

Report to North Central Area Committee 20th November 2023

Re: Flooding In Clontarf on the 05th of August 2023.

Report prepared by Dublin City Council in conjunction with Nicolas O' Dwyer LTD

Executive summary:

In the wake of the extreme weather event of the 05th of August Dublin City Council commissioned Nicolas O' Dwyer LTD (NOD) to complete a review of the flooding event using recorded telemetry, rainfall data, information gathered by Dublin City Council Drainage Department, Irish Rail and eye witness records from Clontarf golf Club as well as affected residents in Auburn Apartments, Castle Court Road and 102 Howth Road. The purpose of this analysis was to inform Dublin City Council of the steps required to ensure such an event can be managed in the future without causing flooding to properties at Auburn Apartments and Castle Court.

The analysis has demonstrated opportunities to optimise the operation of the existing culvert and attenuation storage pond located at the Clontarf Golf Course. The system set up has now been modified to allow for additional flows within the culvert during a storm event, thus reducing the peak flow to the attenuation pond. The hydraulic model estimates that had the revised system set up been in place on the 05th of August the building flooding theoretically may not have happened, as the flows to the attenuation pond may have been managed and the attenuation pond may not have reached capacity and over spilled.

In addition to changes to the existing system operation, Dublin City Council has:

- upgraded the surface water network at 102 Howth Road, therefore removing a unforeseen restriction within the surface water network at this location;
- completed preliminary grading work and associated surveys within the Clontarf Golf Course to allow for the construction of additional storage/attenuation capacity within the area;
- increased operational monitoring of the Clanmoyle flood scheme;
- appointed NOD to complete the detailed design and procurement of a contractor to deliver the Phase 2 works, which include increasing the flow capacity of the existing Wad River under Howth Road and at the seafront.

The above actions ensure that a similar weather event to the one that occurred on the 05th of August can now be managed by the existing system.

1 Introduction:

Nicholas O' Dwyer Ltd (NOD) was originally, appointed by Dublin City Council to carry out a full catchment study of the Wad River in order to examine the hydraulic performance of the existing surface water drainage system and recommend works to improve flood protection within the Wad River catchment.

The study proposed:

- the construction of a flood routing culvert from Clanmoyle to Clontarf Golf Club and the construction of attenuation storage in Clontarf Golf Club (the 'Phase 1 Works'), and
- increasing the flow capacity of the existing Wad River culvert by constructing a new culvert across Howth Road and a new outfall culvert to the sea in Clontarf (the 'Phase 2 Works').

The flood attenuation pond was constructed in Clontarf Golf Course as part of the Clanmoyle Flood Relief Scheme in order to relieve flooding in the Clanmoyle Road and Collins Avenue East area. This was phase 1 of the proposed flood relief for the catchment and the pond controls were commissioned in 2017.

The remaining downstream works to increase culvert capacity at the Howth Road and Clontarf seafront are to be undertaken as part of Phase 2 and have not yet been completed. However, planning permission for Phase 2 was granted by An Bord Pleanála in September 2023 and Dublin City Council has appointed NOD to complete the detailed design and contractor appointment for phase 2 of the works.

1.1 System Catchment:

The Wad River drains a catchment area of approximately 483 hectares, including parts of Ballymun, Santry, Donnycarney, and Killester, discharging to the seafront at Clontarf in north County Dublin. The Wad River, originally an open channel, has been almost completely replaced with culverts and pipelines of varying dimensions over the 6 km route from Albert College Park on Ballymun Road to the seafront at Clontarf Road.

Flooding alleviation works were undertaken at Clanmoyle Road and Clontarf Golf Course during 2014-2017 to provide improved protection to properties at the Clanmoyle Road and Collins Avenue. These works included additional overflow chambers, large diameter pipes and the construction of an approximately 35,000m³ attenuation facility in Clontarf Golf Course.

The extent of the Wad catchment and the route of the main Wad River culvert is highlighted in Figure 1-1.

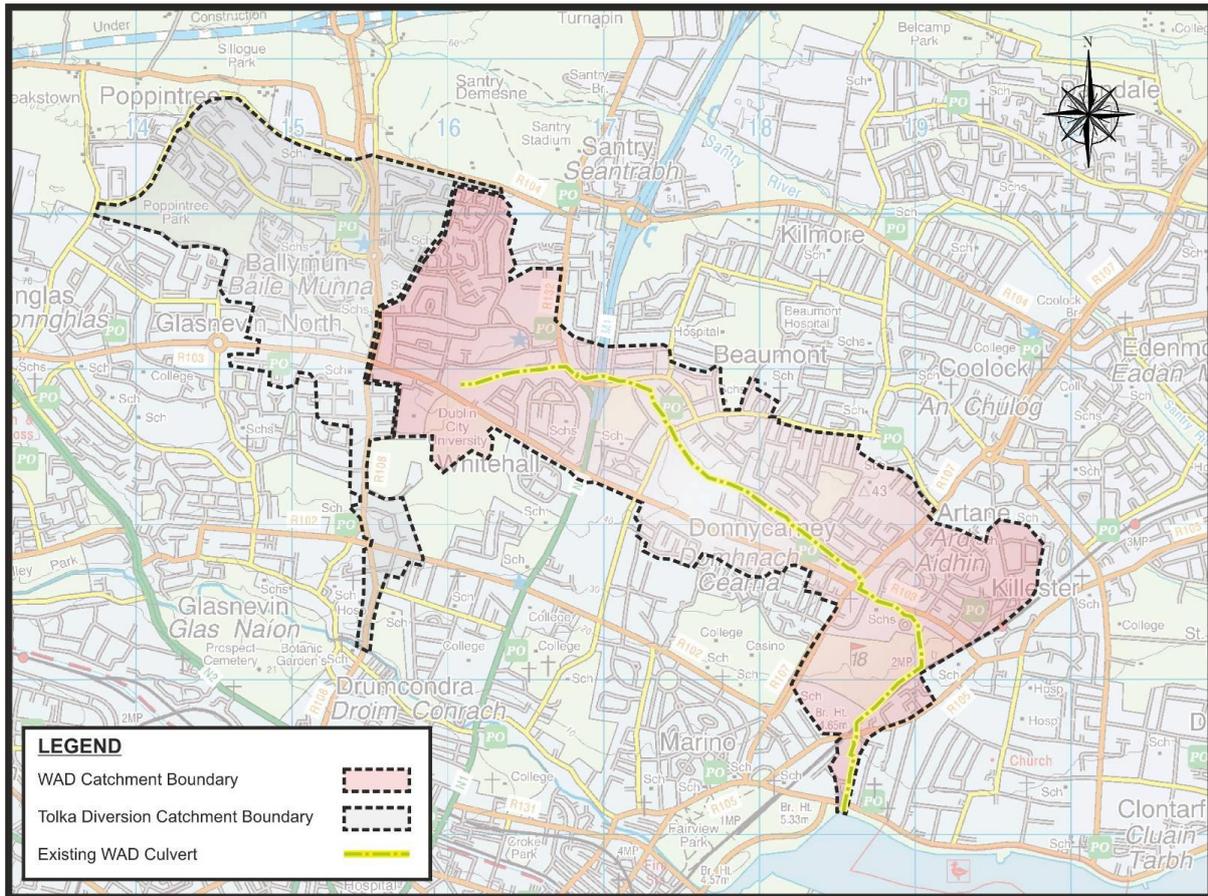


Figure 1-1: Previous and Existing Catchment Boundary, and Route of Wad River

In addition, during an extreme storm event the flows within the Wad Culvert is also influenced by the North Dublin Drainage System (NDDS), with a controlled overflow from the NDDS being discharges into the Wad Culvert. The extent of the NDDS catchment, which impacts on the Wad River is set out below:

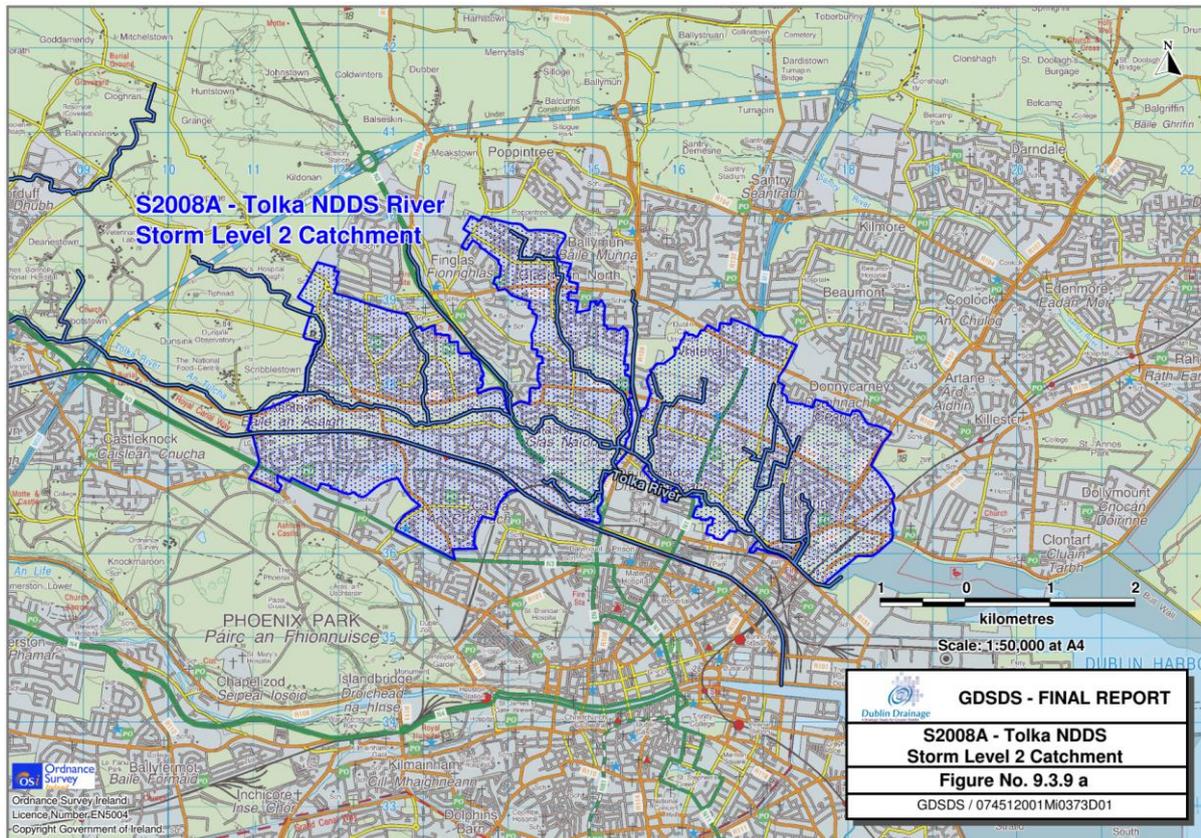


Figure 1-2: Boundary of Tolka NDDS storm level 2 catchment

1.2 Operation of the phase 1 flood scheme

1.2.1 Design of flood bypass culvert and Golf Course Storage Pond

The phase 1 flood works were designed to prevent flooding in Clanmoyle Road and Collins Avenue area and provide protection to manage flows within the downstream network in line with the system's capacity. The attenuation pond was constructed to provide sufficient storage capacity on an interim basis to protect the properties in Clanmoyle Road, Collins Avenue until the phase 2 works were completed and would provide protection for a 1in 100 year fluvial storm with a high tide event.

The attenuation system comprises several elements in addition to the attenuation pond.

Flow Distribution Chamber (FD1)

The flow distribution chamber is upstream of the pond and contains a motorised gate on the main Wad pipeline, and an overflow pipeline which will take flows to the attenuation pond when an overflow occurs.

Flow Return Chamber 1 (FR1)

Flow Return Chamber 1 is on the outflow pipe from the attenuation pond. This chamber also contains a motorised gate which can prevent flow from the pond to the downstream network.

Flow Return Chamber 3 (FR3)

This chamber is located downstream of where the pipeline from FR1 re-joins the original Wad pipeline from FD1.

FD1, FR1 and FR3 are shown on figure 1-3 below.

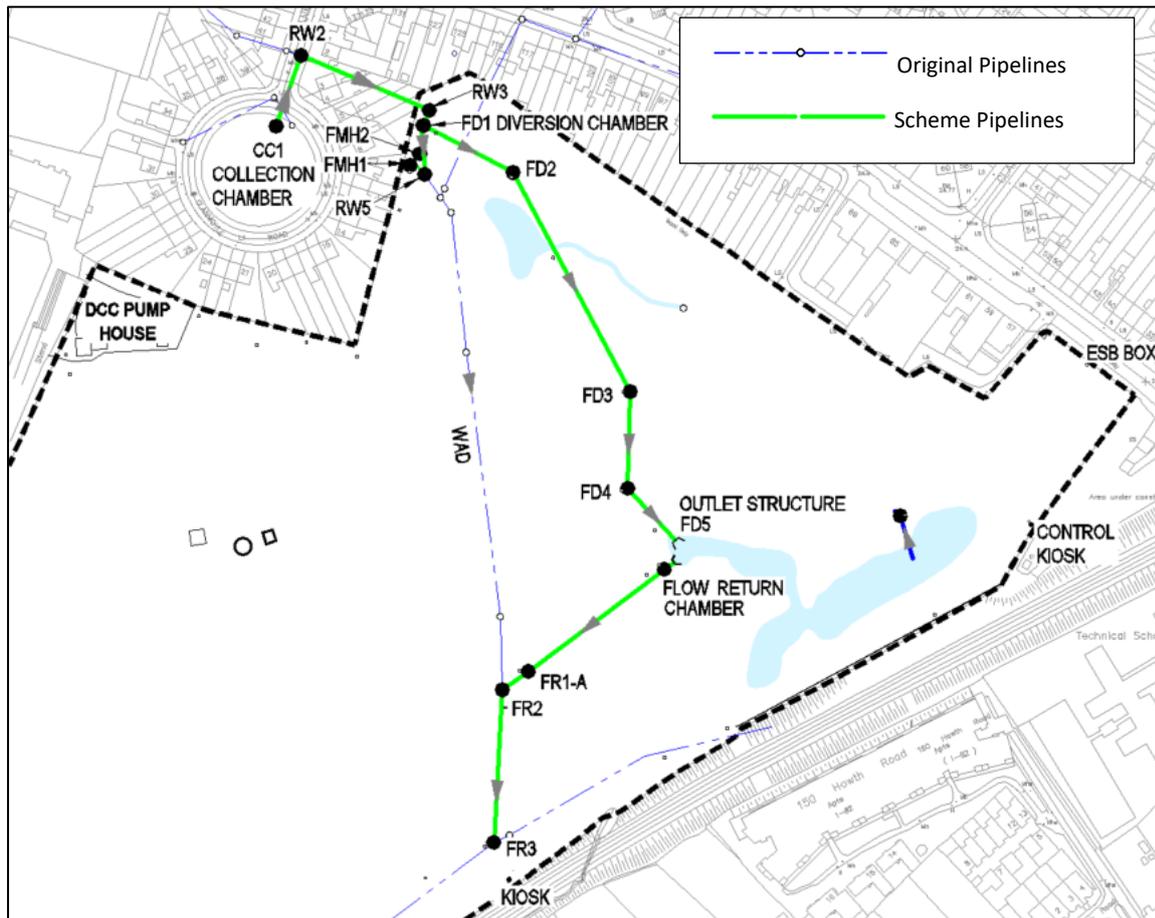


Figure 1-3: Attenuation system at Clontarf Golf Course

1.2.2 Operation

In normal circumstances the motorised gates at Flow Distribution Chamber (FD1) and Flow Return Chamber (FR1) are fully open and all flow continues in the main Wad pipeline with no flow diverted into the attenuation pond.

When the level sensor at the Howth Road detects levels have risen to the pre-set high level point the system becomes active and the motorised gates move to their initial positions of partially open for Flow Distribution Chamber (FD1) and fully closed for Flow Return Chamber (FR1). Thus during the storm event, the peak flows are diverted into the attenuation pond and the downstream culvert flow is maintained at a pre-set flow level. The Flow Distribution Chamber (FD1) motorised gate opens or closes in response to the measured levels at the Howth Road chamber. Thus controlling the volumes of flow diverted to the attenuation pond or allowed to continue downstream within the main Wad pipeline.

Once the Howth Road levels fall below the low level set point the Flow Distribution Chamber (FD1) gate reopens, and no flow is diverted to the attenuation pond. In addition the Flow Return Chamber (FR1) gate begins to slowly open to release the stored water to the downstream network.

1.3 This Report

Following the flooding event of 5th August and subsequent lesser storm event of 19th August, Dublin City Council commissioned NOD to carry out a review of the flooding event using recorded telemetry, rainfall data, information gathered by Dublin City Council Drainage Department, Irish Rail and eye witness records from Clontarf golf Club as well as affected residents in Auburn Apartments, Castle Court Road and 102 Howth Road.

The purpose of this analysis was to inform Dublin City Council of the required measures to ensure that a similar rainfall event could be managed in the future.

2 5th August recorded data

2.1 Storm Event 5th August 2023

Storm Antoni struck Ireland on August 5th bringing high winds and heavy rain to the east of the country. The Dublin City Council rain gauge at Clanmoyle Road recorded 56.8mm of rain between 10pm on August 4th and 9pm on August 5th. The heaviest rainfall recorded at a Met Eireann gauge on August 5th was 48.6mm at Dublin Airport. This rainfall followed an extremely wet July, following which Met Eireann has reported that the Phoenix Park rain gauge experienced its wettest July on the digital record (based on 82 years of digitised data back to 1941).

Following this heavy overnight rain on the night of August 4th/5th flooding occurred in Clontarf Golf Club, along the railway line and at Auburn Apartments and Castle Court in Clontarf. The flooding occurred very rapidly inundating the basement car park and some ground floor apartments in the apartment block, together with 18 houses in Castle Court and at the property at 102 Howth Road.

2.2 Wad and NDDS Catchment Rainfall

The Dublin City Council rain gauge at Clanmoyle Road recorded 56.8mm of rain between 10pm on August 4th and 9pm on August 5th. The peak intensity recorded in any of the 5-minute recording periods was 19.2 mm/hr from 5:35am to 5:40am.

2.3 Catchment Runoff

As part of the works carried out at Clanmoyle Road there are flow gauges installed at various locations in the system. In particular there are flow gauges installed upstream and downstream of the attenuation pond in Clontarf Golf Course, and there is a flow gauge installed downstream at the culvert below the Howth Road.

The recorded data (Figure 2-1) shows that the flows upstream of the Clontarf Golf Club pond increased steadily from approximately 0.3m³/s at 1am to approximately 2.5m³/s at approximately 4:45am. Flows then increased rapidly to more than 5m³/s by 5:15am.

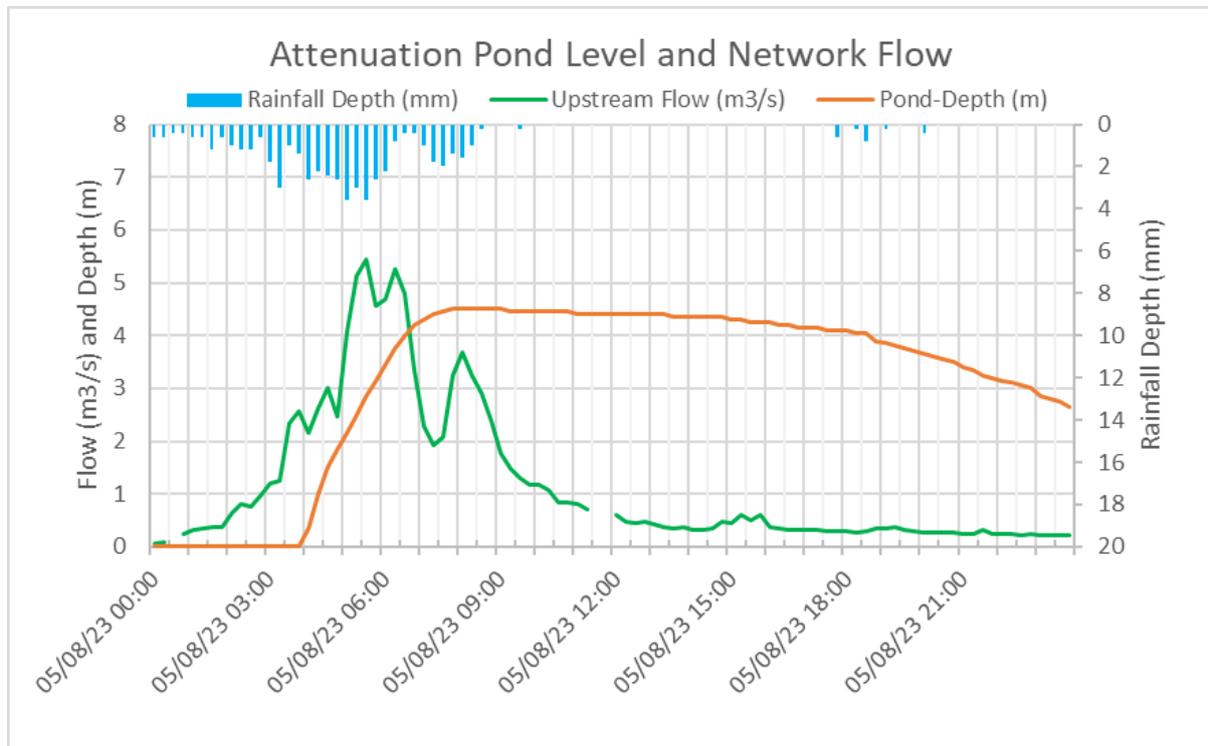


Figure 2-1: Recorded flows and pond levels

Based on the recorded data, the attenuation pond in the golf course started to receive flow at approximately 3:47am. Between 3:47am and 10am that same day approximately 70,000m³ of water was diverted into the attenuation pond.

The attenuation pond has a capacity of approximately 35,000 m³, so at approximately 7am the pond overflowed causing flooding of the golf course. At 8:05am the flooding on the golf course had reached the elevation of the recording instruments in the flow return chamber no. 3 (FRC3), recording a fault event as those recording instruments went offline. These instruments are for recording only and are not involved in controlling the attenuation system, so their loss did not impact the system operation.

The stored water escaped from the golf course onto the adjoining railway tracks via several low points in the boundary and via some potential seepage around the pond wall. Some flow also escaped via the old Wad culvert beneath the railway track. This joins into the trackside drainage and contributed to flooding of the railway line.

As water accumulated on the railway line it flowed southwest along the railway track following the gradient of the tracks. The ground level on the south side of the railway is initially high in the vicinity of the No. 150 Howth Road complex, and remains high into the Apartments at Ashbrook. Continuing southwest the houses at Ashbrook are at a level with the tracks but are protected by a solid wall between the tracks and the gardens. The ground surface at the next property southwards, the Auburn Apartments, is approximately 1m below the level of the tracks, and the divider between the apartments and the track is a wooden slat fence. The rear gardens of the adjoining Castle Court

houses are also approximately 2m below the level of the tracks and are likewise only separated from the tracks by a wooden slat fence.

At approximately 8:45 am the flood waters on the railway line came beneath and through the wooden fence, particularly at the rear of the Auburn Apartments, and flooded the surrounding landscaping. The basement car park of the Auburn Apartments has several large ground level ventilation openings at the rear and side of the building, and these allowed water to rapidly fill the car park.

Some flow was coming through the fences into the rear gardens at Castle Court by this time, however it appears that the main flow of flood water came around the northern side of the Auburn Apartments onto the road. This road is at a higher elevation than the houses on the northern side of the road so floodwaters flowed down the driveways of these houses and into the houses.



Figure 2-2 Sequence of flooding, 5th August 2023

2.3.1 Scheme performance on 5th August

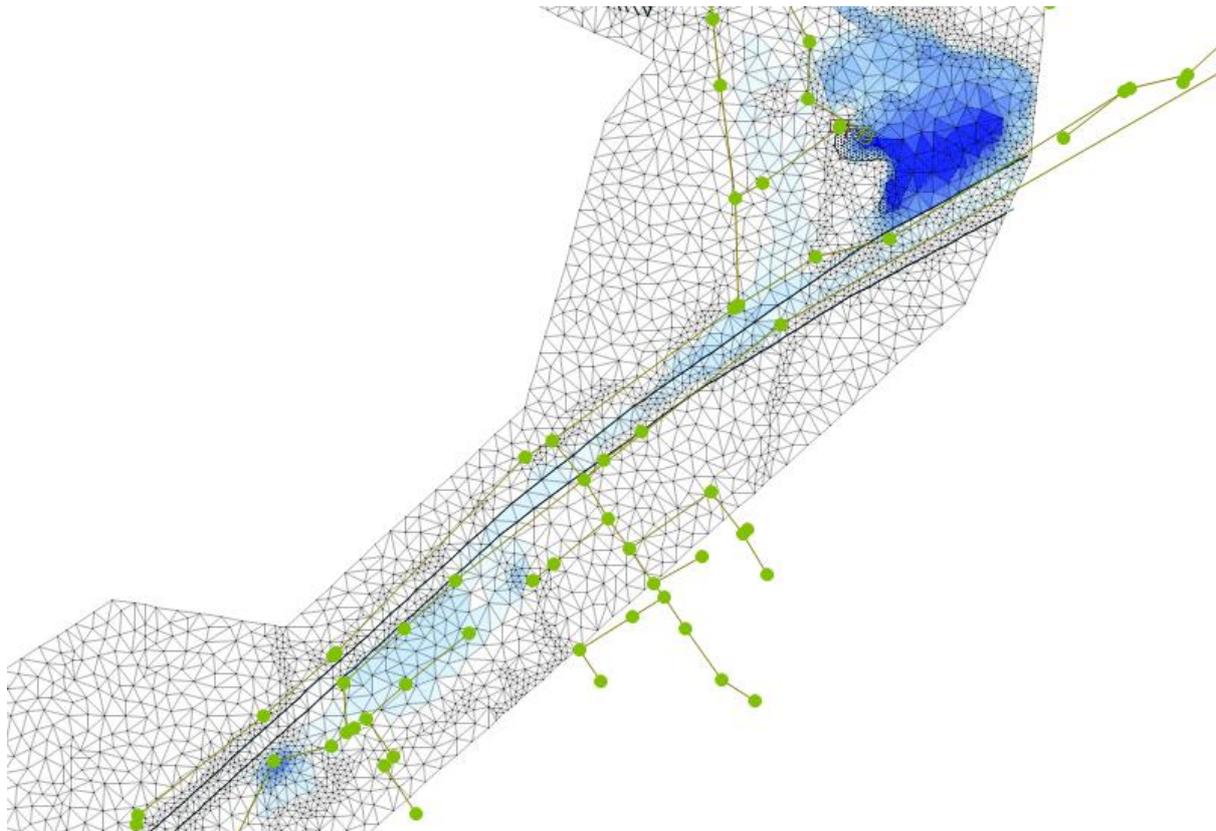
On the morning of 5th August the heavy rain caused the water levels at the Howth Road to increase above the setpoint at which the system enters active mode.

The motorised gate at Flow Distribution Chamber (FD1) became active at 3:47am and began to restrict flow into the downstream network by diverting it into the attenuation pond. The inflows to the Flow Distribution Chamber continued to increase for several hours after this. Due to the recorded water levels at the Howth Road the motorised gate fully closed to ensure the Howth Road levels did not exceed the set level.

By 7:45am the pond level had reached the bank level of the earthworks on the golf course and the pond overflowed into the course. At 8:05am the flow and level instruments at Flow Return Chamber (FRC3) went offline, indicating that water had reached the level of the instrument kiosk. These instruments are for recording only and are not involved in controlling the attenuation system, so their loss did not impact the system operation.

The Flow Distribution Chamber (FDC) gate remained fully closed until 2:37pm when the levels at the Howth road receded enough to allow flow to resume in the main Wad pipeline.

NOD has model the sequence of events which caused the flooding on the day and a screenshot of the model predicted flooding is shown below, which is in line with the flooding encountered on the day.



3 Recommendations, Actions Completed and Ongoing work.

3.1 Review of System performance

Using the hydraulic model as a design tool it is possible to optimise and increase the setpoints which control the system operation and to improve the functionality of the system. The improved functionality allows for a greater flow within the existing Wad Culvert, before the system enters active mode and allows for greater flows within the existing Wad Culvert during flood active mode, thus decreasing the flow to the attenuation pond and optimising its storage capacity. The design team has noted that there is a balance required between passing enough water to prevent the pond overflowing and retaining enough water to prevent flooding at the Howth Road. However, using the hydraulic model as a design tool NOD are satisfied that the setpoints can be increased to allow for the optimal performance of the system. NOD has issued revised setpoints for the system controls, which have been implemented within the control logic.

The hydraulic model estimates that had these setpoints been in place on the 05th of August the building flooding theoretically may not have happened, as the flows to the attenuation pond may have been managed and the attenuation pond may not have reached capacity and over spilled.

To ensure that the control system setpoint update is optimised, Dublin City Council in conjunction with NOD will undertake an iterative process involving review and updates of the settings after each storm event for the forthcoming 12-24 months, followed by ongoing review of the operation of the system after any large storm event. This will ensure that the system will operate to its optimum capacity into the future.

3.2 Upgrade to Surface Water Network at 102 Howth Road

The old course of the River Wad runs through the site at 102 Howth Road and while it's almost exclusively culverted in a pipe of at least 600mm diameter in size, there was a circa 10m long section below the basement at No.102 Howth Road which was only 450mm in diameter. In addition there was a section of open channel, of circa 10m long under the patio/decking at 102 Howth Road. Flood waters affecting the Castle Court/Auburn area (upstream) can only discharge and be relieved, by passing through the property at No.102 Howth Road. Therefore the 450mm culvert section represented a restriction on the capacity to drain flood waters from this area. Furthermore, the open channel section gave rise to a small but not insignificant risk of complete blockage of this watercourse which, if it occurred, would have major flooding implications for upstream and downstream properties.

Following the flood event of the 05th of August, our drainage crews in conjunction with an external contractor has now installed a 600mm culvert across the full extent of the site, ensuring that the maximum flow capacity is available in the network downstream from Castle Court and thus mitigating against the risk of further flooding in the upper catchment due to the surface water restriction.

3.3 Increased storage capacity within Clontarf Golf Course

We have now completed all the necessary survey works within the Clontarf golf club and adjoining areas. Our construction crews have also completed preliminary grading works within an area of the Clontarf golf course that has been identified as being suitable for the storage of storm waters during an extreme weather event.

We also have identified the additional construction work at the golf course boundary – particularly at the low points to ensure that any flooding which occurs on the golf course can be retained within the golf course as far as reasonably possible. The initial design calculations indicate the possibility of adding up to 8,500m³ of additional storage within the golf course. We are now working on the delivery solutions and associated costs to complete the works.

3.4 Update monitoring Programme

We have implemented enhanced monitoring of the Clanmoyle flood alleviation scheme, including ongoing monitoring of the attenuation pond level and rain gauges within the Wad catchment. This enhanced monitoring is being integrated into an updated action plan for our on call engineer responsible for the monitoring and management of flood events.

In brief the updated action plan will set out appropriate actions which can be undertaken by the on call team in response to rainfall and attenuation pond level alarms, allowing for actions to be taken prior to attenuation pond reaching capacity and possibly over spilling.

3.5 Progression of Phase 2 Work

We have appointed NOD to complete the detailed design and appointment of a contractor for the phase 2 works. NOD have been working on the detailed design and associated contract documents since September and it is anticipated that the design and procurement documents will be completed by the end of Q4 2023, with a view to commencing the tender process in early 2024 and the appointment of a contractor in Q2 2024.

James Nolan
Executive Manager Engineering

Appendix 1: Resident Queries RE Report on 18th September 2023

1. The report states: *'In order to deliver the culvert outlet at the seafront at Clontarf, Dublin City Council was required to seek planning approval from An Bord Pleanála. Dublin City Council submitted the application in July 2022 and has subsequently responded to requests for further information from the board in November 2022. The Board granted approval for the scheme on the 04th of September 2023.'*

This prompts a couple of Qs:

- a. Bearing in mind, yesterday's initial report commences with the sentence: *"As a result of flooding events, which occurred in August 2008, July 2009 and October 2011..."*, when did DCC start seeking planning approval from An Bord Pleanála to deliver the Culvert outlet at the seafront?

The City Council commenced the planning process in respect of the scheme in 2012, utilising the public consultation procedure required under Part 8 of the Planning Regulations. Following advice from our engineering and planning consultants, we were required to make a submission to An Bord Pleanála (ABP) in respect of the scheme due to the potential environmental impact of the new outfall culvert to the sea in Clontarf. This Part 20 Application to ABP was due to changes in environmental legislation following the Part 8 approval in 2012. This Part 20 involved the procurement of various environmental surveys during 2021 and 2022 to support this application. These were managed and assessed before submission of the Application in July 2022.

- b. Can the word "subsequently" be clarified in terms of providing a precise date for when DECC replied to ABP?

The City Council replied to ABP in November 2022.

2. Can DCC provide clarity around the timeline for the completion of the 'phase 2 works' that were granted on Sept 4th. Is completion in 2024 guaranteed, or are there further planning obstacles that need to be overcome?

There are no further statutory consents required in advance of delivering the project. The City Council has now appointed Nicolas O' Dwyer to complete the detailed design and to appoint a contractor to complete the works. It is anticipated that the works at the Howth Road will be completed in Q2 2024, with the works at the sea front being completed in Q3 2024, due to environmental restriction on when these works can be completed.

3. *"The City Council has already engaged with Clontarf golf course with a view to retaining addition storm waters within the golf course and eliminating flows via the culvert under the railway or onto the railway line. Survey work is currently being carried out to ensure that that these measures provide additional capacity and do not result in any unintended consequences."*

This statement is not at all reassuring. Is this not a case of doubling down on the existing approach that led to the direction of water from the golf course into the Auburn car park &

Castle Court in August during extreme rainfall? Where is the culvert under the railway located and can this culvert be relocated or directed away from Castle Court & Auburn?

The intention is to remove the flow path from the golf course via the railway line to the Auburn apartment and Castle Court, by creating an impermeable boundary along the railway line and thus retaining any storm waters within the golf course.

4. The full review of the catchment & drainage networks will take another 6 weeks. Does this mean that further, more substantial measures for flood risk management in this catchment area are being considered in addition to what is included in the initial report?

In order to ensure that the appropriate long term flood protection is in place the City Council need to ensure we have completed the appropriate due diligence, this requires a complete review of the catchment and drainage network. It does not necessarily mean that there will be a requirement for additional measures to manage the flood risk within the area.

5. The query is about the possibility of Blackwater contamination from the flood in both Auburn apartments and Castle Court. Can you please advise if Dublin City Council can provide a specialist in this field to ensure the Health and Safety of all residents? This is one of the priorities.

The City Council is in the process of procuring the necessary environmental testing to ensure that the properties can be reoccupied.

6. We obviously need to have a clear understanding of the planned works by Dublin City Council to eliminate the risk in the medium to long term and the timescales for delivery. Further to this if the Auburn Apartment Block cannot get insurance what process is in place to get cover?

Following an analysis of the event of the 05th of August, Dublin City Council has undertaken the following actions:

The control system which manages the operation of the attenuation pond within the Clontarf golf course has been modified to allow for additional flows within the culvert during a storm event, thus reducing the peak flow to the attenuation pond. The hydraulic model estimates that had the revised system set up been in place on the 05th of August the building flooding theoretically may not have happened, as the flows to the attenuation pond may have been managed and the attenuation pond may not have reached capacity and over spilled.

In addition to changes to the existing system operation, Dublin City Council has:

- *upgraded the surface water network at 102 Howth Road, therefore removing a unforeseen restriction within the surface water network at this location;*
- *completed preliminary grading work and associated surveys within the Clontarf Golf Course to allow for the construction of additional storage/attenuation capacity within the area;*
- *increased operational monitoring of the Clanmoyle flood scheme;*
- *appointed NOD to complete the detailed design and procurement of a contractor to deliver the Phase 2 works, which include increasing the flow capacity of the existing*

Wad River under Howth Road and at the seafront. These works are due to completed by September 2024.

7. We have been informed that to move electrical services from the basement Auburn apartments to ground level for flood remediation will not be covered by insurance and will have a considerable financial impact and hardship on residents with estimate cost of €35,000 - €40,000. Given the issue arose from the failure of Dublin City Council to deliver the remedial action which would have prevented flooding in the first instance we are seeking financial commitment for payment of remedial works not covered by insurance.

Any such claims being made against Dublin City Council will be investigated and assessed via Dublin City Council's claims department, which can be contacted at law@dublincity.ie