

Northwich Main Report Details

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Area:	Northwich		
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Document history

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Client signoff

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Northwich Main Report Details

This Northwich specific Main Report should be read in conjunction with the Section 19 Flood Investigation – Main Report (January 2021 Storm Christoph Flooding Event).

1. Background

Northwich is a town and civil parish of approximately 20,000 people located at the confluence of the River Weaver and River Dane. The River Weaver has been made navigable (Weaver Navigation) from Winsford and flows northwards to the Manchester Ship Canal at Runcorn. River levels on the Weaver and Navigation are controlled by a series of sluice gate and lock assets owned and operated for navigation purposes by the Canal & River Trust (the Trust). The Weaver Navigation is a slow flowing river and carries a large volume of flow. In contrast, the River Dane is a fast flowing, natural river which brings high peak flows through Northwich. There are also several ordinary watercourses in the area.

Flood risk across Northwich and outlying areas comprises of predominantly fluvial flooding from the River Dane and River Weaver, as well as surface water flooding from run-off due to limited open spaces or greenfield areas. There is risk identified of drains becoming blocked and surcharging, and risk from combined, foul and surface water sewers.

The risk of flooding from canals is generally considered residual and can occur from leakage, collapse of structures, overtopping or blockage of conduits. However, canals can also act as conveyance routes (taking excess flows into other locations), and that flooding from canals is usually due to excess inflows of water, such as land drainage and surface water run-off entering the canal and exceeding the physical capacity of the canal to contain the volume or flow.

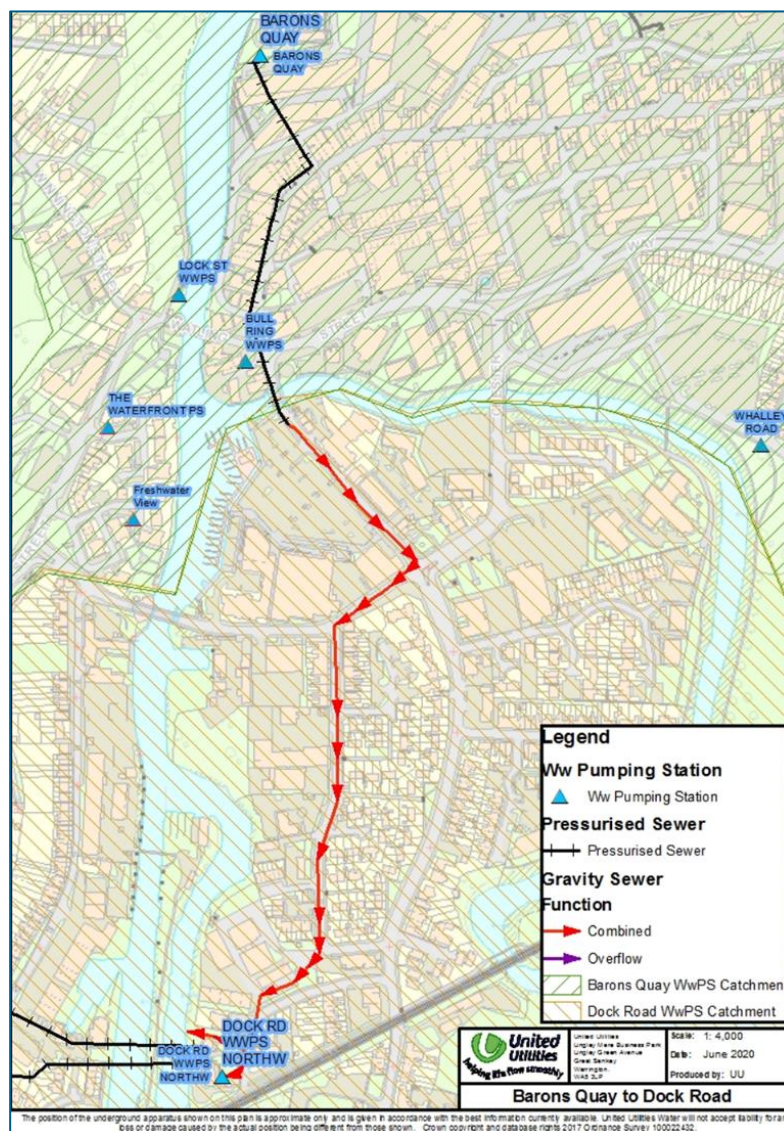
There have been several recorded flood events in Northwich Town Centre with the most severe occurring in 1946, and recent events occurring in 2000, 2012 and 2015. Most recently, Northwich was badly affected by the October 2019 flooding, for which a Section 19 report for the Northwich area was produced. Northwich Town Centre area is largely within the Environment Agency (EA) Flood Zones 2 and 3 and is at risk from fluvial flooding from the River Weaver and River Dane as shown in Appendix I. The flood defences in Northwich Town Centre are also shown along with the areas benefitting from these flood defences. Several properties are within the high-risk (1-in-100-year) and very high-risk (1-in-30 year) surface water flood risk zones as shown in Appendix I.

Northwich town centre is protected by raised flood defences built by the EA in 2015-2016 (officially opened in June 2017) and has a large network of combined sewers owned by United Utilities (UU). There is highway drainage owned by Cheshire West and Cheshire Council (CWaC) and private drainage in the area as well. The below introduces the relevant infrastructure in the areas affected by the flooding in the January 2021 event.

1.1. UU Sewer Network

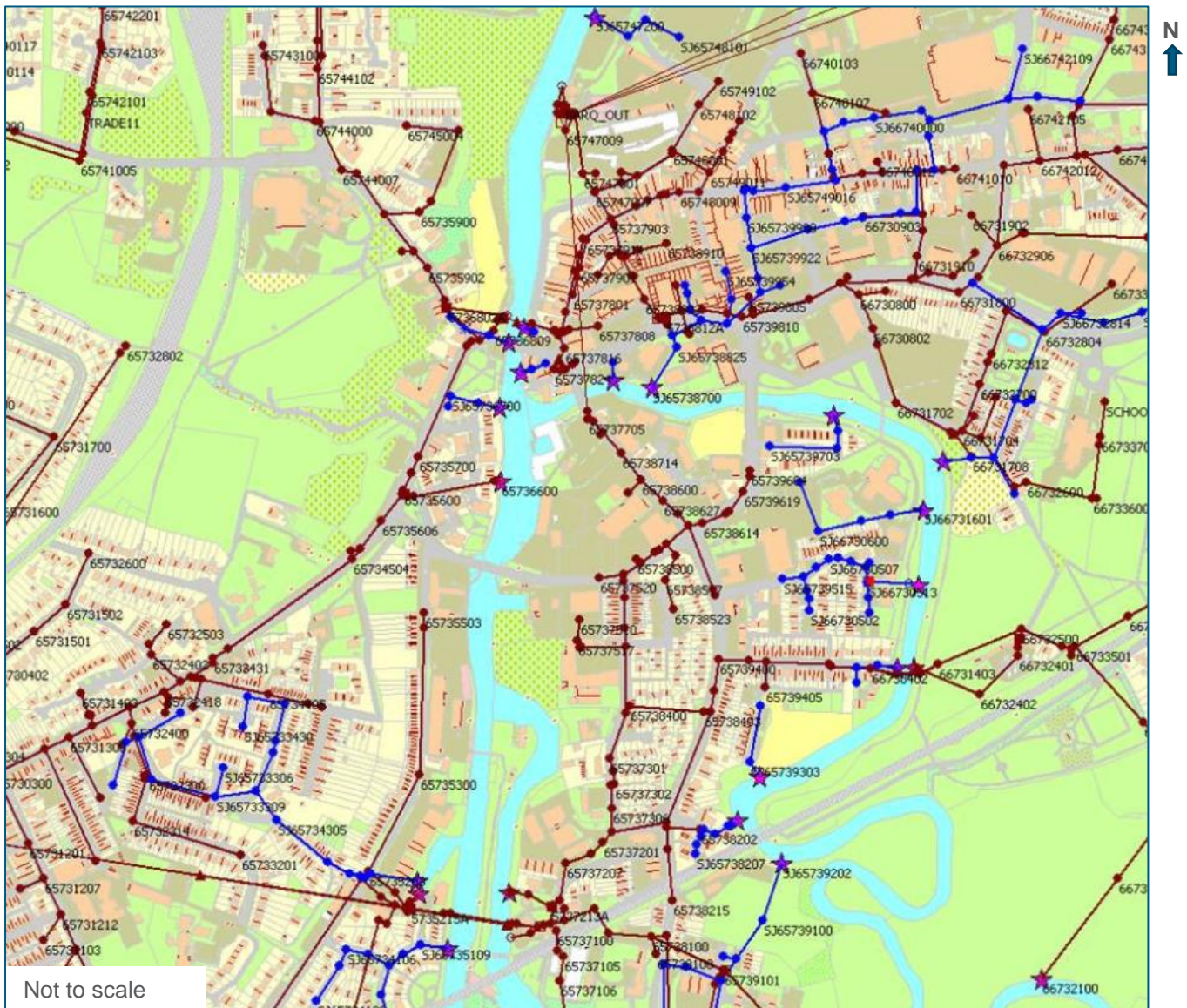
Drainage in Northwich town centre is predominantly made up of a combined sewer system which takes both foul and surface water. There are a number of smaller network pumping stations with two larger last in line wastewater pumping stations: Barons Quay pumping station and Dock Road pumping station. Barons Quay pumping station pumps flow from Dane Street until it meets London Road and then flows via gravity to, Dock Road pumping station which then pumps flow on to Northwich Wastewater Treatment Works (WwTW). This is illustrated in Figure 1 below. For both stations, flows above pass forward flow limits are permitted to be discharged to river.

A schematic drawing of the UU network is presented in Figure 2 and details of their outfall assets, and associated flap valve arrangements, are shown in Figure 3. The catchment descriptions that follow are as described by UU.



Source: UU data 2020

Figure 1 - UU Pumping Station Location Plan



Source: UU data 2020

Figure 2 - UU Network and Outfalls– Northwich Town Centre

UU provided the following record of their outfalls to the Rivers Weaver and Dane. The record is dated 2014, however it is understood UU have since carried out works after the 2019 floods in Northwich.

River Weaver Outfalls:

6805 – Winnington Hill, CW8 1AQ – 375mm flap valve
 6811 – Bull Ring, High Street, CW9 5BU – 150mm tide flex
 6818 – Bull Ring, High Street, CW9 5BU-Under Tower Bridge – 225mm tide flex
 6703 – Marine Approach, CW8 1GF – 225mm outfall under water however proven NRV's on u/s network. Potentially a private asset – still investigating ownership
 6600 – Fresh Water View, CW8 1GE – 450mm flap valve
 5208 – Navigation Road, CW8 1BE – 675mm flap valve
 5210 – Waterside House, Navigation Rd CW8 1DR – 450mm flap valve
 6204 – Dock Road, Weir Street CSO, CW9 5HL – 1200mm flap valve
 6103 – Yarwood Close, CW8 1ET – 300mm tide flex

River Dane Outfalls:

7828 – 2 Watling Street, CW9 5EX – 150mm flap valve
 8700 – Watling Street, CW9 5EX – 750mm flap valve
 0703 – Rear of 34 Heber Walk, CW9 5JB – 300mm tide flex
 1707 – Whalley Road, CW9 5QB – 1050mm flap valve
 1601 – Rear of Daneside Court, Chester Way, CW9 5JA – 300mm tide flex
 1501 – Rear of 81 Drillfield Road, CW9 5HU – 225mm tide flex
 1401 – Water Street, CW9 5HP – 150mm tide flex
 1407 – Opp Water Street, CW9 5HP – 375mm flap valve
 9304 – Waterbank Row, CW9 5UR – 300mm flap valve
 9300 – Chapel Court, CW9 8AX – 225mm flap valve
 9202 – Vickers Way, CW9 8AT – 750mm flap valve
 2100 – Carlton Road, CW9 5PG – 525mm flap

Source: UU, 2022

Figure 3 - United Utilities Outfall and Flap Valve Details

1.1.1. Barons Quay Catchment

Barons Quay catchment encompasses:

- A rising main that receives flows from Great Budworth, Wincham, Marston and Lostock Gralam at the north east of the catchment.
- Combined Sewer Overflow (CSO) points at Winnington Hill, Lock Street, Castle Street and Chester Way.
- Wastewater pumping stations (PS) at Lock Street, Bull Ring, Whalley Road and Barons Quay.

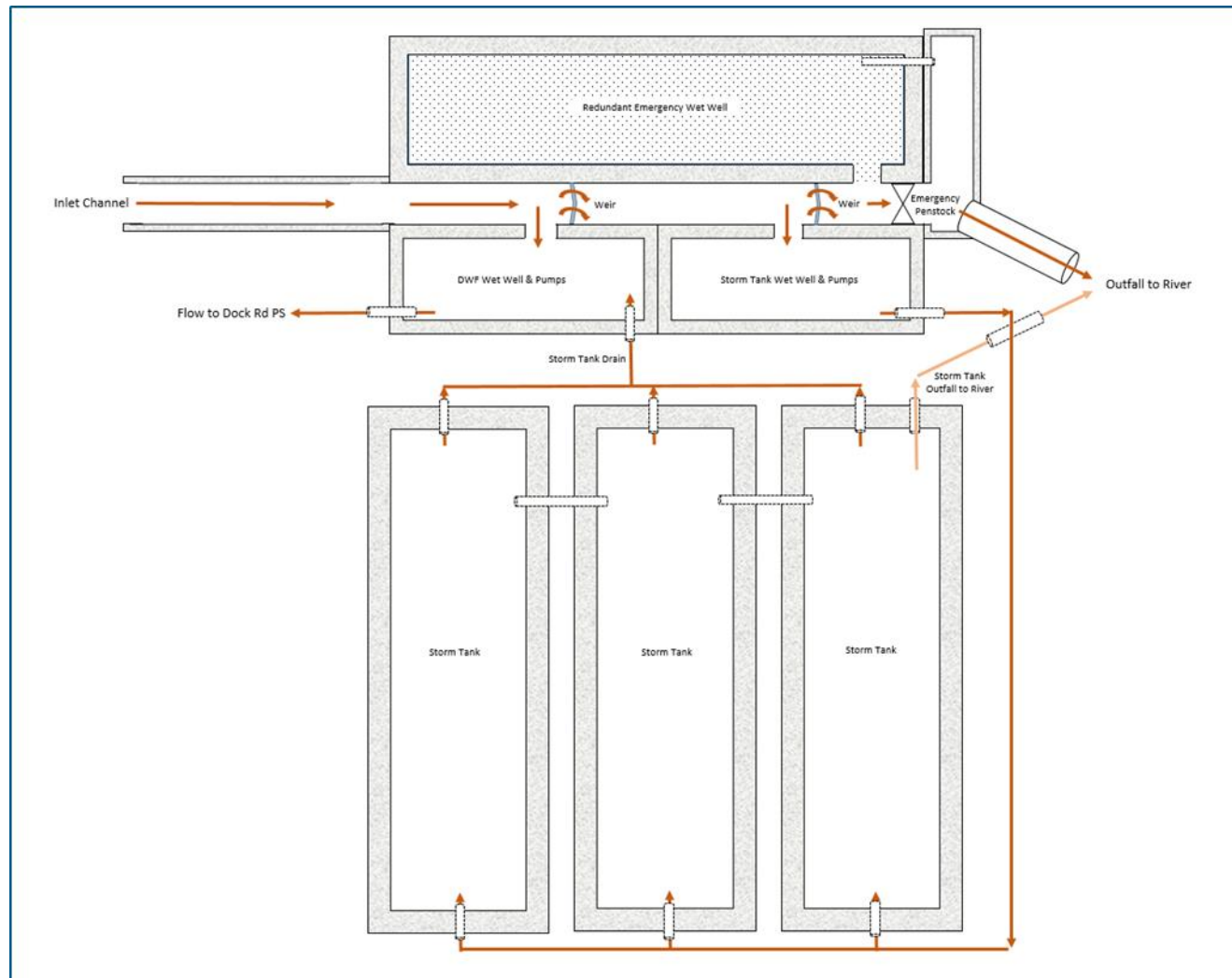
Barons Quay pumping station includes:

- Five dry weather pumps that operate on a Duty, Assist, Assist, Assist, Standby arrangement (if pumping demand exceeds capacity for the Duty pump, then an Assist pump will be enabled to assist with the delivery. If the demand continues to increase, additional assist pumps will start). Flows up to 10 times dry weather flow are pumped to Dock Road Pumping Station.
- There are four storm pumps which pump flows in excess of the 10 times dry weather flow to storm tanks located on site.

Barons Quay pumping station's emergency systems:

- There is an emergency penstock which is automatically opened in a storm event to allow excess flow to the river, when the outfall is not 'river locked' or blocked by water in the river at a higher level.
- This outfall is at 9.69 metres above ordnance datum (mAOD).

Figure 4 shows a schematic plan of the arrangement at Baron's Quay pumping station.



Source: UU data 2020

Figure 4 - Baron's Quay Pumping Station Arrangement

1.1.2. Dock Road Catchment

Dock road catchment encompasses:

- Pumping stations at Monarch Drive and Dock Road.
- CSO points at Weir St, Dane Nurseries, Carlton Road, Middlewich Road and Marlow Road.
- Rudheath Trunk Sewer which receives sewage from Rudheath area, Lach Dennis and Lostock Green.
- Davenham Trunk sewer which receives flows from South Leftwich, Davenham and Moulton.

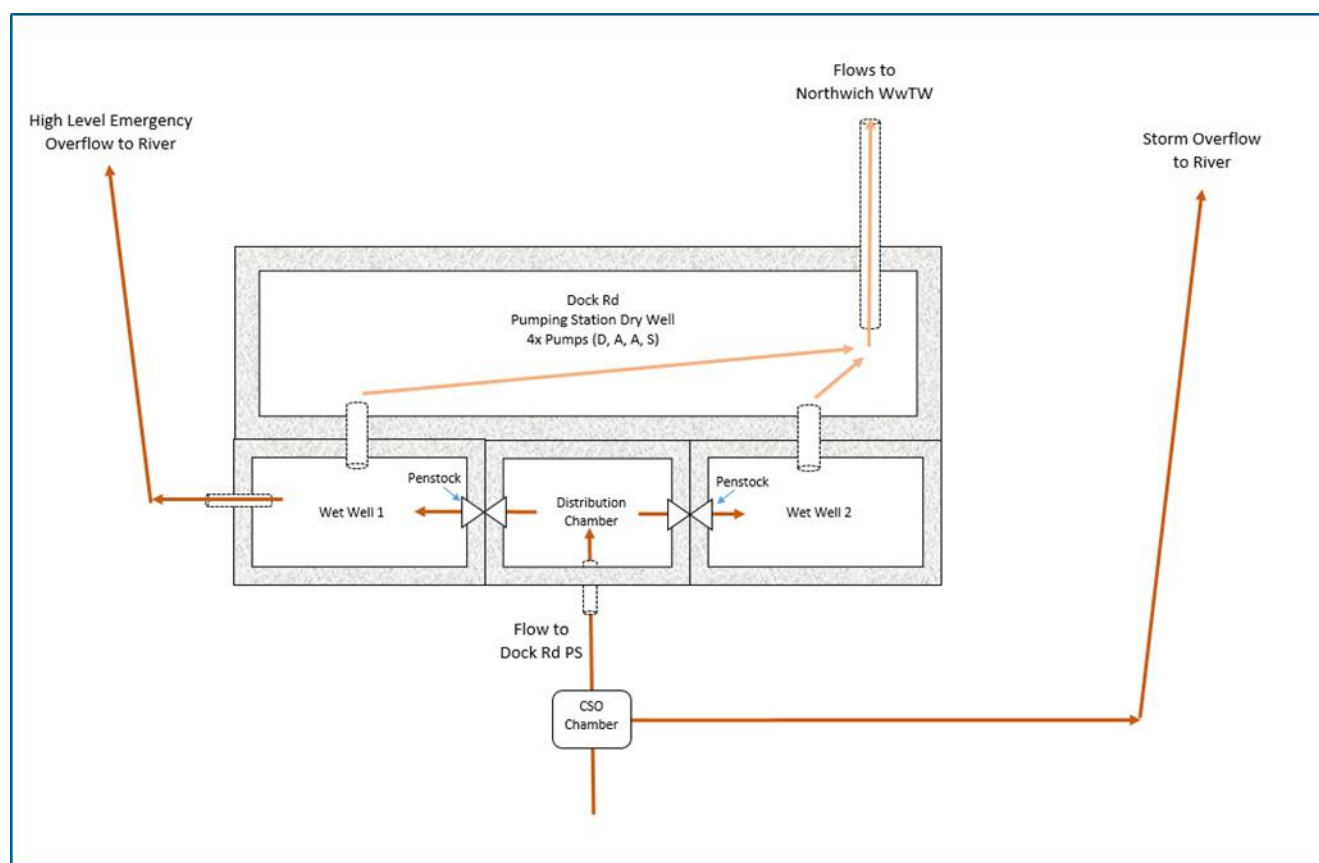
Dock Road is a last in line pumping station to Northwich wastewater treatment works and is permitted to pass forward 510l/s. Dock Road Pumping Station has:

- Four sewage transfer pumps that operate on a Duty, Assist, Assist, Standby arrangement (a standby pump is a backup in the event of the duty and assist pumps failing to meet the pumping requirement).
- Pump 3 was removed and replaced in August 2019 by a hire pump, until the permanent replacement pump was delivered and installed 11th August 2021.

Dock Road pumping station's emergency systems:

- There is an emergency penstock which opens when the incoming flows are in excess of 510l/s in the rising main. When river levels are low, this allows discharge to river.
- When incoming flows to Dock Road exceed the pass forward rate, a network CSO upstream (Weir Street CSO, VRY0102) acts to relieve surcharge in the system by discharging to watercourse. The relief weir crest level is at 10.16m AOD. Levels of protection provided by the CSO can be reduced at lower river levels than this crest level, as the hydraulic gradient in the outfall pipe is forced higher.
- An additional emergency overflow exits directly from the pumping station's wet well in case the emergency penstock fails to open.

Ultrasonic sensors in the wet wells provide signals to the electronic control system which in turn controls the pumps. Figure 5 shows an elevation view of this arrangement.

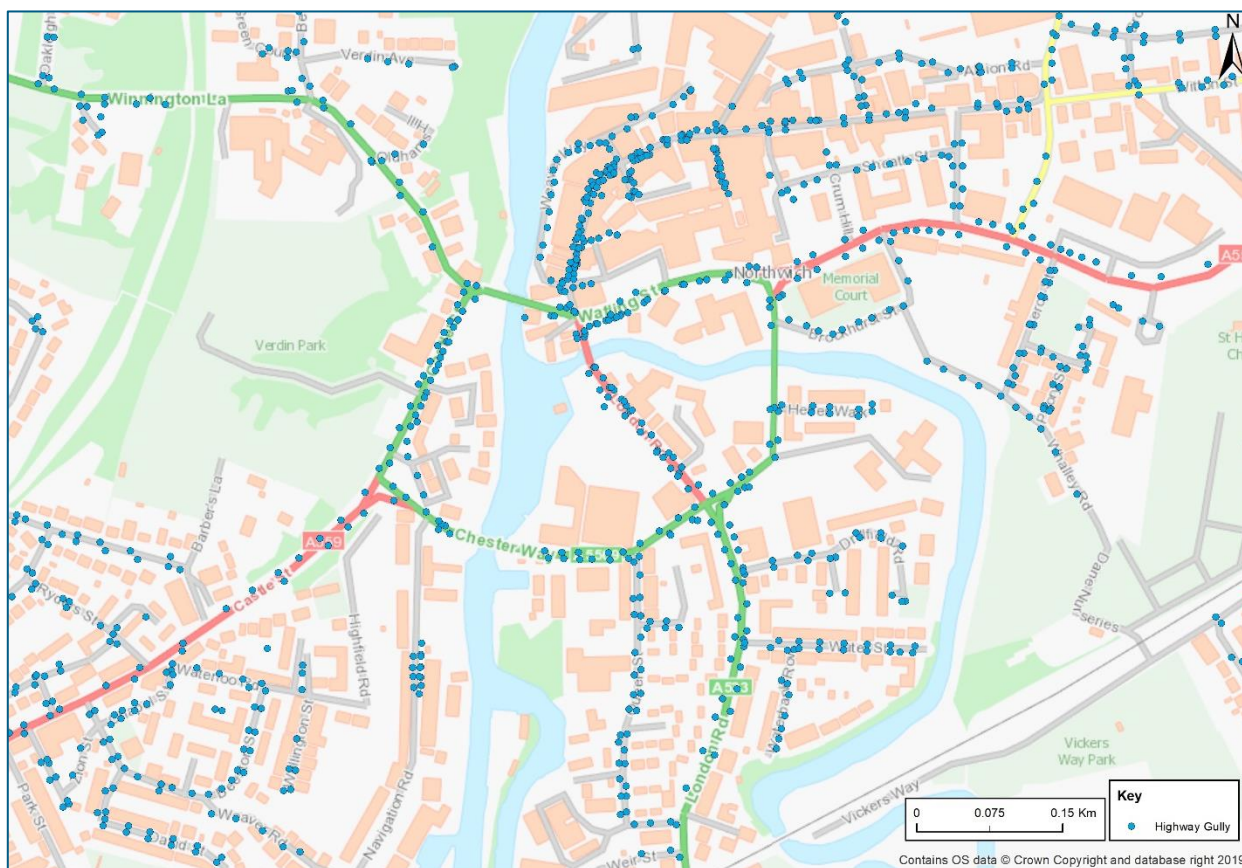


Source: UU data 2020

Figure 5 - Dock Road Pumping Station Arrangement

1.2. Highways Drainage

There are a number of highways drainage gullies which provide drainage to the roads in Northwiche town centre, draining either into the River Weaver or the UU combined sewer. These are maintained by the Highways Authority, CWaC. Records of the highway drainage network, between gully and discharge, and condition are provided by way of a drainage CCTV survey undertaken in 2020 following recommendations of the Northwiche 2019 S19 interim report. The location of the highway gullies can be seen in Figure 6 below. The schematic plan of the highway drainage network, as surveyed, is provided in Appendix II.

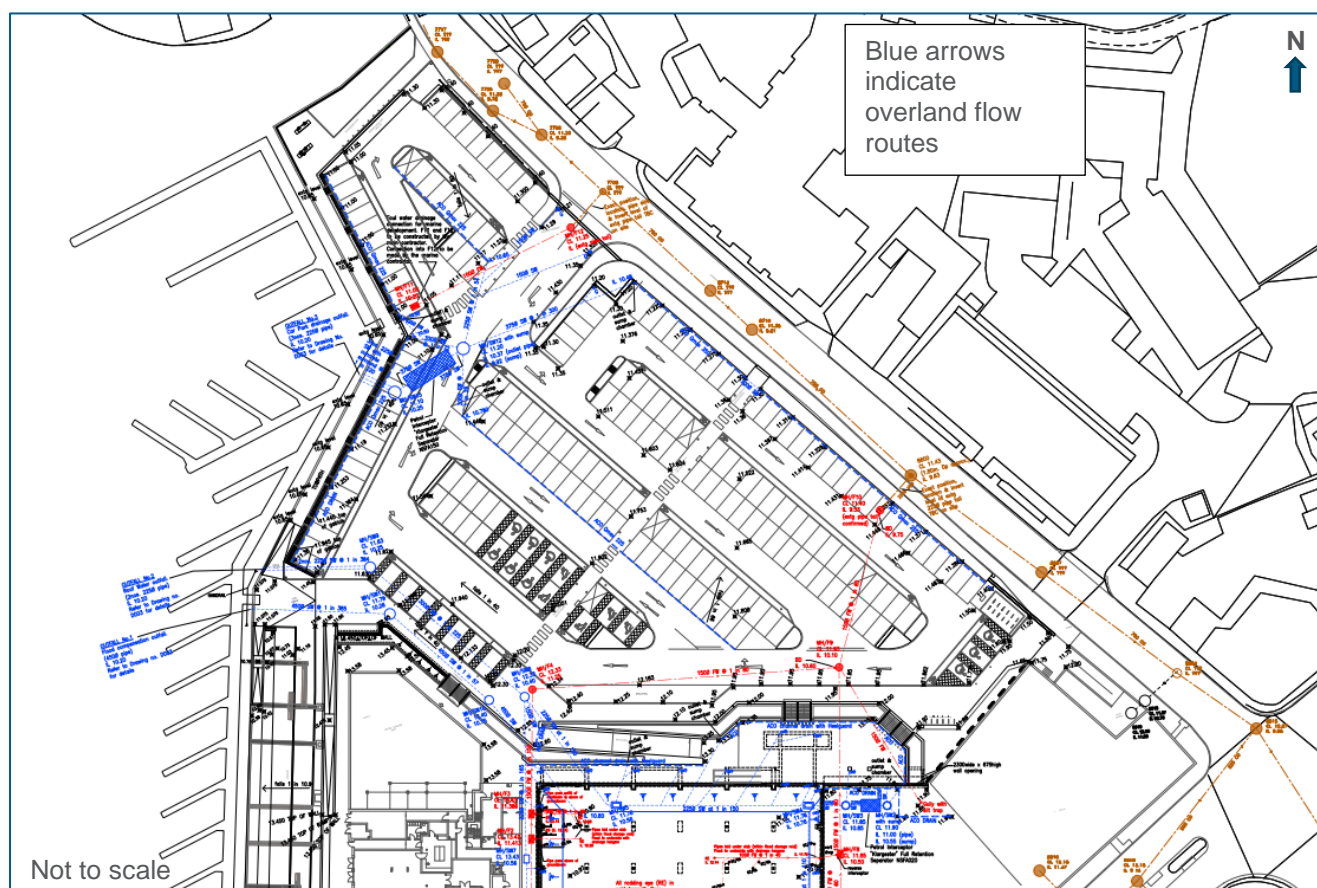


Source: CWaC, 2020

Figure 6 - CWaC Highway Gullies

1.3. Waitrose Drainage

Detailed records of the privately owned, and operated, drainage within the carpark of Waitrose located at the confluence of the River Dane and River Weaver are provided by a CCTV survey undertaken by the EA. This survey confirmed that all the car park area drains to the River Weaver through three outfalls, all of which have flow control valves. Detailed 'As built' records are not available; however, it is understood that the invert levels of these outlets are all 10.2mAOD. Figure 7 presents the drainage plans that were submitted in support of the planning application for the Waitrose development.



Source: Healey Consulting, 2013

Figure 7 - Waitrose Drainage Plans

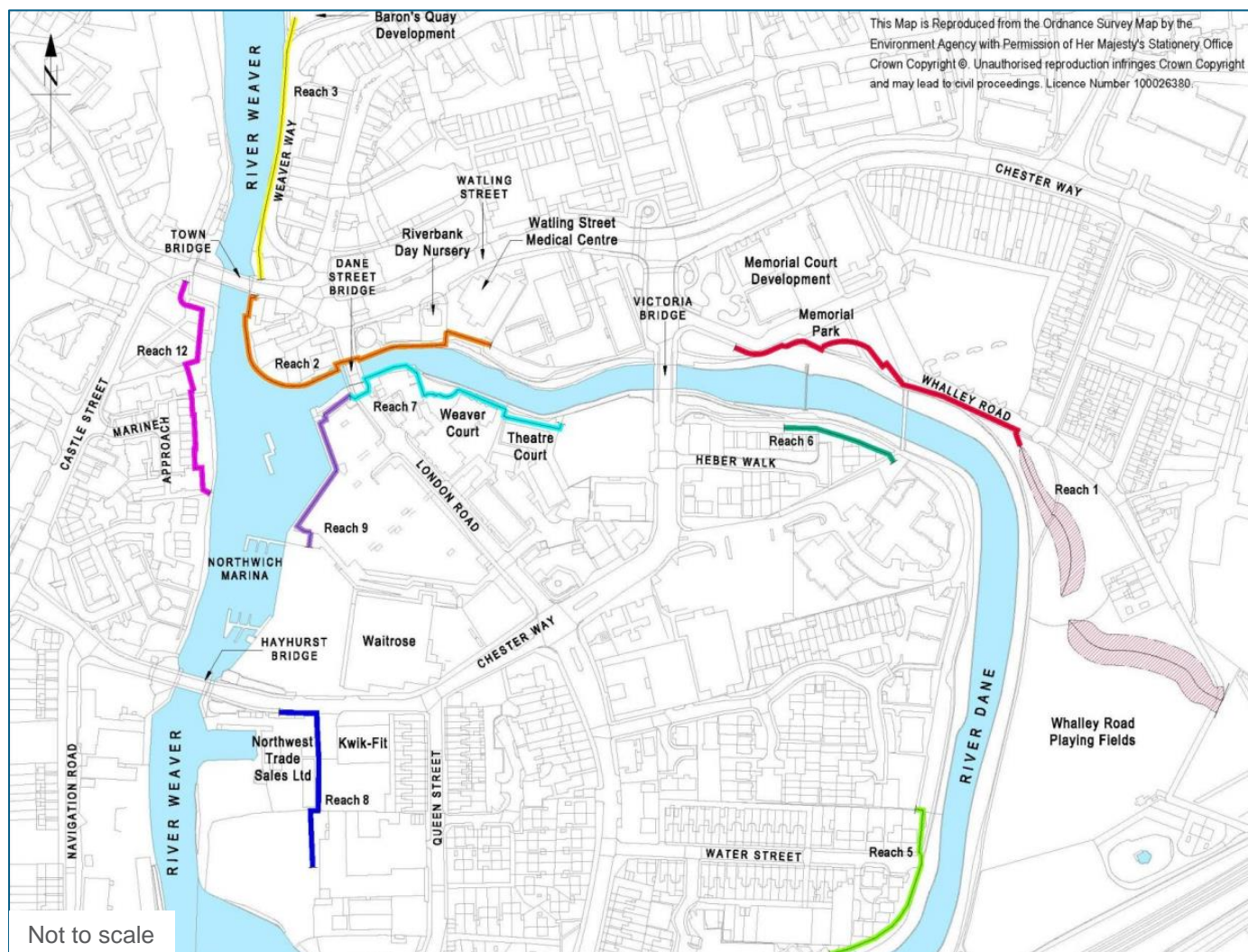
1.4. Flood Defences

1.7km of raised flood defences consisting of walls, embankments and demountable barriers were constructed in Northwich town centre along the River Weaver and Dane. The defences:

- Were built in 2015 and 2016 in response to flooding in 2012, which flooded the lower parts of the town centre including the Bull Ring and the now Waitrose car park; and
- Were built to a flood defence level (FDL) of 1% annual exceedance probability (AEP)¹ at the time, plus 300mm of freeboard allowance.

An overview plan of the raised defences showing their alignment in coloured lines is provided in Figure 8.

¹ The probability associated with a return period e.g. an event of return period 100 years ($T=100$), has an AEP of $1/T$ or 0.01 (1%)



Source: EA, 2016

Figure 8 - Northwich Town Centre Flood Defences

The flood defences were designed to protect 400 properties. The following areas benefitted from the defences during Storm Christoph:

1. Downstream of Town Bridge – Right Bank River Weaver
 - Demountable flood barriers founded on concrete grounding beam and sheet piles
 - Continuous sheet pile wall with structural glass panels
2. Upstream of Town Bridge to Dane St Bridge – Right Bank River Weaver / Right Bank River Dane
 - Continuous sheet pile wall with structural glass panels
 - Demountable flood barriers across Dane St Bridge
3. Northwich Quay to Dane St Bridge – Right Bank River Weaver / Left Bank River Dane
 - Continuous sheet pile wall with structural glass panels
 - Demountable flood barriers and flood gate between Northwich Quay and Waitrose car park
 - Demountable flood barriers across Dane St Bridge
4. Downstream of Victoria Bridge – Right Bank River Dane
 - Embankments

There are numerous outfalls into the river network, including some that are part of the EA flood defences. The responsibility for maintenance of these outfalls, including the installation of flow restrictors, lies with each individual asset owner.

2. Flood Review

Multiple locations in Northwich were affected by the flooding. This area has been split into four separate areas:

- London Road and Theatre Court;
- Bull Ring and Northwich Quay;
- Weaver Way, High Street and Castle Street;
- Witton Church School.

A flood outline map that details the extent of the flooding has been developed in consultation with CWaC and affected property owners, this is shown in Figure 9.

Following October 2019, and as part of the lessons learned from that event, partnership contingency was developed to facilitate over pumping at Dock Road pumping station by UU, and in the town centre by a combination of CWaC and the EA. The EA granted permission to UU to over pump any excess flows, above the maximum pass-forward flow to Winnington WwTW, to the river.

As Storm Christoph was forecast, and in the days leading up to Storm Christoph, the following specific contingency arrangements were put in place. UU arranged contingency of two additional 75 l/s capacity 6" diesel pumps for deployment at Dock Road, and to staff Dock Road pumping station during the event. CWaC closed the footpath behind Dock Road, to allow the discharge pipes from the contingency pumps to reach the river. CWaC procured a series of agricultural high-capacity surface water pumps, set-up to over pump from London Road, Weaver Way and the Bullring. As the events worsened on Wednesday the 20th January 2021, UU also provided an additional 6" diesel pump to Waitrose car park to assist over pumping there.

Flood Advisory Teleconferences, with up to date weather forecasts from the Met Office, and river forecasts from the EA, were held daily from the Sunday 17th January 2021 through to Wednesday 20th January 2021 and preparations were made accordingly.

During Storm Christoph event water levels in the River Weaver and River Dane were high and while the water was fast-flowing, the flood defences were not overtopped. Surface water flooding and the surcharging of drainage systems was observed within the affected areas.

Northwich Resilience meetings with relevant Risk Management Authorities (RMAs) were held by the Council's Flood Risk Action Group (FRAG) to monitor the progress of the implementation of recommendations outlined in the Northwich 2019 S19 report; and to monitor the progress of the interim Section 19 report for Storm Christoph across the borough. The following points were highlighted at the meetings:

- UU said that assets performed as designed with Dock Road pumping 510L/s with an additional pump deployed to pump at a rate of 150l/s. Baron's Quay pumped at full capacity throughout the incident.
- It has been confirmed by United Utilities that Lock Street PS did not function during the event.
- Barons Quay operated as it was designed and permitted to, all 4 pumps were running. Dock Road ran as designed, with the additional over pumping for the duration of the event. Dock Road station was staffed by UU for the duration of the event to manually control the over pumping.
- UU reported that Barons Quay storm overflow outfall silted up during the event and was subsequently cleared by UU contractors.

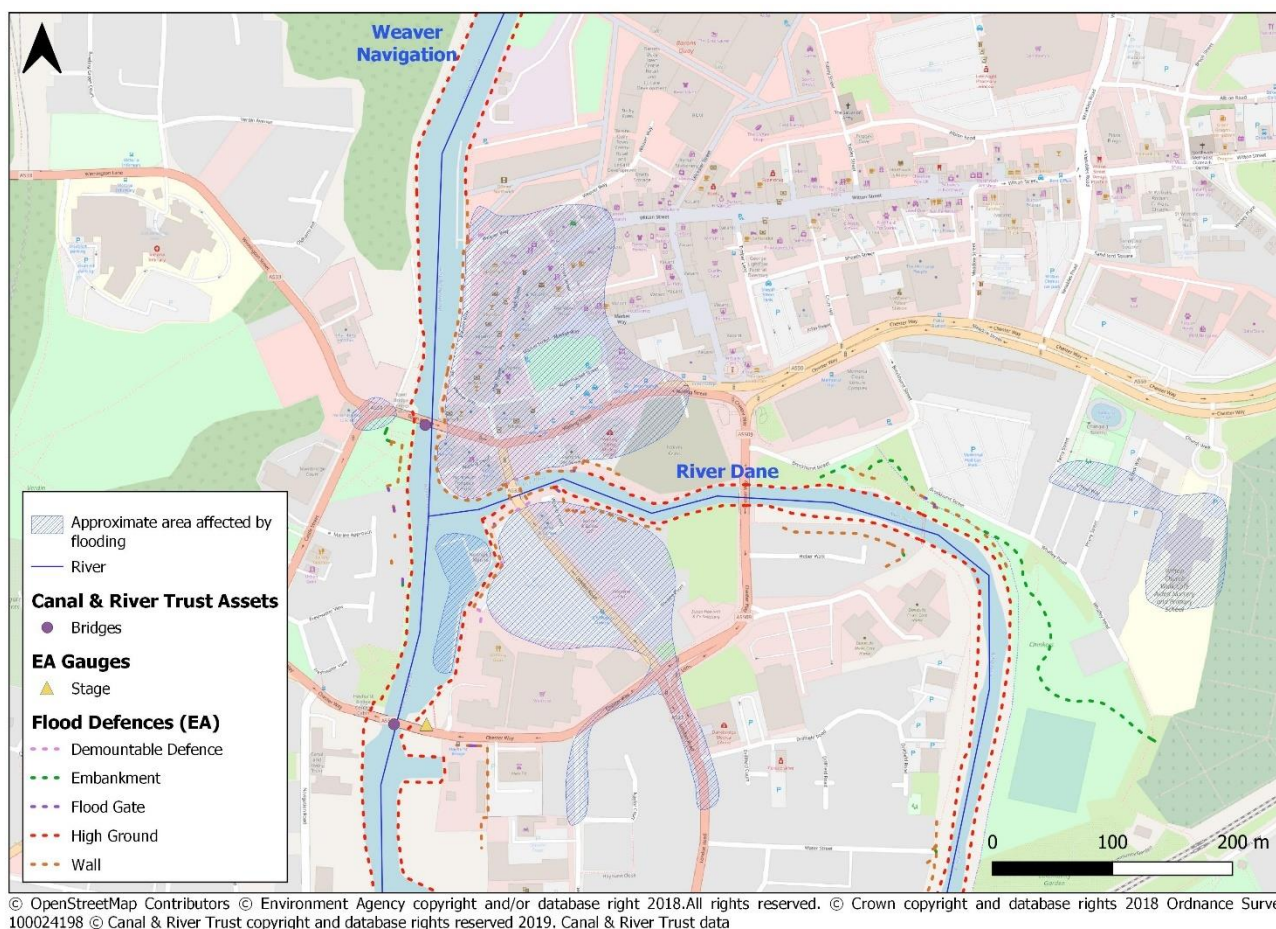


Figure 9 - Flood Overview

Figure 9 shows details the flooding, developed in consultation with CWaC, as LLFA, and affected property owners.

2.1. London Road and Theatre Court

Table 1 provides a brief summary of the flood event, impact and response at the London Road area in the Northwich town centre.

Table 1 - London Road and Theatre Court Flooding

London Road & Theatre Court	
Date	<ul style="list-style-type: none"> 21st January 2021
Affected Roads	<ul style="list-style-type: none"> London Road, Theatre Court, Queen Street and Chester Way
Description	<ul style="list-style-type: none"> Topography falls west towards the River Weaver The area benefits from both permanent and demountable flood defences west and across Dane Bridge that were deployed during this event. Low spots are along London Road by the entrance into Weaver Court and in the Waitrose carpark.
Flood Zone	<ul style="list-style-type: none"> Flood Zone 3, an area benefitting from flood defences protecting against river flooding
Flood Alert / warning issued?	<ul style="list-style-type: none"> Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich (013WAFWE) Flood Alert Issued 18/01/21 19:38 River Weaver at Northwich Marina Flood Warning (013FWFCH24) issued at 09:30 on 20/01/2021 River Weaver at Navigation Road and Marine Approach (013FWFCH26) issued at 21:49 on 20/01/2021 Flood Warnings for Northwich Town Centre, River Weaver and Dane at Northwich, River Weaver at Weaver Way were not issued as these are triggered at a level where the defences are expected to be overtopped
Flooding Incident Information	<ul style="list-style-type: none"> Water started collecting on London Road south of Dane Bridge at the entrance to Waitrose at 10:00 on 20/01/21 Water was reported to come into Theatre Court properties from London Road and Theatre Court (reportedly to be around midday). Sewage was noted in the floodwater in Theatre Court. This was not reported to UU during the event and therefore, they did not attend and investigate. At the deepest level internal flooding in Theatre Court was 700-800mm London Road was flooded from Chester Way to Dane Bridge. Danebridge Medical centre and Queen Street also reported flooding
Flooding Impacts and Observations	<ul style="list-style-type: none"> London Road was closed as per the operational procedures for the deployment of defences. Water surcharging from drains occurred at a rate greater than the over-pumping contingency could cope with, and water levels rose on the landward side of the defences. Significant Property damage to Weaver Court, Theatre court Additional stress and mental anguish on the community over such an event happening again
Summary of Flooding Incident Response During Event	<ul style="list-style-type: none"> EA on site to deploy Phase 1 and Phase 2 demountable flood defences. UU installed temporary pumps were deployed to Waitrose carpark which over pumped surface water through out the event to reduce the flooding in this area. Pumps were provided by UU at 21:00 on 20/01/21 CWaC implemented Northwich Traffic Management emergency plan in conjunction with EA and carried out emergency response including pumping operations. Fire and Rescue organised evacuation of Weaver Court elderly residents. A rest centre was set up in Northwich Memorial Court.

Photographs that illustrate the extents of the flood event at London Road (map provided by the EA) can be seen in Figure 10 and Figure 11.



Figure 10 - Theatre Court. 21/01/21

Source: Business



Figure 11 - Theatre Court at peak flood level. 21/01/21 22:49

Source: Business

2.2. Bull Ring and Northwich Quay

Table 2 provides a brief summary of the flood event, impact and response at the Bull Ring area in the Northwich town centre.

Table 2 – Bull Ring Flooding

Bull Ring	
Date	<ul style="list-style-type: none"> 21st January 2021
Affected Roads	<ul style="list-style-type: none"> Watling Street, Dane Street and Weaver Way
Description	<ul style="list-style-type: none"> Ground falls away towards River Weaver and River Dane confluence. Permanent flood defences are built up along the river edges. Low ground occurs just behind the flood defences. There is a floating pontoon dock attached to dolphin piles, which is a docking point for boats
Flood Zone	<ul style="list-style-type: none"> Flood Zone 3, an area benefitting from flood defences protecting against river flooding
Flood Alert / warning issued?	<ul style="list-style-type: none"> Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich (013WAFWE) Flood Alert Issued 18/01/21 19:38 River Weaver at Northwich Marina Flood Warning (013FWFCH24) issued at 09:30 on 20/01/2021 River Weaver at Navigation Road and Marine Approach (013FWFCH26) issued at 21:49 on 20/01/2021 Flood Warnings for Northwich Town Centre, River Weaver and Dane at Northwich, River Weaver at Weaver Way were not issued as these are triggered at a level where the defences are expected to be overtopped
Flooding Incident Information	<ul style="list-style-type: none"> River levels were within centimetres metres of overtopping flood defences and the floating dock was reported to be at its highest level (up to the white mark on the pile, Figure 12) Flooding within the Bull Ring due to surface water and the surcharging of the drainage network. The outfalls were river locked. At 23:00 on 20/01/21 a minor leak was observed in the raised defences at the Bull Ring and a small pump deployed. At 01:40 the temporary pump was removed and call made for a CW&C tractor unit pump support At 04:00 the tractor pump became active at Bull Ring UU's pumping station 'Bull Ring' was affected by Scottish Power cutting the power supply to the area for safety.
Flooding Impacts and Observations	<ul style="list-style-type: none"> Highway Flooding (Watling St, Dane St/Weaver Way) Roads were closed causing major disruption to traffic on this main access route. Significant Property damage Additional stress and mental anguish on the community over such an event happening again
Summary of Flooding Incident Response During Event	<ul style="list-style-type: none"> Northwich Quay boats evacuated Weaver Quay, located slightly upstream also had to be evacuated



Figure 12 - Northwich Quay Pile. February 2020

Source: Atkins

2.3. Weaver Way, High Street and Castle Street

Table 3 provides a brief summary of the flood event, impact and response at the Weaver Way and High Street in the Northwich Town Centre.

Table 3 - Weaver Way/High Street/Castle St Flooding

Weaver Way/High Street/Castle St	
Date	<ul style="list-style-type: none"> 21st January 2021
Affected Roads	<ul style="list-style-type: none"> Weaver Way, High Street/Witton Street, Castle Street, Crown Street, Barons Quay and Navigation Road
Description	<ul style="list-style-type: none"> Witton Street rises towards Bull Ring, and land slopes towards Weaver Way/River Weaver.
Flood Zone	<ul style="list-style-type: none"> Flood Zone 3, an area benefitting from flood defences protecting against river flooding
Flood Alert / warning issued?	<ul style="list-style-type: none"> Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich (013WAFWE) Flood Alert Issued on the 18th January 2021 at 19:38. River Weaver at Northwich Marina Flood Warning (013FWFCH24) issued at 09:30 on the 20th January 2021/River Weaver at Navigation Road and Marine Approach (013FWFCH26) issued at 21:49 on the 20th January 2021. Flood Warnings for Northwich Town Centre, River Weaver and Dane at Northwich, River Weaver at Weaver Way were not issued as these are triggered at a level where the defences are expected to be overtopped
Flooding Incident Information	<ul style="list-style-type: none"> At 00:00 on 21/01/21 sewer drains began to surcharge causing flooding to High Street and Barons Quay Significant flooding at Barons Quay adjacent to the River Weaver from surface water and drainage network surcharging Several businesses reported internal flooding. Flooding is reported to start at the low point outside Vision Express on the High Street from the surcharging of drains. The outfalls were river locked during the event Reported flooding on the west side of the River Weaver on Castle Street and Navigation Road Some flooding was reported up to a week before the peak of the event
Flooding Impacts and Observations	<ul style="list-style-type: none"> Highway Flooding Subway/Underpass Flooding (Chester Way) Significant Property damage Additional stress and mental anguish on the community over such an event happening again
Summary of Flooding Incident Response During Event	<ul style="list-style-type: none"> Declaration of a Major Incident Standby by Cheshire Police on 18/01 and Major Incident on 20/01 due to flooding across Cheshire, resulting in establishment of a Tactical Co-ordinating Group (TCG) – instigated full multiagency emergency plan and response Establishment of a Council Response Co-ordinating Group to tactically co-ordinate Council response activities. CWaC staff opened an Emergency Reception Centre at Northwich Memorial Court to receive displaced residents from Weaver Court ECV in Northwich. EA deployed flood defences. Phases 1 and 2 of Northwich flood defences installed. CWaC Highways and Street Care Teams had a large number of resources responding to calls, preparing, and delivering sandbags, making inspections on bridges, and closing roads. Pumping of water carried out by some residents/ business owners Fire Service pumping water out of properties Residents of Northwich Marina and Weaver Court ECV were evacuated by the Council and Emergency Services. Range of recovery actions by various CWaC Services and partners, including the Environment Agency and UU, in aftermath of incident including clean-up operations, bridge inspections, Locality Team visits to impacted residents across the borough, provision of

- ongoing accommodation to residents, support to businesses, and ongoing external and internal communications.
- Displaced residents of Northwich were also accommodated at hotels and B&Bs across West Cheshire.
- Establishment of both a Council Recovery Co-ordination Group and multi-agency Strategic Recovery Co-ordination Group – groups met multiple times. Latter group stood down on 24th February 2021

2.4. Witton Church School

Table 4 provides a brief summary of the flood event, impact and response at Witton School area.

Table 4 – Witton Church School Flooding

Witton Church School Flooding	
Date	<ul style="list-style-type: none"> • 21st January 2021
Affected Roads	<ul style="list-style-type: none"> • School Way, Priory Street and Percy Street
Description	<ul style="list-style-type: none"> • Surface water flooding • Sewer flooding (combined system). This was not reported to UU during the event and therefore they did not attend and investigate.
Flood Zone	<ul style="list-style-type: none"> • Flood Zone 3, an area benefitting from flood defences protecting against river flooding
Flood Alert / warning issued?	<ul style="list-style-type: none"> • Weaver catchment including Nantwich, Frodsham, Crewe, Winsford and Northwich (013WAFWE) Flood Alert Issued on the 18th January 2021 at 19:38. • River Weaver at Northwich Marina Flood Warning (013FWFCH24) issued at 09:30 on the 20th January 2021. • River Weaver at Navigation Road and Marine Approach (013FWFCH26) issued at 21:49 on the 20th January 2021. • Flood Warnings for Northwich Town Centre, River Weaver and Dane at Northwich, River Weaver at Weaver Way were not issued as these are triggered at a level where the defences are expected to be overtopped
Flooding Incident Information	<ul style="list-style-type: none"> • Witton Church School was flooded via overland flow to a depth of 200-300mm. • Surface water appeared to be running towards the school building from the northwest on School Way, similarly overland flow was coming from the rear of the school in the South and surcharging through the drains (combined system). This was not reported to UU during the event and therefore they did not attend and investigate. • The school has not been internally flooded before, although the Nursery area is sometimes closed during heavy rain. • The School Way Estate, including School Way, Percy Street and Priory Street, was also affected with many front gardens and the car park flooded.
Flooding Impacts and Observations	<ul style="list-style-type: none"> • Property damage • 282 students and 40 staff had to be placed at other schools during flooding and aftermath until April • Additional stress and mental anguish on the community over such an event happening again
Summary of Flooding Incident Response During Event	<ul style="list-style-type: none"> • Head teacher called Northwich Town Councillor for support who tried to get sandbags • There was no emergency plan in place for the school • Pumping took place after the event

Figure 13 shows debris and silt build up at the Whalley Road Flap Valve. Figure 14 shows evidence of the flooding that occurred in the school area.



Figure 13 - Whalley Road Flap Valve

Source: Business



Figure 14 - Witton School. 21/01/21

Source: School

2.5. Area Summary

Key statistics of the Storm Christoph Flooding in Northwich are summarised in Table 5. A detailed timeline of the flood event can be found in Appendix III.

Table 5 - Flood Impact Summary

Residential properties affected:	Commercial premises affected:	Number of properties evacuated:	Number of properties flooded:	Number of domestic properties flooded:	Number of commercial premises flooded:	Comment
94	65	63	47	1	46	As reported to CWaC prior to publishing

3. Flooding Mechanisms

This section provides a summary of the potential flood mechanisms for Northwich Town Centre and the Witton Church School areas.

3.1. Northwich Town Centre

3.1.1. Fluvial Flooding

Northwich Town Centre did not flood because of fluvial flooding. The peak water level on the River Weaver, recorded at 11:00 on 21/01/21 at Hayhurst Bridge, was 12.905m AOD compared to the lowest flood defence level in Northwich of 13.173m AOD. The temporary defences were installed in time to prevent water overtopping the banks.

The temporary defences were deployed at the following times:

- Phase 1 Defences Deployed – 18th January 2021 11:00.
- Phase 2 Defences Deployed – 20th January 2021 14:00.
- Phase 3 Defences Deployed – 20th January 2021 15:00.

The emergency services successfully evacuated 33 people from this area due to potential risk to life, Cheshire Police declared a major incident.

3.1.2. UU Combined Sewers and Pumping Stations

UU have confirmed that the Barons Quay and Dock Road pumping stations operated as designed throughout the flood event, there were no reported pump or telemetry failures at these locations. UU deployed an additional 150l/s pump at Dock Road to provide over pumping.

The Bull Ring Pumping Station was affected by Scottish Power's decision to cut power at the Bull Ring for safety reasons. This meant that the Bull Ring pumping station did not run throughout Storm Christoph.

UU provided and operated temporary pumps at the Waitrose Car Park, London Road, to provide additional over pumping.

It is not known whether waste water backed up from river locked CSOs and, if so, how much contributed to flooding on the 'dry side' of the defences.

3.1.3. CWaC Highway Drainage

The highway drains were surcharged during Storm Christoph due to a combination of insufficient capacity within the systems and backing up from river locked flap valves. This caused excess water to pond on the 'dry side' of the flood defences and build up in low lying ground.

3.1.4. Waitrose Car Park Surface Water Drains

All three surface water drains discharging to the River Weaver have flap valves, which appear to be in working order, and were river locked during the majority of the event. This resulted in excess surface water from rainfall in the car park unable to drain to the river and being held behind the raised defences and backing up towards the London Road area. This would have contributed to flooding on London Road but is not considered to be the main cause.

3.1.5. Private Drains

Within Northwich there are a number of private drains that discharge to the River Weaver, it has been confirmed that all but one have non-return valves in place. The drain without a non-return valve is thought to be a redundant land drain and is situated away from the town centre. The drains with non-return valves would have been river locked during the majority of the flood event, resulting in excess surface water unable to drain to the river. This would have contributed but not considered to be the main cause of flooding.

3.1.6. The Trust Assets

This section of the watercourse is part of the Weaver Navigation and the water levels are managed by the Trust through the operation of the sluices and spill weirs at Barnton, Saltersford and Winnington Sluices.

The normal operating rules for these gates is that they should open in response to increasing water levels.

Winnington Sluices

Winnington Sluices consist of 3 sluice gates which can operate independent of one another. All three sluices were over 80% open for the majority of time between the 12th January 2021 through to the 21st January 2021. The gates were open to their maximum during the following periods, coinciding with Storm Christoph:

- Gate 1 - 13:45 on the 19th January through to 03:05 on the 21st January 2021.
- Gate 2 - 13:00 on the 20th January through to 03:20 on the 21st January 2021.
- Gate 3 - 14:50 On the 20th January through to 03:10 on the 21st January 2021.

Saltersford Sluices

Saltersford Sluices consist of a single sluice gate. This gate was 99% open from 10:40 on the 20th January 2021, opening to 100% at 21:25 on the 20th January 2021, and then remained fully open until 14:40 on the 21st January 2021 when it returned to 99% open where it remained until 17:15 on the 22nd January 2021.

Barnton Sluices

Barnton Sluices consist of a single sluice gate. This gate was 100% open from 22:00 on the 20th January 2021 through to 10:20 on the 22nd January 2021.

3.1.7. Summary

Northwich town centre did not flood as a result from the River Weaver overtopping the town's flood defences. Therefore, it is likely that flooding occurred due to the conveyance and capacity issues within the highways, combined and surface water systems.

During Storm Christoph, river levels on the Weaver in Northwich town centre were the highest ever recorded. The defences held the main river back but the highway and combined drainage systems were surcharged and experienced backing up from river locked outfalls and CSOs.

3.2. Witton Church School

3.2.1. Fluvial Flooding

Witton Church School and the surrounding area did not flood because of fluvial flooding. The peak water level on the River Weaver was 12.905m AOD compared to the lowest flood defence level in Northwich of 13.173m AOD and, the temporary defences were installed in time to prevent water overtopping the banks.

3.2.2. Highways and Combined Drainage Systems

The school and surrounding area flooded as a direct consequence of the drainage networks, including highways, surface and combined, being collectively surcharged causing overland flow, notably from School Way towards the school, to a depth of between 200-300mm.

It is noted that United Utilities reported that there were no reported incidents of surcharge of their combined system however, during the event whereby flooding was widespread it would have been difficult to determine the exact source.

3.2.3. Surface Water Drainage on Site

The local surface water drainage system on site was surcharged. The location of some of these drainage assets are in such a position that surcharging of these drains contributed directly to water crossing the threshold into school buildings.

3.2.4. Summary

The school had not suffered from flooding before, it is likely that this first case of flooding occurred due to the conveyance and capacity issues within the highways, combined and surface water systems.

4. RMA Response – Strategic Overview

This section outlines the RMA response to the flood event and identifies areas for improvement of flood risk management within the CWaC administrative boundary. Consultations have been undertaken with the participating RMAs, local residents and business owners to inform this assessment.

4.1. Response and Resources

The following responses were made during Storm Christoph:

- Phase 1 to 3 of the demountable flood defences in Northwich were deployed by the EA following the trigger level procedure adopted by the Environment Agency. The threshold level of this demountable is 11.5mAOD and river levels were closely monitored to ensure water did not come behind the defence line through this pathway.
- Surface water pumps were deployed prior to the event in the Waitrose Car Park by UU and at the Bull Ring by the EA.
- CWaC mobilised the local farming community to provide tractor mounted pumps to the most affected areas during the event, including the Bull Ring and London Road areas. The local farmers supported the subsequent clean up operations and their support was gratefully received by CWaC and the Northwich community.
- Via agreement with the EA, United Utilities had contingency over pumping in place at their pumping stations. and staffed their Dock Road pumping station to ensure that it remained operational during the flood event.
- CWaC opened an emergency reception centre at Northwich Memorial Court to receive displaced residents
- A declaration of a Major Incident Standby was called by Cheshire Police due to flooding across Cheshire, instigating a full multiagency emergency plan and response.
- The Fire and Rescue Service evacuated a care home.
- The CWaC highways team were called to distribute sandbags, inspect highways and bridges and made any road closures necessary.
- Private owners were seen to be pumping water from their properties and businesses, with help from the fire service.

4.2. Communication and Multi-Agency Planning

Managing this flood event has highlighted the need for the LLFA to:

- Review data collection processes during and after an event and create a place where this multi-agency information can be stored in one central accessible hub.
- Review how the public will be made aware of the findings from the Section 19 Report and review the process to expedite release of information.
- Review the collective approach to manage surface water flood risk in the Town Centre.
- The EA and the Trust have started to explore opportunities to integrate and automate the Trust's assets within the EAs flood incident response. Further work is required to formalise this approach and to explore whether funding is available to support this process

4.3. Community Resilience

Although the community and local government acted quickly and were able to use and offer their own pumps to remove water from properties and businesses, managing this flood event has highlighted the need for improvements such as:

- Reviewing how the LLFA disseminates information to promote an increased awareness of personal flood action plans, to increase wider community engagement with the RMAs

- Increasing community engagement through open events in promoting awareness of flooding and the need for individual property action plans to be implemented by the property owners

4.4. Positive Observations

The following items have been identified as positive observations that should be noted:

- All RMAs and agencies were proactive in their individual response with the information and resources available to support this Section 19.
- EA Installation of Phase 1-3 flood defences were completed in timely manner, before water from the Weaver came out of bank.
- CWaC initiated their emergency traffic plan.
- Emergency services were on site and provided invaluable assistance to residents, particularly to undertake evacuations of the Marina and old people's home.
- All RMAs have consequently worked together in a collaborative partnership and provided post-event community support to affected residents.
- Since the previous Section 19 report following the October 2019 event, all RMAs and the Trust have taken steps to mitigate, and better manage, flood events in Northwich.
- CWaC and the RMAs committed to undertaking actions identified within the interim report prior to the completion of the final report.

4.5. Actions Taken to Date

CWaC as LLFA, alongside the RMAs and the Trust have made significant progress in developing a collaborative approach to the mitigation and management of flood risk and, in the post event recovery, since the October 2019 event.

Flood Risk Action Group (FRAG)

The FRAG has been set up for Northwich Town Centre and other affected areas borough wide with the first meeting held in May 2021. The FRAG is a regular and collaborative meeting at which the RMAs and the Trust have shared information and responded to questions raised by the public.

Northwich Infrastructure Flood Resilience Group.

Attended by representatives of CWaC (LLFA), Environment Agency and United Utilities, the purpose of this group is to discuss ongoing issues and to develop strategic approaches to improve understanding of flood risk and its mitigation. This group is currently planning the development of an Integrated Catchment Model for Northwich.

The group has discussed wider issues affecting the drainage networks and potential solutions to this, including:

- Implementing temporary pumping solutions.
- Ensuring all outfalls to the Weaver and Dane have non-return valves.
- An early warning system to identify rising water levels in the highway drainage system at key locations.

Northwich Emergency Plan Development

Attended by representatives of CWaC (LLFA), CWaC (Emergency Planning Team), CWaC (Area Office), United Utilities, Environment Agency and the Trust.

This group is aimed at developing and updating the Emergency Response Plan for Northwich given different flood alerts and forecast peak river levels. Subjects of discussion include developing clear lines of communication and, clarity of when different agencies begin to mobilise flood defences, resources and staff.

This group has taken responsibility for discussing, identifying and agreeing suitable locations for temporary pumping arrangement and associated access.

Operational Meetings.

Attended by CWaC (LLFA), CWaC (Network Management), Environment Agency, Canal and River Trust.

The purpose of this group is to discuss current and future works programmes that effect each of the RMAs assets, bridge swings that require road closures for example, to ensure routine activity by one party does not adversely affect another organisation or, the collective ability to manage flood risk.

In addition to the working groups identified above the following actions have been undertaken.

Owner	Action
EA / CWaC	Inspections have been carried out to assess all of the flap valves on outfalls in Northwich to ensure they are in the correct condition which will allows for them to be functionable during a flood event. Owners of the flap valves are aware of their role in maintaining their outfall and the importance of their upkeep. This included an Ad-Hoc visual asset inspection of the flood defences in and around Northwich.
CWaC	Gully covers have been replaced on London Road. The original covers were impacting their ability to be cleaned and maintained.
CWaC	The gully network has been surveyed and a cleaning programme was carried out. This included sewers all around Northwich. One package of work, which included Witton Street, has been identified and is the process of being addressed.
Private	Theatre Court have installed property resilience measures to their properties and have completed a drainage survey of the properties and installed non return valves for their outfall to the river network.
CWaC	Extended the drainage network CCTV area from the CCTV undertaken after the 2019 floods to include Chester Way and Queen Street.
CWaC and RMA Groups	Identified a flood risk action group (FRAG) and have held seven meetings to date. This included details such as identifying modelling areas of the town, pumping stations and the risk to infrastructure. Northwich emergency planning meetings have also been set up to fine tune action plans for the town if a flood event is forecasted. This involves planned steps for the town and all involved as predicted water levels rise.
CWaC / EA / the Trust	Operational meetings to discuss the impact of planned maintenance on the rest of the town, This involves how repairs such as bridge abutments and how the bridge swings will impact the town's traffic and the public following any planned maintenance.
CWaC	The operational team and emergency planning teams have carried out ad-hoc site visits to Northwich to discuss plans.
UU	United Utilities have either confirmed flap valves are present or added flap valves to existing pipes as part of their network.
UU	Completed a CCTV survey and cleaning of their sewer network in Northwich
UU	Installed 53 monitors at PS's and CSO's and 299 in sewer monitors within Northwich. This is part of their Dynamic Network Management Project which is a suite of sensors to enable proactive management of the Wastewater Network.
CWaC / EA	Broad talks have been held including drop-in sessions to discuss plans and progress with the public. The EA have also run demonstrations of flood defences and how they work.
CWaC, UU, EA, the Trust	Multi-Agency Flood Response Plans are being developed.
CWaC, UU, EA	Joint funding of temporary over-pumping at UU's pumping stations at Barons Quay and Dock Road agreed. These will provide an additional 1000l/s capacity to help mitigate the future risk of flooding.
The Trust	The Trust has undertaken works to maintain their assets on the River Weaver in line with their statutory obligations to manage water levels for navigation purposes.

5. Recommended Actions

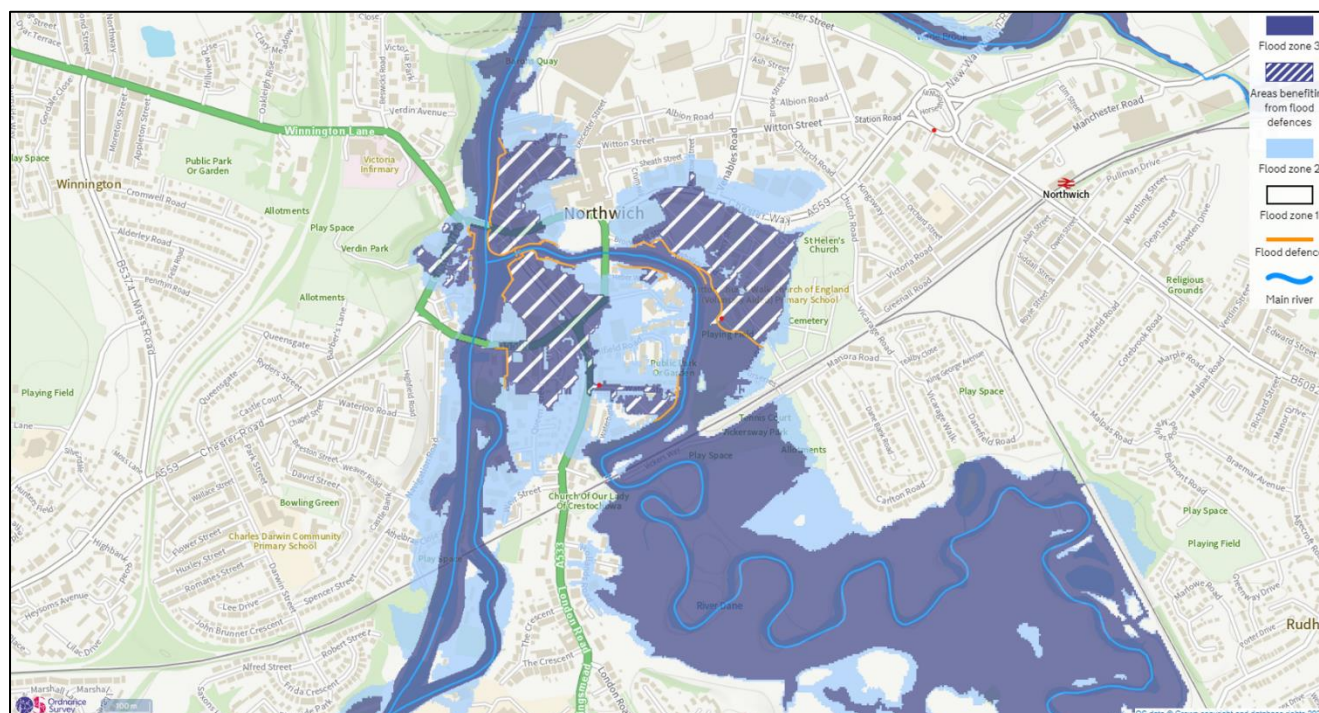
The LLFA role is to coordinate the management of flood risk within their administrative area. It is suggested that the recommendations made within this report are taken on board by the relevant RMAs and reviewed on a regular basis.

If, following a review of this Flood Investigation Report and its recommendations, and liaison with RMAs, flood risk is considered unacceptable, CWaC should investigate, alongside the RMAs, potential capital schemes which could provide flood alleviation.

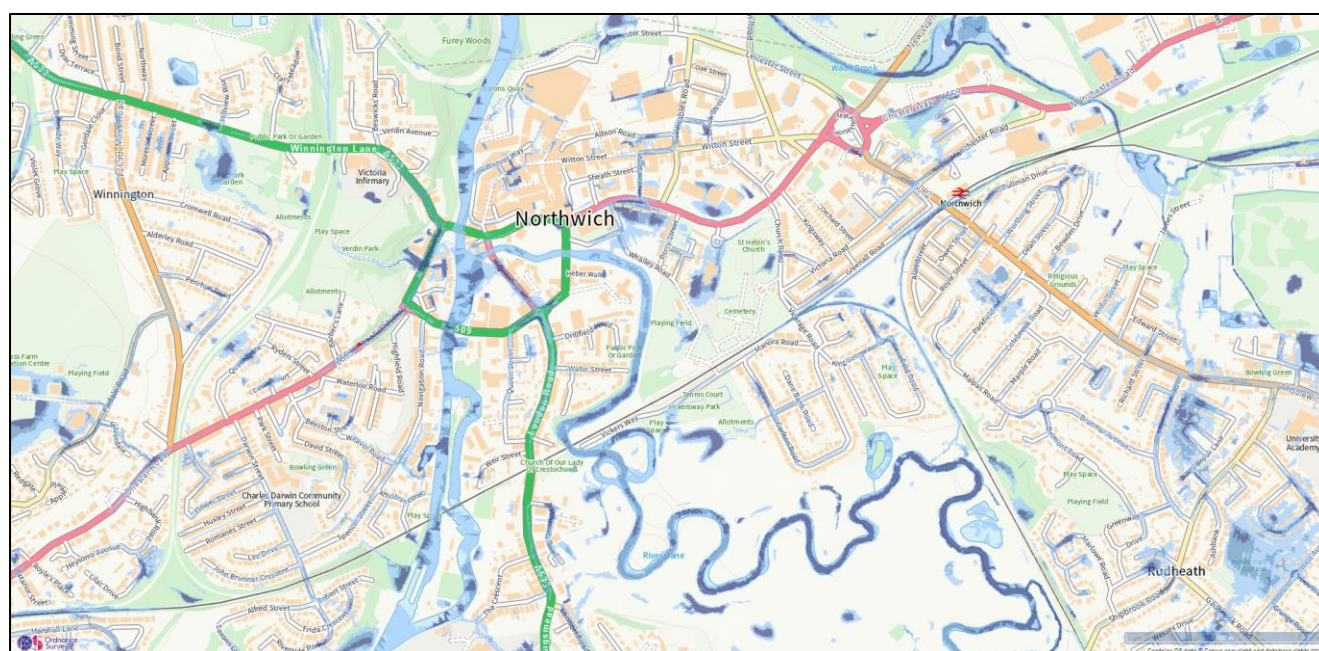
This Section 19 report recommends the following actions be taken:

- Construction of a sump on London Road from which temporary pumps can be operated to relieve the Waitrose car park of surface water when outfalls are river locked (NPFG/ CWaC). This is in addition to the empty chamber which has been located within the Waitrose car park.
- Following the work of the Councils Flood Risk Action Group (FRAG), the Council are to produce a holistic plan as to where the outfalls discharge to the river network and whether each asset owner has installed a flow control mechanism.
- Businesses should consider the implementation of Property Level Protection (PLP) measures to individual businesses in the short term (Businesses and CWaC).
- Continue the rollout of replacing poor condition highway and surface water gullies on London Road. This is partially complete, remaining works to be completed.(UU and CWaC).
- Undertake highway drain maintenance for School Way and Priory Lane.
- CWaC to increase its gulley emptying frequency for the area covered by this Section 19 investigation in line with its risk-based approach to gulley emptying.
- Continue to develop the Multi-Agency Flood Response Plans, the last update was June 2021.
- Undertake further CCTV surveys at the following locations:
 - Northwich - Weaver Court and Theatre Court through to outfall. This is a private system which should be surveyed.
- Develop a robust and coordinated incident response plan which should include the Witton Church of England School. Northwich Town Council to be consulted for the development of the plan.
- CWaC to provide guidance and support for the Witton Church of England School in their assessment and suitability of property level protection measures and additional approaches for mitigating risk to their school, this will include the development of their own flood resilience plan.
- Consideration of long-term solutions through the development of an integrated catchment model. This is to be a collaborative exercise between all RMAs and supported by the Trust. As part of this modelling exercise consider the following:
 1. Ensure the integrated modelling exercise extends to cover the area of the Witton Church of England School.
 2. Determine whether there is sufficient capacity within the collective drainage system and establish whether additional capacity is required. Sensitivity testing to be undertaken to review the impact of high water in the River's Weaver and Dane on the drainage systems which discharge to them.
 3. Determine whether the combined pumping regime within the catchment, across all RMAs, is sufficient and whether additional pumping capacity is required.
 4. Upon completion of the modelling exercise, and with reference to the conclusions, ensure a long-term development strategy for the town of Northwich is prepared that gives appropriate consideration of flood risk from all sources, and future flood risk, and measures required to mitigate risk to people and business.
- Continue to work closely with the EA and the Trust given their separate statutory functions in the management of water levels on the Weaver Navigation to identify and explore opportunities for additional funding to support the dual functionality of their assets, for navigation and flood management purposes.

Appendix I. Flood Maps



Source: EA

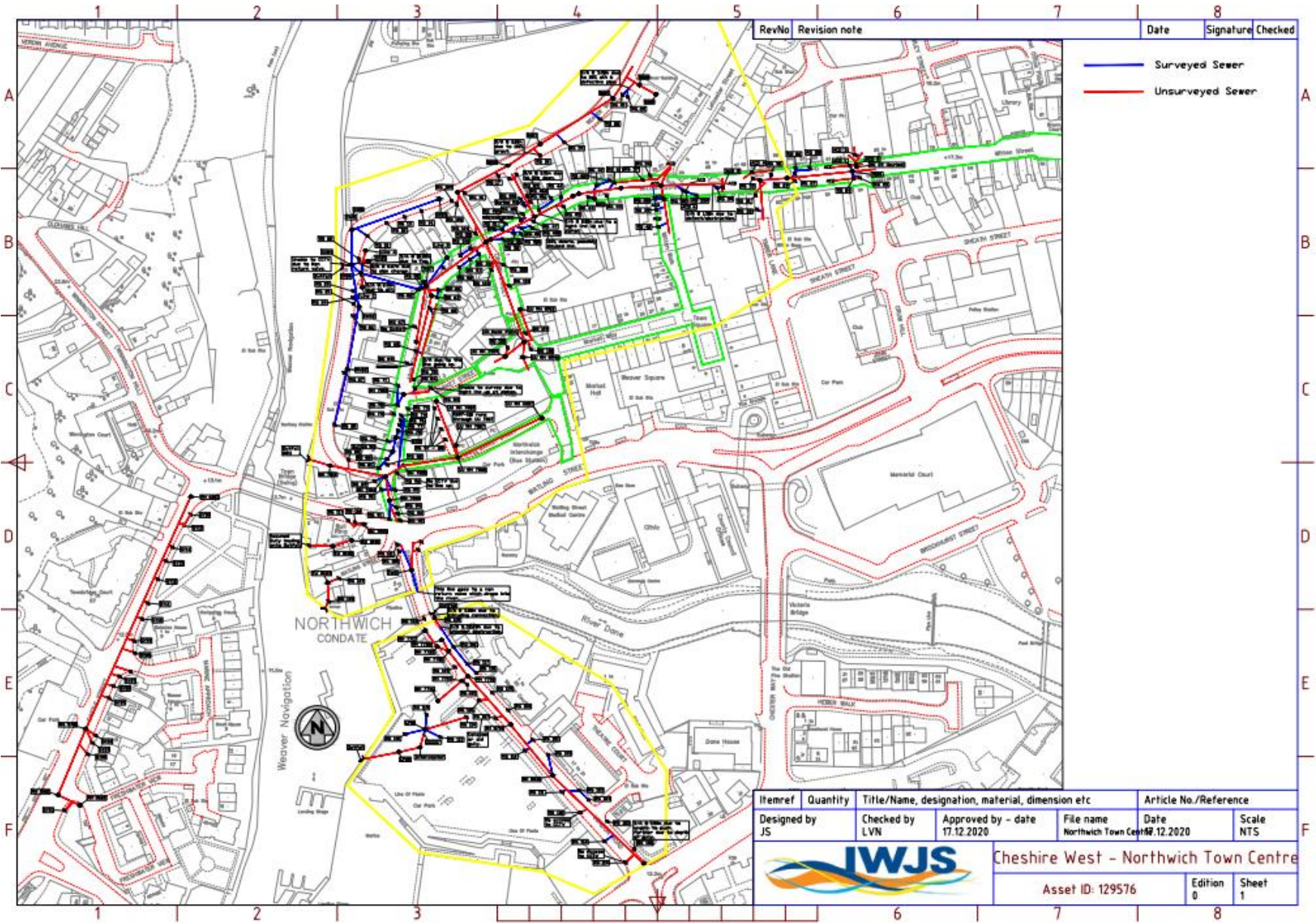


Extent of flooding from surface water

High Medium Low Very low

Source: EA

Appendix II. Highway Drainage Network



Appendix III. Timeline

Time	London Road and Theatre Court
21 st Jan 12:20	Water began to enter properties in Theatre Court.
21 st Jan 22:50	Flood levels reached their peak.

Time	Bull Ring and Northwich Quay
21 st Jan	No information available at this time

Time	London Road and Theatre Court
21 st Jan	No information available at this time

Time	Witton School
20 th Jan pm	Water was observed coming up from the drains in the school ground. This was not reported to UU during the event and therefore they did not attend and investigate.
21 st Jan 10:00	Flood water began to enter the school grounds. Sandbags were placed at the doors.
21 st Jan 11:30	The school was surrounded by water.
21 st Jan pm	In the early afternoon the school was internally flooded to approximately 150mm depth