photograph of Gunville Stream (north of Hornbeam, Blackthorn and Hawthorn Close)

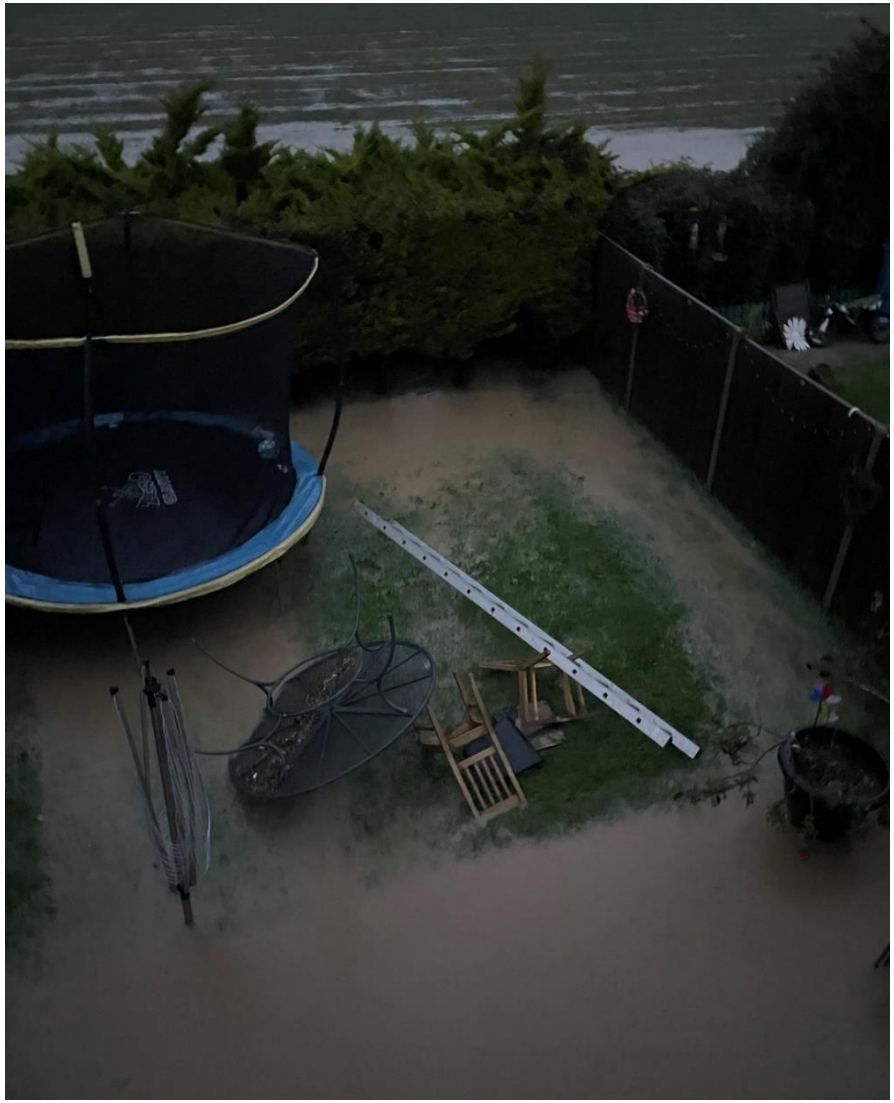

Figure 7-3 Photograph 1, rear garden flooding on Broadwood Lane

Figure 7-5 Photograph 2, flooding on Forest Hills looking southeast

Figure 7-6 Photograph 3, sandbags placed on Forest Hills, looking west

Figure 7-8 Photograph 4, 300mm culvert passing under Arthur Moody Drive, from neighbouring fields

Figure 7-7 Photograph 5, artificially dug channel, east boundary of fields adjacent to Forest Hills

7.2 Location - Alvington Manor View

7.2.1 Source

The community response survey highlighted that flooding originated in the fields south of Alvington Manor View. The five properties that were known to flood in this time have gardens backing onto these fields. Resident responses indicated that flooding was caused by poor drainage in the rear field. The site visit on 27 February 2024 concluded that pond levels were more than 5m below the level of the Alvington Manor View properties. Therefore, water levels in the pond were unlikely to have caused or influenced flooding to these properties.

7.2.2 Pathway

The community response survey and incident reports indicated that flooding originated in the fields to the rear of the 5 highlighted properties. Further flooding occurred on the 28 October which was reported by a resident to originate in the fields to the rear of the property.

The topography in the area slopes from south to north, as seen in Figure 7-10. Surface water that was unable to infiltrate the ground is likely to have followed this natural topographic pathway. Surface water flow, combined with the topography of the land, would account for the accumulation of water at the bottom of the field to the rear of the affected property, shown in Figure 7-11.

7.2.3 Receptor

The community response survey indicated internal damage to property. One resident recounted subfloor, insulation, skirting board, floor covering and low wall damage, which all required replacement. Photographs from the affected properties suggest up to 5cm of flooding internally. Alvington Manor View properties are part of a new development. The properties are less than 10 years old. A review of the planning application for the residential development can be found in Appendix B.

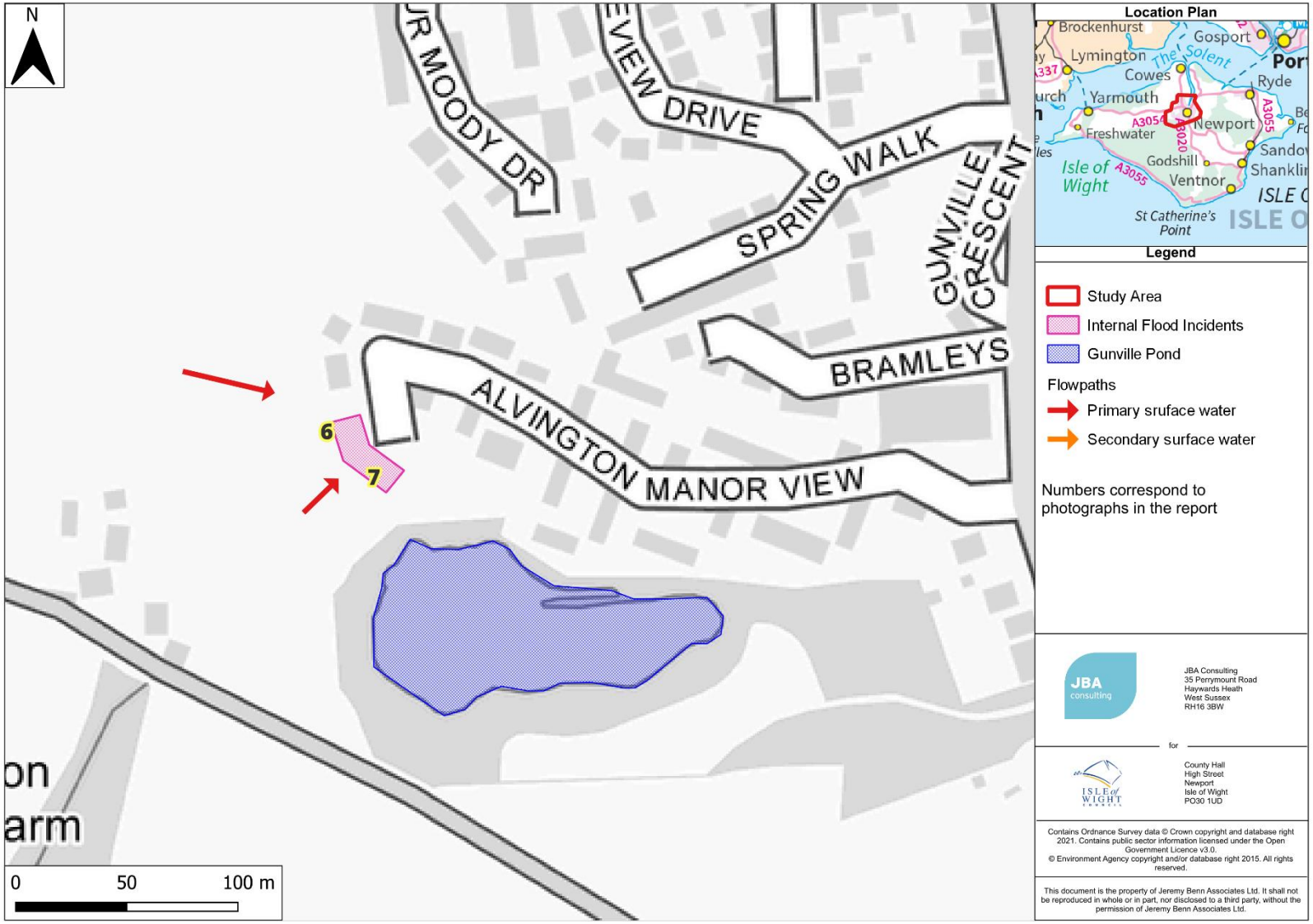

Figure 7-9 Source Pathway Receptor mapping for Alvington Manor Farm

Figure 7-10 Photograph 6, Alvington Manor Farm hills, looking southwest

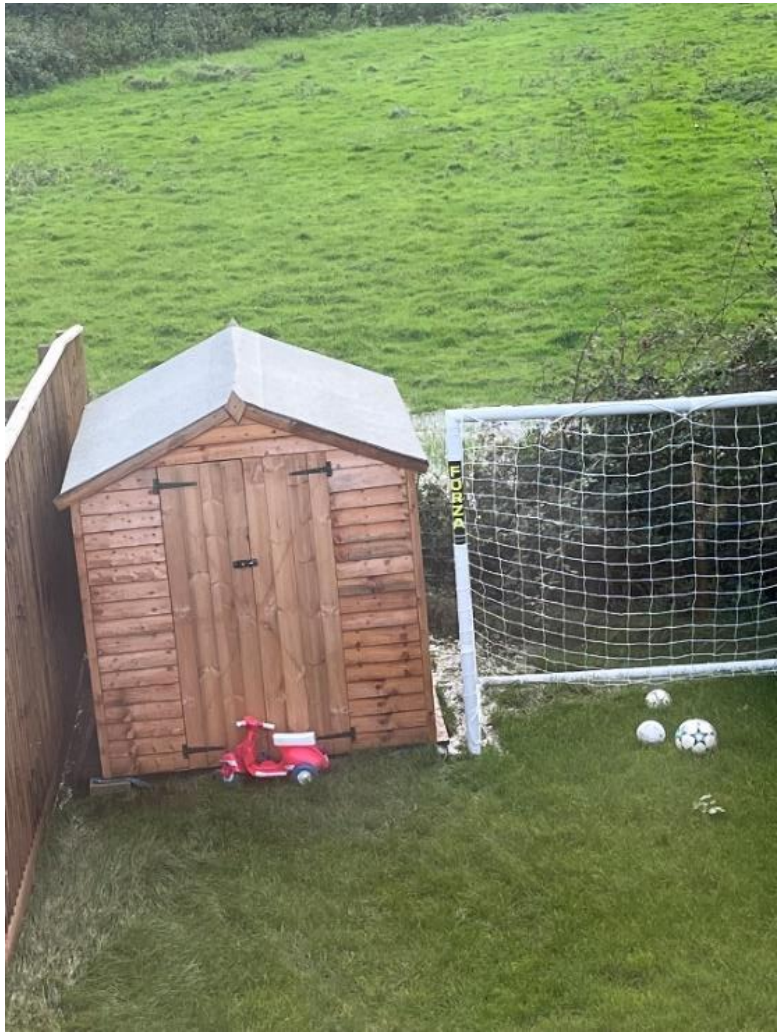

Figure 7-11 Photograph 7, rear garden flooding on Alvington Manor View

7.3 Location – Carisbrooke

7.3.1 Source

The Lukely Brook flows over Spring Lane via a ford, travelling northwards under the B3401, to continue flowing parallel to the B3323. The Lukely Brook flows via another impassable ford at Spring Lane, continuing to flow east under Carisbrooke Road towards the River Medina.

Responses from the community survey indicate that flooding on Carisbrooke Road began at approximately 6am on 25 October and continued into the following day. The two responses from residents on Carisbrooke Road in the community survey indicate flooding began in the early hours of the morning, between 04:00 and 06:00 and continued up until 10:00 on 26 October. Combined issues of river flooding, drain blockage and foul sewer overflows, caused by sewer network issues, were reported by residents.

7.3.2 Pathway

An image from the front of Carisbrooke WWTW (Figure 7-16) indicates that flooding was caused by fluvial sources. The water was seen to exceed the channel of the ford on Spring Lane flowing north towards Carisbrooke Road.

The locations surrounding Carisbrooke Road were subject to fluvial flooding. Intense rainfall caused the volume of water in local rivers to increase and consequently led to exceedance of the Lukely Brook river channel.

The ford on Castle Street was subject to high water velocity which exceeded the flood barrier depicted in Figure 7-14 flowing freely north up Castle Street. Responses from the community survey indicates that flooding on Castle Street began at 07:00 until 22:00. This aligns with river flow levels at the Carisbrooke gauge, which indicates a peak flow of 2.22m^3s^{-1} at 08:22am. Survey information highlighted those flows quickly exceeded the channel capacity of the bridge below the footpath adjacent to the ford, which caused the Lukely Brook to flow out of bank to nearby properties. Further to this, residents from Castle Street highlighted an additional flow of surface runoff from Carisbrook Road. There is a general downward slope along the High Street heading northeast towards Newport town centre. Castle Street and Spring Lane would both receive surface water runoff from this road.

Figure 7-16 highlights that the flooding to properties on Carisbrooke Road originated in the rear gardens, which back onto the Lukely Brook. The FMfP indicates that these properties are in Flood Zone 3, which further indicates the fluvial flood risk. High levels of rainfall experienced on the 25 October 2023 caused increased volume and velocity of water in the Lukely Brook which led to channel exceedance.

7.3.3 Receptor

Flooding in this area has had significant negative impact on local residents and their wellbeing. At least nine properties were known to have experienced internal flooding during the flood event on the 25 October 2023.

The flood event impacted locals' mental health, implementing an anxiety surrounding future flood events. Physical stress has also been caused through the requirement for additional cleaning and property repairs.

Water ingress to property increases safety concerns surrounding the functionality of electrical circuits. In some instances, this led to residents being unable to use electricity until properties had dried out.

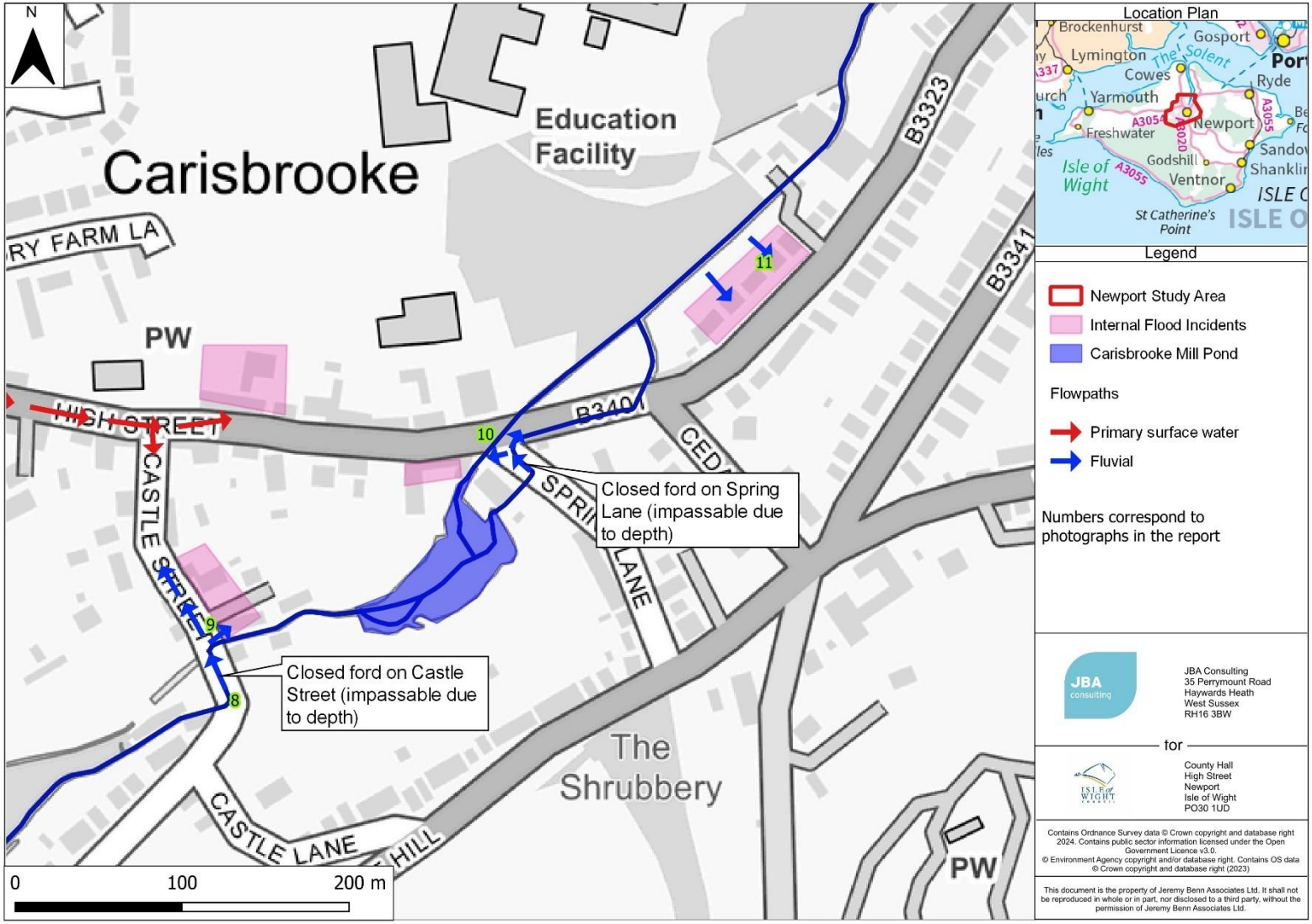

Figure 7-12 Source Pathway Receptor mapping for Carisbrooke

Figure 7-14 Photograph 8, Castle Street ford, looking north (October 2023)

Figure 7-13 Photograph 9, Castle Street ford, looking south (February 2024)

Figure 7-16 Photograph 10, flooding on Spring Lane, looking southeast

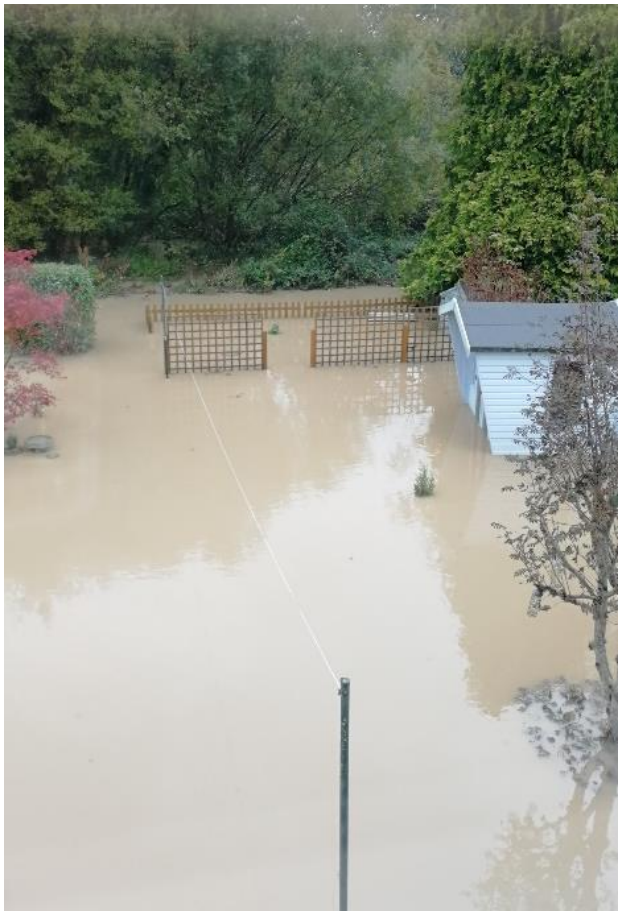

Figure 7-15 Photograph 11, rear garden flooding of Carisbrooke Road property

7.4 Wider areas of flooding

7.4.1 Garden Way, Pan

This site is entirely located in Flood Zone 3, indicating the fluvial flood risk in the area. The Pan Stream flows to the east and south of the known flooded properties. The source of flooding along Garden Way on 25 October 2023 was fluvial. The Pan Stream is understood to have exceeded channel capacity, leading to flooding to the surrounding properties.

7.4.2 Mill Court, Furlongs

Mill Court is situated partially in Flood Zone 2 and 3, indicating the significant risk of fluvial flooding to the building. Mill Court is located approximately 30m east of the River Medina. There is a small ordinary watercourse flowing northwards, directly below Matalan car park and the west region of the Island Day Nursery. The watercourse continues to flow beneath the Matalan access road via twin 600mm culverts to join back to the River Medina.

The intense rainfall on 25 October 2023, coupled with a high tide, resulted in elevated river levels. Located about 0.5km north of the estuary head, Mill Court likely faced the effects of tidal locking during this flood event. The rise in water levels, together with impeded river drainage, is expected to have put pressure on the channel's capacity near this site. Consequently, these conditions would have significantly influenced the impacts of flooding at the Mill Court building.

Figure 7-17 Photograph of twin culvert on the ordinary watercourse at Mill Court

7.4.3 Hunnyhill

Hunnyhill is situated entirely in Flood Zone 3. The site is located approximately 100m west of the confluence of the Gunville Stream and Lukely Brook at Townsend Pond. Figure 7-20 shows the extent of flooding experienced on Vicarage Walk and Foxes Road, both proximal to St James Street Duck Pond, on the event of 25 October. A staff member from Hunnyhill Aquatics recorded flood depths of approximately 1200mm inside the shop. The shop is understood to have lost 99% of their stock, leading to a loss of revenue.

The site visit highlighted that a debris screen had been present on the upstream end of a culvert on the Gunville Stream, 55m east of Hunnyhill. On 26 February 2024, this was found to be removed. Upon discussion with the Environment Agency, it was established that this debris screen was removed due to blockages, which caused the Gunville Stream to backup. The top portion of the debris screen remains in place and monitored. Two arch culverts, each with a diameter of 1400mm, defined the confluence of the Gunville Stream into the Lukely Brook. Based on the EAs comments from the event it is understood that debris may have caused a blockage at this location during the storm on 25 October. Hunnyhill is situated approximately 0.45km upstream of the estuary head and consequently likely experienced the impacts of tidal locking. Tidal locking would have increased river levels upstream, causing water to exceed channel capacity.

Figure 7-19 Photograph of debris screen on Gunville Stream, near Hunnyhill Aquatics

Figure 7-18 Photographs of twin culvert on Gunville Stream, at Towngate Pond

Figure 7-20 Photograph of flooding on Vicarage Walk, looking south onto Foxes Road

Figure 7-21 Aerial photograph of flooding on Sylvain Drive

7.4.4 Camp Hill

The flooding on 25 October caused internal flood damage to properties in the Camp Hill area. Crossways follows downward slope, from west to east, varying in elevation from 53.46m to 50.49m AOD. The intense rainfall would have flowed as surface water runoff down Crossways. Properties at the east of Sherwood Road also experienced the impacts of surface water runoff, where elevations vary from 27.08m AOD, west, to 22.28m AOD, east. The Camp Hill region is seen to be subject to risk of flooding from surface water in the 3.3%, 1% and 0.1% chance of occurrence in any given year.

7.4.5 Caesars Road

Properties on the north side of Caesar's Road back onto the Lukely Brook. These rear gardens are situated partially in Flood Zone 2 and 3. Responses from the community surveys indicate that the Lukely Brook at Caesar's Road began flooding into rear gardens at 09:16 on 25 October 2023, reaching up to 400mm in height. Residents reported that as the tide went out, it appeared that the Lukely Brook was able to drain out the Medina River and subside in height.

The flooding on 25 October caused minor damage to rear gardens on Caesar's Road as seen in Figure 7-22. Residents highlighted the mental health implications, such as stress and nerves during following rainfall events, in particular highlighting their concern upon receiving Environment Agency flood alerts.

Figure 7-22 Photograph of Lukely Brook, view from rear garden of Caesars Road property.

8 Condition assessment

8.1 Methodology

During the site walkover in Newport there were several flood risk assets identified for a visual asset condition grading and assessment. The visual asset condition assessment was carried out by using the Environment Agency's One Business Condition Assessment Manual (OBCAM). The assets are graded and assessed in Table 9-1 to 9-5 below with the following OBCAM Condition Grading system.

- Very Good (1)
- Good (2)
- Fair (3)
- Poor (4)
- Very Poor (5)
- ENI (Element not inspected)

8.2 Condition inspection

This section assesses and grades the assets in Newport area, such as Gunville and Hunnyhill Aquatics.

8.2.1 Gunville Road

There is a watercourse which runs under Gunville Road highway bridge from west to east direction. This watercourse is bordered with natural high grounds on both sides (left and right) and both sides were considered for a visual asset inspection. The highway bridge over the watercourse forms a culvert, which was also considered for a visual asset inspection. On the right side of the watercourse the natural high ground is connected to the back gardens of the properties on Ash Lane and The Hollows. The natural high ground on the left side of the watercourse has a public footpath running along the watercourse towards the east direction.

During the site walkover the following assets were identified for a visual inspection.

- Simple culvert
- Natural high ground (left)
- Natural high ground (right)

Table 8-1 Simple culvert asset grading and assessment

Asset type	Elements	Material	Condition	Comments
Simple culvert	Upstream headwall	Brick and concrete	Fair (3)	Spalling and erosion to concrete headwall. Loss of mortar for brick headwall.
	Downstream Headwall	Brick and concrete	Fair (3)	Loss of mortar and possibly mineral seepage through brick headwall. Concrete part of headwall has spalling and erosion.
	Soffit	Concrete	Fair (3)	Spalling and some erosion to the concrete material on both ends. Missing concrete block on the upstream end of asset.
	Culvert barrel	Concrete	ENI	Unable to fully see element but from point of view could see light through barrel.
	Channel bed	Earth	ENI	Unable to see from water.
	Apron	Earth	Fair (3)	Soil accumulation, overhanging vegetation and debris present on element.

Further comments: There is a pipe on the left side of the downstream end of the culvert barrel where water continuously flowed into the watercourse during the survey. On both ends of the culvert the concrete material is spalling and has some erosion in places. Was unable to fully see the culvert barrel, but from point of view some daylight was visible through the culvert barrel. It is recommended to undertake a full CCTV inspection for the culvert barrel to see if any structural damages are present or there are any debris build up inside.

Figure 8-1 Upstream headwall of culvert – picture was taken from the right bank of the asset in front of the back garden of the Ash Lane properties

Figure 8-2 Downstream headwall of culvert - picture was taken from the public footpath on left bank

Table 8-2 Natural high ground on the right bank of the watercourse

Asset type	Elements	Material	Condition	Comments
Natural High ground	Channel side	Earth	Poor (4)	Undercutting and erosion to channel side. Channel side overgrown and steep.
	High ground	Earth	Poor (4)	Vegetation growth and uneven high ground. Localised erosion.

Further comments: asset seems to have no maintenance. The channel is heavily overgrown and silted. Significant number of debris are present in channel. There are some concrete blocks and potentially concrete sandbags on the downstream end of the asset. These concrete materials have some movement. The high ground is overgrown and has significant localised erosion (Figure 8-3).

Table 8-3 Natural high ground on the left bank of the watercourse

Asset type	Elements	Material	Condition	Comments
Natural High ground	Channel side	Earth	Fair (3)	Localised undercutting and erosion to channel side. On the upstream end of the asset the channel side is locally overgrown, steep and debris are present. Mature tree obstructing channel.
	High ground	Earth	Fair (3)	Localised heavy vegetation growth on the upstream end of asset. Along the public footpath, the high ground is uneven.

Further comments: asset seems to have no maintenance. The channel is silted and heavily overgrown in sections, with a mature tree causing some obstruction of conveyance upstream of Gunville Road bridge (Figure *8-8*). Significant number of debris are present in channel (Figure 8-7), Channel side has localised undercutting and erosion.

Figure 8-3 Right bank of natural high ground behind Ash Lane properties

Figure 8-4 Watercourse looking downstream from the Gunville Road highway bridge, right bank with the concrete blocks

Figure 8-5 Downstream end of watercourse - image taken from right bank, facing downstream towards the left bank of the watercourse

Figure 8-6 Downstream end of watercourse - image taken from the right bank and facing upstream towards the left bank

Figure 8-7 Upstream end of the watercourse – image taken from the right bank behind the back garden of Ash Lane properties, facing upstream.

Figure 8-8 Upstream end of the watercourse – image taken from the right bank behind the back garden of Ash Lane properties, facing downstream.

8.2.2 Hunnyhill Aquatics

There is a watercourse which flows into the St James St Duck Pond from west to east direction. Its banks are formed of natural high grounds. The watercourse flows under a highway bridge (Foxes Road) which forms a twin culvert. Along the upstream end of the watercourse there is a concrete structure which accommodates two debris screens. It is worth mentioning that during the survey the debris screens were removed from the structure, but obvious signs of its presence were observed on its wingwalls, and debris screens were found in a container near the asset location.

The following assets were identified for a visual inspection.

- Twin culvert
- Debris screen

Table 8-4 Twin culvert grading and assessment

Asset type	Elements	Material	Condition	Comments
Twin culvert	Upstream headwall	Concrete	Fair (3)	General spalling to concrete headwall.
	Downstream Headwall	Brick	Fair (3)	General spalling to concrete headwall.
	Culvert barrels	Concrete	ENI	Unable to fully see elements.
	Channel bed	Earth	ENI	Unable to see from water.
	Apron	Earth	Fair (3)	Soil accumulation, overhanging vegetation and debris present om element.

Further comments: No major damages from point of view. Concrete headwall spalling and honeycombing. Unable to fully see culvert barrels, therefore a full CCTV inspection to be carried out.

Figure 8-9 Downstream headwall and twin culvert connecting to St James St Duck Pond

Figure 8-10 Upstream headwall and twin culvert along the watercourse

Table 8-5 Debris screen grading and assessment

Asset type	Elements	Material	Condition	Comments
Debris Screen	Screen 1	Metal	ENI	Element not present.
	Screen 2	Metal	ENI	Element not present.
	Gantry 1	Metal	Good (2)	No damage or missing fixtures and fittings observed.
	Gantry 2	Metal	Good (2)	No damage or missing fixtures and fittings observed.
	Frame	Metal	ENI	Element not present.
	Upstream Headwall	Concrete	Fair (3)	Some wear to concrete and spalling but no major damages observed.
	Left bank wall	Concrete	Fair (3)	Some wear and spalling to concrete, moss cover.
	Right bank wall	Concrete	Fair (3)	Some wear and spalling to concrete, moss cover.

Further comments: both debris screens were not present during the survey but were spotted in a container approximately 20 metres away from the asset location. The asset was still considered for a visual asset condition assessment. Traces on the wingwalls would confirm the previous presence of the debris screens. The left bank wall and right bank wall had spalling and some wear to the concrete material. Gantry 1 furthest downstream and gantry 2 furthest upstream were observed to be in good condition.

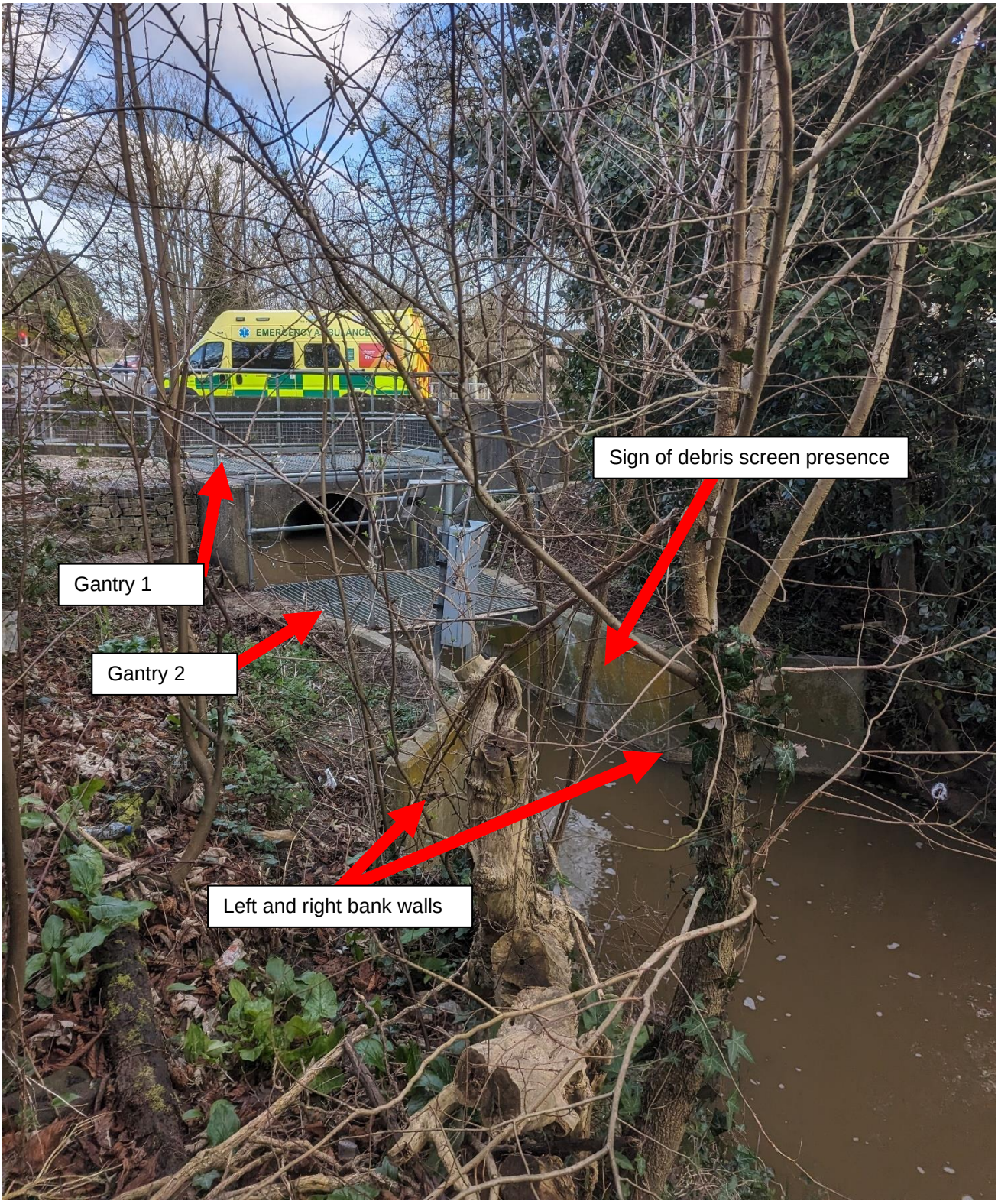

Figure 8-11 Location and place of the debris screen structure, facing downstream from the left bank

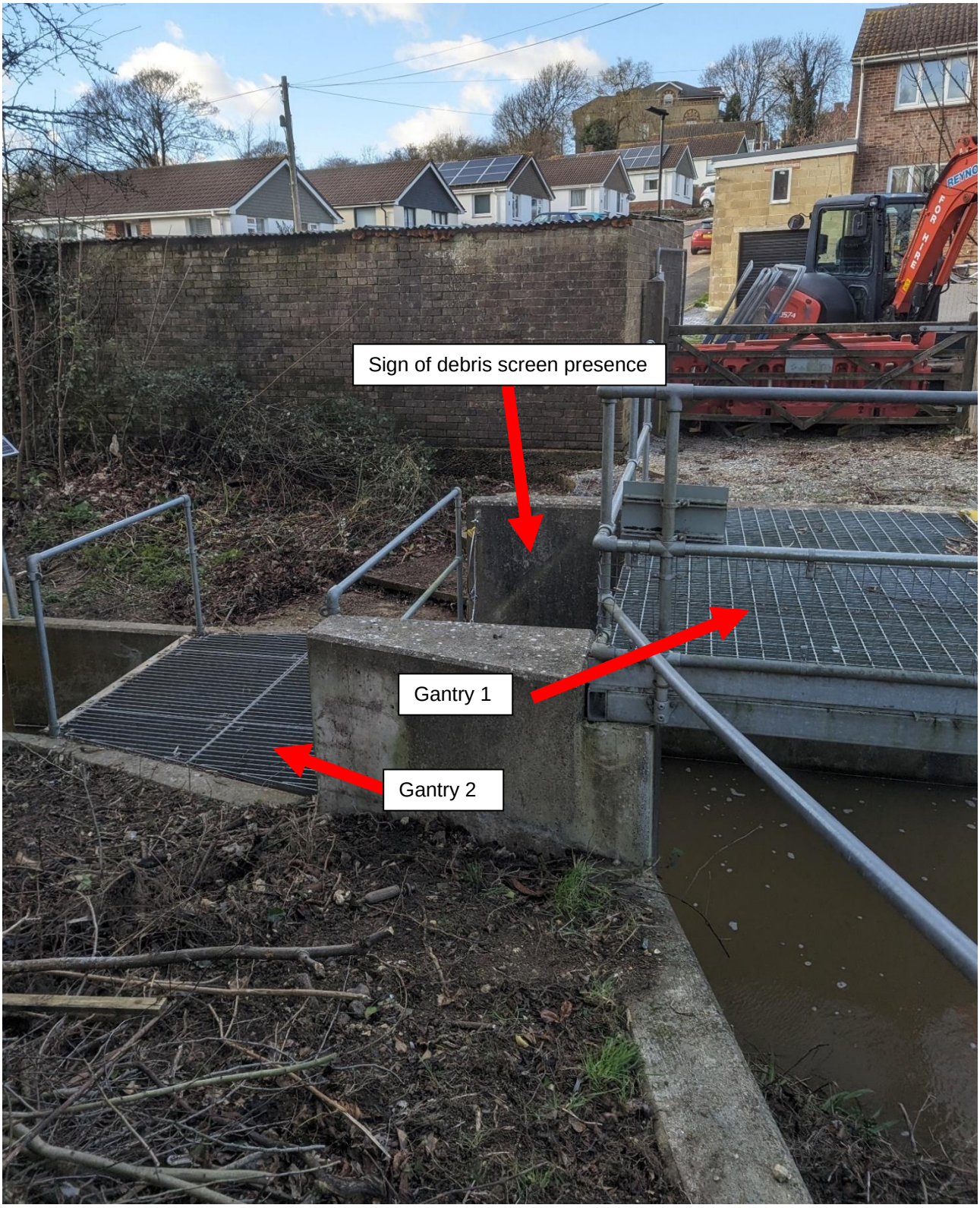

Figure 8-12 Location and place of the debris screen structure – image taken from the right bank

8.3 Impact of condition on flood risk

The condition of the channel side and natural high ground assets along the watercourse in Gunville vary between Fair (3) and Poor (4). The watercourse is overgrown and has debris in the channel which could impact on the performance of the asset to convey water in times of high flow. The culvert on the upstream end of the watercourse, could potentially be restricted by this debris and vegetation which could cause the flood water to build up in the channel and overflow its banks. Furthermore, on the downstream end of the watercourse (along The Hollows) if the natural high ground further eroded, it could potentially slump and collapse which could reduce conveyance in the channel. The culvert itself was graded Fair (3) although further inspections would need to be undertaken to observe if there are any damages or debris build up inside the culvert barrel.

The condition of the assets in Hunnyhill Aquatics were in Fair (3) condition. The debris screen on the culvert has been removed (February 2024). The culvert barrels were graded Fair (3), and water seemed to flow into the pond clearly although further inspections would need to be undertaken to observe if there are any damages or debris build up inside the culvert barrel.

9 Preliminary appraisal

9.1 Multi-criteria analysis methodology

We undertook a high-level option appraisal focussing on benefit, practical and viability considerations. We carried out a multi-criteria analysis to compare each option, which included consideration of relative costs and timescales, buildability, health safety and environment, stakeholder perceptions and public acceptability, land ownership etc. This included consideration of:

- Contribution to reducing flood risk to property.
- Contribution towards reducing flood impacts to people/communities.
- Contribution to improving the availability of data, evidence and modelling to support options for development or flood incident response.
- Deliverability (including construction complexity, access, designations, space, land ownership, availability of resources, equipment or advice required)
- Community acceptability
- Contribution towards biodiversity and water quality betterment
- Amenity benefits
- Contribution towards carbon reduction
- Maintenance requirements

Relative costs and timescales have been provided for information only and are not included in the scoring. The scoring criteria provided in more detail in Appendix A. Options with a score of 7 or above were taken forward to become recommendations.

It is important to note that this is a high-level, preliminary assessment undertaken on behalf of Isle of Wight Council. The LLFA must adopt a strategic approach to flood risk management by integrating recommendations from this Section 19 into the broader Local Flood Risk Management Strategy (LFRMS), to ensure that localised action aligns with long-term objectives, funding and resources. In particular, where taking forward a recommendation is likely to be reliant on securing grants from central government to fund the project, significant further work by the responsible organisation will be required to assess the costs/benefit of the proposals, and consideration will need to be given to the timing and availability of funding. This is likely to be the case for the recommendations within this section. For such projects to be taken forward to design and construction, a business case may need to be made into a national programme, with the success of the bids being dependent on the following:

- Any works are cost beneficial and financially viable
- The works will provide a sufficient level of benefit for the residents at flood risk

- Any project has considered all sources of flood risk
- The project does not increase flood risk to others (people, property, business)
- The works do not cause environmental harm
- Any proposals are accepted by the community and residents

9.2 Long list of options

Based on the identified causes and mechanisms of flooding, the long list of options below have been identified and brought forward for assessment in the Multi-Criteria Analysis (Appendix A) to produce a short list of suitable recommendations, outlined in Section 9.

9.2.1 Improved mapping of Flood Zones and Watercourses

It is evident that there are inaccuracies regarding the extent of SFRA Flood Zones surrounding the Lukely Brook. Mapping shows misalignment between flood zones and the river's course. An inaccurate understanding of flood zones can lead to potential issues, including lack of sufficient awareness of flood risk and absence of flood alerts and warnings in the areas that require these. As a result, it is recommended that additional information surrounding fluvial flood risk on the Lukely Brook is investigated and updated to be shown on the Environment Agency flood zone mapping correctly. This updated mapping will help to inform flood response plans in the future.

Further to this, it is vital that all ordinary watercourses are correctly mapped and made available via public access. Flow pathways which are inaccurately mapped and infrequently updated can cause inaccuracies when accounting for discharge, runoff and channel capacities. By updating mapping of watercourses, the riparian ownership will be clearer and more regularly enforced to prevent channel blockages.

9.2.2 Undertake feasibility study into increasing the capacity of the Lukely Brook and Gunville Stream

This recommendation involves identifying current and potential issues that could contribute to flooding, by assessing the river's flow capacity, condition of its banks, sediment levels and any obstructions or debris that could impede water flow. By identifying areas where the river's condition may lead to overflow or blockages during heavy rainfall, appropriate measures can then be implemented to manage fluvial stormwater overflow. These measures may include dredging of the riverbed, reinforcing riverbanks to prevent collapse and clearing blockages. A thorough investigation of these rivers would allow for targeted and appropriate interventions that could significantly reduce the risk of flooding to surrounding communities, especially during high flow events.

9.2.3 Property Flood Resilience (PFR) Scheme

Property Flood Resilience (PFR) can provide effective resistance and resilience to flooding at an individual property level. PFR measures include flood barriers and seals, non-return valves and automatic airbricks. These are methods of flood resistance, which aim to limit to the ingress of water. Other methods of flood resilience exist, to prevent the effects of flooding once water has accessed a property, these include sump pumps, elevated electrical ports, quick drying or easy cleaning materials, raised level of appliances.

PFR is a cost efficient method of flood risk management, which targets properties that at the most significant risk of flooding. PFR is a successful approach in locations where other methods of flood reduction are not physically possible. Figure 9-2 shows the significant volume of water which were pouring out of an airbrick on a property on Broadwood Lane, highlighting the significant potential ingress through airbricks.

9.2.4 Develop a Community Flood Plan and Provide Community training and exercising of the new Community Flood Plan

It is understood that a group of residents in Newport teamed together to provide flood alleviation assistance during the floods of 28 October 2023. Further to this, a community information hub was set up by IWC, at Ambassador Snooker Hall in Gunville, Newport. This was to offer support and advice to those local to Alvington Manor View, who had experienced flooding to their property. It has been stated by residents that the communication about this community information hub could have been improved. Continuation of community outreach projects such as these are key for informing and better preparing the community for future floods.

9.2.5 Upgrade existing sewer capacity

Increasing sewer capacity in Newport could be undertaken in multiple ways, such as increasing pipe diameters, adding further stormwater storage facilities and implementing further separation of sewer systems into foul and surface water subcategories. Given that flooding occurred in locations with separated foul and surface water drainage systems, it can be deduced that the pipe capacities are unsuitable for the demand in heavy storm events.

Within the Gunville area of Newport, there is a clear issue with drain capacity.

This option has constraints, as the works would require road closures and disruptions to supply. Given that many sewer networks are likely to run beneath gardens, this option may be unfavourable to residents.

9.2.6 Investigate condition and capacity of the culvert under Arthur Moody Close and watercourse at Ash Lane

The investigation into the capacity of the Arthur Moody Close culvert is crucial for understanding the volume of water it can safely convey, particularly during periods of heavy rainfall, to ensure it is not overwhelmed. By assessing the capacity of this culvert, necessary upgrades or maintenance can be identified and implemented to prevent overflow and reduce the risk of flooding to properties in surrounding areas. This option is particularly critical due to the potential 149 dwelling development to the west of Forest Hills and Arthur Moody Close, which would potentially increase runoff and overwhelm local drainage networks.

9.2.7 Seek opportunities for drainage improvement at land adjacent to Forest Hills

During the flood event on 25 October 2023, Forest Hills experienced intense surface water flooding, caused by heavy runoff from the fields to the west. This high rainfall, combined with limited capacity sewer networks and drainage from the fields caused this to flow overland. Improvements to drainage systems in the area would alleviate the overland channelling of surface water. The construction of rain gardens in strategic locations would capture excess rainwater during storm events, reducing the overland flows.

As there is potential for development at land adjacent to Forest Hills, we have considered two sets of recommendations depending on whether this land is eventually developed or not.

If the site remains undeveloped

The flooding to Gunville has taken place despite the fact the current site can be classed as greenfield. If the site remains undeveloped there are a number of recommendations that could be implemented to mitigate the impacts of flooding.

Consideration should be given to working with natural processes and nature based solutions (NBS), for example using NBS to store water in the upper catchment can reduce surface water flows during relatively low magnitude events, and it has been noted by residents that flooded has occurred recurrently.

Surface water flows down Forest Hills from this land, it is recommended investigating whether options to retrofit SuDS could alleviate this, for example through designing a basin or swale to hold and attenuate surface water flows.

Furthermore, a watercourse on the site discharges into a culvert and it is unknown what the condition and capacity of this culvert is. This should be investigated to establish whether any improvements could be undertaken to improve drainage capacity in the area. If the site remains undeveloped, these options in tandem could mitigate surface water flood risk to Gunville.

If the site is developed

JBA has undertaken a review of the planning application associated with this development, please see Appendix B for more information on the proposed drainage scheme. If this site is developed, the surface water drainage proposals would be expected to comply with Isle of Wight Council's SuDS Supplementary Planning Document which was published in May 2024.

The surface water drainage proposals must not result in any off-site detriment, particularly with consideration to flooding in Gunville. This may require additional investigative work, for example investigating the condition and capacity of the proposed culvert which will serve as an outfall. Given the downstream flooding issues, it would not be unreasonable for IWC to expect a betterment on existing discharge rates above the equivalent greenfield runoff rates as far as practicable.

The Flood Risk Assessment must be clear as to how flood risk will be managed during the construction phase so as not to increase flood risk and measures for how runoff will be managed during construction must be implemented. This is important as compaction of ground can increase surface water runoff. Silt from the site can also lead to blockages of drainage infrastructure if not carefully managed.

9.2.8 Upstream flood attenuation

Incorporating flood storage upstream of the affected properties could slow down surface water flows and reduce the impacts of flooding in Newport. This could include the use of Sustainable Drainage Systems (SuDS) such as rain gardens, basins or underground storage tanks to intercept and temporarily store flows during extreme rainfall events.

A scheme utilising flood storage within a single location or multiple storage features could be taken forward and assessed in terms of feasibility. This is likely to be a relatively expensive option due to construction costs and the requirement to undertake surveys.

Flood attenuation upstream on the Lukely Brook would involve the implementation of measures to slow down the flow of water before it reaches the urban extent of Newport, which is more densely populated. Some options for flood attenuation include creation of wetlands, river restoration, construction of detention basins and addition of forests.

9.2.9 Sustainable Drainage Systems

Implementation of green infrastructure can reduce the volume of water entering the sewer systems, this can be in the form of swales, green roofs or biofiltration strips. Sustainable drainage systems are subject to spatial constraints and require significant space in order to be constructed and implemented.

Southern Water have highlighted that no soakaways, swales, ponds, watercourses or other surface water retaining or conveying features should be located within 5

metres of a public sewer. This may be source of added complications for surface water drainage techniques, particularly in the Alvington Manor View area.

9.2.10 Enhanced monitoring of assets and removal of obstructions

The flooding on 25 October 2023 saw blockages cause issues in fluvial flow on the Gunville Stream. These blockages occurred at the debris screens near Hunnyhill Aquatics and have consequently meant the screens have been removed. Blockages, as seen in this instance, increase flood risk in extreme rainfall events. Regular and enhanced monitoring of assets, in person or via the installation of CCTV cameras, enables early detection of potential blockages that could impeded river flow. This proactive measure ensures that river's capacity to handle high water levels during storm events, which would reduce the risk of flooding to surrounding properties and businesses.

9.2.11 Update Flood Warning and Flood Alert Areas

The Environment Agency's flood warning and flood alert areas, shown in Figure 4-1 and Figure 4-2, show that Gunville is not included into either of the areas. This report has found fluvial flooding to be one of the leading sources of flooding in some parts of Gunville. Provision of early warning systems in Gunville, particularly for properties on Ash Lane, could provide the opportunity for residents to become more resilient to flooding and enable the evacuation of their properties if necessary.

Figure 9-1 Photograph of unmapped watercourse on Ash Lane

Figure 9-2 Photograph of flooded air bricks, Broadwood Lane

10 Conclusion and recommendations

10.1 Conclusions

JBA has collated data from a range of sources, which indicates that at least 56 residential and commercial properties experienced internal flooding between 24 October and the 2 November 2023 in Newport. The area to the west of Gunville Road and area surrounding Carisbrooke High Street recorded the highest number of localised property flooding. It is suspected that more properties flooded during the event, although it is not possible to confirm this. IWC, as the Lead Local Flood Authority for Newport, has exercised their responsibility to undertake a Section 19 investigation, as the event fulfilled its criteria of 'significant flooding'. The council appointed JBA Consulting to undertake this investigation on its behalf.

The two leading sources of flooding in Newport during the event of the 25 October 2023 were fluvial and pluvial, and it is likely that tide locking exacerbated the flooding. The storm event of the 25 October brought unprecedented rainfall to Newport, identifying it as a 1 in 28 and a 1 in 38 year storm event. The drainage systems could not capacitate the intense increase in water volumes, consequently leading to high levels of surface runoff. The steep topography and high degree of urbanisation across Newport further exacerbated the flooding, leading to significant widespread damage. The intense rainfall also added pressure to the main rivers in the area, leading to breach of river channels along the Gunville Stream and Lukely Brook.

A community engagement survey provided a better insight into the flooding, with reports of foul sewage entering gardens, and reported reductions in standing water following the unblocking of drains. Surface water also seemingly pooled in low spots, such as Alvington Manor View and Park Close. The community response survey indicated significant property damage and impact to mental health. Further community engagement was undertaken during the Section 19 site visit on 27 February 2024; during which, input from Council members and residents provided a better understanding of the sources, pathways and receptors of flooding during the October event.

10.2 Recommendations

JBA undertook a high-level option appraisal focussing on benefits, practicality and viability considerations. A multi-criteria analysis was carried out to assess the long list of options which included the consideration of relative costs and timescales, buildability, health safety and environment, land ownership etc. This was used to develop recommendations for flood risk mitigation in Newport.

Carefully considering all possible recommendations for Newport to mitigate future flood events, the following recommendations are highlighted.

It is recommended that all options with a score of **12** or greater are prioritised for delivery.

Table 10-1 Summary of short list recommendations for Newport

Recommendation	Organisation (s) responsible	Multi-criteria analysis score	Timescale
Improve mapping of Flood Zones and Watercourses	Environment Agency	13	<1 year
Develop a Community Flood Plan	IWC	15	<1 year
Provide community training and exercising of the new Community Flood Plan	Isle of Wight Council (Highways)	13	<1 year
Investigate condition and capacity of culvert under Arthur Moody Close and watercourse at Ash Lane	IWC / Southern Water/ developer	12	< 1 year
Forest Hills - investigate opportunities for Nature Based Solutions and SuDS retrofit if the land remains undeveloped	IWC/ landowners	16	1 – 3 years
Forest Hills - design surface water drainage in accordance with SuDS SPD and manage off site flood risk appropriately, if the site is developed	IWC/ developer	16	< 1 year
Sustainable drainage systems	IWC	14	1 – 3 years
Enhanced monitoring of assets and removal of obstructions	Environment Agency	13	1 – 3 years

A Multi-Criteria Analysis

As part of the Newport Section 19 flood investigation, a qualitative assessment was carried out on the long list options, to compare their relative benefits and limitations. The scoring was informed by site conditions, site visit observations and discussions within stakeholders.

The scores were totalled, with:

- A negative score meaning the option has high constraints or meets fewer objectives.
- A score of 0 meaning the option had a neutral impact
- A positive score meaning benefits outweigh constraints and the intervention meets more objectives. The larger the positive score, the more beneficial the scheme.

Table 10-2: Criteria used to assess long list options

Multi-criteria analysis category	Assessment criteria
Contribute towards reducing flood risk to property	Increase in flood risk to any property
	No perceived change
	Reduction in flood risk to property
Contribute toward reducing flood impacts on people/communities	Major / minor negative change in flood impacts on people/communities
	No perceived change
	Minor / medium / major positive change in flood impacts on people/communities
Contribute to improving the availability of data, evidence and modelling to support option development or flood incident response	Does not improve the availability of data, evidence and modelling
	Will provide additional data, evidence or modelling, helpful in development of interventions
	Improvement to data, evidence and modelling which is essential to the development of a capital scheme
Deliverability	Deliverability is at high risk of complexity/constraints
	Not known/not applicable

Multi-criteria analysis category	Assessment criteria
	Deliverability is at low risk of complexity/constraints
Community / resident acceptability	Community/residents are likely to have objections
	No known objections / constraints
	Community/residents are likely to be receptive and have no constraints
Contribute towards biodiversity and water quality betterment	Significant detriment
	No perceived change
	Significant betterment
Contribute towards amenity benefits	Significant detriment
	No perceived change
	Significant betterment
Contribute to carbon reduction	Significant net carbon increase
	Not known/no effect
	Significant net carbon reduction
Maintenance	High cost/frequency maintenance, requires new and specialised maintenance routines
	Not known/no effect
	No active maintenance required (passive maintenance designed)
Timescale	Long term strategic aim (>10yrs to progress, funding route unclear)
	Likely to be able to progress in next 1 – 5yrs
	Quick win (<1yr)
Cost	>£2m
	£500 - £1m
	<£100k

Long-list options results

Table 10-3: Multi-criteria analysis total scores for long list options

Recommendation	Organisation (s) responsible	Multi-criteria analysis score	Timescale
Do nothing	N/A	-2	N/A
Business as usual	N/A	-1	N/A
Improve mapping of Flood Zones and Watercourses	Environment Agency	13	<1 year
Undertake feasibility study into increasing the capacity Lukely Brook and Gunville Stream	Environment Agency	10	<1 year
Update flood warning and flood alert areas	Environment Agency	10	1 – 3 years
PFR Scheme	IWC	11	1 – 3 years
Develop a Community Flood Plan	IWC	15	<1 year
Provide community training and exercising of the new Community Flood Plan	Isle of Wight Council (Highways)	13	<1 year
Upgrade existing sewer network capacity	Southern Water	9	> 10 years
Investigate condition and capacity of culvert under Arthur Moody Close and watercourse at Ash Lane	IWC / Southern Water/ developer	12	< 1 year
Forest Hills - investigate opportunities for Nature Based Solutions and SuDS retrofit if the land remains undeveloped	IWC/ landowners	16	1 – 3 years
Forest Hills - design surface water drainage in accordance with SuDS SPD and manage off site flood risk appropriately, if the site is developed	IWC/ developer	16	< 1 year
Upstream flood attenuation	Environment Agency/ IWC	4	1 – 3 years
Sustainable drainage systems	IWC	14	1 – 3 years
Enhanced monitoring of assets and removal of obstructions	Environment Agency	13	1 – 3 years

Newport Section 19 Investigations
Multi-Criteria Appraisal Matrix

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Evaluation Scoring: *See tab "Scoring Criteria" for details*

-2	Major negative impact.
-1	
0	Neither paritive or negative impactr
1	
2	
3	
4	
5	Major paritive impact

			1	2	3	4	5	6	7	8	9	10	11	
Reference	Opportunities	Lead RMA	Flood risk benefits to property	Flood impact on people	Data and evidence	Deliverability	Community/ resident acceptability	Biodiversity and water quality betterment	Amenity benefits	Carbon reduction	Maintenance costs	Timescale	Cost (for information only)	TOTAL
1	Do nothing	N/A	-2	-2	0	0	0	0	0	0	2	0	5	-2
2	Business as usual	All	-1	-1	0	0	0	0	0	0	1	0	4	-1
	Data and evidence													
3	Improve mapping of Flood Zones and Watercourses	Environment Agency	1	2	5	1	1	0	0	0	0	3	5	13
4	Undertake feasibility study into increasing the capacity Lukely Brook and Gunville Stream	Environment Agency	0	0	5	1	1	0	0	0	0	3	5	10
5	Update flood warning and flood alert areas	Environment Agency	0	2	3	1	1	0	0	0	0	3	4	10
	Community, property and infrastructure flood resilience													
6	PFR Scheme	IWC	3	4	0	-1	1	0	0	0	1	3	4	11
7	Develop a Community Flood Plan	IWC	3	5	0	1	2	0	0	0	0	4	5	15
8	Provide community training and exercising of the new Community Flood Plan	IWC	1	5	0	1	2	0	0	0	0	4	5	13
9	Upgrade existing sewer network capacity	Southern Water	5	4	0	-2	1	0	0	0	-1	2	1	9
10	Investigate condition and capacity of culvert under Arthur Moody Close and watercourse at Ash Lane	IWC / Southern Water	1	0	5	1	1	1	0	0	0	4	5	12
11	Forest Hills - investigate opportunities for Nature Based Solutions and SuDS retrofit if the land remains undeveloped	IWC/ landowners	3	3	2	-2	1	1	1	1	1	3	4	16
12	Forest Hills - design surface water drainage in accordance with SuDS SPD and manage off site flood risk appropriately, if the site is developed	IWC/ developer	3	5	2	1	1	1	0	0	-1	4	5	16
13	Upstream flood attenuation	Environment Agency	2	2	0	-1	-1	0	0	0	-1	3	4	4
14	Sustainable drainage systems	IWC	2	3	0	2	1	1	2	1	-1	3	4	14
	Maintenance and minor works													
13	Enhanced monitoring of assets and removal of obstructions	Environment Agency	1	3	0	1	2	0	1	0	1	4	4	13

B Planning Application Review

B.1 Dwellings west of Forest Hills and Arthur Moody Drive

There is an existing hybrid planning application for up to 147 residential dwellings on land to the west of Forest Hills and Arthur Moody Drive in Gunville, with full planning permission sought for 36 dwellings. A Flood Risk Assessment (FRA) and Surface Water Drainage Strategy8 has been submitted as part of this application.

B.1.1 Purpose of review

During stakeholder engagement, concerns were raised surrounding the flooding implications that the proposed residential development west of Forest Hills could have on the surrounding properties. Therefore, as part of this Section 19 investigation, a review of the submitted flood risk and drainage proposals was undertaken to understand the potential impacts the development could have on flood risk in Gunville

B.1.2 Surface Water Drainage Proposals

- FSR rainfall has been used to size attenuation storage, given the sensitivities of off-site receptors it is recommended to use FEH rainfall in sizing storage as this will provide a more conservative approach.
- No calculations have been provided that demonstrate the proposed storage features will be sufficiently sized to accommodate flows from the development. Network calculations indicating the performance of the proposed network and hydraulic connectivity between drainage features should also be provided.
- Clarification on discharge rate – Appendix A gives a Qbar value of 12.4 l/s whereas paragraph 5.11 states that the maximum discharge rate will be 36 l/s, this discrepancy is unexplained. As a greenfield site, the proposed discharge rate should be restricted to Qbar at minimum,
- Proposed attenuation – the dry basins are designed as ‘offline’ storage structures and will only fill during ‘extreme events’ (unclear whether this is events in excess of the 1 in 30 year). Consequently, there will be little if any attenuation during more frequent rainfall events that are likely to exceed existing discharge rates from the site, this could worsen existing flooding issues.
- Some pipework appears to be discharging into the existing ditch without any attenuation.
- Proposed discharge point – one of the proposed outfalls is a ditch (Figure 7-8) which discharges into a 300mm pipe. It is unclear where this pipe ultimately discharges to and whether there would be sufficient capacity to accept flows from the development.

8 Forest Hills FRA - https://publicaccess.iow.gov.uk/online-applications/files/053EC662A344AD3945B229857F3AB9DA/pdf/22_00629_OUT-FLOOD_RISK_ASSESSMENT___DRAINAGE_STRATEGY-3097615.pdf

- Exceedance flows – it is unclear if the impact of exceedance flows (in excess of the 1 in 100 +40% CC) have been considered so as not to worsen off site flood risk to existing properties.
- Layout – the report refers to a drawing (18297/ 50). Although it is acknowledged it's a hybrid planning application, the level of detail provided is not sufficient.

Overall, a greater level of detail should be provided to understand the proposed drainage system and the potential impacts of this on flood risk. Although this is a hybrid planning application, it is seeking full planning for part of the development. A more detailed drainage strategy is typically provided to support 'full' planning applications.

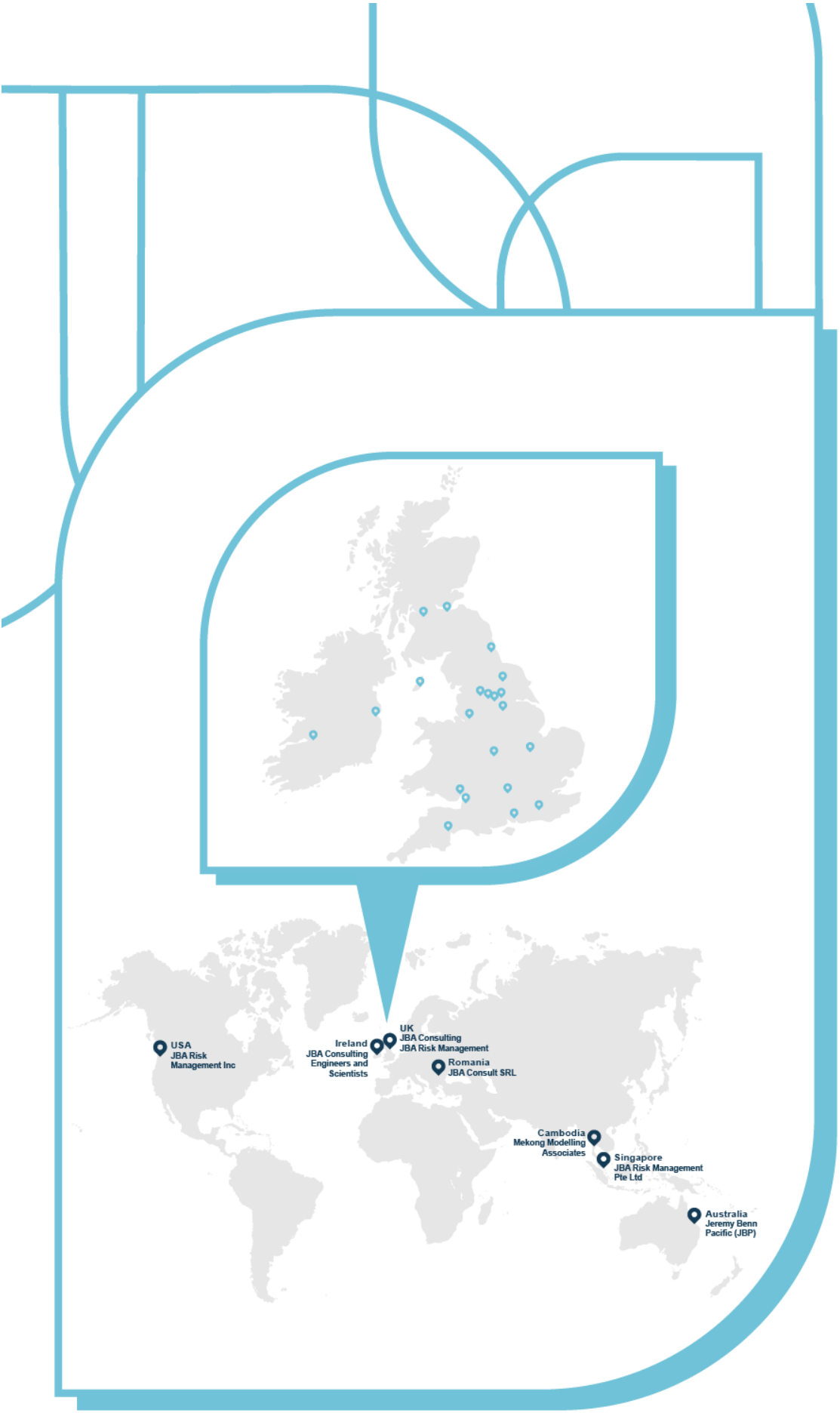
Fundamentally, the submitted drainage strategy does not provide any assurance that discharge rates will be limited to the corresponding greenfield runoff rates for all rainfall events. The provision of offline storage features is a concern with regard to this, as these features will not provide any attenuation during more frequent flood events.

10.2.1 Flood risk proposals

The hybrid plan outlines some flood risk defence strategies that will be adopted in the development. These are set out below:

- Works will be undertaken to clear and re-establish the ditch, along the length of the west boundary of the site, to provide additional capacity for land drainage function.
- A wall is proposed to be installed along the rear of No.2, extending along to No.17 Forest Hills. The proposed wall will be situated on the development side of the flank and will merge into a concrete headwall at the aforementioned 300mm drainage pipe.
- Finished Floor Levels (FFL) have been outlined for Phase 1 in document ref. '18297-LP01A'. Phase 1 extent concerns 36 dwellings on the east portion of the site. FFL are proposed to be between 24.65m and 26.52m.

In the development proposal, climate change has been accounted for in line with the PPS25 advise used to generate the Isle of Wight 2010 SFRA. National rainfall intensity climate change allowances for the 2085-2115 epoch were recommended as +30% in the PPS25, for which the Upper End allowances in the 2080s epoch have now increased to 40% (3.3% AEP event) and 45% (1% AEP Event). National river flow climate change allowances were recommended as 20% for the PPS25, which has now increased to 33% (Central CC Allowance, 2080s epoch) in line with updated EA data. The FRA for the site acknowledges this alteration in climate change allowance, claiming that the attenuation measures have been designed to allow for this rainfall intensity and that impacts on the site will be limited.



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