



# Flood & Water Management Act 2010

## Section 19 Flood Investigation Report FI0096

Location: Sandycroft, Flintshire

Incident Date: October 2023

## Document Control Sheet

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|--------------------------|---------------------------------------------------------------------------|
| <b>Document Author</b>   | Iwan Thomas BSc (Hons)                                                    |
| <b>Document Checker</b>  | Aled Williams BSc (Hons) MCIWEM C.WEM                                     |
| <b>Document Approver</b> | Mike Wellington BEng (Hons) MSc CEng CEnv FICE<br>FCIWEM C.WEM IMaPS MAPM |

## Revision History

| Date       | Version Number | Summary of Changes                                            |
|------------|----------------|---------------------------------------------------------------|
| 20/08/2024 | Draft Report   | NA                                                            |
| 10/07/2025 | Version 2      | Updated to document feedback from Risk Management Authorities |
| 01/09/2025 | Final Version  | Final edits made by the LLFA                                  |
|            |                |                                                               |
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## Executive Summary

This report has been prepared for the purpose of meeting the requirements of Section 19 of the Flood and Water Management Act 2010. Under Section 19 of the Flood and Water Management Act 2010, the Lead Local Flood Authority, Flintshire County Council, on becoming aware of a flood in its area, must, to the extent it considers necessary or appropriate, investigate, prepare and publish a Flood Investigation Report.

As a Lead Local Flood Authority (LLFA), it is the responsibility of Flintshire County Council (FCC) to manage the local flood risk from surface water, groundwater and ordinary watercourses such as streams and ditches (including lakes and ponds).

Section 19 of the Flood and Water Management Act 2010 states:

*“On becoming aware of a flood in its area, a lead local flood authority must to the extent it considers necessary or appropriate, investigate –*

- (a) Which risk management authorities have relevant flood risk management functions, and*
- (b) Whether each of those risk management authorities has exercised, or is intending to exercise, those functions in response to the flood”*

The flood risk management authorities in Flintshire are:

- Flintshire County Council
- Flintshire’s Environment Department
- Natural Resources Wales
- Dŵr Cymru / Welsh Water

Internal flooding to a single residential property warrants that the incident should be investigated, and a report prepared in accordance with the Council’s Local Flood Risk Management Strategy (LFRMS):<sup>1</sup>

In October 2023, Storm Babet brought periods of heavy rainfall across large areas of the United Kingdom. The Met Office reported that the 18th to the 21st of October saw “the third-wettest independent 3-day period for England and Wales in a series from 1891”.

Representatives of Waterco Ltd, on behalf of FCC, have carried out community engagement and communicated with relevant stakeholders to gain an understanding of the nature of the October 2023 flood event. This Report provides details of the flooding incident.

Across the entirety of Sandycroft, there were a total of 43 reports of internal flooding. The source of flooding can be attributed to a combination of watercourses and drainage systems exceeding capacity due to the high amounts of rainfall. The watercourses (ditches) flowing along Chester Road (designated as Main Rivers) exceeded their capacity resulting in flooding of Chester Road. Flood waters on Chester Road entered the drainage network which subsequently exceeded the drainage networks capacity causing flooding to properties.

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<sup>1</sup> <https://www.flintshire.gov.uk/en/PDFFiles/Flooding-and-Drainage/Flintshire-Local-Flood-Risk-Management-Strategy.pdf>.

The table below sets out the recommended actions required to reduce the flooding and the stakeholder required to undertake each action.

**Table 1 - Recommendations to Address Flooding**

| Ref | Stakeholder                         | Action                                                                                                                                                                                                                                                                                                            |
|-----|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01  | FCC Highways Authority              | Post event review of highway assets to ensure they are operational.                                                                                                                                                                                                                                               |
| 02  | FCC LLFA                            | Investigate the potential natural flood management in the upstream catchment as to attenuate flood flows.                                                                                                                                                                                                         |
| 03  | FCC LLFA / Highways Authority & NRW | Investigate local capacity improvements to mitigate flood risk, including the use of highways assets.                                                                                                                                                                                                             |
| 04  | FCC LLFA & NRW                      | Communicate with local communities to raise awareness of property level flood resilience measures that can be implemented to help mitigate flood risk.                                                                                                                                                            |
| 05  | NRW                                 | Continue to survey and maintain the Main Rivers in the area (Pentre Drain North, Pentre Drain South and Broughton Brook) to ensure they are free flowing.                                                                                                                                                         |
| 06  | NRW                                 | Consider a capital scheme to improve the tidal outfall and flap valves.                                                                                                                                                                                                                                           |
| 07  | NRW                                 | Investigate the feasibility of the implementation of pumping equipment either in a fixed pumping station or temporary sites to pump excessive storm flows away from areas at risk of flooding.                                                                                                                    |
| 08  | Sandycroft Flood Action Group       | Continue to engage with residents to help raise awareness of local issues surrounding flooding.                                                                                                                                                                                                                   |
| 09  | Property Owners / Residents         | Sign up to the free signing up to the NRW Flood Warning System and consider the implementation of property level flood resilience measures. These could include; the installation of non-return valves to prevent ingress of floodwater on private drainage systems and installing flood barriers or flood doors. |

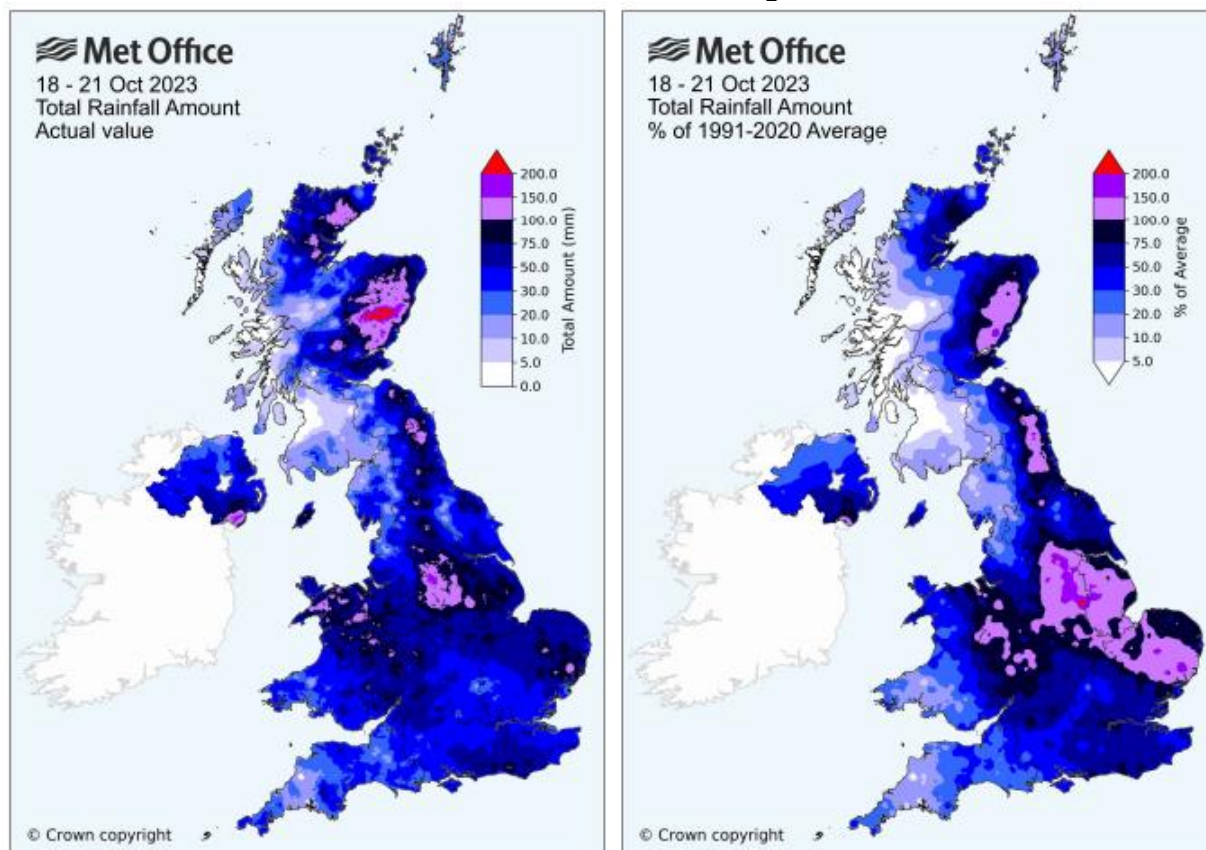
## **1.0 Introduction**

- 1.1 Since the introduction of the Flood and Water Management Act 2010 (FWMA) Flintshire County Council (FCC) is the designated Lead Local Flood Authority (LLFA).
- 1.2 Under Section 19 of the FWMA, FCC as the LLFA on becoming aware of a flood in its area must to the extent that it considers necessary or appropriate investigate and prepare a report.
- 1.3 Where a LLFA carries out an investigation, then the report must be published, and any relevant risk management authorities notified.
- 1.4 Waterco have been commissioned by FCC to carry out a Flood Investigation Report in relation to flooding in Sandycroft during Storm Babet which occurred in October 2023. Storm Babet caused internal and external flooding to residential properties in Sandycroft.
- 1.5 The purpose of this Section 19 (S19) Flood Investigation Report is to identify the cause of internal flooding to properties in Sandycroft during the October 2023 flood event. This report will provide an overview of flooding mechanisms, identify relevant Risk Management Authorities and stakeholders, and provide a list of recommendations.
- 1.6 The opinions expressed in this report and the comments and recommendations given are based on an assessment of available information.
- 1.7 The information, views and conclusions drawn are based, in part, on information supplied to Waterco by other parties. Waterco has proceeded in good faith on the assumption that this information is accurate. Waterco accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to Waterco from others.

## 2.0 Summary of Storm Babet

### National Context

- 2.1 Storm Babet brought heavy and persistent rainfall across much of the UK and ‘*was the third-wettest independent 3-day period for England and Wales in a series from 1891*’ according to the Met Office<sup>2</sup>. As shown in Figure 1, many parts of the UK received over 50mm of rain, with 75-100mm of rain recorded across areas of North Wales. Several areas across the UK received over 100% of the average rainfall amount for October.



**Figure 1 - Met Office Accumulated Daily Rainfall 18th-21st of October 2023**

- 2.2 Storm Babet was part of a wider period of heavy rainfall across the country. According to NRW, the 9 month period ending in March 2024 was the second wettest of any 9 month period recorded in North Wales, and the wettest 9-month period ending in the month of March. Storms over this period (such as Storm Babet) were characterised more by their prolonged rainfall rather than their intensity. Between September 2023 and March 2024, NRW issued 194 Flood Warnings and 3 Severe Flood Warnings.

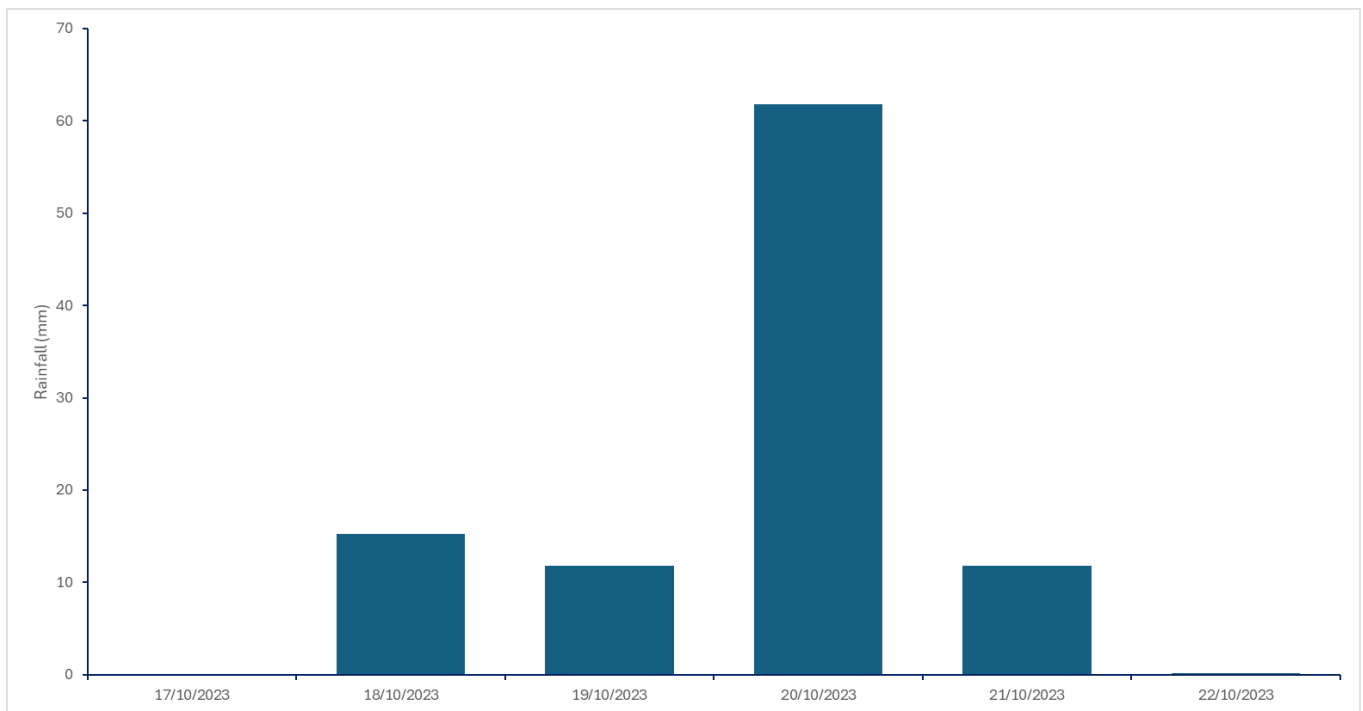
### Regional Context

- 2.3 Unlike most storms, Storm Babet did not pass over rapidly. This allowed multiple fronts to add more rainfall over a prolonged period of time. The evapotranspiration rate in October was low and rainfalls were frequent throughout the month, with high levels of antecedent rainfall on October 13<sup>th</sup> / 14<sup>th</sup> (27mm in Mold) leading to soils being close to saturation.
- 2.4 Rainfall records have been obtained from NRW’s Mold rain gauge<sup>3</sup>.

<sup>2</sup> Storm Babet Report [https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2023/2023\\_08\\_storm\\_babet.pdf](https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2023/2023_08_storm_babet.pdf)

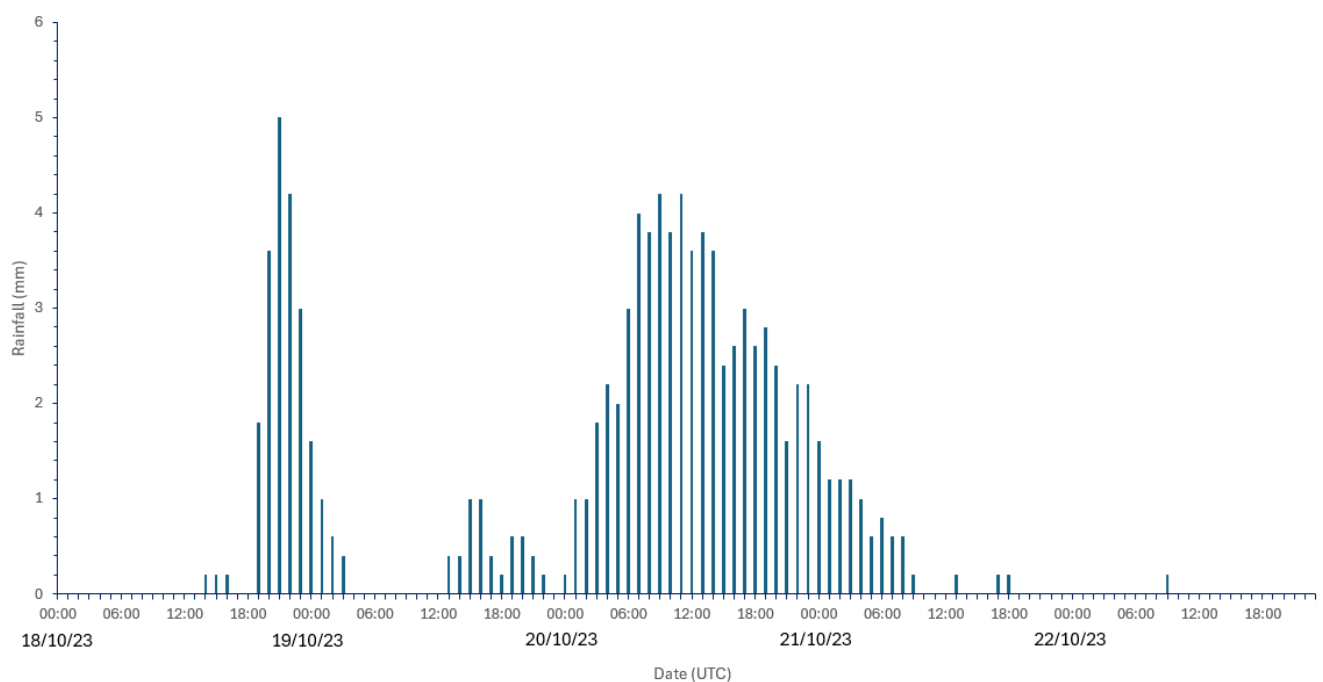
<sup>3</sup> <https://rivers-and-seas.naturalresources.wales/Station/1011?parameterType=2>

- 2.5 Figure 2 shows the rainfall in the days leading up to the flooding on the 20<sup>th</sup> October. Flintshire experienced rainfall two days prior to the 20<sup>th</sup> October, with 15.2mm of rainfall on the 18<sup>th</sup> and 11.8mm on the 19<sup>th</sup>. On 20<sup>th</sup> October, Mold rain gauge recorded 61.8mm of rainfall.



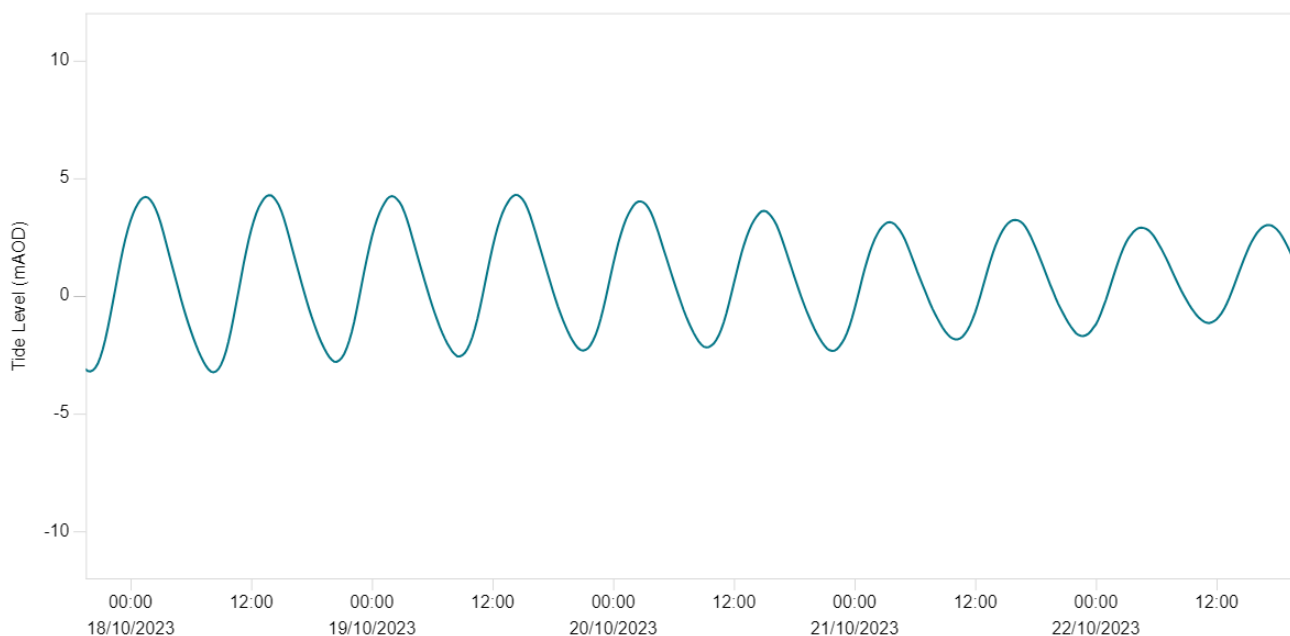
**Figure 2 - NRW Mold Rain Gauge- Daily Rainfall From 18<sup>th</sup>-21<sup>st</sup> October**

- 2.6 Figure 3 shows that there was a period of intense rainfall on Wednesday the 18<sup>th</sup> October which began at 19:00pm and peaked between 21:00-22:00 with 5mm of rainfall per hour. There was some additional rainfall on Thursday the 19<sup>th</sup> October peaking at approximately 1mm per hour. During 20<sup>th</sup> October, rainfall was prolonged with peak rainfall intensities at approximately 4.2mm per hour.



**Figure 3 - Hourly Rainfall Between the 18th and 22nd of October**

- 2.7 Flood Estimation Handbook (FEH) analysis estimates that a total rainfall of 61.8mm over 24 hours (on the 20<sup>th</sup> October), as recorded at the NRW Mold rain gauge, equates to a return period of 1 in 20 years.
- 2.8 The 73.6mm of rainfall over a 48-hour period between the 19<sup>th</sup> and 20<sup>th</sup> of October (recorded at the NRW Mold rain gauge) equates to a return period of approximately 1 in 23 years. The 88.8mm of rainfall over a 72-hour period between the 18<sup>th</sup> and 20<sup>th</sup> of October equates to an approximate return period of 1 in 38 years.
- 2.9 Due to high amounts of rainfall throughout October, there would have been a lack of soil water storage and in consequence, higher and quicker runoff resulting in flooding.
- 2.10 Tide levels have been obtained from the Liverpool tide gauge<sup>4</sup> (closest to Sandycroft). Rainfall during Storm Babet was at its heaviest between 10am and 2pm on the 20<sup>th</sup> of October, whilst high tide on the 20<sup>th</sup> of October was at 3pm. The high tide immediately following the heavy rainfall will have restricted water from the surrounding watercourses freely discharging into the Dee.



**Figure 4 - Tide Level (m AOD) between 18<sup>th</sup> and 22<sup>nd</sup> of October:  
Liverpool Tidal Gauge**

## Local Context

- 2.11 Community engagement was undertaken by Waterco in Sandycroft on the 31<sup>st</sup> of October and the 1<sup>st</sup> of November 2023. The purpose of the community engagement exercise was to gather information on the number of properties affected and the flooding mechanisms / source(s). A questionnaire was also posted to residents to seek additional feedback. Table 2 shows a summary of the number of responses received.

<sup>4</sup> <https://rivers-and-seas.naturalresources.wales/Station/70139?parameterType=3>

**Table 2 - Summary of Community Engagement Undertaken in Sandycroft**

| <b>Location</b>                | <b>Verbal responses received (properties)</b> | <b>Number of postal / email responses</b> |
|--------------------------------|-----------------------------------------------|-------------------------------------------|
| Church View                    | 9                                             | 5                                         |
| Gladstone Terrace              | 1                                             | 0                                         |
| Hamilton Avenue                | 9                                             | 10                                        |
| Bernsdale Close                | 9                                             | 10                                        |
| Phoenix Street                 | 3                                             | 4                                         |
| Fairway                        | 5                                             | 0                                         |
| Lawrence Street                | 2                                             | 0                                         |
| Wood Street                    | 4                                             | 2                                         |
| Rosslyn Close                  | 4                                             | 1                                         |
| Chester Road (Bridge Cottages) | 0                                             | 1                                         |
| Chester Road (Sandycroft)      | 9                                             | 5                                         |
| Chester Road (Pentre)          | 4                                             | 3                                         |
| Glendale Avenue                | 1                                             | 0                                         |

2.12 In addition to the community engagement exercise, a number of stakeholders were consulted regarding any information on flooding in Sandycroft:

- **Natural Resources Wales** – provided information on calls received during Storm Babet; a record of properties known to have flooded; and correspondence with North Wales Fire & Rescue Service.
- **FCC Highways Authority** – provided a call log showing where members of public had reporting flooding.
- **Dŵr Cymru Welsh Water** – held a post-Storm Babet meeting with FCC and Waterco to share details of asset performance and flooding records during Storm Babet.

2.13 Table 3 provides a summary of the locations and reported effects of flooding following the community engagement exercise and stakeholder engagement.

**Table 3 - Summary of Flooding in Sandycroft During Storm Babet**

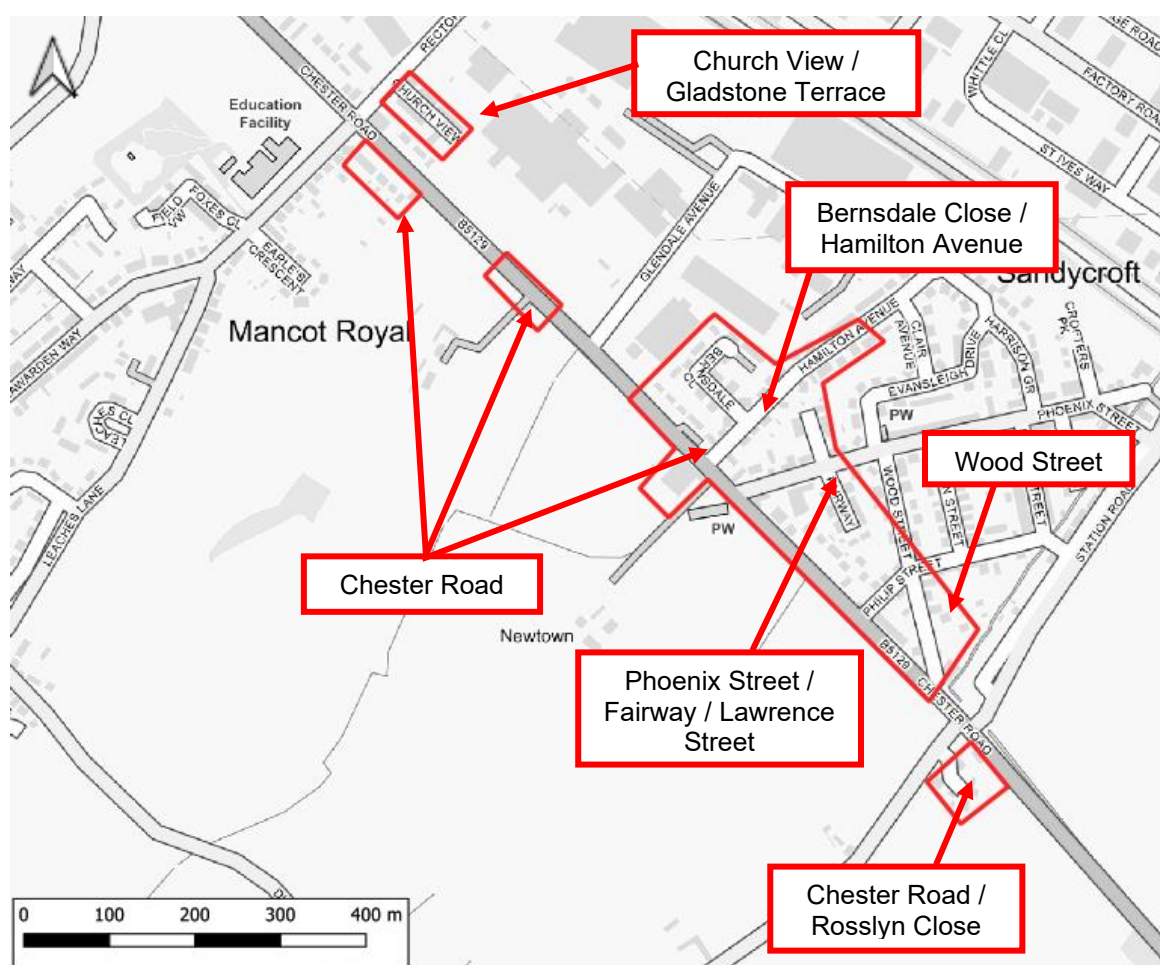
| Location                       | Internal Flooding | Impact                                                                                                                                                                                                    |
|--------------------------------|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Church View                    | 13                | Internal flooding to 13 properties, driveway / garden flooding confirmed to at least 1 other                                                                                                              |
| Gladstone Terrace              | 1                 | Internal flooding to 1 property, driveway / garden flooding confirmed to at least 1 other                                                                                                                 |
| Hamilton Avenue                | 13                | Internal flooding to 13 properties, driveway / garden flooding confirmed to at least 7 others                                                                                                             |
| Bernsdale Close                | 4                 | Internal flooding to 4 properties, driveway / garden flooding confirmed to at least 11 others                                                                                                             |
| Phoenix Street                 | 0                 | Initial report of flooding from FCC - no reports of internal flooding from community engagement. External flooding to at least 7 properties                                                               |
| Lawrence Street                | 0                 | FCC and NRW were unsure if flooding occurred, community engagement found no flooding to properties, only flooding on street                                                                               |
| Fairway                        | 0                 | Initial reports of flooding on Fairway. Community engagement found zero reports of internal flooding, however responses were not received from all properties. External flooding to at least 5 properties |
| Wood Street                    | 3                 | Internal flooding to 3 properties, driveway / garden flooding confirmed to at least 4 others                                                                                                              |
| Rhoslyn Close                  | 0                 | External flooding to garden reported at 1 property                                                                                                                                                        |
| Chester Road                   | 9                 | Internal flooding to 9 properties, driveway / garden flooding confirmed to at least 6 others                                                                                                              |
| Glendale Avenue                | 0                 | FCC had report of flooding however no flooding reported during community engagement                                                                                                                       |
| <b>Total Internal Flooding</b> | <b>43</b>         | <b>Number of internal flooding incidents based on community engagement exercises and stakeholder engagement. Flooding to additional properties may have occurred but not reported to FCC.</b>             |

2.14 An additional visit was undertaken by Waterco on 28/05/2024 to inspect areas of interest across Sandycroft. A photographic record of the site visit is included in Appendix A.

## 3.0 Study Area Overview

### Location

- 3.1 The area affected by flooding during Storm Babet in Sandycroft covered in this report stretches from Rosslyn Close in the south-eastern corner of Sandycroft to Church View in the north-western corner towards Pentre and Mancot. Flooding to properties in Pentre and Mancot is subject of further investigation and will be detailed in a separate S19 Flood Investigation Report.
- 3.2 For the purposes of this report, the investigation focuses on the following streets where flooding was reported: Church View, Gladstone Terrace, Chester Road, Bernsdale Close, Hamilton Avenue, Phoenix Street, Fairway, Lawrence Street, Wood Street and Rosslyn Close. Figure 5 shows the approximate outline of areas impacted by flooding during Storm Babet. The approximate flooding locations are also shown on the Location Plan in Appendix B.



**Figure 5 - Location Plan of Reported Flooding Areas**  
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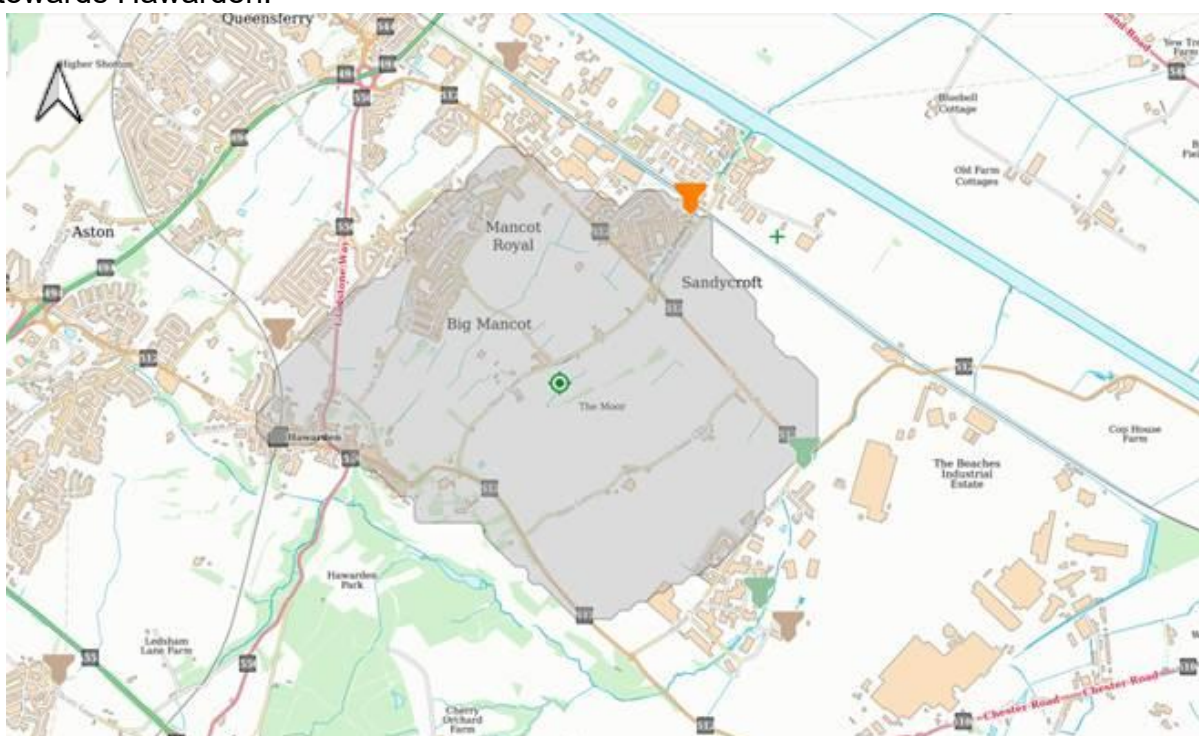
### Geology

- 3.3 The British Geological Survey (BGS) online mapping (1:50,000 scale) indicates that Sandycroft, inclusive of the study area considered by this report, is underlain by superficial tidal flat deposits, generally comprising clay, silt, and sand. The superficial deposits are identified as being underlain by interbedded mudstone, siltstone and sandstone.

- 3.4 A borehole record, obtained from the BGS GeoIndex (BGS ID: SJ36NW428), indicated a standing water table of 2.3m below ground level in October 1980. The borehole is located to the east of Sandycroft adjacent to Station Road / Factory Road. The high-water table leaves little sub-surface storage for rainfall in the underlying soils when rainfall arrives. The borehole record along with a borehole location plan is included in Appendix C.

### Hydrological Setting

- 3.5 Watercourses within and adjacent to Sandycroft have been heavily modified over the years. Broughton Brook (also known as Sandycroft Drain North) flows south-east along Chester Road before orientating north-east towards its outfall into the River Dee. Pentre Drain North and Pentre Drain South flow parallel to Chester Road and drain into Broughton Brook. An unnamed watercourse flows north-east through agricultural land to the south of Sandycroft. The unnamed watercourse flows into Pentre Drain South. A watercourse plan is included in Appendix D.
- 3.6 Historical maps obtained from the National Library of Scotland<sup>5</sup> shows that Pentre Drain North was predominantly an open channel before the 1950's. Urbanisation since the 1950's has resulted in Pentre Drain North becoming culverted along Chester Road.
- 3.7 Figure 6, derived from the FEH web service<sup>6</sup>, shows that the catchment area for Pentre Drain South and the associated unnamed watercourse covers 5.5km<sup>2</sup> and extends towards Hawarden.



**Figure 6 – Pentre Drain South Catchment**

Source: UK Centre of Ecology & Hydrology

- 3.8 As shown by the LiDAR extract in Appendix E, Sandycroft is very flat, with the majority of the urbanised area lying between 4 meters Above Ordnance Datum (m AOD) and 6m AOD. The catchment area draining to Broughton Brook, south-west of Sandycroft, is relatively steeply sloping. The steep nature of the catchment would result in overland

<sup>5</sup> National Library of Scotland - <https://maps.nls.uk/>

<sup>6</sup> UK Centre of Ecology & Hydrology - <https://fehweb.ceh.ac.uk/Map>

flows being accelerated towards Sandycroft with little to no attenuation of flows in the upstream catchment.

## **Drainage**

- 3.9 Public sewer records have been obtained from Dŵr Cymru Welsh Water<sup>7</sup> (DCWW). Sandycroft is served by surface water, combined and foul sewers. The DCWW sewer plans are included in Appendix F.
- 3.10 Many areas in Sandycroft are served by surface water sewers including Wood Street, Fairway, Phoenix Street, Hamilton Avenue and Bernsdale Close. The surface water sewers are either shown to discharge into the public combined sewer system or into Broughton Brook. 2no. combined sewer overflows discharge to Broughton Brook at the north-eastern edge of Sandycroft (near Sandycroft Community Centre). The combined sewer overflows are likely to function in the event that the capacity of Sandycroft sewage pumping station is reached.

## **NRW Flood Maps**

- 3.11 The Natural Resources Wales (NRW) 'Flood Map for Planning'<sup>8</sup> (Appendix G) shows that the Majority of Sandycroft is located within Flood Zone 3 – meaning it has a 1% (1 in 100) or greater annual probability of fluvial flooding (from rivers), including the effects of climate change, and / or a 0.5% (1 in 200) or greater annual probability of flooding from the sea, including the effects of climate change.
- 3.12 The NRW Flood Zones-Rivers map (Appendix G) shows that the majority of Sandycroft, including the majority of locations which recorded internal flooding during Storm Babet, are located in Flood Zones 2 and 3 for flooding from rivers. Flood Zone 2 is defined as an area with between a 0.1% (1 in 1000) and 1% annual probability of flooding from rivers, including the effects of climate change. Flood Zone 3 is defined as an area with a greater than 1% annual probability of flooding from rivers, including the effects of climate change. The Flood Zone 2 and 3 extents appear to be associated with Broughton Brook and its tributaries.
- 3.13 The NRW 'Flood Zones - Surface Water and Small Watercourses' map (Appendix G) indicates that the majority of the urban area of Sandycroft is within surface water Flood Zone 1, meaning it has a less than 0.1% annual probability of flooding. Church View, Gladstone Terrace and Fairway are located in surface water Flood Zone 2. Flood Zone 2 is defined as having between a 1% and 0.1% annual probability of surface water flooding, including the effects of climate change.
- 3.14 The NRW 'Flood Zones - Surface Water and Small Watercourses' map (Appendix G) identifies a number of surface water flow routes orientating towards Chester Road from agricultural land south-west of Sandycroft. The flow routes are associated with ordinary watercourses (ditches) which drain agricultural land west of Sandycroft and discharge to Broughton Brook (via Pentre Drain South).

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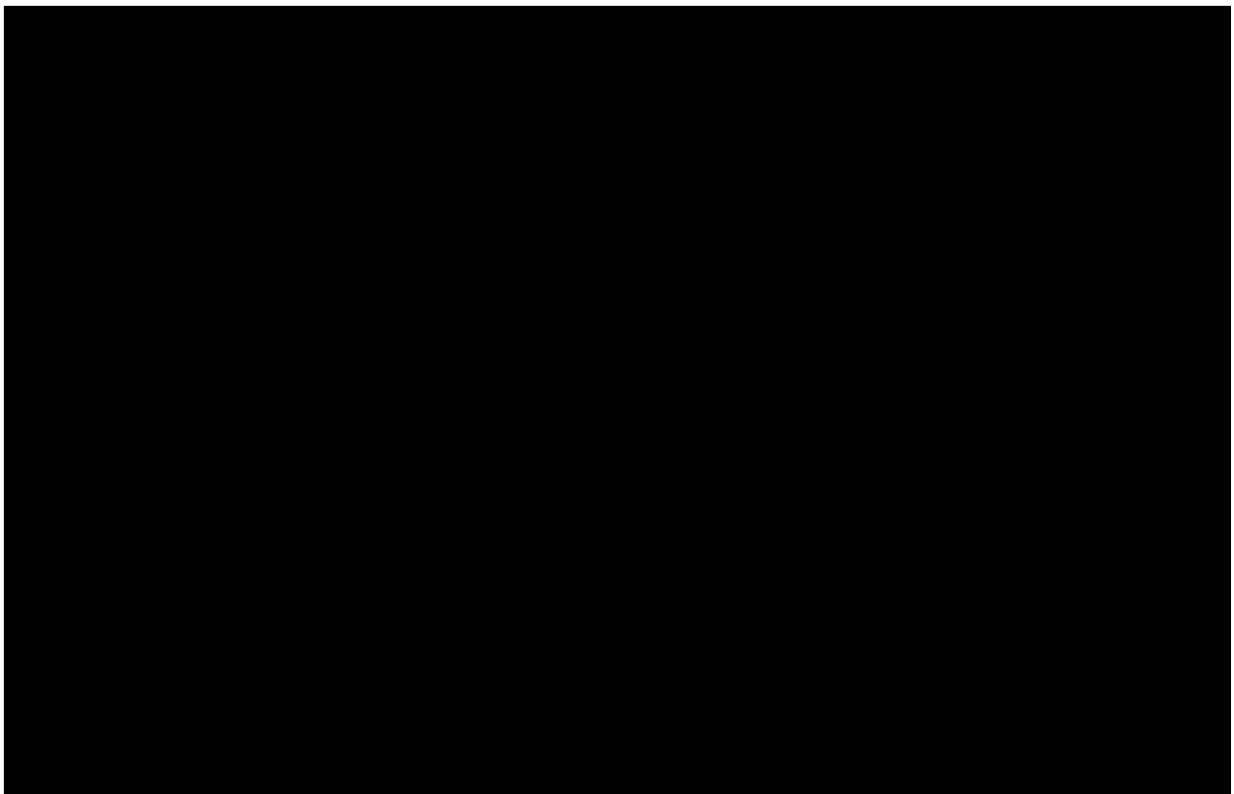
<sup>7</sup> DCWW sewer plans - <https://developers.dwrcymru.com/en/applications/planning/locating-our-water-pipes-and-sewers>

<sup>8</sup> NRW Flood Map for Planning <https://flood-map-for-planning.naturalresources.wales/>

## 4.0 Flood Locations, Descriptions and Mechanisms

### Church View / Gladstone Terrace

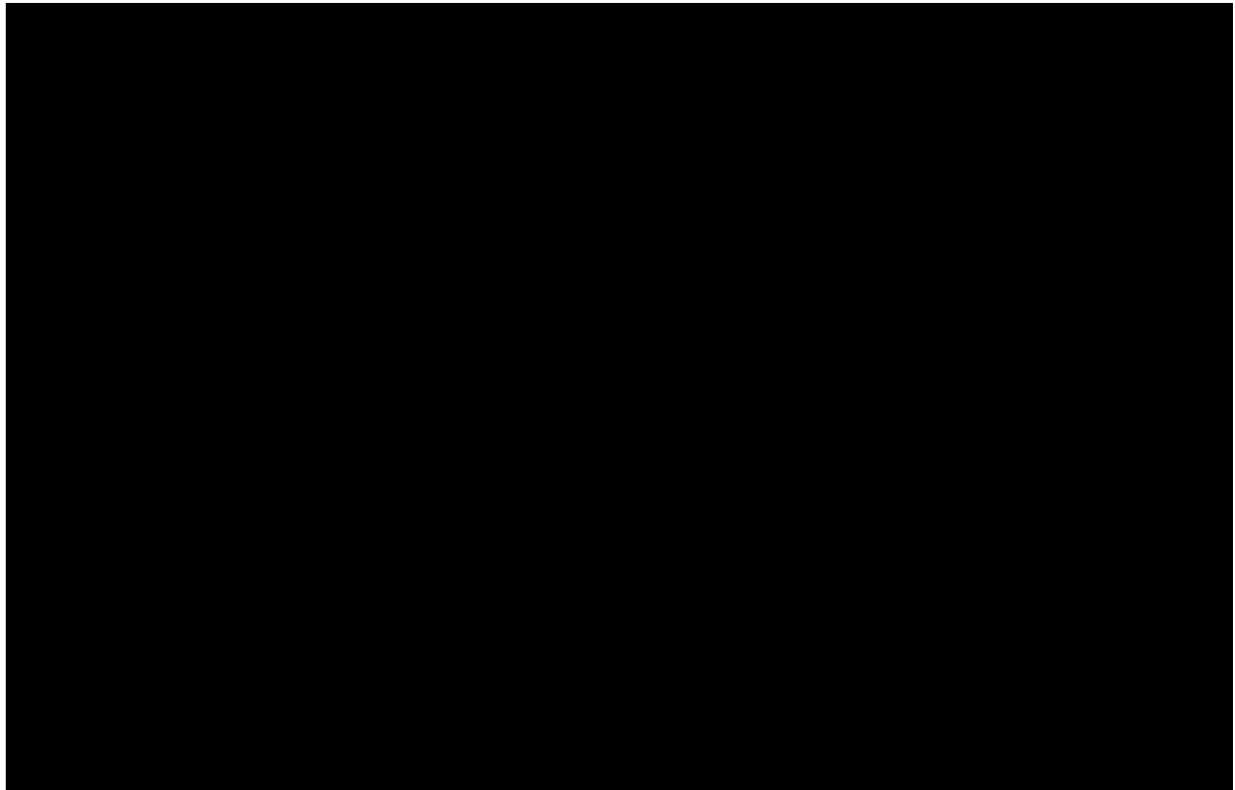
- 4.1 Church view and Gladstone Terrace are located off Rectors Lane and Chester Road. The houses in this area are served by a public foul sewer which flows north-west and drains into the wider combined sewer system flowing along Chester Road. A public surface water sewer flows south along Gladstone Terrace and is assumed to discharge into a culverted section of Pentre Drain North.
- 4.2 During the heavy rainfall experienced during Storm Babet, residents reported that the public sewer system exceeded its capacity. The foul manholes were also reported to have surcharged causing flooding, as well as floodwaters rising thorough internal drainage systems. Residents also report water coming through the floors of their properties.
- 4.3 It is understood that flooding of local drainage systems was exacerbated by flooding from agricultural land south-west of Sandycroft exceeding the capacity of Pentre Drain. Flood flows from Pentre Drain flowed onto Chester Road and entered local drainage systems. Figure 7 provides a summary of the reported flooding.



**Figure 7 - Church View / Gladstone Terrace Incident Area**  
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### **Chester Road (Pentre)**

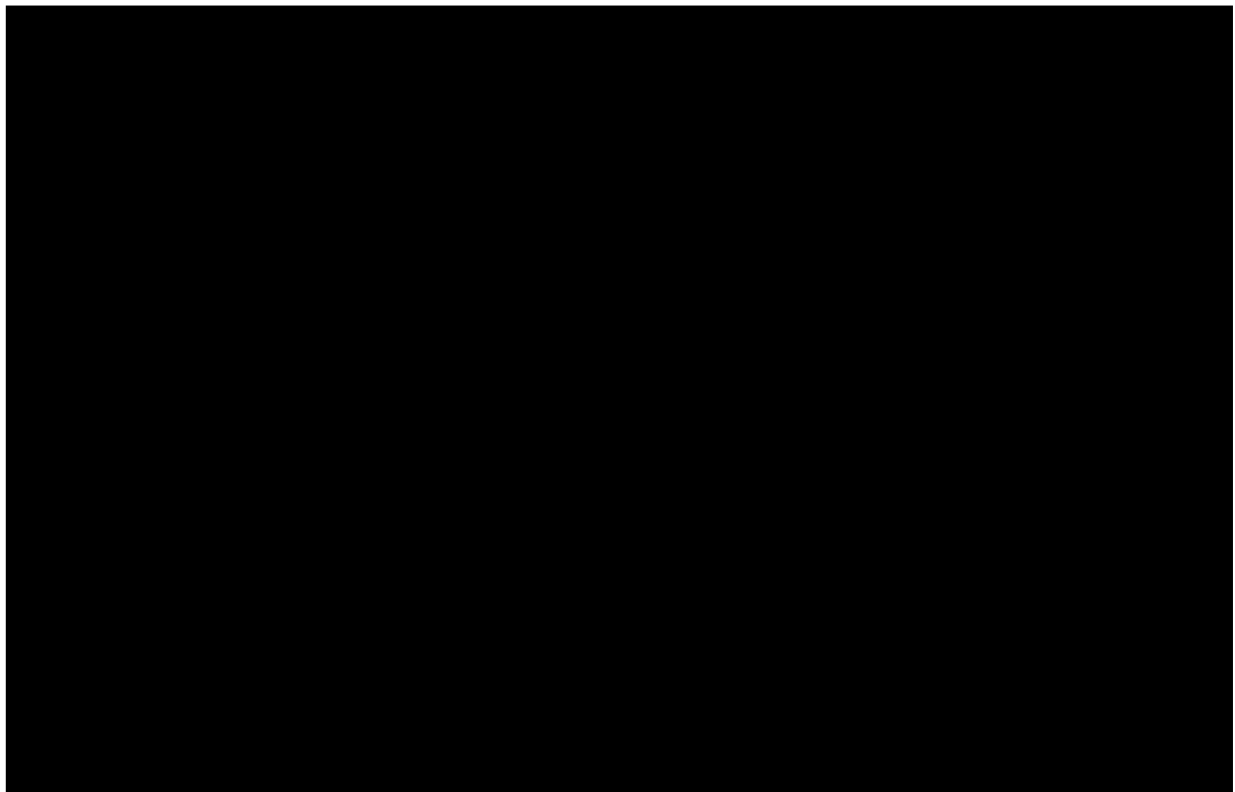
- 4.4 During Storm Babet the fields to the south-west of Chester Road were inundated with water and the watercourses that run parallel to Chester Road (Pentre Drain North and Pentre Drain South) exceeded their capacity. Furthermore, residents off Chester Road reported that the drainage network was blocked with debris and leaves.
- 4.5 The flooding to the field and watercourses adjacent to Chester Road was caused by the heavy rainfall during Storm Babet. Flood water from agricultural land overflowed onto Chester Road and entered drainage systems. Figure 8 provides a summary of the reported flooding.



**Figure 8 - Chester Road (Pentre) Incident Area**  
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### **Chester Road / Hamilton Avenue / Bernsdale Close**

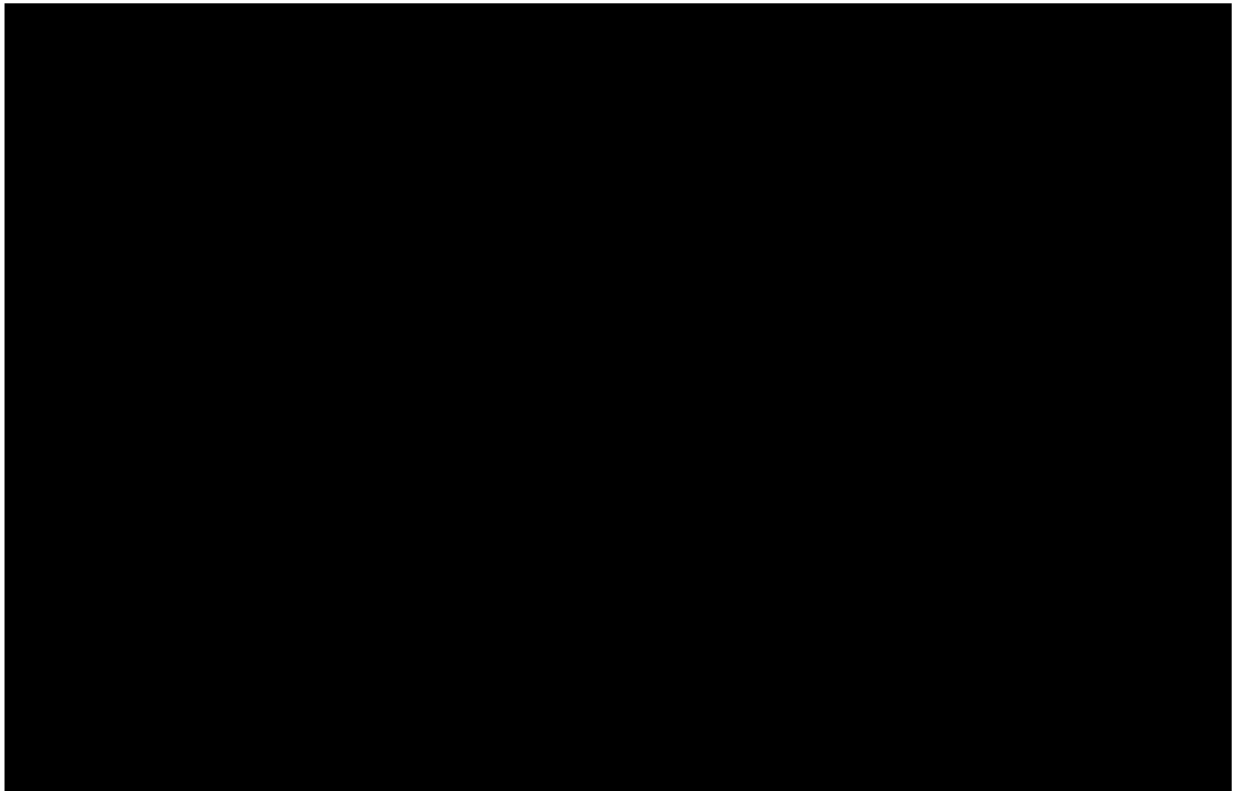
- 4.6 There are a total of 20 reports of internal flooding along Bernsdale Close, Hamilton Avenue and the section of Chester Road directly adjacent to Hamilton Avenue. As with the wider flooding issues reported across Sandycroft, there are reports that flooding from the watercourses along Chester Road overflowed and entered drainage systems, resulting in the surcharge of drainage systems.
- 4.7 The DCWW sewer plans (Appendix F) show a pumping station on Hamilton Avenue. Correspondence with DCWW suggests that all their assets were operational during Storm Babet. Infrastructure such as sewers and pumping stations are not designed to accommodate flood water derived from exceedance of watercourses.
- 4.8 There were reported issues with water pumped from properties, with 1 resident located on the northern end of Hamilton Avenue reporting that external flooding was caused by water being pumped from further down Hamilton Avenue. Flood waters from Chester Road were reportedly being pushed towards properties and gardens by passing traffic. Figure 9 provides a summary of the reported flooding.



**Figure 9 - Chester Road / Hamilton Avenue / Bernsdale Close Incident Area**  
Contains OS Data © Crown Copyright (2024)

## **Phoenix Street / Lawrence Street / Fairway**

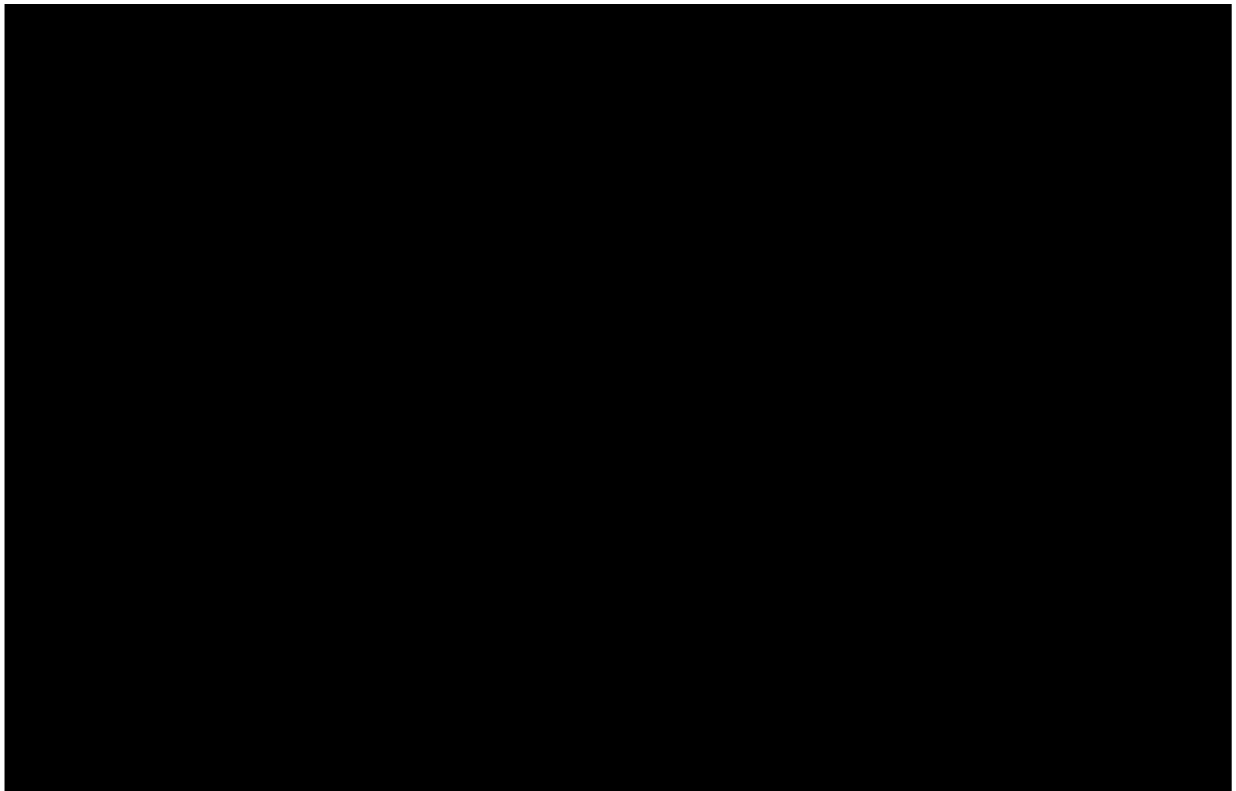
- 4.9 Phoenix Street, Lawrence Street and Fairway are located off Chester Road which was inundated during Storm Babet. There were no reports of internal flooding in this area however several properties experienced external flooding to driveways. The flooding was a result of flood flows from agricultural land south-west of Sandycroft exceeding the capacity of Pentre Drain South causing flooding to Chester Road. Flooding from the watercourses along Chester Road overflowed and entered drainage systems, resulting in the surcharge of drainage systems. Figure 10 provides a summary of the reported flooding.



**Figure 10 - Phoenix Street / Fairway / Lawrence Street Incident Area**  
Contains OS Data © Crown Copyright (2024)

## **Wood Street / Chester Road**

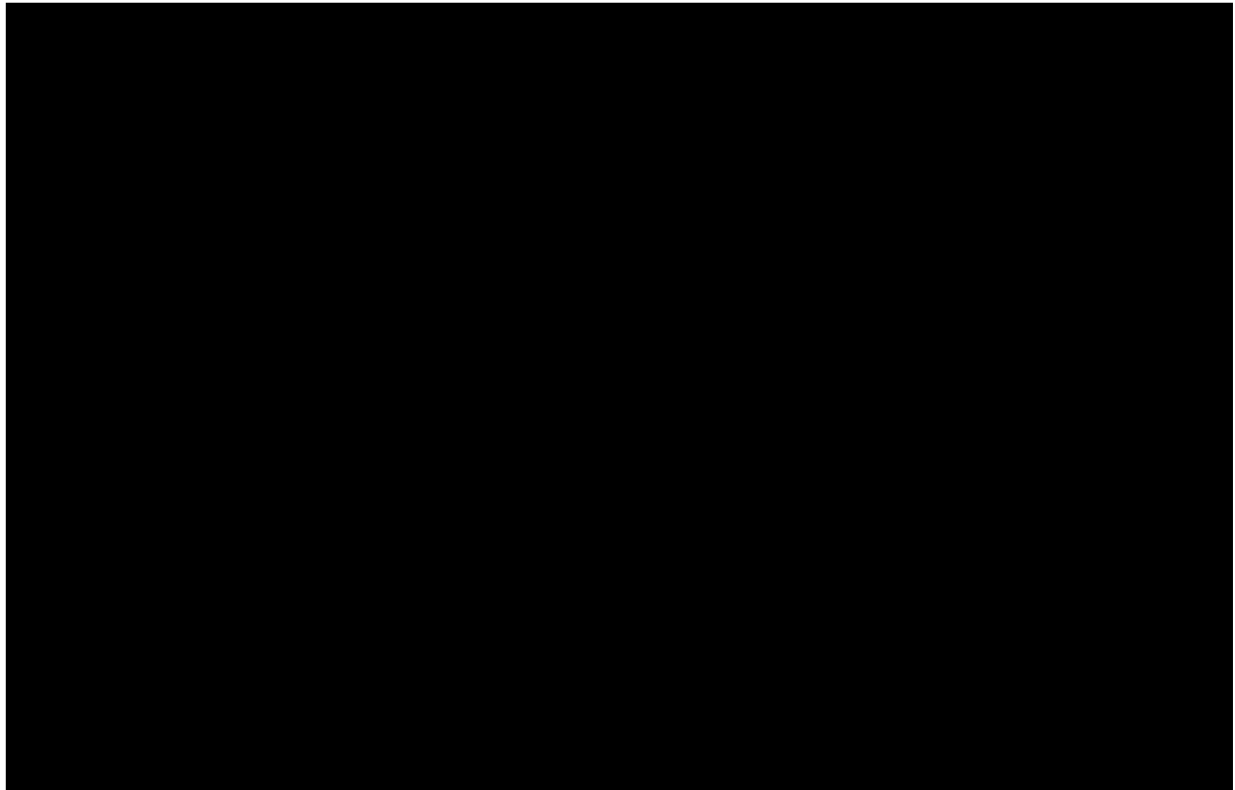
- 4.10 Broughton Brook is located directly east of Wood Street. 1 resident reported that floodwaters along Wood Street came from Broughton Brook as water backed up as the tide gates were closed.
- 4.11 Floodwaters along Chester Road originate from the watercourses (Pentre Drain South and Pentre Drain North) exceeding their capacity and overflowing onto the road. Reports from residents stated that passing traffic pushed floodwaters onto driveways. The 1 reported internal flooding incident in this area originates from exceedance of a private drainage system. Exceedance of drainage systems is linked to flooding from the watercourses along Chester Road. Floodwater on Chester Road entered drainage systems resulting in their exceedance. Figure 11 provides a summary of the reported flooding.



**Figure 11 - Wood Street / Chester Road Incident Area**  
Contains OS Data © Crown Copyright (2024)

### **Chester Road / Rosslyn Close**

- 4.12 The reported flooding is a result of Broughton Brook exceeding its capacity and flowing onto Chester Road. Flood water on Chester Road flowed into adjacent properties.
- 4.13 There were no reports of internal flooding along Rosslyn Close. 1 resident reported external flooding, with floodwaters originating from the fields south of the property. Figure 12 provides a summary of the reported flooding.



**Figure 12 - Chester Road (South) / Rosslyn Close Incident Area**  
Contains OS Data © Crown Copyright (2024)

- 4.14 A photographic record of images received of the flooding during Storm Babet is included as Appendix H.

## **Other Areas**

### **Glendale Avenue**

- 4.15 FCC's call log had a report from North Wales Police stating that Glendale Avenue was closed. Waterco's community engagement did not identify any internal flooding reports along Glendale Avenue.

## 5 Relevant Parties Communication Register

- 5.1 The table below provides the details of communications that have taken place with relevant parties up to the time of writing this report. Relevant parties are considered to be all authorities and stakeholders directly involved and responsible for the flood risk management, all property owners affected by the flood event and affecting the flood event, and all parties who may be able to provide information salient to the flood investigation.

**Table 4 - Relevant Parties Communications Register**

| Contact                                            | Communications                                                                                                                                                      |
|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Local Residents                                    | Community engagement undertaken on 31/10/2023 and 01/11/2023.<br><br>Questionnaires and photographs returned to Waterco.                                            |
| Broughton, Bretton & Sandycroft Flood Action Group | Meeting on 22/03/2024 to share information of flood locations and sources.                                                                                          |
| Flintshire County Council (FCC)                    | Shared details of call logs and confirmed flooding locations.                                                                                                       |
| Dŵr Cymru Welsh Water DCWW                         | Meeting on the 19/02/2024 to share information of flood locations and sources.                                                                                      |
| Natural Resources Wales (NRW)                      | Email consultation from NRW with information on flood locations and sources. NRW also shared data from North Wales Fire and Rescue (on callouts / flood locations). |
| North Wales Fire & Rescue                          |                                                                                                                                                                     |

## **6 Conclusions**

- 6.1 Waterco Ltd. were appointed by FCC to prepare a Flood Investigation Report for Sandycroft following flooding from Storm Babet on the 20<sup>th</sup> of October 2023. The investigation focused on the following areas which were initially identified FCC: Hamilton Avenue, Bernsdale Close, Phoenix Street, Church View, Gladstone Terrace, Lawrence Street, Fairway, Wood Street, Rosslyn Close and Chester Road.
- 6.2 Internal flooding was confirmed along Hamilton Avenue (13), Bernsdale Close (4), Church View (13), Gladstone Terrace (1), Wood Street (3) and Chester Road (9).
- 6.3 Rainfall experienced during Storm Babet was prolonged and steady, and high levels of rainfall throughout October meant soils were already saturated which led to faster runoff rates.
- 6.4 Across the entirety of Sandycroft, there were a total of 43 reports of internal flooding. The source of flooding can be attributed to a combination of watercourses and drainage systems exceeding capacity due to the high amounts of rainfall. The watercourses (ditches) flowing along Chester Road (designated as Main Rivers) exceeded their capacity resulting in flooding of Chester Road. Flood waters on Chester Road entered the drainage network which subsequently exceeded the drainage networks capacity causing flooding to properties.

## 7 Recommendations

7.1 Table 5 below sets out the recommended actions required to reduce the flooding and the stakeholder required to undertake each action.

**Table 5 - Recommendations to Address Flooding**

| Ref | Stakeholder                         | Action                                                                                                                                                                                                                                                                                                            |
|-----|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 01  | FCC Highways Authority              | Post event review of highway assets to ensure they are operational.                                                                                                                                                                                                                                               |
| 02  | FCC LLFA                            | Investigate the potential natural flood management in the upstream catchment as to attenuate flood flows.                                                                                                                                                                                                         |
| 03  | FCC LLFA / Highways Authority & NRW | Investigate local capacity improvements to mitigate flood risk, including the use of highways assets.                                                                                                                                                                                                             |
| 04  | FCC LLFA & NRW                      | Communicate with local communities to raise awareness of property level flood resilience measures that can be implemented to help mitigate flood risk.                                                                                                                                                            |
| 05  | NRW                                 | Continue to survey and maintain the Main Rivers in the area (Pentre Drain North, Pentre Drain South and Broughton Brook) to ensure they are free flowing.                                                                                                                                                         |
| 06  | NRW                                 | Consider a capital scheme to improve the tidal outfall and flap valves.                                                                                                                                                                                                                                           |
| 07  | NRW                                 | Investigate the feasibility of the implementation of pumping equipment either in a fixed pumping station or temporary sites to pump excessive storm flows away from areas at risk of flooding.                                                                                                                    |
| 08  | Sandycroft Flood Action Group       | Continue to engage with residents to help raise awareness of local issues surrounding flooding.                                                                                                                                                                                                                   |
| 09  | Property Owners / Residents         | Sign up to the free signing up to the NRW Flood Warning System and consider the implementation of property level flood resilience measures. These could include; the installation of non-return valves to prevent ingress of floodwater on private drainage systems and installing flood barriers or flood doors. |

# **APPENDIX A**

## **Waterco Photographic Record**

|                                |                                                                                    |
|--------------------------------|------------------------------------------------------------------------------------|
| Photo No.1                     |                                                                                    |
| Date: 28/05/2024               |  |
| Description:<br>NRW Tidal Gate |                                                                                    |

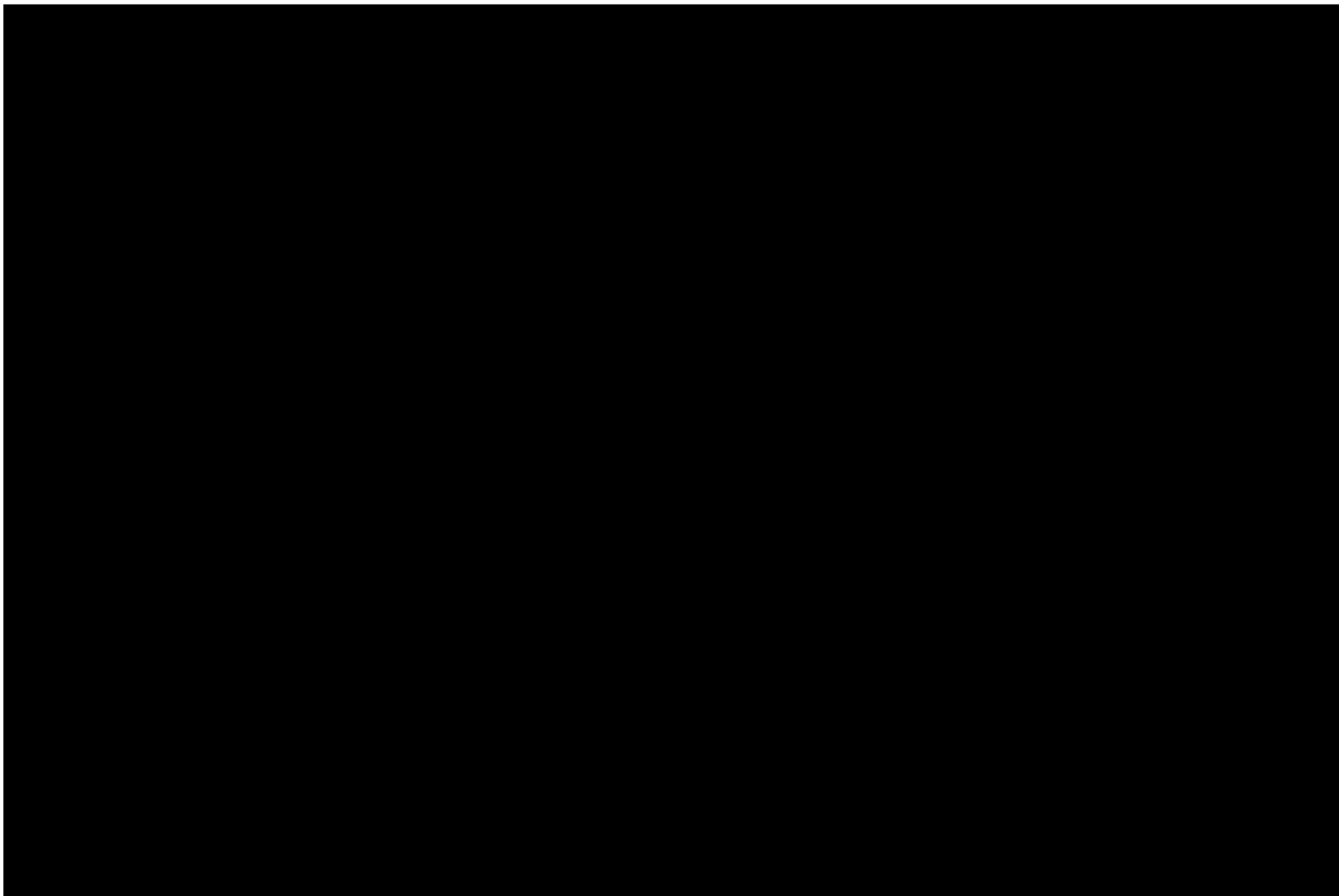
|                                    |                                                                                      |
|------------------------------------|--------------------------------------------------------------------------------------|
| Photo No. 2                        |                                                                                      |
| Date: 28/05/2024                   |  |
| Description:<br>Pentre Drain South |                                                                                      |

|                                        |                                                                                    |
|----------------------------------------|------------------------------------------------------------------------------------|
| Photo No.3                             |                                                                                    |
| Date: 28/05/2024                       |                                                                                    |
| Description:<br><br>Pentre Drain North |  |

|                                                                                                        |                                                                                      |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Photo No. 4                                                                                            |                                                                                      |
| Date: 28/05/2024                                                                                       |                                                                                      |
| Description:<br><br>Confluence of the unnamed watercourse from field to Pentre Drain South (overgrown) |  |

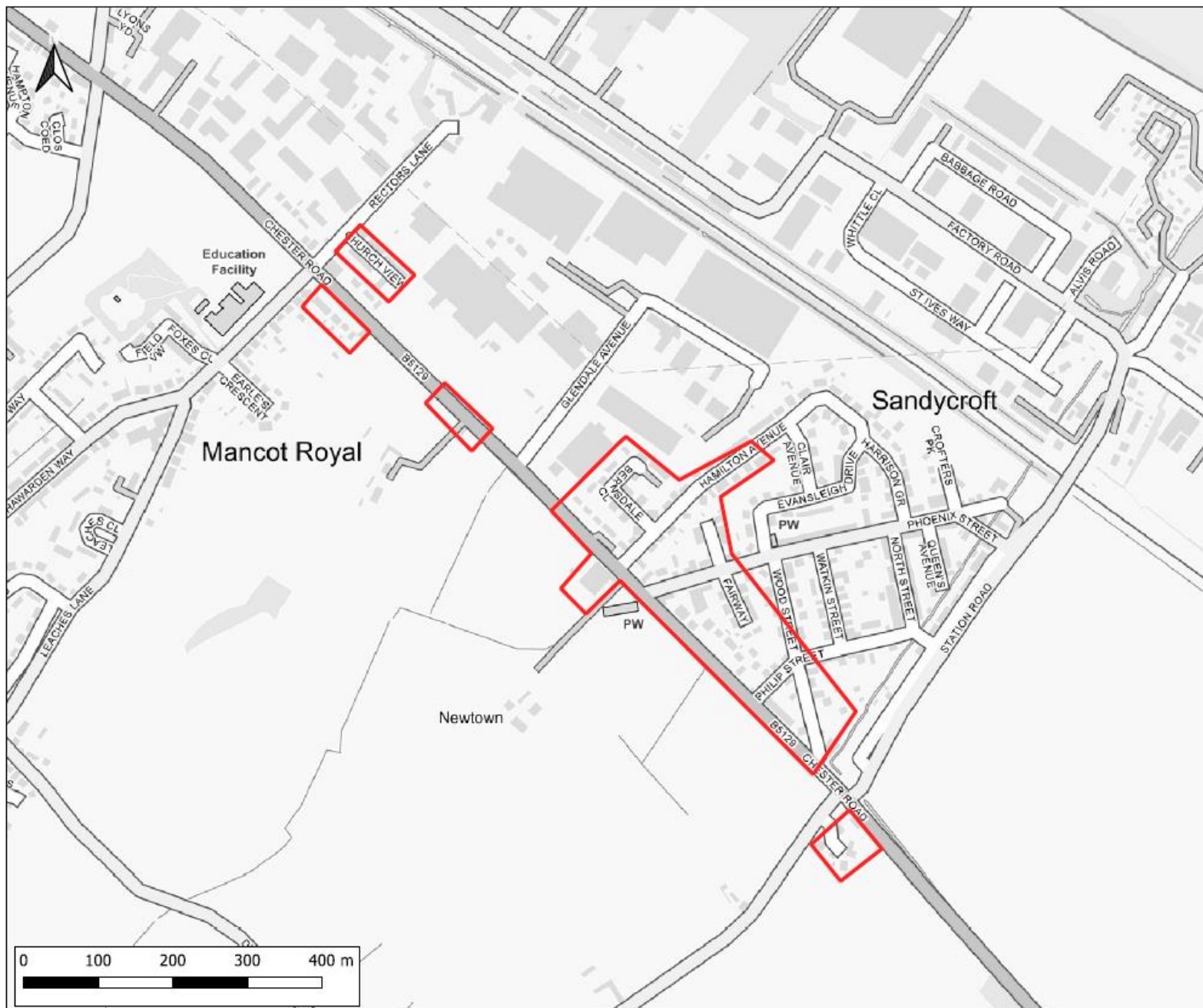
|                                                                                                       |                                                                                    |
|-------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Photo No.5                                                                                            |                                                                                    |
| <b>Date: 28/05/2024</b><br><b>Description:</b><br>Unnamed watercourse in fields south of Chester Road |  |

|                                                                                                       |                                                                                      |
|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Photo No. 6                                                                                           |                                                                                      |
| <b>Date: 28/05/2024</b><br><b>Description:</b><br>Unnamed watercourse in fields south of Chester Road |  |



# **APPENDIX B**

## **Reported Flooding Areas**



Confirmed flooding based on door knocking exercises and stakeholder engagement. Additional flooding may have occurred but not reported to Waterco

#### LEGEND

 Areas Impacted by Storm Babet



SCHEME:

Sandycroft

PLOT TITLE:

Location Plan

PLOT STATUS:

DRAFT

DATE:

28-03-2024

DRAWN:

IT

CHECKED:

AW

APPROVED:

MW

PLOT SCALE AT A3:

1:5000

PLOT NAME:

14113\_Location\_Plan

REVISION:

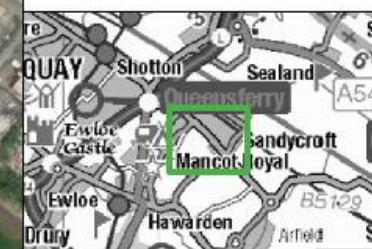
-



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

#### LEGEND

 Site Boundary



CLIENT:



SCHEME:

Sandycroft

PLOT TITLE:

Aerial Plan

PLOT STATUS:

FINAL

DATE:  
28-03-2024

DRAWN:

RM

CHECKED:

AW

APPROVED:

MW

PLOT SCALE AT A3:

1:5000

PLOT NAME:

14113\_Aerial\_Plan

REVISION:

-

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BASEMAP: WORLD IMAGERY. SOURCES: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRIID, IGN, IGP, SWISSTOPO, GIS USER COMMUNITY

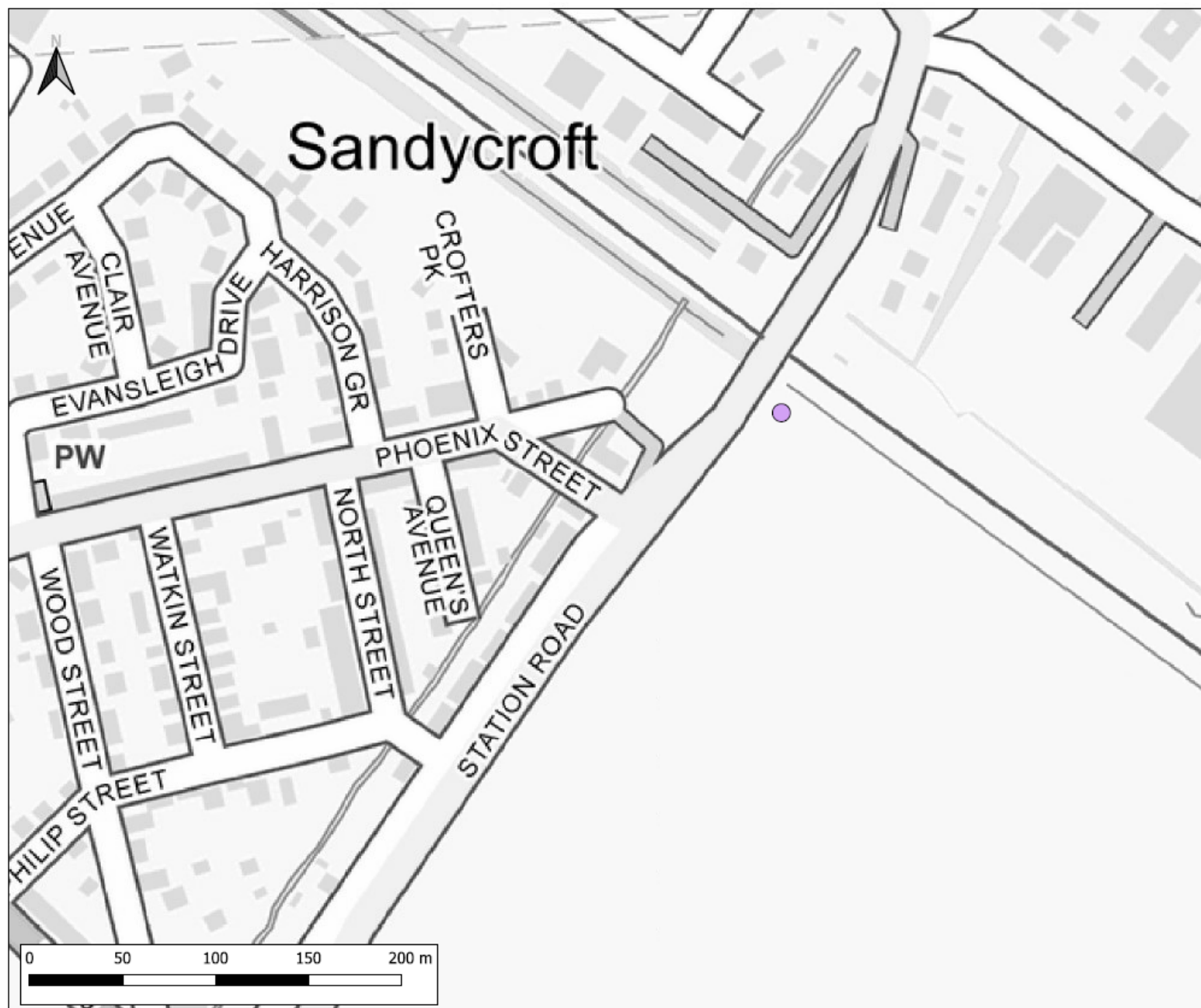
# **APPENDIX C**

## **Borehole Information**



3336NW 428

| Norwest Holst Soil Engineering Ltd.                                   |        |                                                                           |                |                            |                     | Borehole No.    |                  |
|-----------------------------------------------------------------------|--------|---------------------------------------------------------------------------|----------------|----------------------------|---------------------|-----------------|------------------|
| BOREHOLE LOG                                                          |        |                                                                           |                |                            |                     | 1               |                  |
| Contract No. F4722                                                    |        | Location Sandycroft                                                       |                | Sheet 1 of 1               |                     | Chainage        |                  |
| Client Welsh Water Authority                                          |        | Method of Boring Percussion                                               |                | Ground Level 4.75 m.A.O.D. |                     | Date 20/10/80   |                  |
| Diameter of Borehole 150 mm                                           |        |                                                                           |                |                            |                     |                 |                  |
| Description of Strata                                                 | Legend | Depth Below G.L. (m)                                                      | O.D. Level (m) | Casing Depth at Sampling   | Sampling and Coring | "N"/ R, Q, C, % | Quality Progress |
| MADEGROUND: Hardcore.                                                 |        | 0.60                                                                      | 4.2            |                            |                     |                 |                  |
| Medium dense grey silty fine SAND.                                    |        |                                                                           |                |                            | 1.00                | 15              |                  |
|                                                                       |        |                                                                           |                |                            | 2.50                | 14              |                  |
|                                                                       |        |                                                                           |                |                            | 4.00                | 15              |                  |
|                                                                       |        |                                                                           |                |                            | 5.50                | 17              |                  |
|                                                                       |        |                                                                           |                |                            | 7.00                | 17              |                  |
|                                                                       |        |                                                                           |                |                            | 8.50                | 20              |                  |
|                                                                       |        |                                                                           |                |                            | 9.50                | 20              |                  |
|                                                                       |        | 10.00                                                                     | -5.2           |                            |                     |                 |                  |
| Type of Sample                                                        |        | Remarks (Observations of Ground Water etc.)                               |                |                            |                     |                 |                  |
| S.P.T.  Undisturbed<br>C.P.T.  Vane<br>Jar  Water<br>Bulk  Piezometer |        | Water struck at 2.30 m.<br>Standing level 2.30 m.<br>Piezometer inserted. |                |                            |                     |                 |                  |



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

#### LEGEND

-  Borehole Location (BGS ref: SJ36NW428)



CLIENT:



SCHEME:

Sandycroft

PLOT TITLE:

Historical BGS Borehole Location Plan  
Data from British Geological Survey (BGS)

PLOT STATUS:

FINAL

DATE:

05-07-2024

DRAWN:

IT

CHECKED:

AW

APPROVED:

MW

PLOT SCALE AT A1:

1:2000

PLOT NAME:

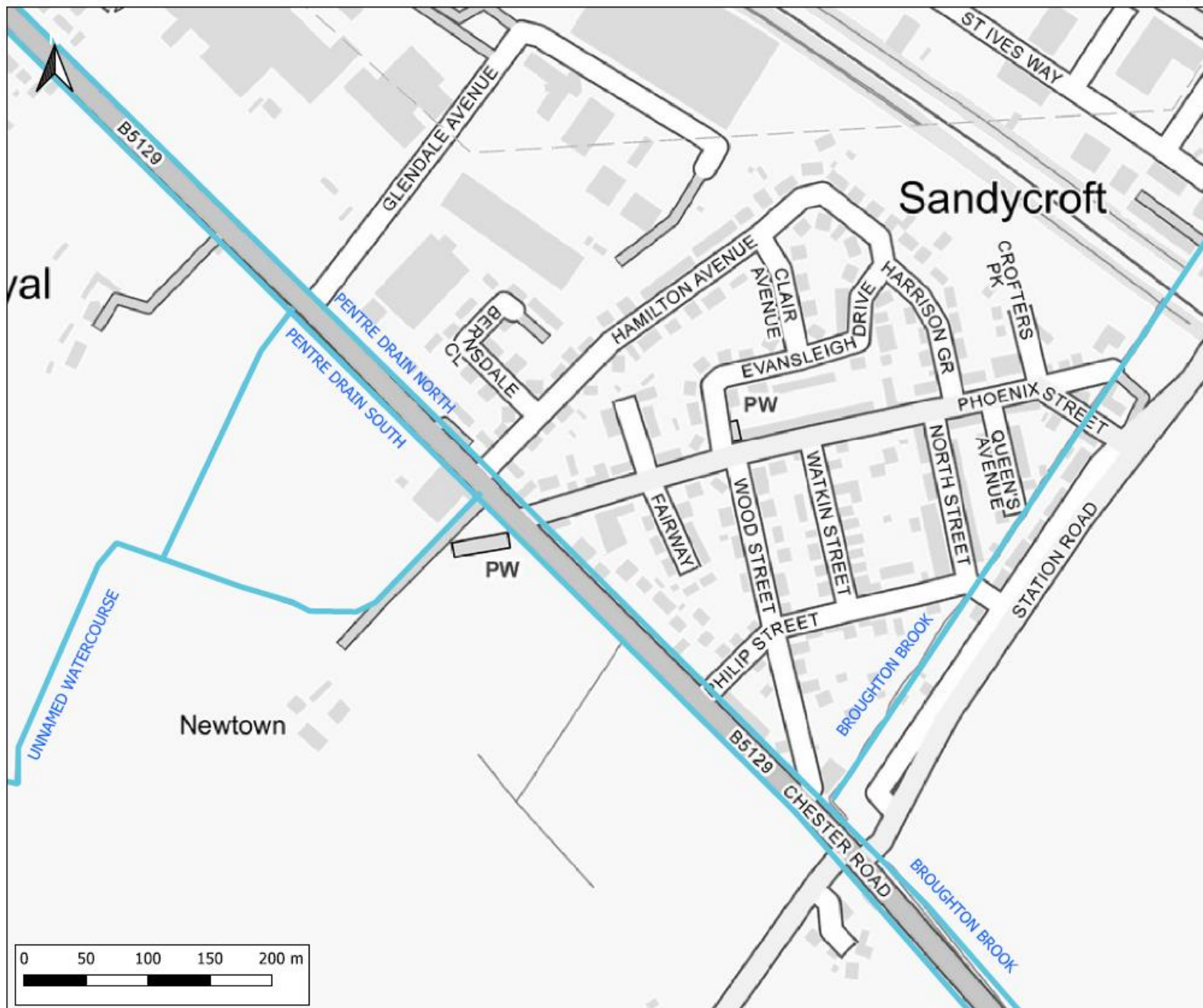
14113\_BGS\_Borehole\_Location\_Plan

REVISION:

-

# **APPENDIX D**

## **Watercourse Location Plan**



### Legend

— Sandycroft Watercourses



CLIENT:



SCHEME:

Sandycroft

PLOT TITLE:

Watercourse Location Plan

PLOT STATUS:

FINAL

DATE:

09-07-2024

DRAWN:

IT

CHECKED:

AW

APPROVED:

MW

PLOT SCALE AT A3:

1:3000

PLOT NAME:

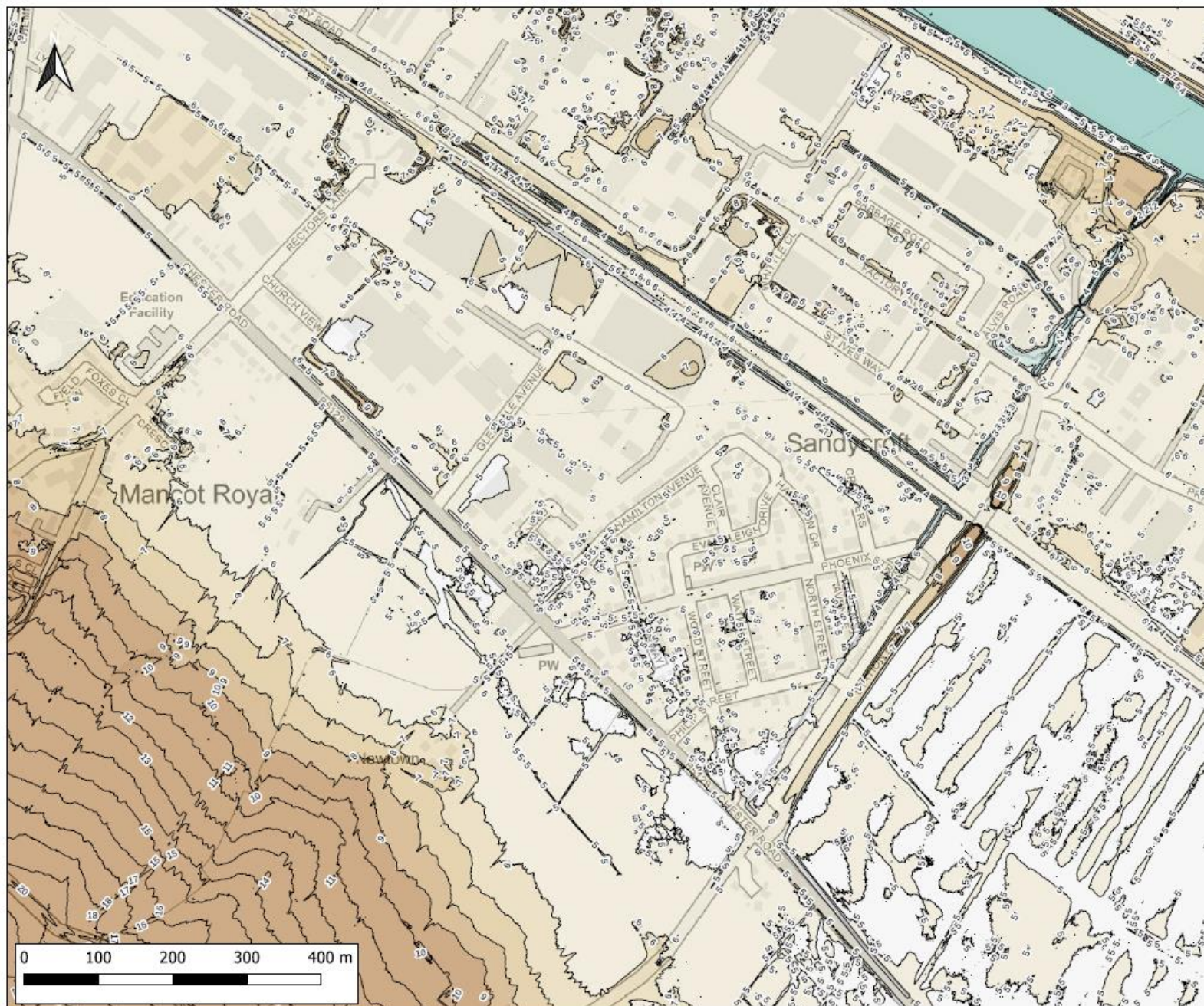
14113\_Sandycroft\_Watercourses

REVISION:

-

# **APPENDIX E**

## **LiDAR Plan**



Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

#### LEGEND

- 1m contour
- Ground Elevations (m AOD)
- <= 1.0
  - 1.0 - 2.0
  - 2.0 - 3.0
  - 3.0 - 4.0
  - 4.0 - 5.0
  - 5.0 - 6.0
  - 6.0 - 7.0
  - 7.0 - 8.0
  - 8.0 - 9.0
  - > 9.0



CLIENT:



SCHEME:

Sandycroft

PLOT TITLE:

LIDAR Plan  
1m Resolution  
Data from Natural Resources Wales

PLOT STATUS:

FINAL

DATE:

16-08-2024

DRAWN:

CHECKED:

APPROVED:

PLOT SCALE: A3

1:5000

PLOT NAME:

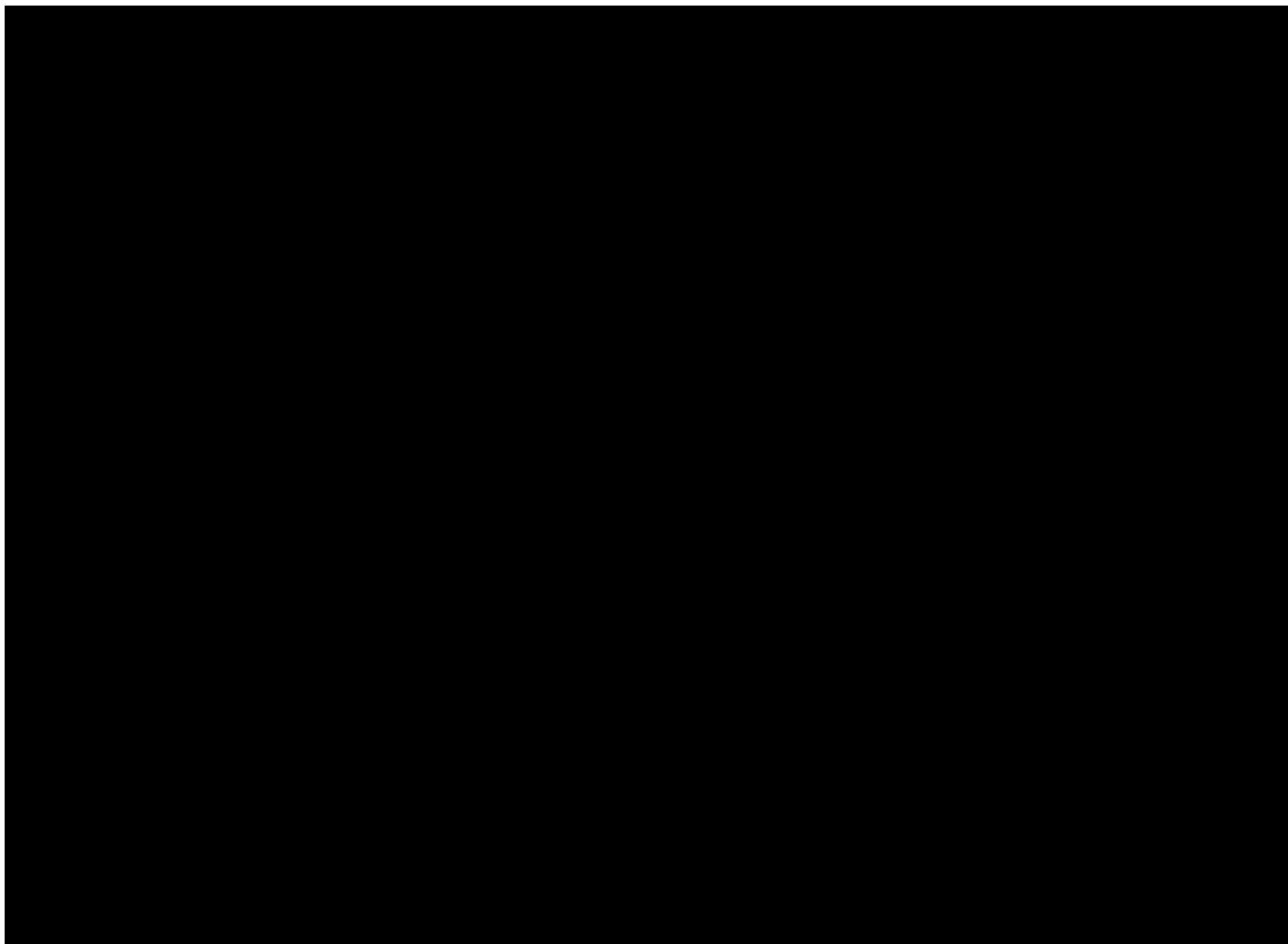
14113\_LIDAR\_Plan

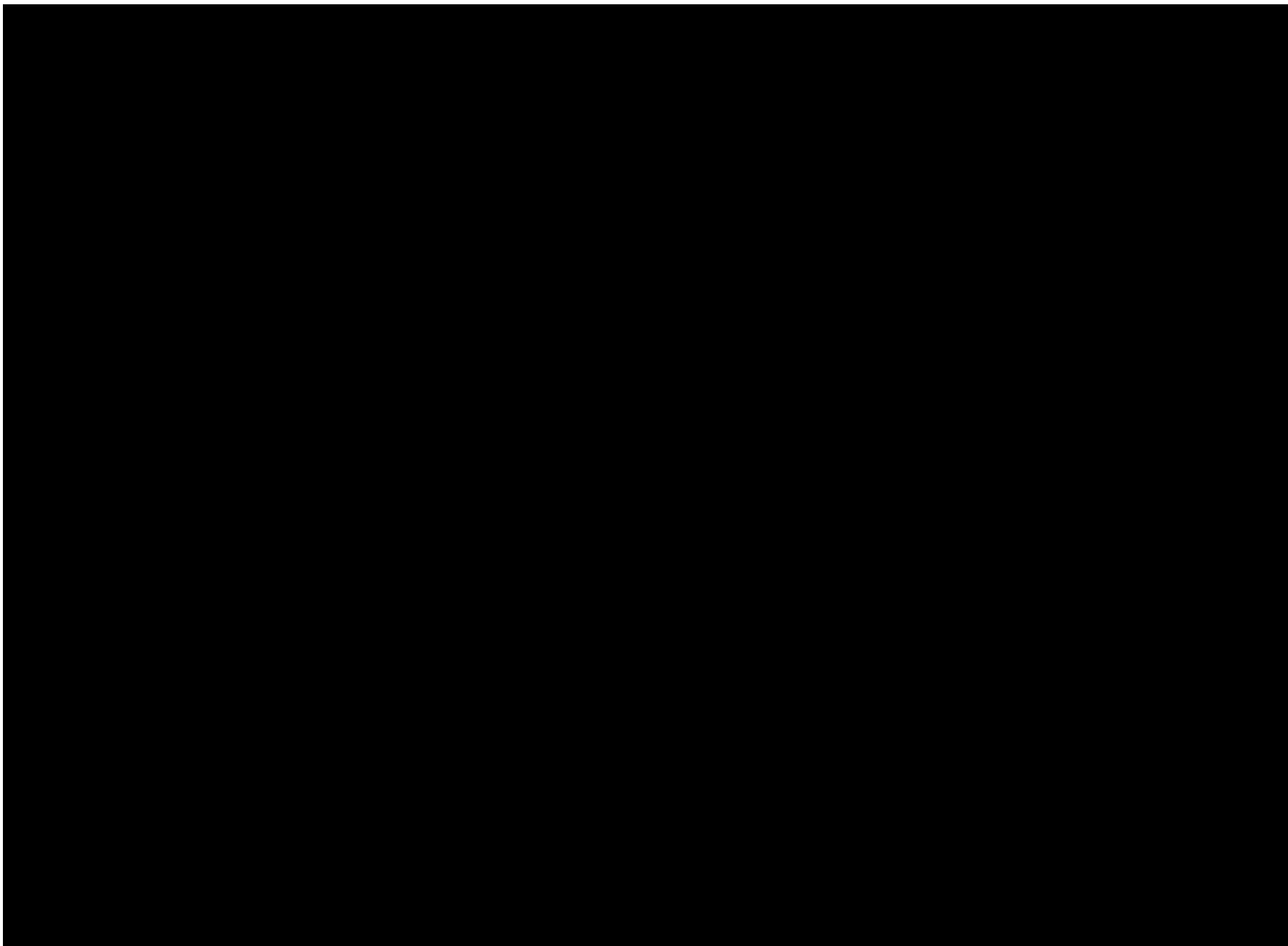
REVISION:

-

# **APPENDIX F**

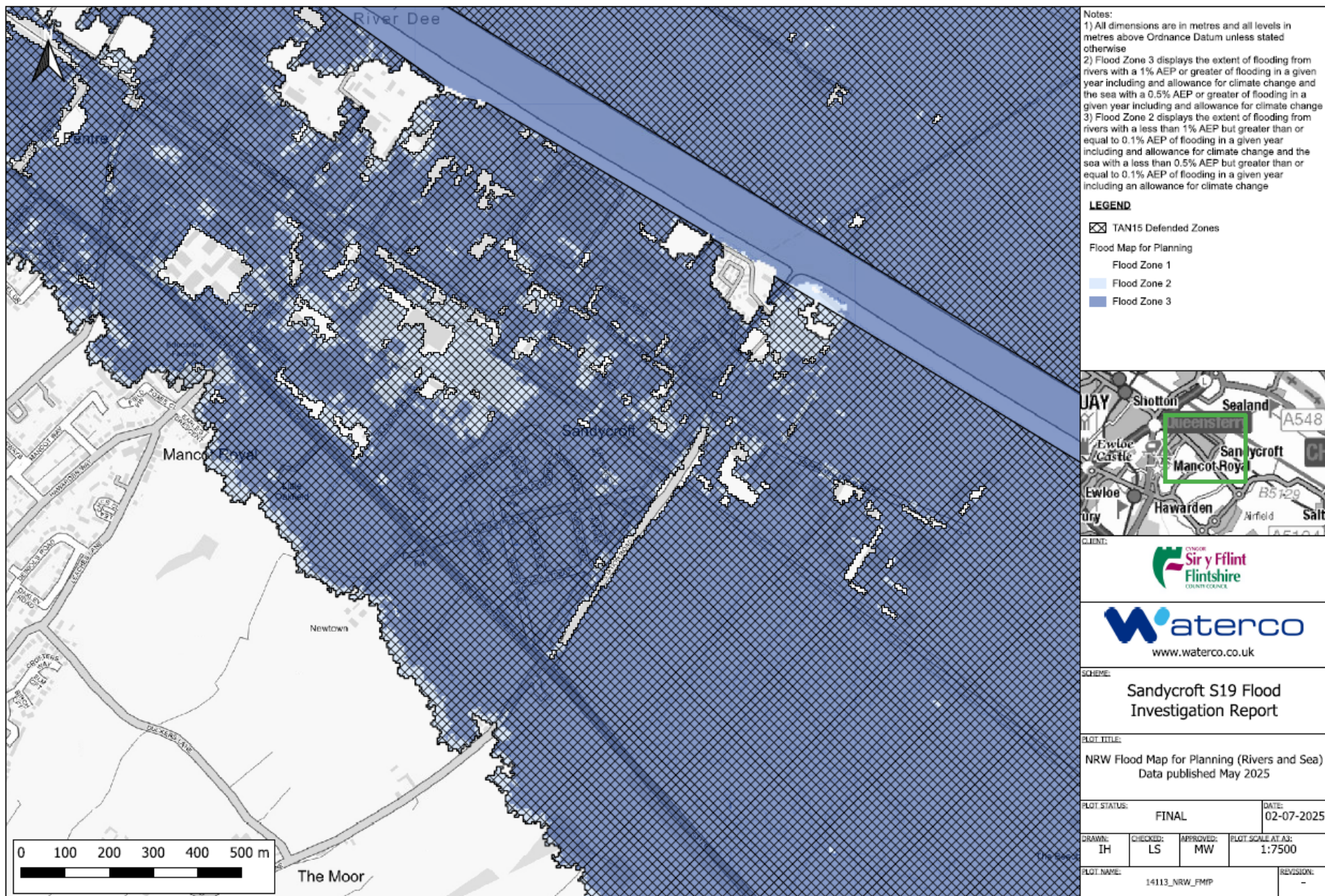
## **DCWW Sewer Plans**





# **APPENDIX G**

## **NRW Flood Maps**



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Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise  
2) Flood Zone 3 displays the extent of flooding from rivers with a 1% AEP or greater of flooding in a given year including and allowance for climate change and the sea with a 0.5% AEP or greater of flooding in a given year including and allowance for climate change  
3) Flood Zone 2 displays the extent of flooding from rivers with a less than 1% AEP but greater than or equal to 0.1% AEP of flooding in a given year including and allowance for climate change and the sea with a less than 0.5% AEP but greater than or equal to 0.1% AEP of flooding in a given year including an allowance for climate change

LEGEND

- TAN15 Defended Zones
- Flood Map for Planning
- Flood Zone 1
  - Flood Zone 2
  - Flood Zone 3



SCHEME:  
**Sandycroft S19 Flood Investigation Report**

PLOT TITLE:  
NRW Flood Map for Planning (Rivers and Sea)  
Data published May 2025

PLOT STATUS: FINAL DATE: 02-07-2025

|           |             |              |                          |
|-----------|-------------|--------------|--------------------------|
| DRAWN: IH | CHECKED: LS | APPROVED: MW | PLOT SCALE AT A3: 1:7500 |
|-----------|-------------|--------------|--------------------------|

|                          |             |
|--------------------------|-------------|
| PLOT NAME: 14113_NRW_FMP | REVISION: - |
|--------------------------|-------------|





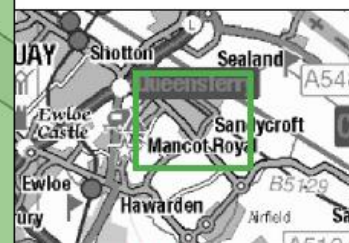
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Notes:  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

#### LEGEND

Flood Zones - Sea  
Flood Zone 1  
Flood Zone 2  
Flood Zone 3



CLIENT:



SCHEME:

Sandycroft S19 Flood Investigation Report

PLOT TITLE:

NRW Flood Risk from the Sea  
Data published May 2025

PLOT STATUS:

FINAL

DATE:

02-07-2025

DRAWN:

IH

CHECKED:

LS

APPROVED:

MW

PLOT SCALE AT A3:

1:7500

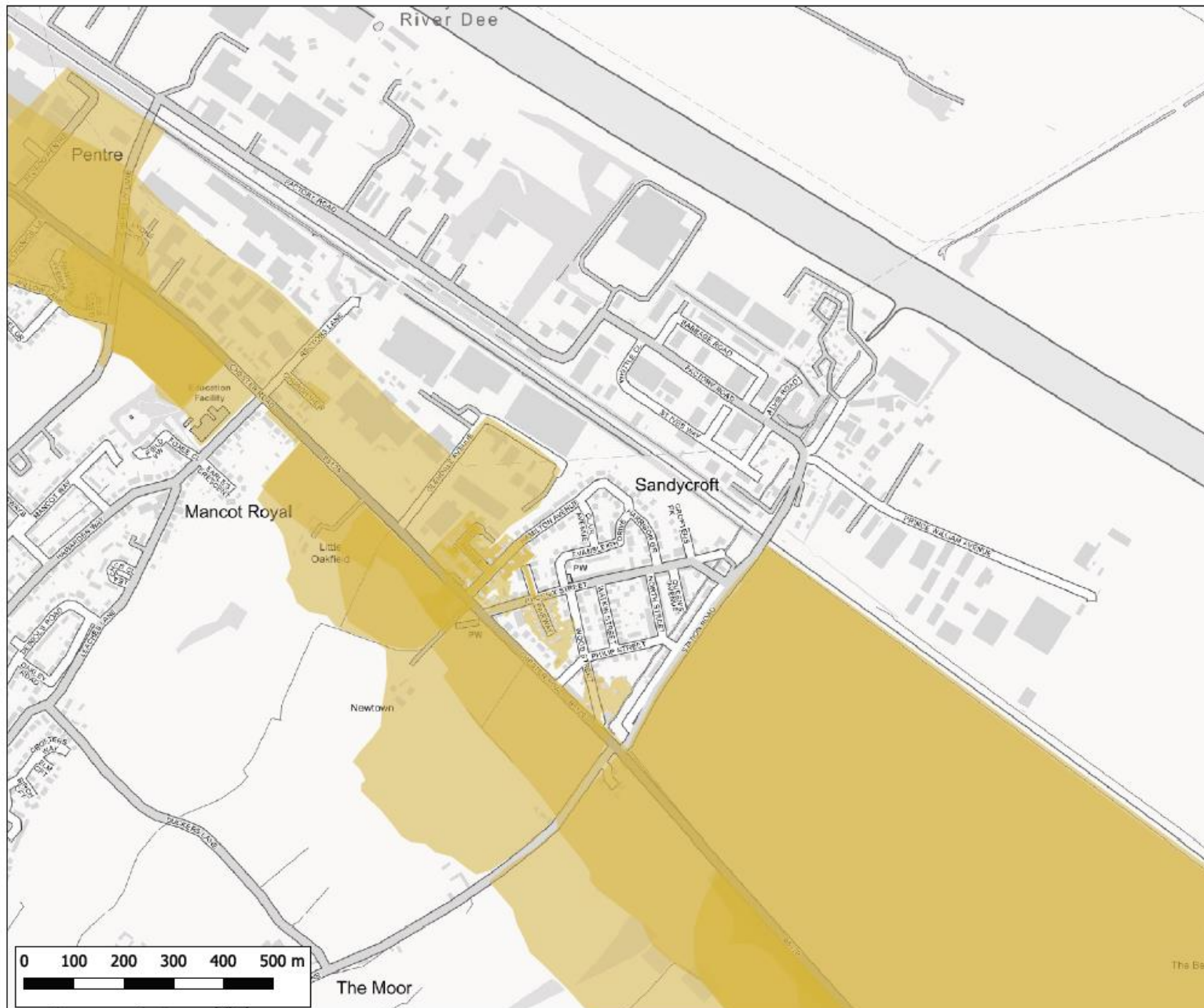
PLOT NAME:

14113\_NRW\_Flood\_Zones\_Sea

REVISION:

-

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**Notes:**  
1) All dimensions are in metres and all levels in metres above Ordnance Datum unless stated otherwise

**LEGEND**  
■ NRW Recorded Flood Extents



CLIENT:  


  
www.waterco.co.uk

**SCHEME:**  
Sandycroft S19 Flood Investigation Report

**PLOT TITLE:**  
NRW Recorded Flood Extents  
Data published May 2025

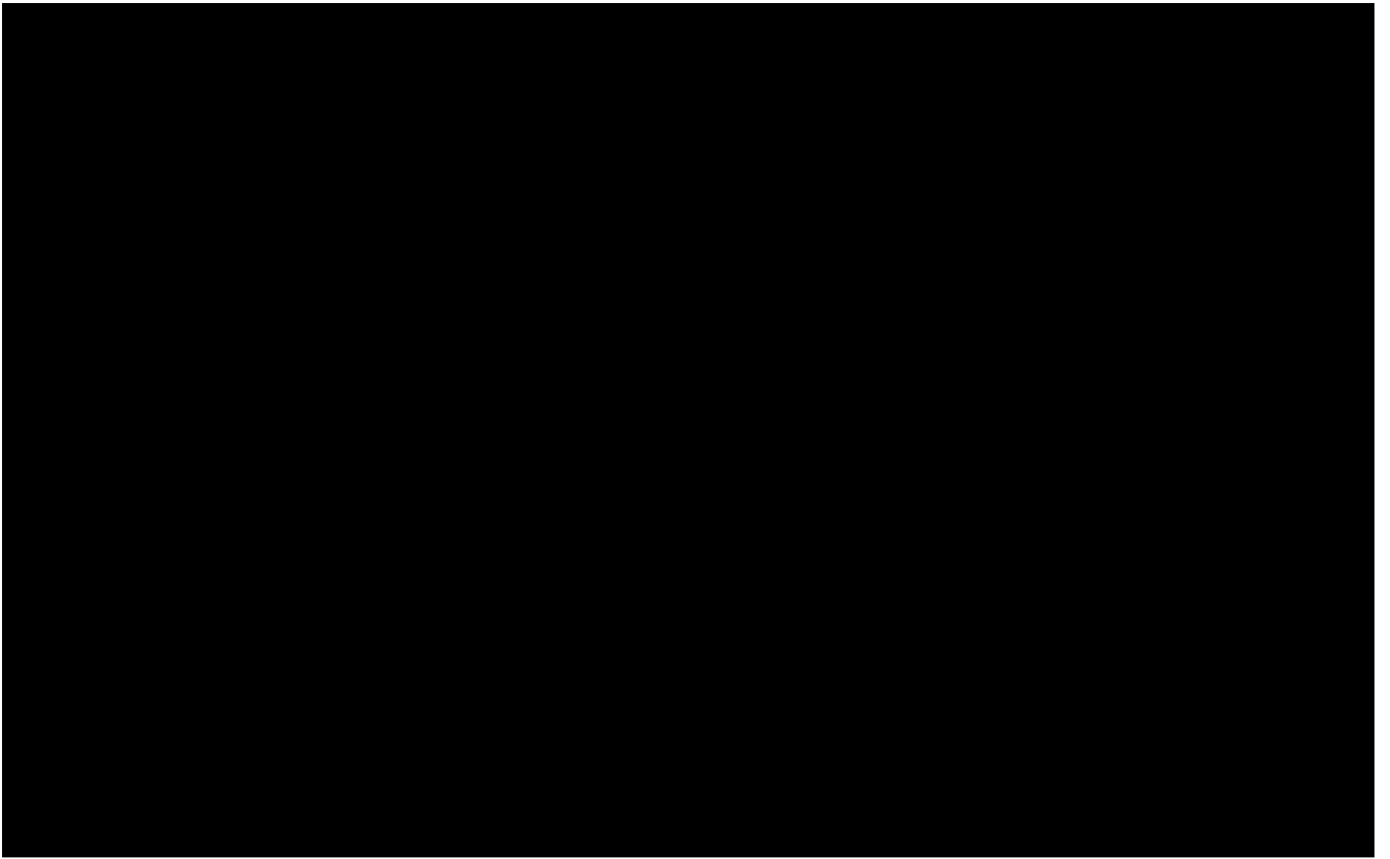
**PLOT STATUS:** FINAL **DATE:** 02-07-2025

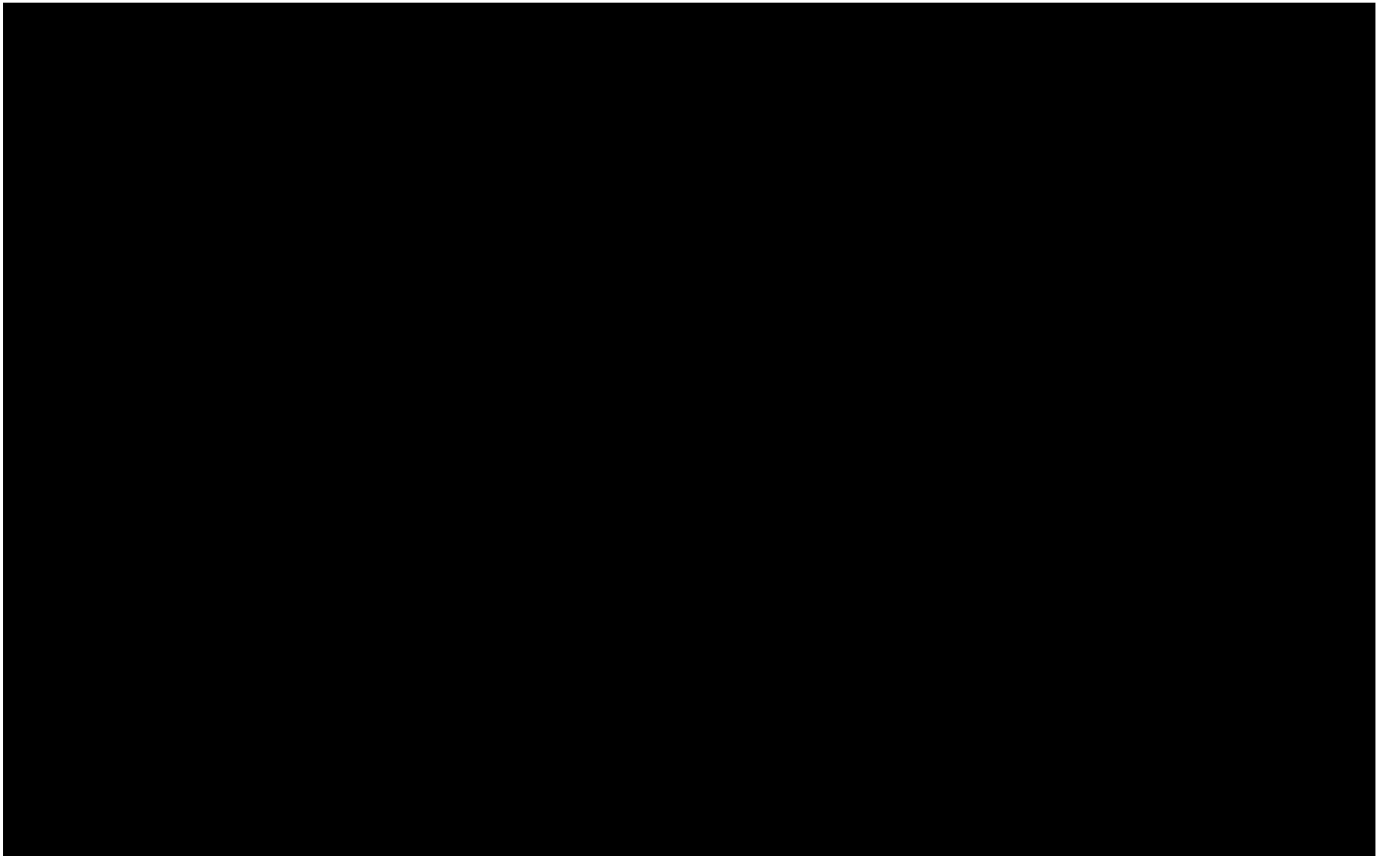
|                  |                    |                     |                                 |
|------------------|--------------------|---------------------|---------------------------------|
| <b>DRAWN:</b> IH | <b>CHECKED:</b> LS | <b>APPROVED:</b> MW | <b>PLOT SCALE AT A3:</b> 1:7500 |
|------------------|--------------------|---------------------|---------------------------------|

**PLOT NAME:** 14113\_NRW\_Recorded\_Flood\_Extents **REVISION:** -

# **APPENDIX H**

## **Resident Photographs**





|                                                |                                                                                      |
|------------------------------------------------|--------------------------------------------------------------------------------------|
| Photo No. 4                                    |                                                                                      |
| Date: 20/10/23                                 |                                                                                      |
| Description:<br><br>Flooding along Wood Street |  |

**Photo No.5**

**Date: 20/10/23**

**Description:**

Flooding to fields south  
of Rosslyn Close.



