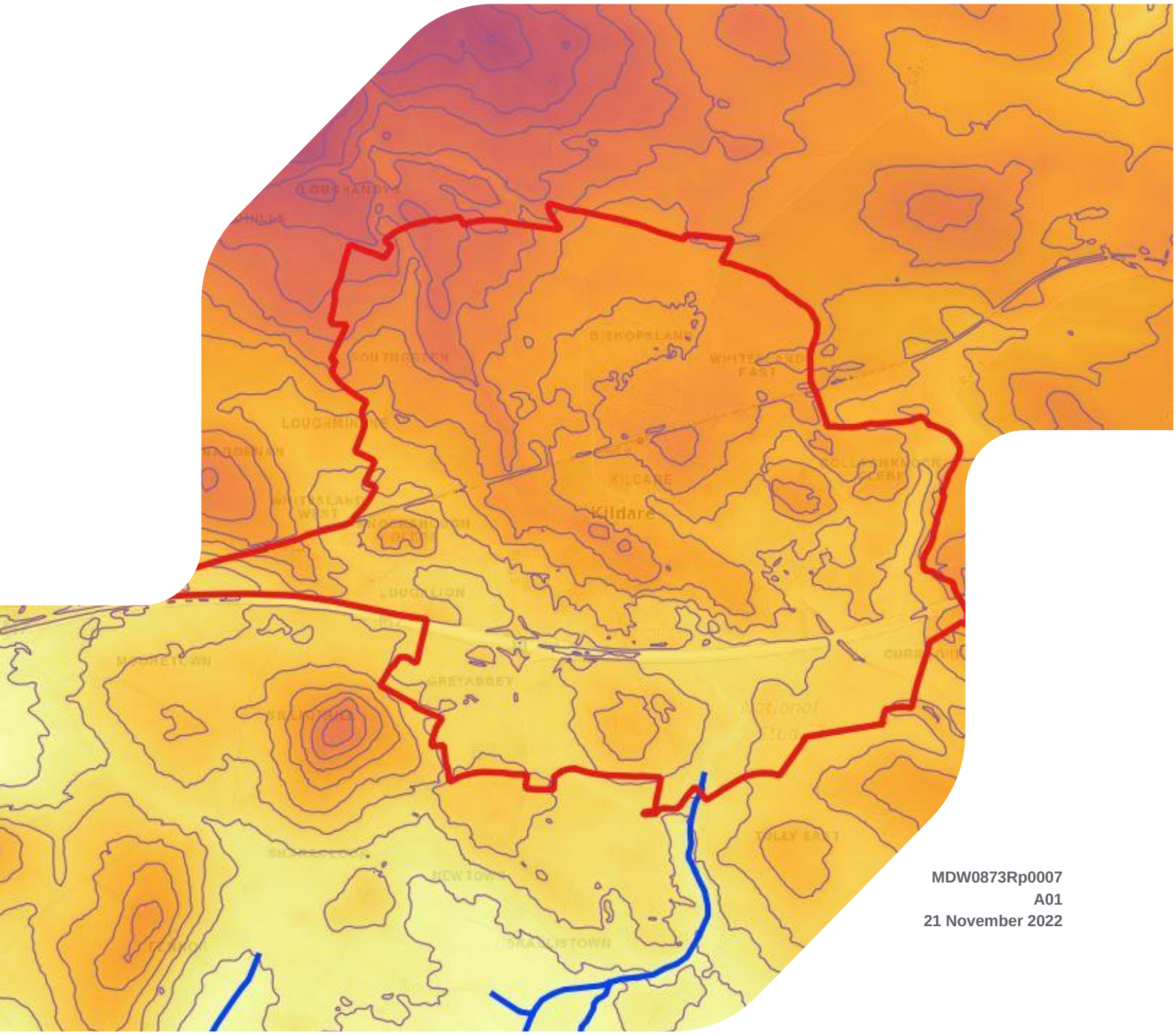
KILDARE TOWN SURFACE WATER STUDY

Stage 1 – Data Collection



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21 November 2022

Stage 1 – Data Collection

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Prepared by:

RPS

Prepared for:

Kildare County Council

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1 INTRODUCTION

1.1 Background

RPS was commissioned by Kildare County Council (KCC) to complete a Surface Water Study (SWS) for the town of Kildare. The overall objective of the study is to identify a municipal-level, multi-site, nature-based solution to surface water management for Kildare Town.

Kildare Town has four forms of existing surface water drainage:

1. Discharge into a combined sewer. Sewage is collected and treated in the town sewerage scheme and discharges to the Tully Stream;
2. Discharge into the M7 motorway surface water drainage network which ultimately discharges to tributaries of the River Barrow;
3. Discharge to groundwater via infiltration; and
4. Discharge to watercourses south of the M7 motorway.

KCC has commissioned this study to identify a sustainable long-term solution for managing surface water for the town.

1.2 Objectives of the Surface Water Study

The scope of the Kildare Town SWS will aim to identify a sustainable surface water management strategy with the following key aims:

- Develop a Kildare County Council approved plan for developers to work within and contribute to sustainable drainage for the wider area;
- Prioritize nature-based solutions where possible;
- Designate areas where surface water can be managed;
- Identify opportunities to build additional surface water attenuation capacity;
- Identify combined drainage systems and consider future separation ambitions;
- Identify locations of existing surface water outfalls and locations where future surface water systems can outfall to;
- Consider the amenity potential for any solution of scale (open space/parkland/linear and riparian access for example).

1.3 Key Constraints and Opportunities

A meeting held with KCC on 31st May 2022 identified some key constraints and opportunities that shall be considered during the SWS:

- Potential impacts on Pollardstown Fen (SAC) should be considered through this process. It is located approximately 3km to the north-east of the study area;
- M7 Motorway traversing the natural drainage catchment of the study area;
- Much of the surface water runoff in the town centre is directed through combined sewers to the Wastewater Treatment Plant located south of the M7 Motorway;
- M7 Motorway Surface Water Drainage Network is also used as an outfall for part of the surface water runoff in the study area;
- M7 Motorway Surface Water Drainage Network is at capacity;
- Surface water runoff from newer housing developments is generally directed to infiltration areas;

- The surface water drainage network database is incomplete and not been updated in the past number of years;
- Potential locations for natured based solutions include Cherry Avenue Park;
- Engagement with Irish Water would be required if the combined sewer network is the only viable option for a given area's surface water.

1.4 Objectives of this Report

This report records the initial phase of the study and the output of the following tasks:

1. Identification and mapping of existing surface water drainage infrastructure;
2. Identification of permitted proposed developments and their future surface water management infrastructure;
3. Identification of high-level drainage sub-catchments within the study area;
4. Update and generate a GIS database of available surface water management infrastructure information;
5. Liaison with Local Authority Operations staff to identify current known surface water drainage issues.

A scope and future tasks for the remaining phases of the study will be assessed and discussed with KCC following completion of this initial phase.

1.5 Study Area

The study area is the existing Kildare Town Local Area Plan (LAP) area. Figure 1-1 below (also included in Appendix A) shows the study area in the context of the *OPW Flood Studies Update* delineated catchments.

Stage 1 – Data Collection

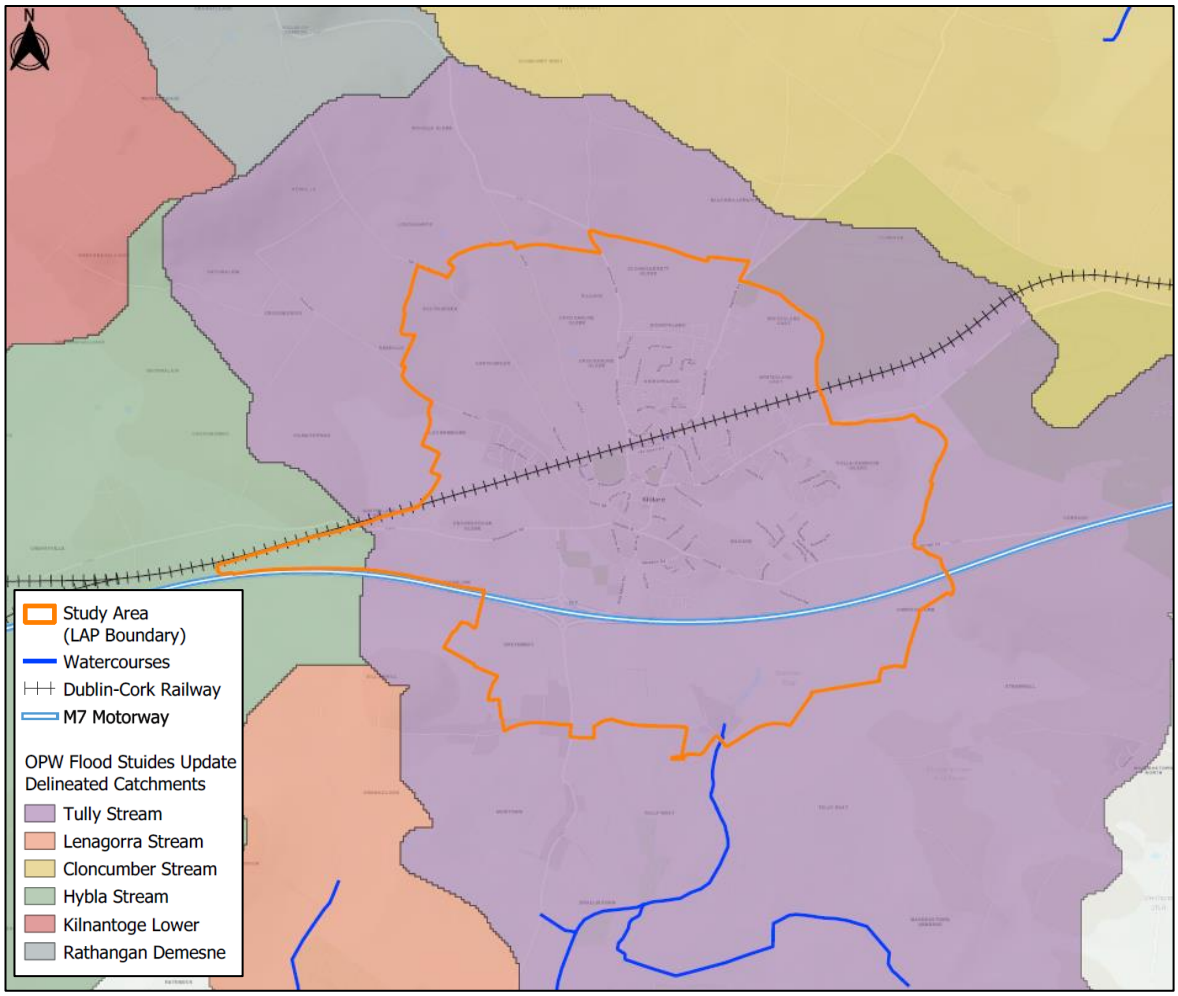

Figure 1-1 Kildare Town SWS study area and FSU Delineated Catchments

2 DATA COLLECTION

2.1 Overview

Data and information was gathered to assist in defining the surface water drainage catchments. Table 2-1 below shows the primary datasets and reports used in the study.

Table 2-1 Datasets and Reports used to help define the surface water drainage catchments

Dataset	Ownership	Source
Flood Studies Update (FSU) Ungauged Hydrological Estimation Points (HEPs)	Office of Public Works (OPW)	FSU Web Portal https://opw.hydronet.com/
Flood Studies Update Ungauged Catchments	OPW	FSU Web Portal https://opw.hydronet.com/
Watercourse Network	Environmental Protection Agency (EPA)	EPA GeoPortal https://gis.epa.ie/GetData/Download
5m DTM Raster of Study Area	KCC	Bluesky Geospatial Limited https://www.bluesky-world.ie/
Hydrogeological Assessment (Phase 1) At Saint Brigid's Well	KCC	Aqua Geoservices Ltd https://aquageo.ie/
Surface Water Drainage Layouts from the KCC Planning Portal	KCC	KCC Planning and Strategic Development Department http://webgeo.kildarecoco.ie/planningenquiry
Surface Water Network Records within the Study Area	KCC	KCC Planning and Strategic Development Department https://kildarecoco.ie/AllServices/Planning/
Foul Water Network Records within the Study Area	Irish Water	KCC Water Services Department https://kildarecoco.ie/AllServices/Environment/Water/ (Under the Local Authority Service Level Agreement with Irish Water)
Kildare Town Wastewater Treatment Plant Discharge Licence	EPA	EPA https://epawebapp.epa.ie/terminalfour/wwda/wwda-view.jsp?regno=D0178-01

2.2 History of flooding

The OPW Flood Hazard Mapping website (www.floodmaps.ie) was consulted to determine whether there was any evidence of previous flooding within the study area.

Stage 1 – Data Collection

There was one location in the study area, highlighted by the Area Engineer on 30/03/2005, that was prone to flooding at that time (ID-1487). The description given was *"Low lying area to the north of the town floods every year. A significant portion of the surface water drainage in Kildare town is piped to this location."* It is not clear what location this refers to. No photographic records are available.

In a meeting with RPS in November 2022, Kildare County Council operational staff described several areas that experience surface water flooding due to lack of capacity in nearby soakaways. Flooding issues are further discussed in Section 4.5.

3 NATURAL DRAINAGE

3.1 Overview

Kildare Town is located within the Tully Stream catchment (as shown in Figure 1-1), which is a tributary of the River Barrow (Hydrometric Area 14). The town is located in the upper reaches of the Barrow catchment at the base of Red Hill. There are no significant watercourses flowing through the town itself, with the natural drainage of the town catchment flowing southerly towards the Tully Stream. A number of smaller streams, namely, Lenagorra, Cloncumber, Oghill, Shesoon and Hybla are located in the surrounding regions. The study area is largely underlain by shallow well drained with pockets of poorly drained material, as shown in **Figure 3-1**.

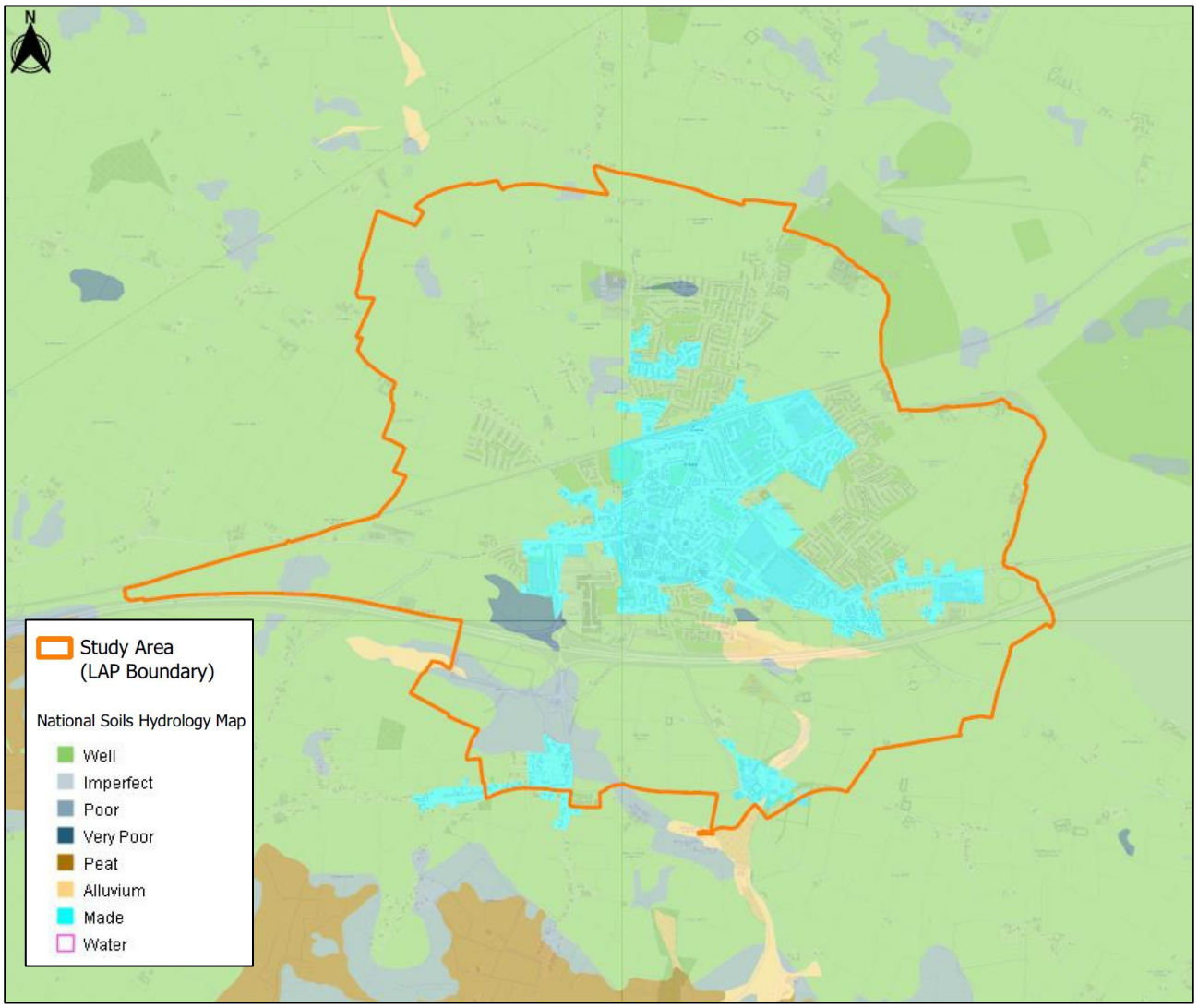

Figure 3-1 Soils Hydrology in the Study Area

The section of the Dublin-Cork Railway traversing the Tully Stream catchment was completed in 1845 (up to Cherryville west of Kildare Town). The railway, which is partially in cut within the study area, is likely to have disrupted the natural drainage paths in the catchment which generally flow north to south.

The section of M7 Motorway traversing the Tully Stream catchment was completed by December 2003, with the section extending further south westerly towards Monasterevin completed by November 2004. The motorway is largely in cut within the study area.

This report attempts to locate any drainage crossings under the M7. An existing drain flows from the south side of the M7 at Grey Abbey south-eastwards through the National Stud and into the Tully Stream. This

appears to have been severed by the M7 and no longer receives flows from the north. This is known locally as the Armour Stream and is discussed in Section 3.2 and 4.4 below.

3.2 Receiving Surface Water Bodies

The Tully Stream and the land drainage network to the west of Kildare Town are located within the Kildare Drainage District Scheme and Barrow Drainage District Scheme respectively, as shown in **Figure 3-2**. The Drainage Districts works were undertaken by the Commissioners of Public Works (now known as the Office of Public Works) under a number of drainage and navigation acts from 1842 to the 1930s. The objectives within the Drainage Districts are to improve land for agriculture and to mitigate flooding. Local authorities are charged with responsibility to maintain Drainage Districts. The M7 motorway surface drainage discharges to the land drainage network to the west of the town i.e. the Barrow Drainage District.

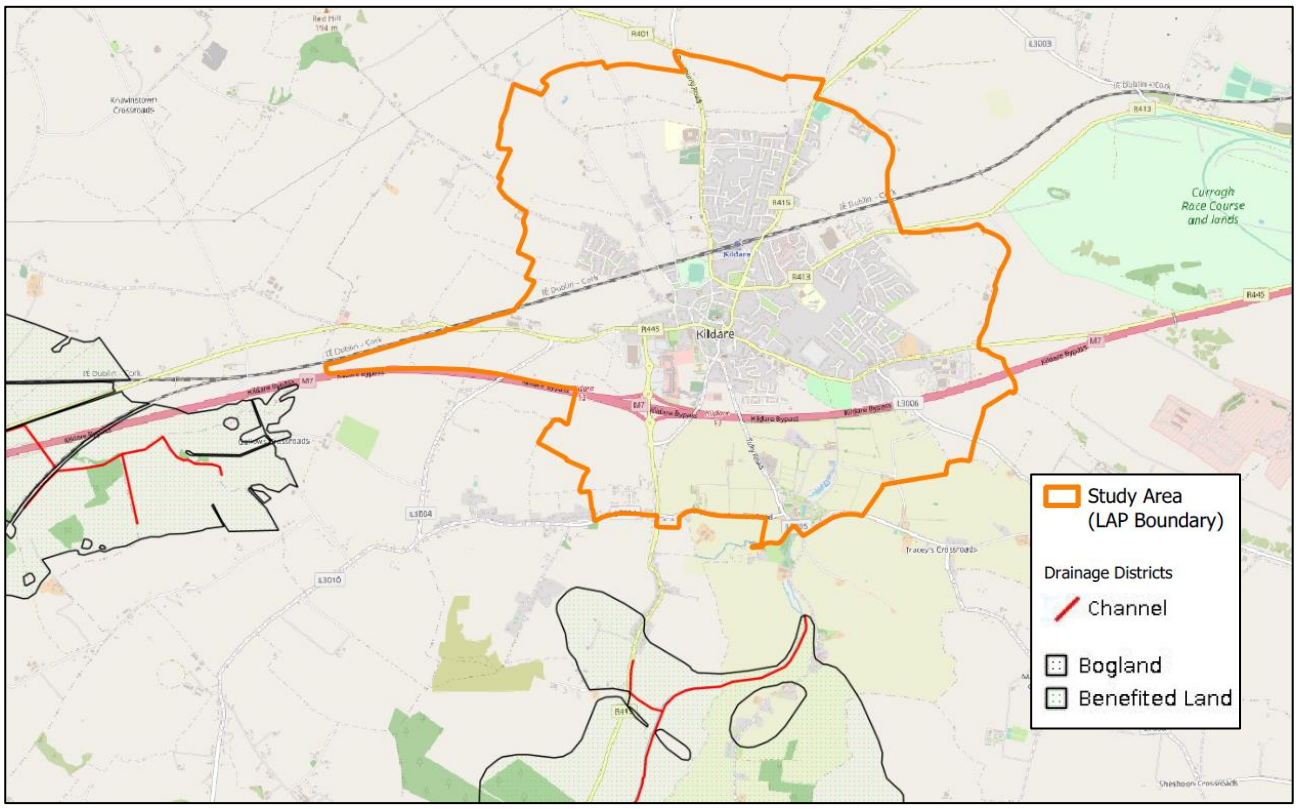

Figure 3-2 Local Drainage Districts near the Study Area

Further information on the natural drainage catchments was taken from a Hydrogeological Assessment of Saint Brigid's Well (Aqua Geoservices Ltd, 2021)[1]. The assessment states that the Kildare Town By-Pass (M7 Motorway) may have partly altered the natural flow of a Tully Stream tributary (Armour Stream), as some of the feeding springs/wells in its upper catchment area were located to the North of the motorway. **Figure 3-3** below shows an extract map from the report showing the assumed catchment feeding the tributary. The map shows the M7 motorway has altered the Tully Stream catchment, with the upper portion of the catchment now assumed to be diverted westward towards the River Barrow.

[1] Hydrogeological Assessment (Phase 1) At Saint Brigid's Well, Aqua Geoservices Ltd, 2021

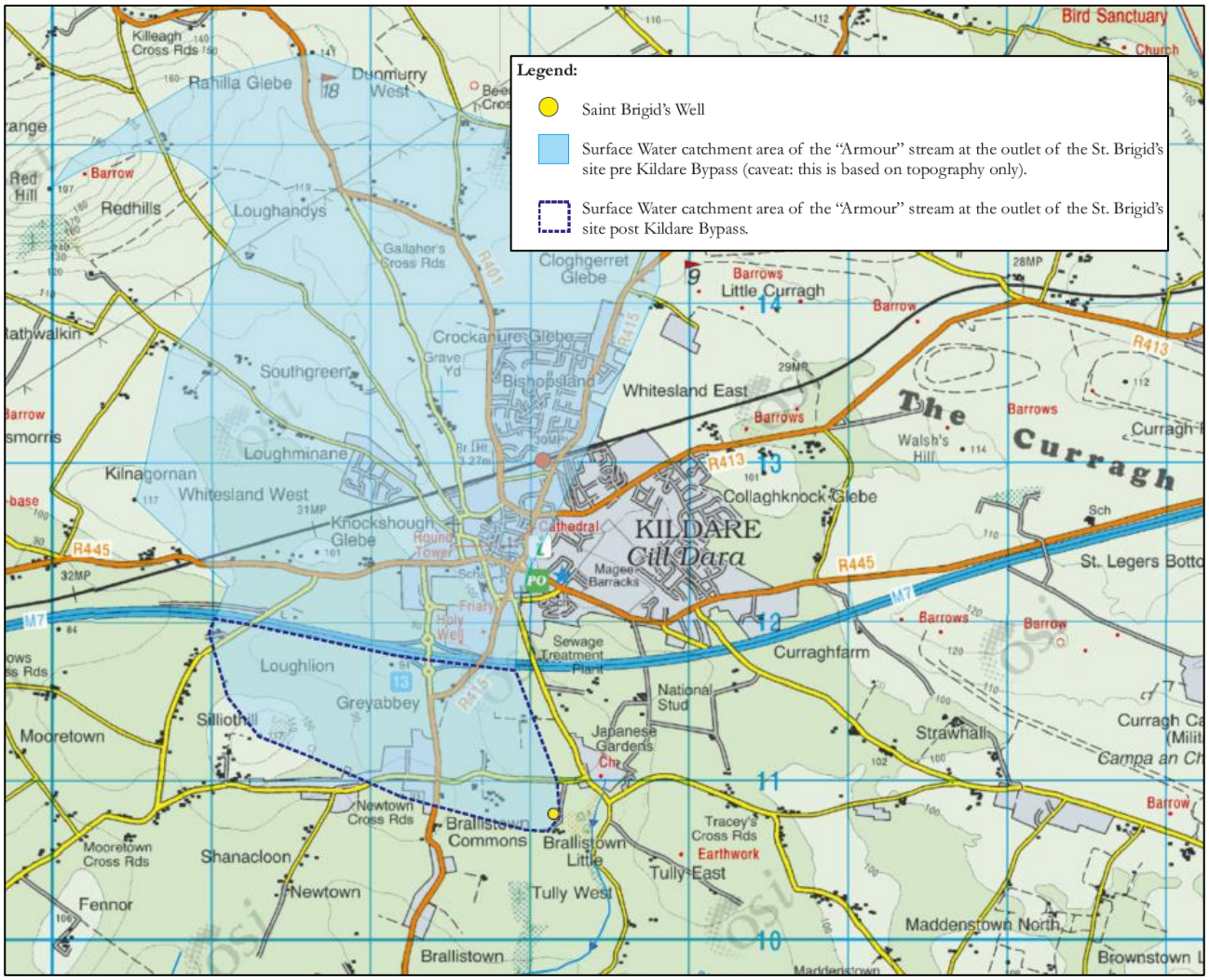

Figure 3-3 Extract from Hydrogeological Assessment of Saint Brigid's Well showing M7 motorway has altered the Tully Stream catchment

Consultations undertaken as part of the EIAR for the proposed development at Magee Barracks in Kildare town indicate that the construction of the M7 Bypass has impacted on groundwater flow south of the motorway, reducing water levels over time to such an extent that "*a deep groundwater abstraction well was recently installed by the National Stud to augment water levels within [its] ponds on a permanent basis*"[2].

3.3 Catchment Delineation Review

The catchment areas for the River Barrow and associated tributary streams are defined within the OPW Flood Studies Update (FSU) dataset, as shown in **Figure 1-1**. These catchments have been reviewed and updated using both desktop and GIS analyses. The steps outlined below were followed to review and update the catchments:

1. The best available digital terrain model (DTM) of the Study Area was procured;
2. Automated catchment delineation tools available in the GIS software package QGIS were used to generate the catchments and flow paths from the DTM;

[2] Magee Barracks Phase 1 Environmental Impact Assessment Report, John Spain Associates, July 2019

3. These catchments were reviewed against the FSU catchments, the EPA blueline river network dataset, OSi Historical 25" and 6" mapping as well as surface water drainage datasets / records for Kildare Town and the M7 motorway;

4. Following the review, corrections were made to the automated catchment.

Figure 3-4 shows an overview of the surface water catchments for the study area. Hatching in Figure 3-4 indicates differences within the SWS catchments from the OPW FSU catchments, the most notable of which is on the western side of Kildare Town where approximately 5.5km^2 has been diverted from the Tully Stream to the Hybla Stream due to the construction of the M7 motorway.

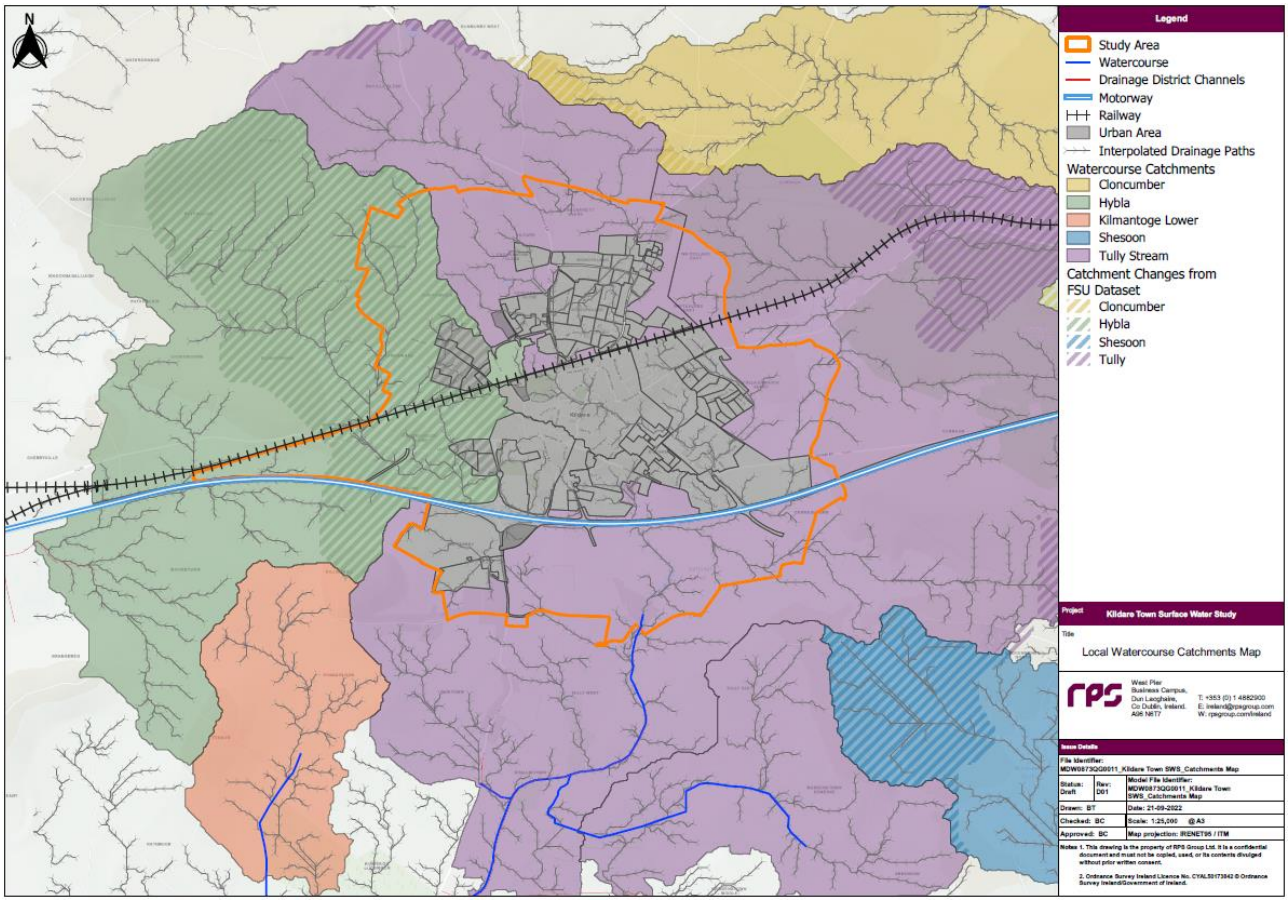

Figure 3-4 Local Watercourse Catchment Map

4 EXISTING SURFACE WATER DRAINAGE PATHS

Kildare Town has four main forms of existing surface water drainage:

1. Discharge into a combined sewer. Sewage is collected and treated in the Kildare Town wastewater treatment plant and discharges to the Tully Stream;
2. Discharge into the M7 motorway surface water drainage network which ultimately discharges into tributaries of the River Barrow;
3. Discharge to groundwater via infiltration; and
4. Discharge to open watercourses.

4.1 Combined Sewer Network

For areas in the centre of the town, the wastewater network collects a combination of foul and surface water. Available records on the wastewater network are shown in Figure 4-1 below. All flows collected are transferred to the Kildare Town wastewater treatment plant south of the M7 for treatment. Treated effluent discharges to the Tully Stream via a 1km long outfall pipeline.

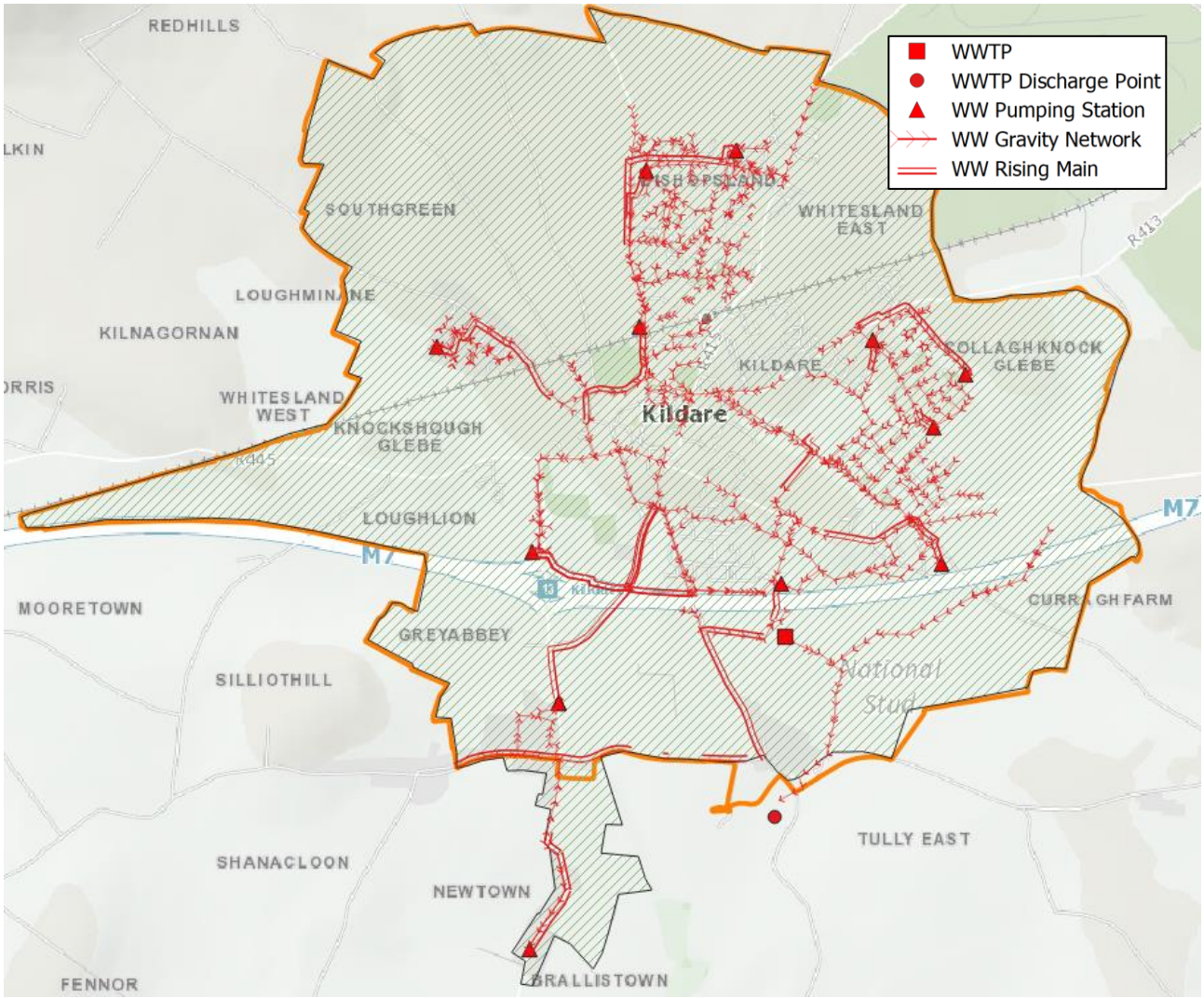

Figure 4-1 Agglomeration served by the combined sewer network

4.2 M7 Drainage Network

The M7 road drainage conveys surface water runoff in a westerly direction for discharge to the Barrow Drainage District. The catchment comprises the motorway itself and some areas on the south side of Kildare town that are connected by gravity sewers. The network is shown in Figure 4-2.

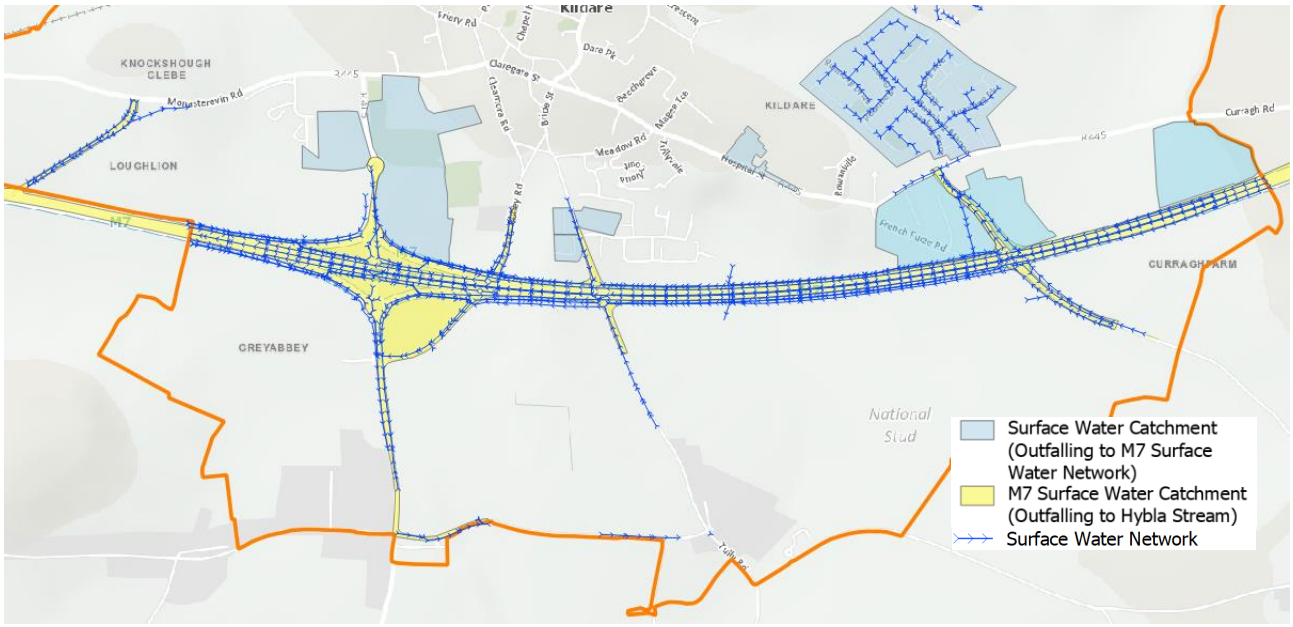

Figure 4-2 M7 Drainage Network and Connected Areas

4.3 Surface Water Networks Draining to Infiltration

The study area is largely situated on well drained soils amenable to infiltration. Many existing housing estates have soak pits to cater for surface water runoff. Specific design details of soakaway sizings are unavailable. Figure 4-3 shows the areas within the study area that have surface water catered for by infiltration. Records of surface water network draining to soakaways is also shown. This map includes planned permitted developments either under construction or yet to go to site. Drainage via infiltration has been the predominant approach in granted applications in recent times.

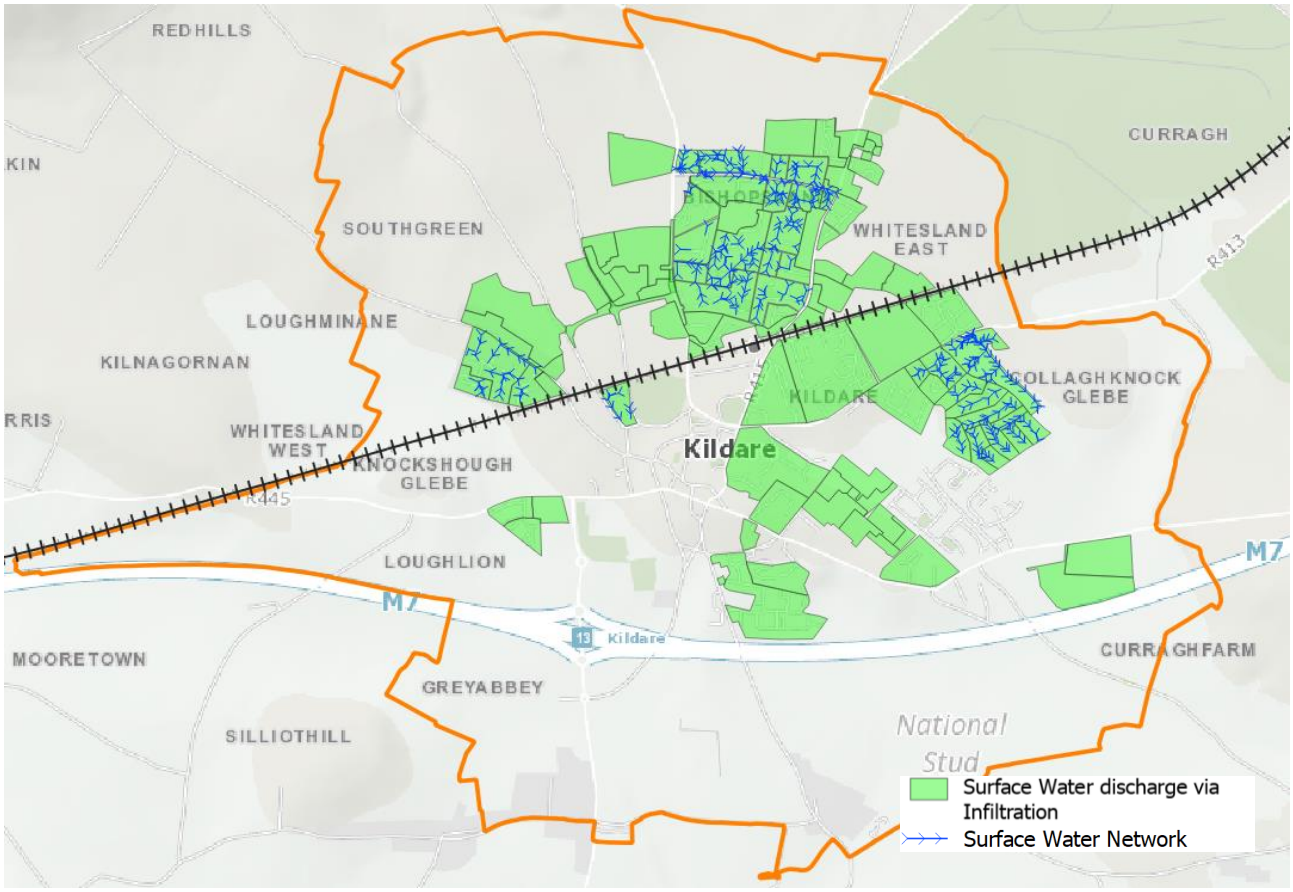

Figure 4-3 Areas Draining to Infiltration

4.4 Drainage to watercourses

The Armour Stream is a watercourse to the south of the M7, rising in the Grey Abbey area and fed by springs, some of which were cut off when the M7 was constructed. It flows south east and is culverted under the R415 and the National Stud. According to planning documents for proposed developments at Grey Abbey, surface water generated on site will be attenuated before discharging to the Armour Stream at Armour Bridge. The stream will also be culverted through the site. A section of the M7 motorway (Nurney Rd slip and approach) also discharges to the stream at this location. Figure 4-4 shows the location of the watercourse and the catchment areas contributing runoff to it.

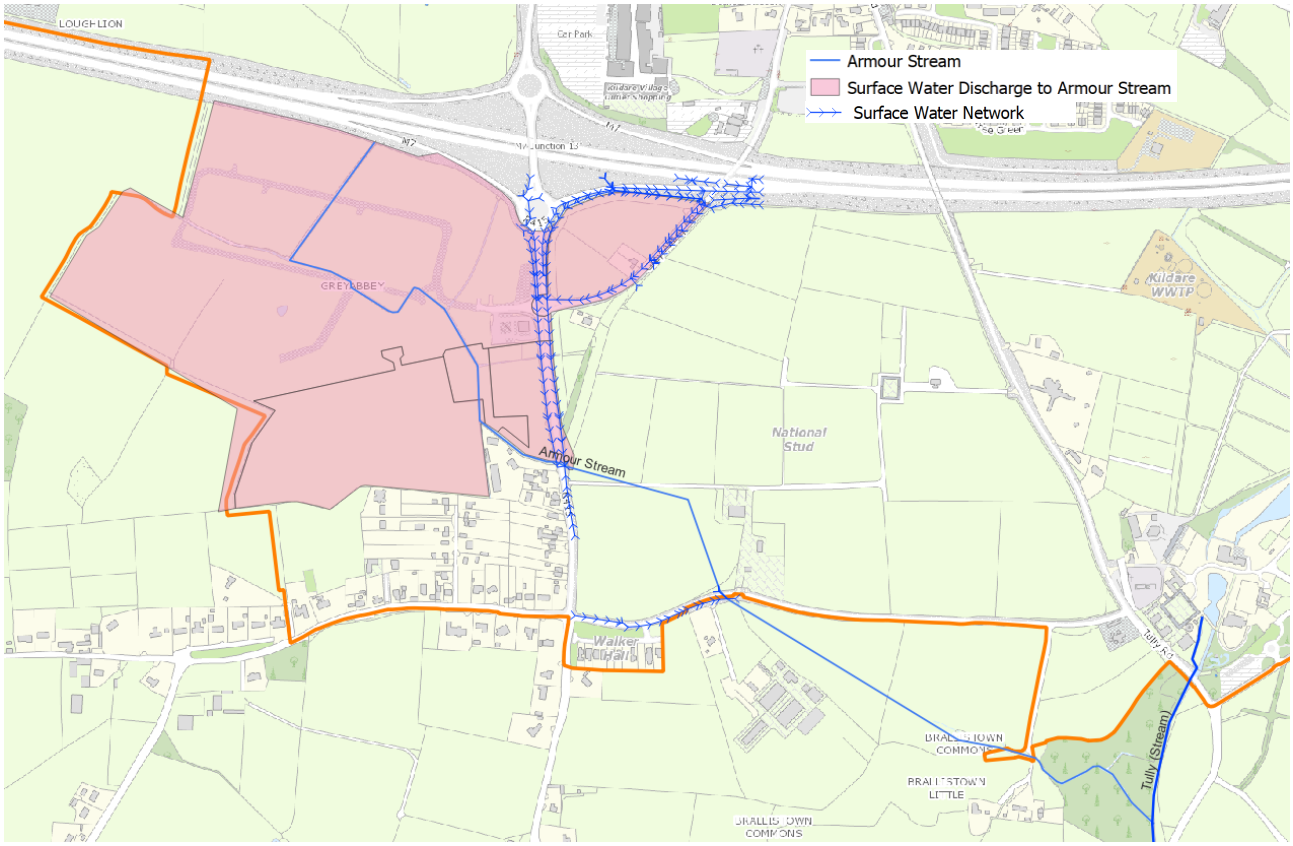

Figure 4-4 Areas Outfalling to Armour Stream

4.5 Workshop Findings

Following completion of the catchment review, a workshop was held with Kildare County Council Operations staff to discuss the catchment map. The key findings of the workshop were as follows:

- We confirmed locations thought to be on soakaways, locations draining to foul network and locations draining to M7 network;
- Some soakaways lack capacity resulting in overland flow when full. These include:
  - The soakaways and holding tanks servicing the Maryville, Melitta Park, Beechgrove, and Dara Park housing estates. When full, overland flow gravitates to the Magee Barracks area;
  - The holding tanks in the Loughminane housing estate lack capacity and cause ponding in one corner of the estate when full.
- Planning documents were revisited to confirm the drainage arrangements for some sites;
- Pluvial flooding issues were discussed and locations marked on the map;
- An old stone culvert was references as the main drainage route for the town south of the railway, outfall location unknown;
- The Magee Barracks area receives surface water flow from the surrounding areas. A proposed housing development has been granted planning permission at the site;
- A crossing point under the M7 motorway was highlighted in the vicinity of the Wastewater Treatment plant.

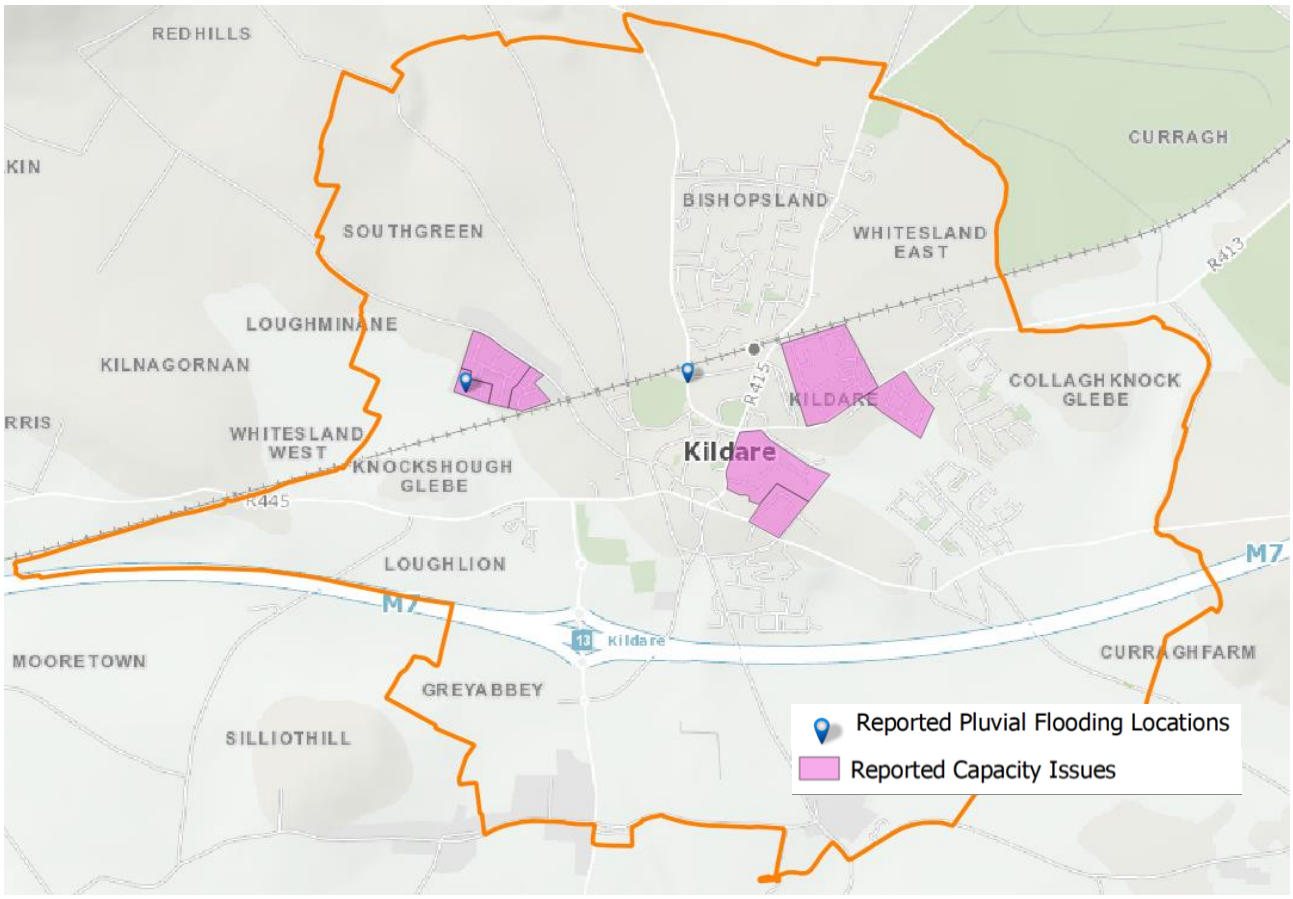

Figure 4-5 Areas with Reported Issues

4.6 Drainage Summary

Figure 4-6 shows the final developed surface water catchment map for Kildare Town based on the data collection stage of this study. This includes information contained in the planning documentation for permitted developments in the area, some of which are still under construction or yet to start.

It should be noted the catchment map is subject to change during the next stage of the study as more information and data may come available. More detailed mapping is provided in Appendix A.

Stage 1 – Data Collection

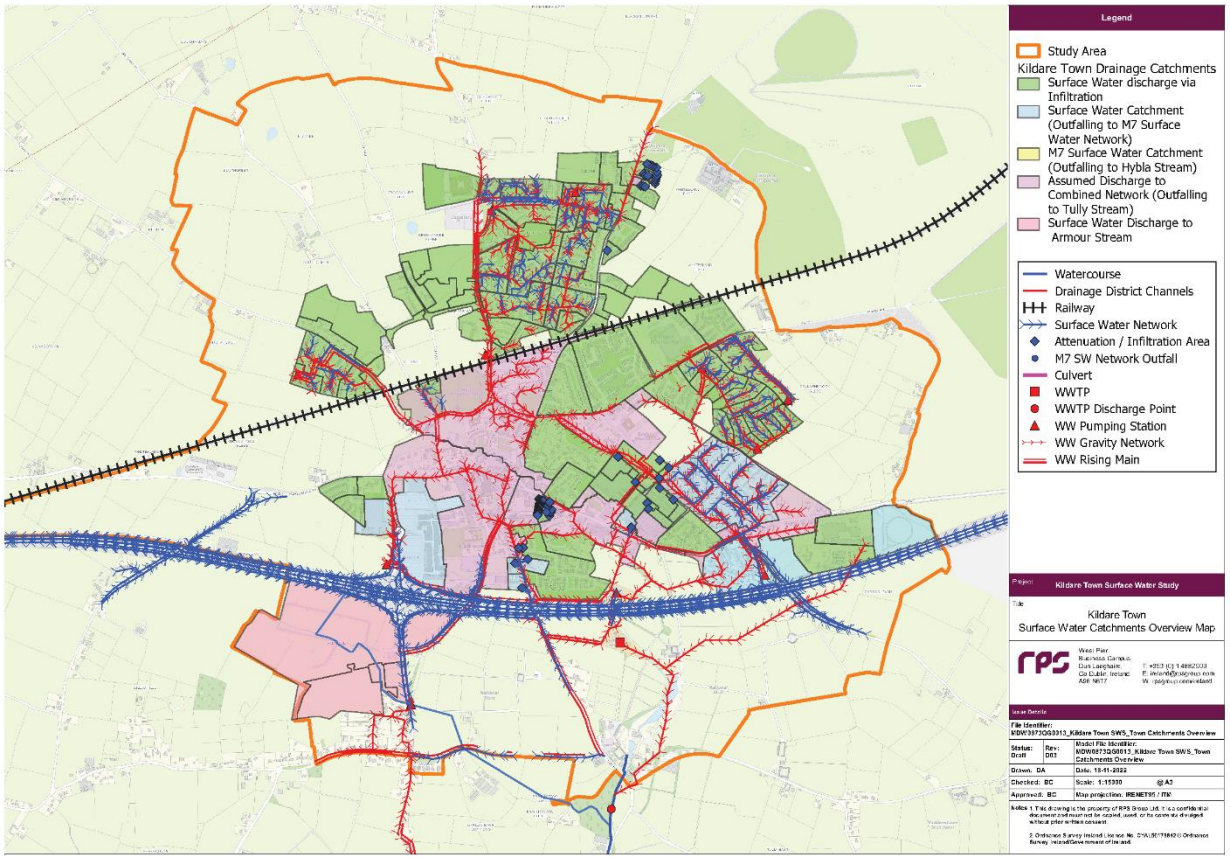

Figure 4-6 Kildare Town Drainage Map

5 CONCLUSIONS

5.1 Conclusions

- Data was collected by desktop assessment and consultation with operational staff. The data gathered includes information on the existing and proposed future surface water drainage infrastructure within the study area. Some data gaps remain due to unavailable records at the time of writing.
- The natural catchment drainage paths have been altered by urbanisation, construction of the railway and construction of the M7 motorway.
- A combined sewer system serves the agglomeration within the study area, conveying foul and a proportion of the surface water to the Kildare town wastewater treatment plant.
- The M7 motorway has its own surface water collection system, which is at capacity. Some areas outside the motorway also connect to this system.
- Various sites within the study area are served by soakpits. Capacity issues were noted in some instances.
- Information was collected on surface water management for various permitted developments which are now either completed or under construction.
- Flooding has not been a primary concern within the study area though isolated pluvial flooding issues have been reported.

5.2 Recommended Next Steps

The surface water drainage map for Kildare Town has been established. This can be used as a basis to inform the future planning strategy for the town.

The proposed methodology to complete in Stage 2 of the project is as detailed below:

- Attempt to fill in outstanding data gaps regarding:
  - The route of the surface water culvert through the town centre;
  - M7 surface water pipe crossings;
  - The NRDO M7 drainage report.
- Explore options to reopen drainage paths across the M7 and maximise use of existing crossings;
- Investigate an extension of the surface water network discharging to the Tully Stream;
- Include key LAP zonings on the drainage maps – Development zonings and Open Space zonings;
- Identify open space zonings that can be leveraged for surface water drainage solutions, based on surface water flooding history and topography;
- Assign future drainage and existing drainage issues to specific open space areas that could provide a solution, with a focus on nature-based solutions;
- Assign each zoned land parcel to a specific drainage solution;
- Recommend design criteria for infiltration soakaways for new developments.

Appendix A
Catchment Maps

Watercourse
Drainage District Channels
Railway
Surface Water Network
Attenuation / Infiltration Area
M7 SW Network Outfall
Culvert
WWTP
WWTP Discharge Point
WW Pumping Station
WW Gravity Network
WW Rising Main

Black Millers Hill (Permitted Development)
Rathbride Road
Community School
Dunmurray Rise
Rathbride Abbey
Curraghbeg Meadows
Meadow Court / Willow Grove
Rathbride Demense
Rathbride Close
Maple Lawn / Oakland Grove
Crockanure Avenue
Bishoplands
Oakchurch (Permitted Development)
Fennor Lawns
Drumcree Court
Whitelands East (Permitted Development)
Old Road
North Glebe
Curragh Finn
Ridgewood Manor
Walkers Gate (Permitted Development)
South Green Link (Permitted Development)
Bishopsland House
Dunmurray Court
Station View
Dunmurray Drive
Montessori
Loughmaine Green
Green Road
White Abbey Lawns

CLOGHGARRETT GLEBE
CROCKANURE GLEBE
SOUTHGREEN
BISHOPSLAND
KILDARE
Cemetery
Kildare Railway Station
Kildare Town AFC
Kildare Business Park
Saint Bridget's Park

Legend

- Study Area

Kildare Town Drainage Catchments

- Surface Water discharge via Infiltration
- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
- Discharge to Combined Network (Outfalling to Tully Stream)
- Surface Water Discharge to Armour Stream

Client: Comhairle Contae Chill Dara, Kildare County Council

Project: **Kildare Town Surface Water Study**

Title:

Kildare Town
Surface Water Catchments Map No. 1

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Issue Details

File Identifier:
MDW0873QG0008_Kildare Town SWS_Town Catchments Map

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Drawn: BT		**Date:** 21-11-2022
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Approved: BC		**Map projection:** IRENET95 / ITM

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Watercourse
Drainage District Channels
Railway
Surface Water Network
Attenuation / Infiltration Area
M7 SW Network Outfall
Culvert
WWTP
WWTP Discharge Point
WW Pumping Station
WW Gravity Network
WW Rising Main

Whitelands East (Permitted Development)
Ridgewood Manor
Ruanbeg Manor
Magee Barracks (Permitted Development)
Dunmurray Drive
Station View
Leinster Walk
Lidl
Cunnaberry Hill
Tully Rd
The Plains
R413 Melitta Rd
Curragh Rd

Legend

- Study Area

Kildare Town Drainage Catchments

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- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
- Discharge to Combined Network (Outfalling to Tully Stream)
- Surface Water Discharge to Armour Stream

Client: Comhairle Contae Chill Dara, Kildare County Council

Project: **Kildare Town Surface Water Study**

Title:

Kildare Town Surface Water Catchments Map No. 2

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Bishopsland House
Dunmurray Court
Dunmurray Drive
Station View
Montessori
Green Road
White Abbey Lawns
Saint Bridget's Park
Kildare
Kildare Railway Station
Fair Green Rd
Dunmurray Rd
Elm Grove
Elm Pk
Woodside Pk
Maryville
Kildare Business Park
Assembly Villas
Greenfield Glebe
St Barbara's Pk
Strand
Chapel Ln
Fairview Cottages
R401
Old Rd
Boherbeenagorr
Sth Green Rd
Green Rd
Loughlion Green
Knockshough Glebe
Monasterevin Rd
Modus Link
Kildare Village / Tesco
R445
R415
M7
M7 Junction 13
Grey Abbey (Permitted Development)
Sovereigns Well
St.Brigid's Primary School
Ruanbeg Manor
Magee Barracks (Permitted Development)
Leinster Walk
Lidl
Tully Rd
Cunnaberry Hill
Wavertree
Oaktree Rd
Oaktree Green
TULLY WEST
TULLY EAST

Legend

- Study Area

Kildare Town Drainage Catchments

- Surface Water discharge via Infiltration
- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
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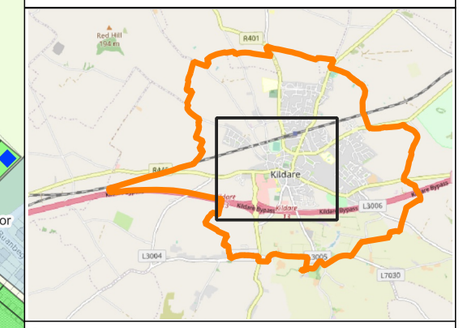

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Issue Details

File Identifier: MDW0873QG0008_Kildare Town SWS_Town Catchments Map		
Status: Draft	**Rev: D03**	**Model File Identifier: MDW0873QG0012_Kildare Town SWS_Town Catchments Map**
Drawn: BT		**Date: 21-11-2022**
Checked: BC		**Scale: 1:6,000 @A3**
Approved: BC		**Map projection: IRENET95 / ITM**

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Watercourse
Drainage District Channels
Railway
Surface Water Network
Attenuation / Infiltration Area
M7 SW Network Outfall
Culvert
WWTP
WWTP Discharge Point
WW Pumping Station
WW Gravity Network
WW Rising Main

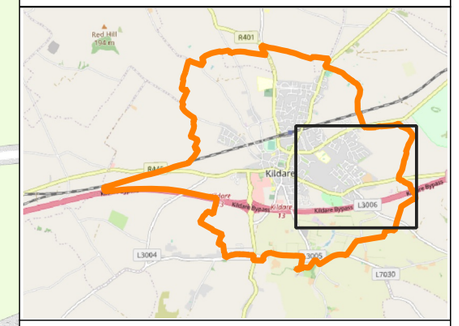
Ridgewood Manor
The Plains
Ruanbeg Manor
Magee Barracks (Permitted Development)
Leinster Walk
Lidl
Cunnaberry Hill
Kildare WWTP
Curragh Rd
M7
R445
CURRAGHFARM

Legend

Study Area

Kildare Town Drainage Catchments

- Surface Water discharge via Infiltration
- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
- Discharge to Combined Network (Outfalling to Tully Stream)
- Surface Water Discharge to Armour Stream



Client
Comhairle Contae Chill Dara
Kildare County Council

Project **Kildare Town Surface Water Study**

Title

Kildare Town
Surface Water Catchments Map No. 4

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Watercourse
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Surface Water Network
Attenuation / Infiltration Area
M7 SW Network Outfall
Culvert
WWTP
WWTP Discharge Point
WW Pumping Station
WW Gravity Network
WW Rising Main

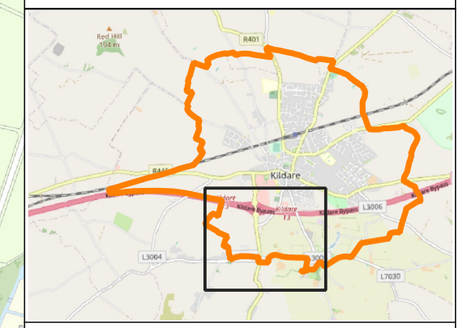
Modus Link
Kildare Village / Tesco
Lidl
St Brigid's Primary School
Tully Rd
Cunnaberry Hill
Wavertree
Oaktree Rd
Oaktree Green
TULLY WEST
M7
M7 Junction 13
R415
Grey Abbey (Permitted Development)
GREYABBEY
Grey Abbey Rd
Kildare WWTP
National Stud
TULLY WEST
NEWTOWN
Tully Bull Performance Test Centre
BRALLISTOWN COMMONS
BRALLISTOWN LITTLE
BRALLISTOWN COMMONS

Legend

Study Area

Kildare Town Drainage Catchments

- Surface Water discharge via Infiltration
- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
- Discharge to Combined Network (Outfalling to Tully Stream)
- Surface Water Discharge to Armour Stream



Client: Comhairle Contae Chill Dara, Kildare County Council

Project: **Kildare Town Surface Water Study**

Title

Kildare Town
Surface Water Catchments Map No. 5

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- Watercourse
- Drainage District Channels
- Railway
- Surface Water Network
- Attenuation / Infiltration Area
- M7 SW Network Outfall
- Culvert
- WWTP
- WWTP Discharge Point
- WW Pumping Station
- WW Gravity Network
- WW Rising Main

LACKAGH MORE
CHERRYVILLE
R445
M7
OGHIL
GRANGEBEG

Legend

- Study Area

Kildare Town Drainage Catchments

- Surface Water discharge via Infiltration
- Surface Water Catchment (Outfalling to M7 Surface Water Network)
- M7 Surface Water Catchment (Outfalling to Hybla Stream)
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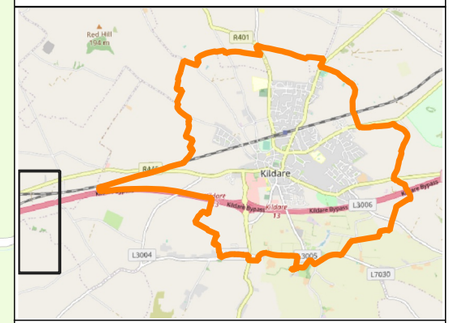

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Project: **Kildare Town Surface Water Study**

Title

Kildare Town
Surface Water Catchments Map No. 6

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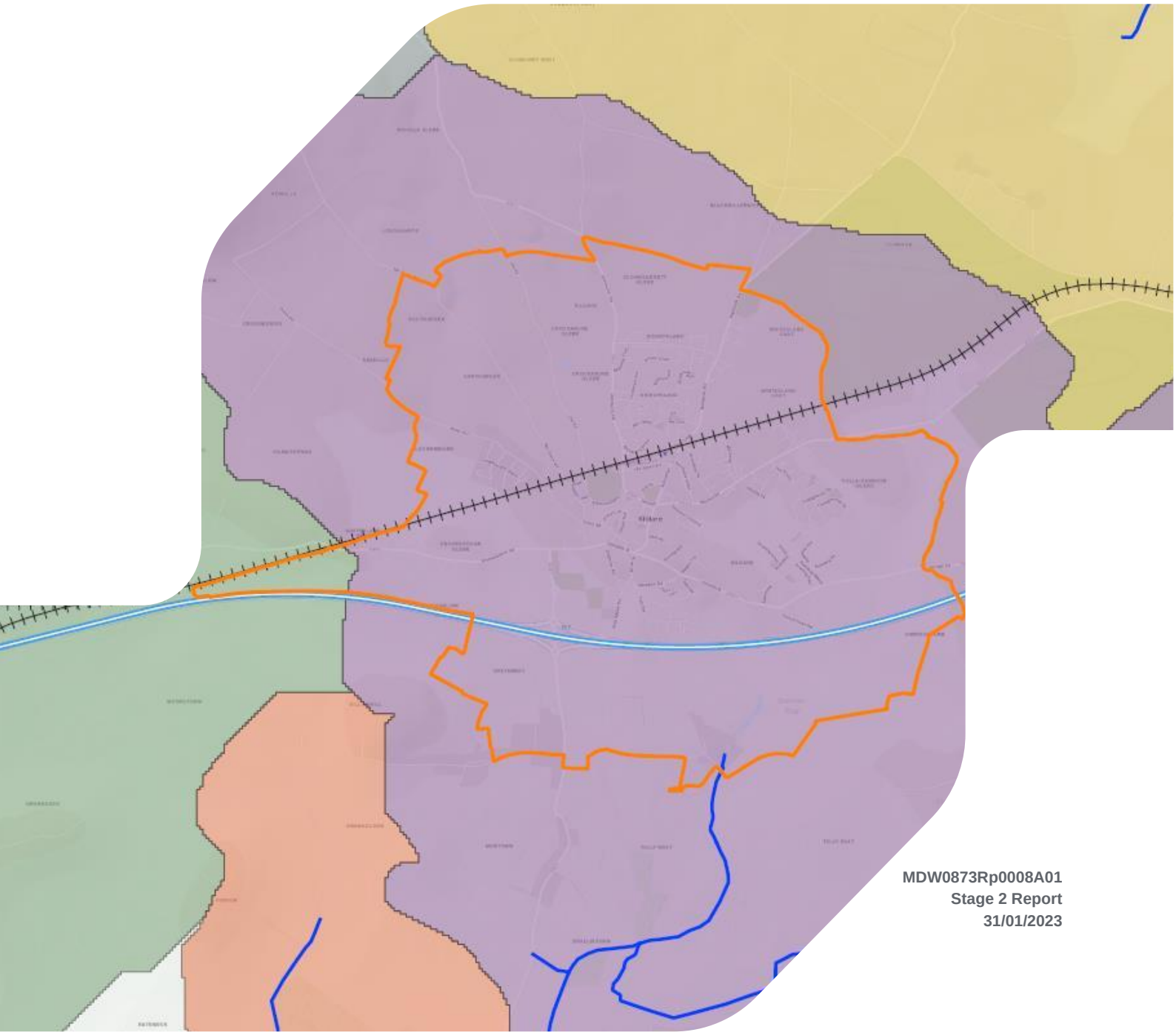
KILDARE TOWN SURFACE WATER STUDY

Stage 2 – Surface Water Management Proposals



MDW0873Rp0008A01
Stage 2 Report
31/01/2023

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
A01	Issue for Approval	DA	BC	BC	17/01/23
A02	Issue for Approval	DA	DA	BC	27/02/23

Approval for issue

BC	27/02/2023

Prepared by:	Prepared for:
RPS	KCC

Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 Background

RPS was commissioned by Kildare County Council (KCC) to complete a Surface Water Study (SWS) for the town of Kildare. The overall objective of the study is to identify a municipal-level, multi-site, nature-based solutions to surface water (SW) management for Kildare Town (i.e. the Study Area outlined in Figure 1 below).

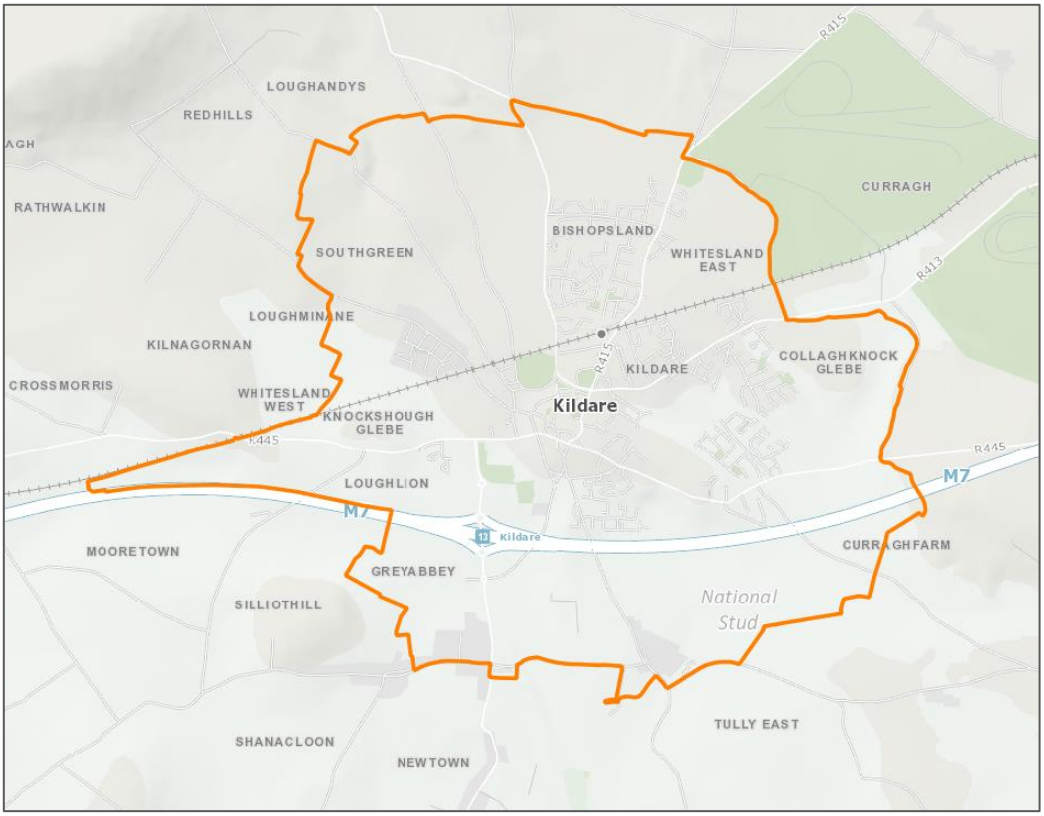


Figure 1: Study Area

1.1.1 Objectives of the Surface Water Study

The scope of the Kildare Town SWS is to identify a sustainable surface water management strategy with the following key aims:

- Develop a KCC-approved plan for developers to work within and contribute to sustainable drainage for the wider area;
- Prioritize nature-based solutions where possible;
- Designate areas where surface water can be managed;
- Identify opportunities to build additional surface water attenuation capacity;
- Identify combined drainage systems and consider future separation ambitions;
- Identify locations of existing surface water outfalls and locations where future surface water systems can outfall to;
- Consider the amenity potential for any solution of scale (open space/parkland/linear and riparian access for example).

1.1.2 Stage 1 Report

The Kildare Town SWS Stage 1 report, prepared by RPS, contained the following:

- Identification of high-level drainage sub-catchments within the study area;
- Identification and mapping of existing surface water assets;
- Identification of permitted developments and their surface water arrangements.

Figure 2 shows the surface water catchment map for Kildare Town developed for the Stage 1 report.

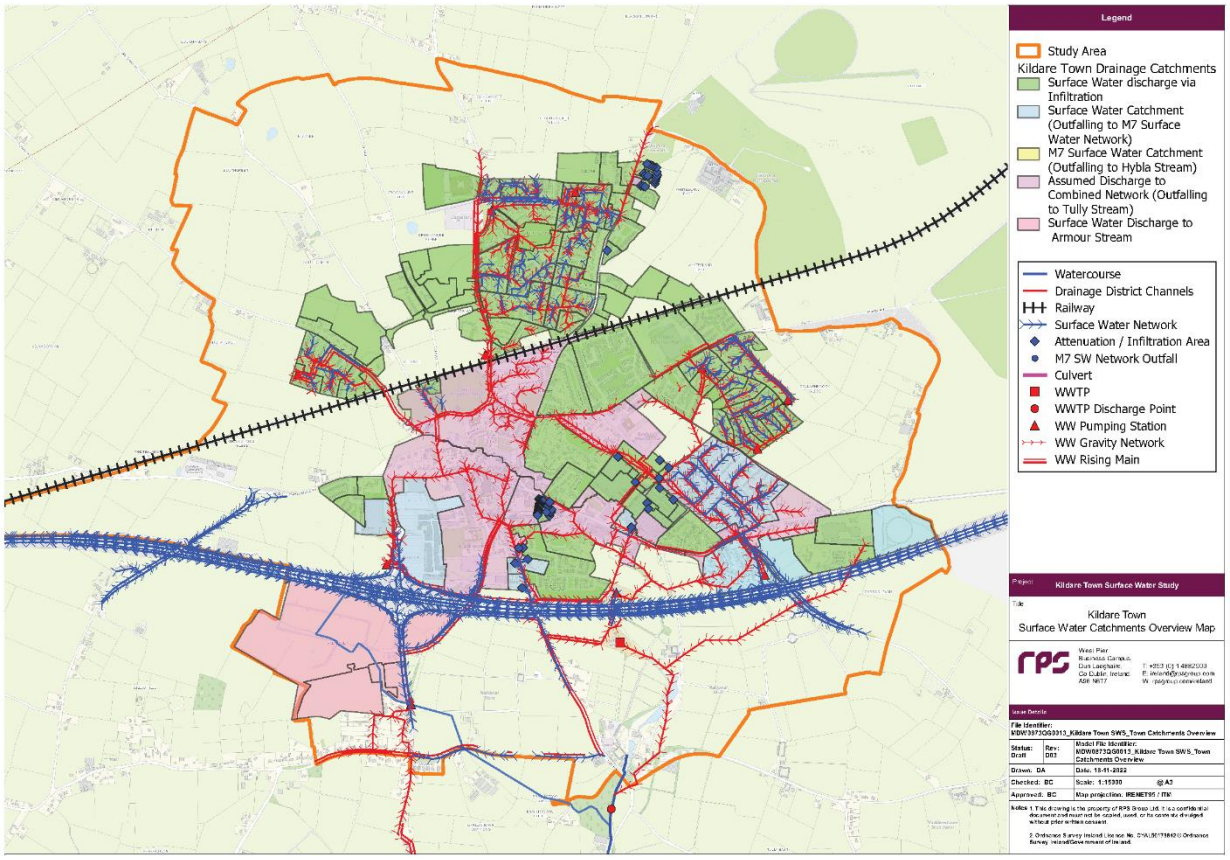


Figure 2: Surface Water Catchment Map for Kildare Town

1.2 Objectives of this Report

The objectives of the Kildare Town SWS Stage 2 report are outlined below:

- Propose areas for managing surface water, using nature-based solutions where possible;
- Identify drainage corridors that will have to be facilitated in development proposals;
- Identify opportunities for increasing capacity in the existing network;
- Consider the amenity potential for solutions of scale.

The report is intended to inform the preparation of the new Draft Local Area Plan 2023-29 (LAP) for Kildare Town. The report could be used as a precursor to a future Surface Water Masterplan for Kildare Town.

2 METHODOLOGY

2.1 Data Gathering

Data and information was gathered to assist in preparing this report. Table 2-1 below shows the primary datasets and reports used.

Table 2-1 Information sources used in this report

Information Source	Ownership	Source
Kildare Town SWS Stage 1 Report	KCC	RPS
Surface Water Drainage Layouts from the KCC Planning Portal	KCC	http://webgeo.kildarecoco.ie/planningenquiry
Sites zoned for Employment, Residential and Open Space	KCC	KCC
Magee Barracks EIAR	Ballymount Properties Ltd	https://www.pleanala.ie/en-ie/case/305007
Groundwater and subsoil conditions	GSI	https://www.gsi.ie/en-ie/data-and-maps/Pages/default.aspx
Loughminane Green, Kildare, Co. Kildare - Preliminary report on the existing SW and Foul Drainage Networks	KCC	Donnachadh O'Brien & Associates Consulting Engineers
Kildare Town LAP 2012-18	KCC	https://kildarecoco.ie/AllServices/Planning/LocalAreaPlans/LocalAreaPlans/KildareLAP2012-2018/

A data gap identified in the Stage 1 report that remains outstanding is the route of the surface water culvert through the town centre. It does not appear on records and its outfall location is unknown.

2.2 Key Constraints

The following key constraints apply to the management of surface water at new developments within the Study Area:

- There is limited scope for new connections to existing sewers. Much of the surface water in the town drains to a combined sewer and therefore new connections are not desirable. The M7 Motorway Surface Water Drainage Network is at capacity and therefore can't accommodate further connections from new developments.
- Pollardstown Fen SAC must not be negatively impacted. It is located approximately 3km to the north-east of the Study Area in the Cloncumber catchment and is dependent on groundwater from the aquifer underlying Kildare Town (Curragh Gravels West). Both the surface water and groundwater catchment dividing lines are outside the Study Area[1,2] and therefore the SAC is unlikely to be impacted by the development sites considered in this report.

[1] Kildare Town SWS Stage 1 Report (RPS, 2022)

[2] Magee Barracks Phase 1 EIAR Chapter 9 – Water & Hydrogeology (John Spain Associates, 2019)

- The River Barrow And River Nore SAC must not be negatively impacted. There is hydrological connectivity between the River Barrow and the Study Area via the Tully Stream and the Drainage District channels as shown in Figure 3. There is potential for increased loading of pollutants to the SAC from surface water drainage from Kildare Town outfalling to these watercourses.

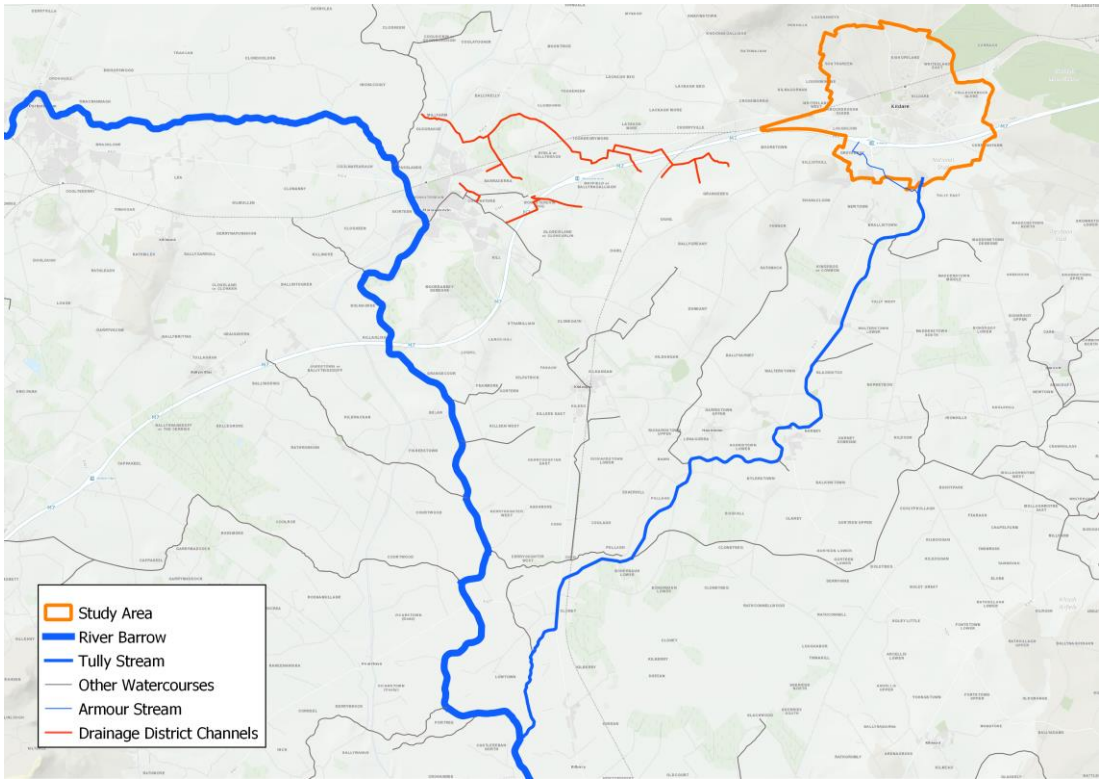


Figure 3: Hydrological Connections between Study Area and River Barrow

- Flood risk must not be increased at any location due to the surface water management measures implemented in another location.
- Habitat mapping is currently underway by KCC. Any solutions arising out of this study will have to take existing habitats into account.
- AA and SEA screening will be undertaken by KCC as part of the development of the LAP. Any solutions arising out of this study will be included in the screening.

2.3 Conceptual Approach

Surface water management in Kildare Town should be in accordance with modern sustainable design practice, incorporating SuDS and water-sensitive urban design (WSUD) principles. The use of SuDS and nature-based solutions is required by the County Development Plan.

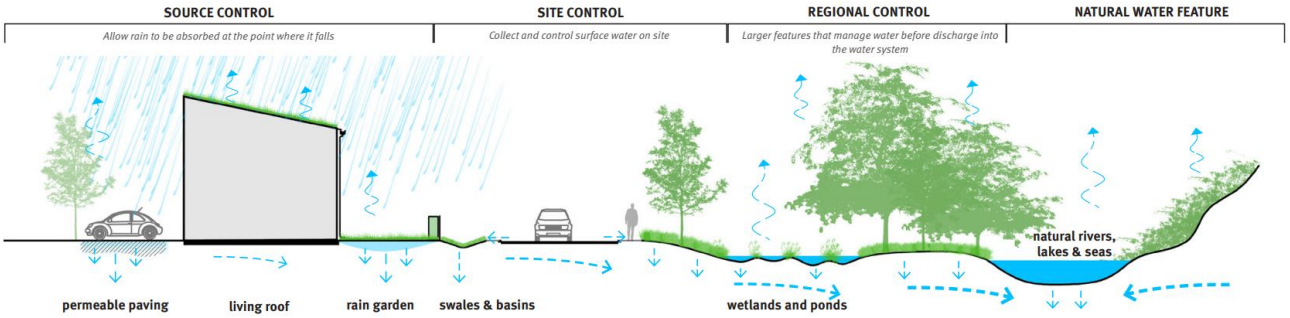
The following guidance applies:

- Greater Dublin Strategic Drainage Study (DDC, 2005)
- The SuDS Manual C753 (CIRIA, 2015)
- Nature-based Solutions to the Management of Rainwater and Surface Water Runoff in Urban Areas – Best Practice Interim Guidance Document (DoHLGH, 2022)

In order to promote a holistic, catchment-wide approach to surface water management between neighbouring development sites, the concept of a SuDS ‘management train’ is used. This means surface water controls are implemented in a hierarchical fashion from the point at which rain lands (source control)

up to the extent of a development site (site control) and eventually up to the wider subcatchment level (regional control).

A level of disposal is designed in at each stage of the management train and the surplus is conveyed to the next stage at an attenuated quantity and improved quality. This allows for connectivity of drainage systems between sites and the creation of green corridors providing habitat and amenity value. The concept is illustrated below in Figure 4.



Source: Sustainable Rainwater Management Guidance, CEC 2021

Figure 4: SuDS Management Train

The means of final discharge are limited within Kildare Town due to the absence of a watercourse north of the M7 and limited capacity in the existing drainage networks. Planning for specific areas dedicated to managing surface water at the subcatchment level is therefore considered to be a practical and efficient approach. These areas are intended to allow for slow infiltration discharge to the groundwater store. Opportunities to open new surface water drainage outfall routes are also examined.

There is an existing surface water drainage siphon crossing under the M7 that should be leveraged insofar as possible to assist in delivering a sustainable drainage strategy. According to records it is a circular concrete pipe of 1200mm diameter and outfalls at the WWTP. The condition and current usage of the pipe should be verified by survey.

3 SURFACE WATER MANAGEMENT PROPOSALS

The sites identified in this section of the report for potential Residential and Employment uses are based on the zoning map contained in the Kildare Town Local Area Plan 2012-2018. The same sites are considered in the Settlement Capacity Audit (SCA) which is also being prepared to inform the Draft LAP 2023-2029. Each of the Residential and Employment sites were assessed for sustainable surface water management solutions. Flow routing analysis was used to identify natural drainage paths to convey surface water to potential nature-based management areas (NBMAs), for example ponds, infiltration systems and bioretention areas. These represent opportunities to build additional surface water attenuation capacity into the catchment.

Maps were produced for six areas surrounding the town centre (refer to Figure 5) and measures suggested for the subcatchments within each area. Following site-specific SuDS measures, surface water should be conveyed from each site to potential NBMAs in the directions indicated on the maps via open swales where feasible.

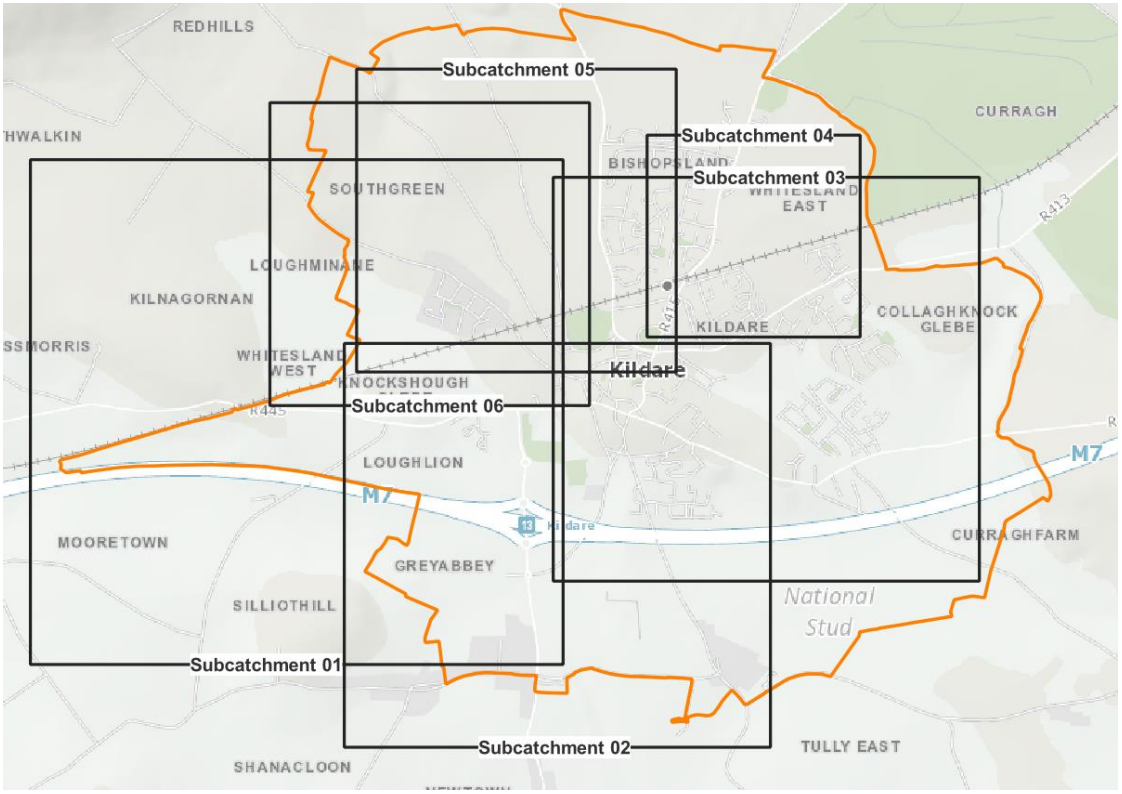


Figure 5: Area Key Map

The topography of the Study Area roughly bisects the town into two catchments which are crossed by the railway and M7 motorway (see Figure 6 below). Ideally all surface water from either side of the dividing line could enter SuDS management trains running from north to south and enter the watercourses south of the M7 on their respective sides. However, the presence of the railway and M7 interfere with these drainage paths, particularly the M7 which is largely in cut. To achieve such a drainage solution, the following would need to be completed (discussed further in the following sections):

- Leveraging the existing crossing under the M7 by extending a surface water network from it through the east side of the town
- Creating a new crossing under the M7 west of Kildare Village and extending a surface water network from it through the west side of the town
- Identifying crossing points under the railway to allow connectivity with the north side of the town

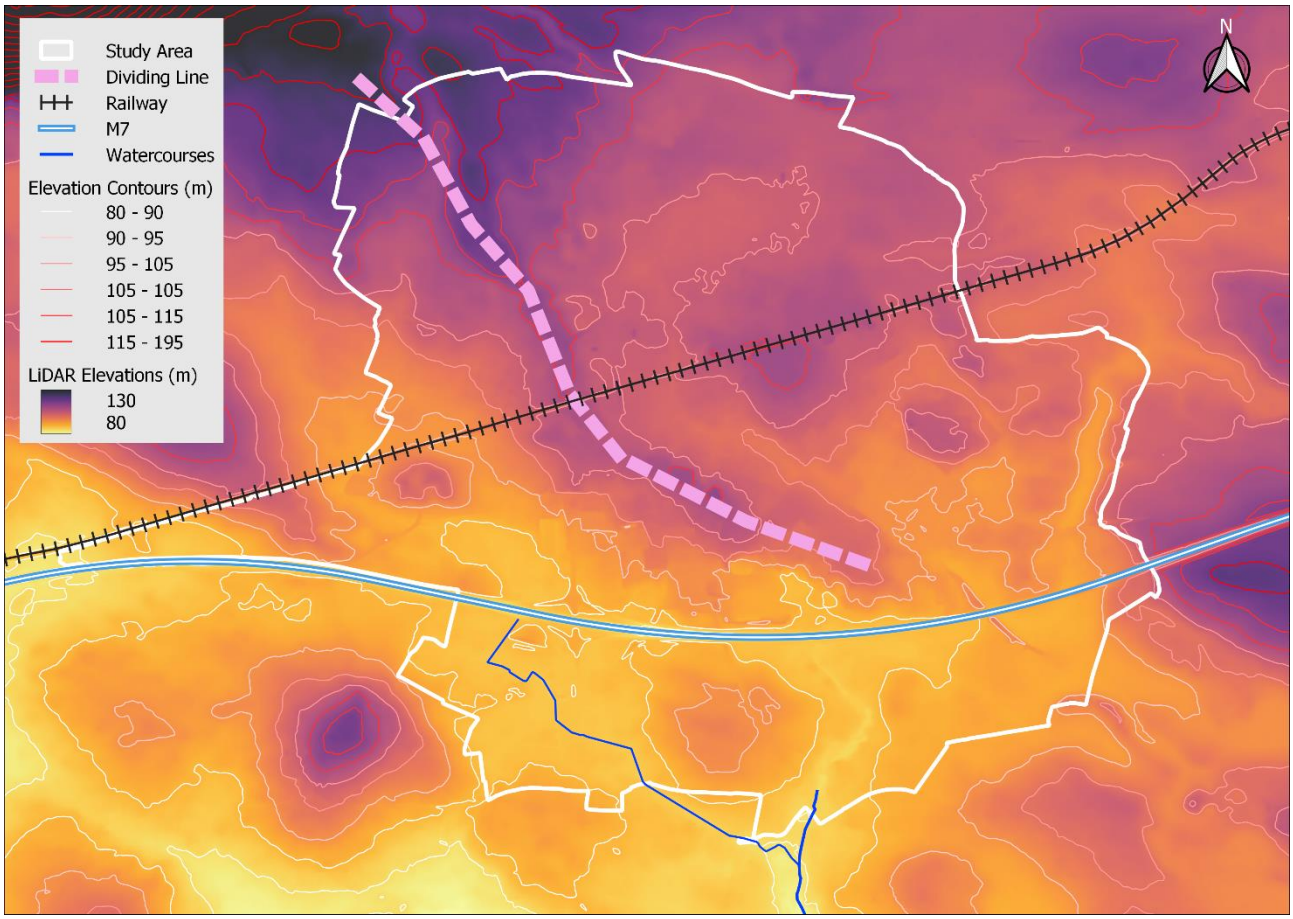


Figure 6: Study Area Topography

The subsections below discuss drainage options for the zoned lands. Development areas are grouped by a common 'regional control' proposal.

3.1 Subcatchment 01

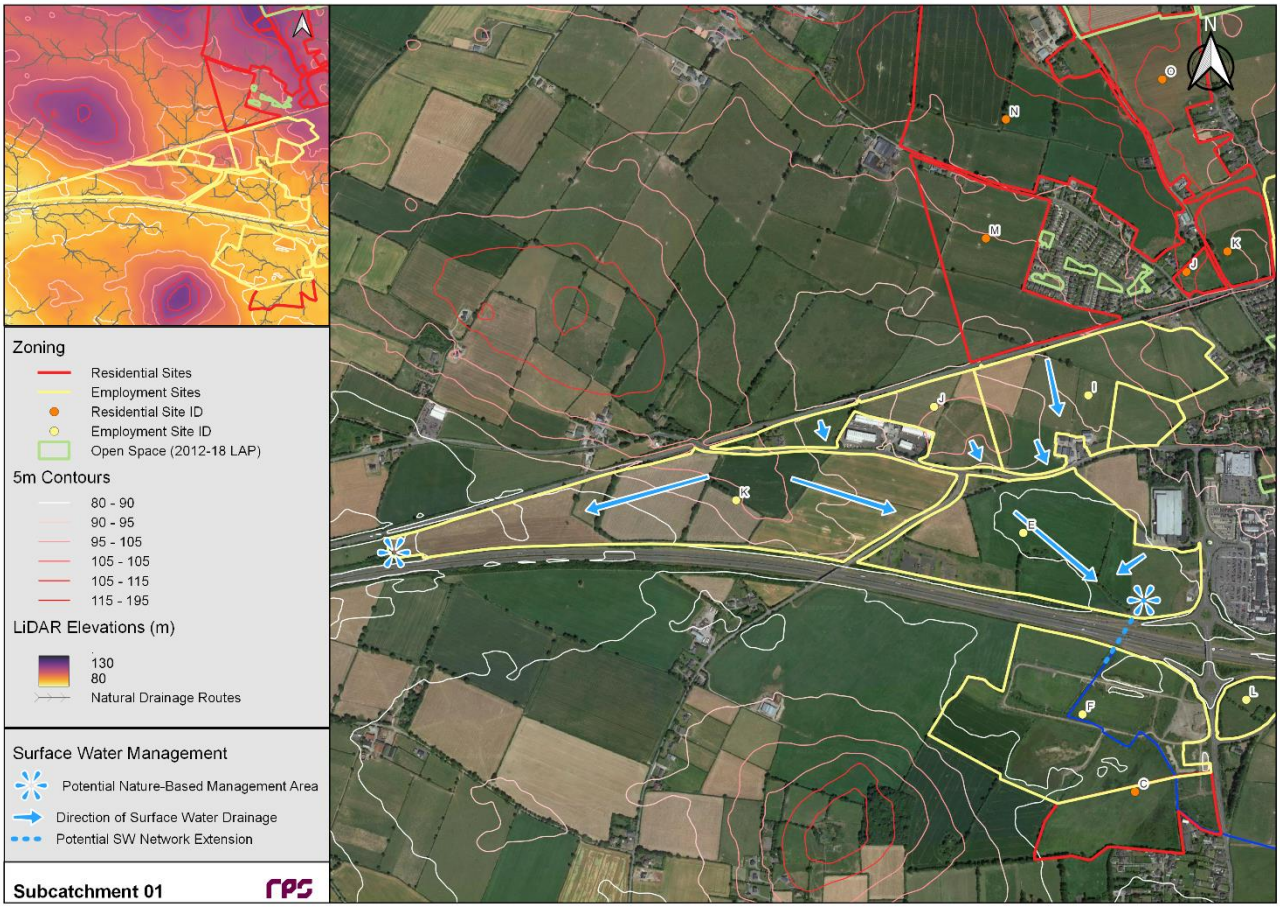


Figure 7: Subcatchment 01 Assessment

3.1.1 Development Zoning (as per LAP 2012-2018)

The west side of the town between the railway and M7 comprises mostly agricultural lands zoned for industrial use. The zoned Employment sites in this area are:

- E - Lough Lion (24.24 Ha)
- I - Monasterevin Road (19.94 Ha)
- J - Knockshough Glebe (8.83 Ha)
- K - Mooretown / Whiteland East (31.95 Ha)

3.1.2 Proposed Drainage Strategy

1. A housing development has been constructed at Loughlion Green which discharges surface water to an existing ditch at Site E, which will have to be maintained. There appears to be a pond on the western boundary of Whitesland West Business Park collecting runoff from lands to the north. Development on the Monasterevin Road site should retain this pond and its drainage paths as far as practicable.
2. A potential NBMA is identified in the south west corner of Site K and would receive surface water from the west side of the field in Site K. Continued conveyance is recommended from this point to the drainage district watercourses approximately 2.3km to the west (outside the Study Area), which is also where the M7 drainage network outfalls.
3. A second potential NBMA is in the south-east side of Site E, roughly corresponding with the historical location of Sovereign's Well. This would receive surface water from the majority of the subcatchment and also potentially from Subcatchment 06 to the north if a crossing under the railway is feasible (refer

to Section 3.6). According to GSI data, this site is situated on lacustrine sediments which may be suitable for a pond or wetland feature but not infiltration systems.

4. Installing a new surface water pipe, via directional drilling, under the M7 to connect this NBMA to the Armour Stream should be explored as it would open up a new route to allow the majority of surface water in the west and northwest side of the town to outfall to a watercourse.

5. The Kildare Town LAP 2012-18 included an objective to construct a relief road through Site E from the Kildare Retail Outlet roundabout to the R445 Monasterevin Road, including the provision of new junctions/crossings. The Transport Strategy for Kildare Town[3] includes this in the 'Do Minimum road network' and refers to it as the Modus Link Road with pedestrian and cycle paths included. planning application was submitted in 2022 but was invalid at the time of writing. The road drainage proposals should seek to incorporate the proposed NBMA.

3.2 Subcatchment 02

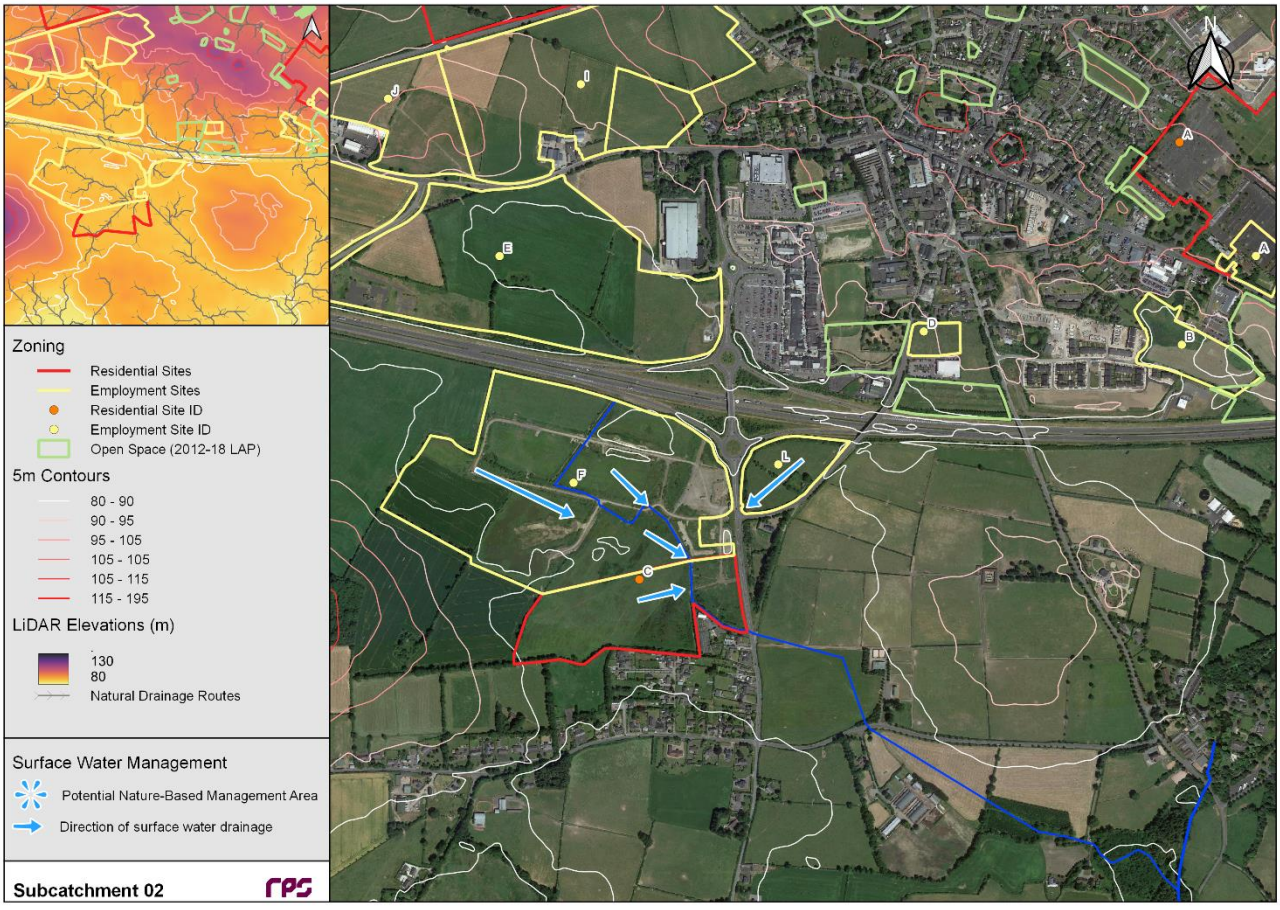


Figure 8: Subcatchment 02 Assessment

3.2.1 Development Zoning (as per LAP 2012-2018)

The south side of the town below the M7 comprises mostly agricultural lands including the National Stud and lands zoned for industrial and residential use. The zoned Employment sites in this area are:

- F - Grey Abbey (26.54 Ha)
- L - Grey Abbey Road (2.86 Ha)

The zoned Residential sites are:

[3] Kildare Town Transport Strategy (AECOM, 2022)

- C - Grey Abbey (8.65 Ha)

3.2.2 Proposed Drainage Strategy

Surface water from the above sites can be directed to the Armour Stream which eventually outfalls to the Tully Stream. Planning permission has been granted at Site C which includes proposals to drain to the Armour Stream.

Installing a new surface water pipe under the M7 to connect this NBMA to the Armour Stream should be explored as this would open up a new route to allow the majority of surface water in the west and northwest side of the town to outfall to a watercourse.

3.3 Subcatchment 03

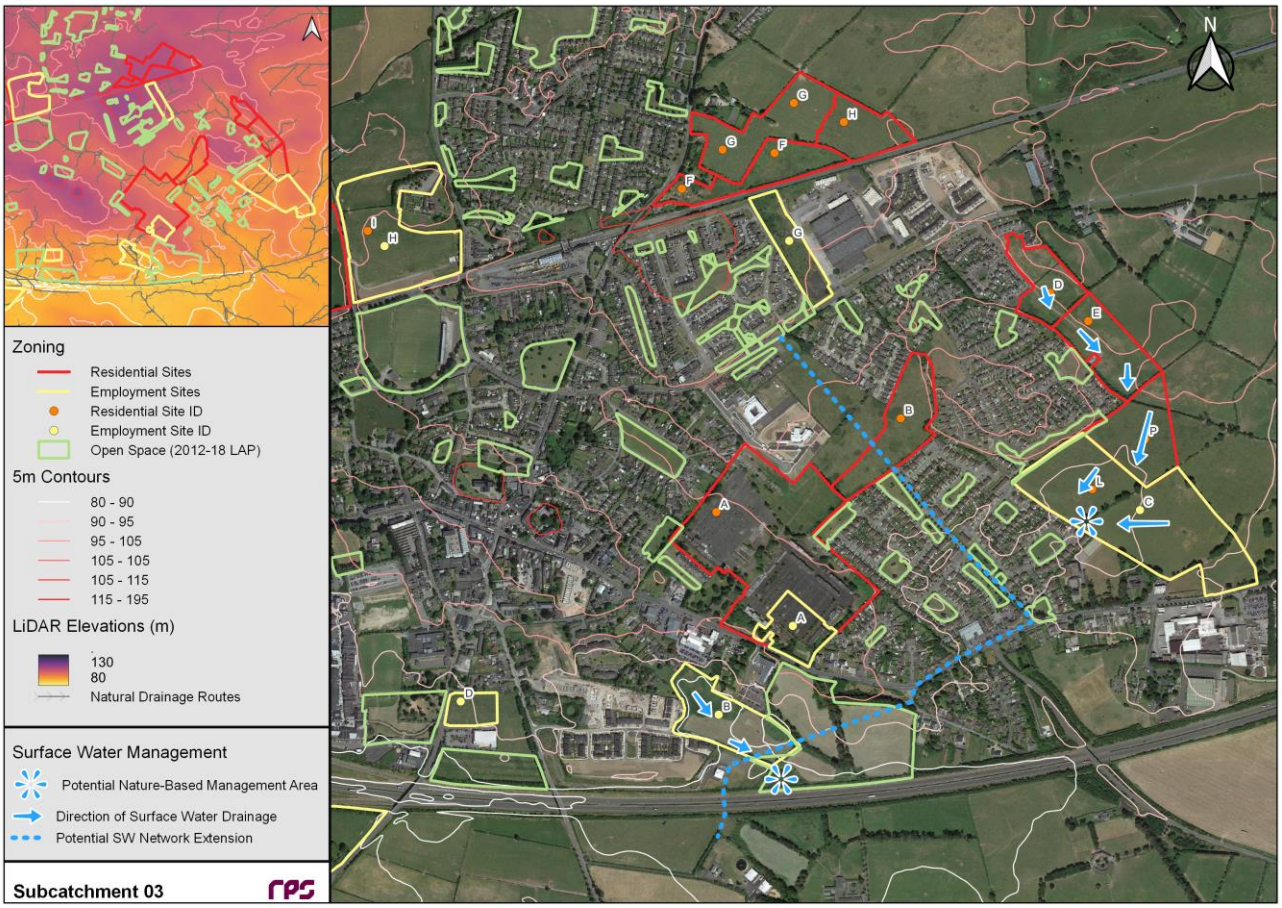


Figure 9: Subcatchment 03 Assessment

3.3.1 Development Zoning (as per LAP 2012-2018)

The east side of the town between the railway and M7 comprises a mix of developed and agricultural land. The zoned Employment sites in this area are:

- A - Magee Barracks (1.63 Ha)
- B - Tully East (3.20 Ha)
- C - Curragh Road (9.42 Ha)
- D - Academy Street (0.80 Ha)
- G - Kildare Business Park (1.70 Ha)

The zoned Residential sites are:

- A - Magee Barracks (10.98 Ha)
- B - Magee Barracks (3.08 Ha)
- D - Collaghknock (2.07 Ha)
- E - Collaghknock (2.80 Ha)
- L - Curragh Road (9.42 Ha)
- P - Southeast of Coolaghknock Park (3.01 Ha)

3.3.2 Proposed Drainage Strategy

Planning permission has been granted for the Magee Barracks sites which will mostly drain to infiltration. A small portion of Site A is proposed to connect to the existing combined sewer on Hospital Road. The SWS Stage 1 report found that Magee Barracks receives runoff from surrounding areas during periods of heavy rainfall due to lack of capacity in their soakaway systems – it is not clear whether this has been taken into account in the developer's surface water design proposals.

It is recommended that a new surface water pipe be installed through the Magee Barracks sites which could convey surface water to the existing siphon under the M7 towards the WWTP, from where it can be directed to the Tully Stream. A wayleave should be reserved through Site B and the Cherry Avenue Park site to allow this new pipe be installed, and incorporating it into the Magee Barracks drainage design should be explored. The wayleave is identified in Figure 9 ('Potential SW Network Extension'). The route of the wayleave is flexible and subject to the final detailed design of other features affecting the site.

A potential NMBA was also identified in the open space reserved for the Cherry Avenue Park to the east of Site B. Infiltration is proposed in the planning application for Site G.

A potential corridor was identified from Coolaghknock Site D down to a potential NBMA at the Curragh Road sites. There is no obvious outlet for NBMAs at this location due to the Ruanbeg Housing estate located downstream. Therefore infiltration is proposed through bioretention areas, infiltration basins or similar.

Planning permission has been granted for Academy Street which will drain to the existing M7 drainage network following infiltration and attenuation on site. An alternative would be to utilise the area zoned for open space to the south of the Academy Street site, adjacent to the M7.

3.4 Subcatchment 04

Figure 10: Subcatchment 04 Assessment

3.4.1 Development Zoning (as per LAP 2012-2018)

The north-east side of the town bordering the railway comprises agricultural land. The zoned Residential sites in this area are:

- F - Rathbride Road (2.46 Ha)
- G - Whitesland East (3.59 Ha)
- H - Whitesland East (2.00 Ha)

3.4.2 Proposed Drainage Strategy

Two potential NBMAs were identified - one at a low point on the east side of Site H, and one at a low point at the bottom of Site F. There is no obvious outlet for NBMAs at these locations due to the presence of the railway downstream. Therefore infiltration is proposed through bioretention areas, infiltration basins or similar.

Planning permission for Whitesland East has been sought which includes proposals to drain to infiltration. KCC has requested further information regarding the surface water proposals in this application.

3.5 Subcatchment 05

Figure 11: Subcatchment 05 Assessment

3.5.1 Development Zoning (as per LAP 2012-2018)

The north side of the town between Southgreen Road and Dunmurry Road comprises mix of agricultural and residential land. The zoned Residential sites in this area are:

- I - West of Dunmurry Road (5.73 Ha)
- O - Between Old Road and South Green Road (11.59 Ha)
- K - West of Old Road (4.53 Ha)

The Oakchurch residential development is under construction between Old Road and Dunmurry Road and will drain to infiltration. The zoned Employment Sites in this area are:

- H - Southgreen (5.73 Ha)

3.5.2 Proposed Drainage Strategy

A 0.6 Ha strip along the railway at the south of Site I/H was identified as a suitable NBMA. An existing pond was identified as a suitable NBMA to cater for site O. The proposed NBMA within Site I/H is envisaged as a linear strip of infiltration systems between the pumping station access road and the railway.

There is no obvious outlet for NBMAs at these locations due to the presence of the railway downstream. Therefore infiltration is proposed through bioretention areas, infiltration basins or similar.

A new link road has been constructed between Southgreen Road and Dunmurry Road bordering the northern boundaries of Sites K, I/H which is not shown on the aerial map in Figure 11. The planning application proposed drainage to infiltration.

3.6 Subcatchment 06

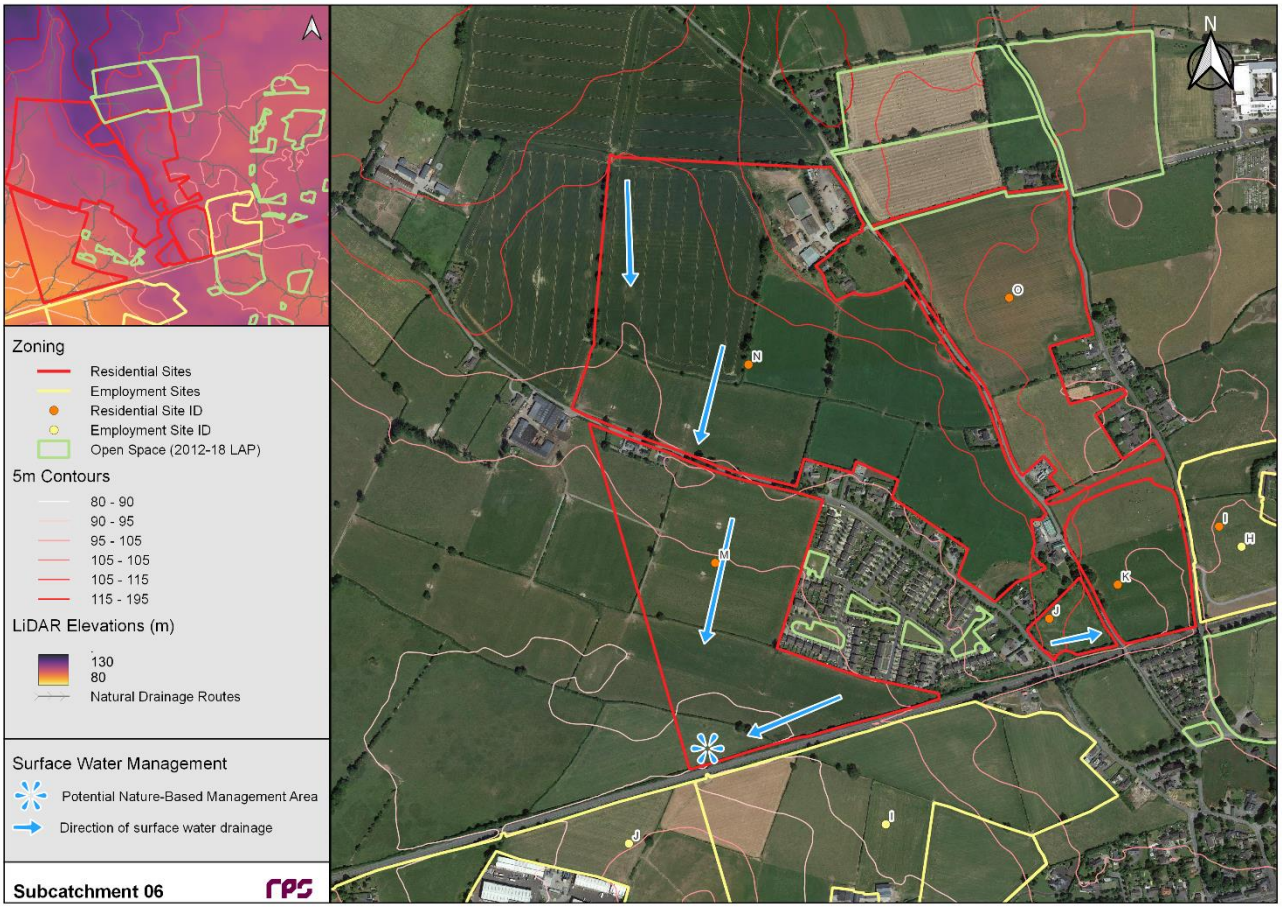


Figure 12: Subcatchment 06 Assessment

3.6.1 Development Zoning (as per LAP 2012-2018)

The north west side of the town between Southgreen Road and the railway comprises mix of agricultural and residential land. The zoned Residential sites in this area are:

- J - West of South Green Road (1.14 Ha)
- M - Loughminane (15.44 Ha)
- N - Southgreen (31.96 Ha)

3.6.2 Proposed Drainage Strategy

The Walkers Gate residential development is under construction within Site N and will drain to infiltration. The existing Loughminane Estate is subject to pluvial flooding issues which may be resolved by outfalling to Site M.

A low point at the south west corner of Site M was identified as a suitable NBMA. If the existing crossing under the railway at this location could be utilised for surface water conveyance, subcatchment 06 could flow to subcatchment 01 and eventually subcatchment 02 via the proposed surface water pipe under the M7 discussed in Section 3.1.

Stage 2 – Surface Water Management Proposals

A report[4] into the pluvial flooding issues occurring in Loughminane Estate identified defects in the surface water management infrastructure and low infiltration rates at the site as the likely cause of the flooding. A recommended measure to reduce the risk of continued flooding was to open an overland flow route from the estate into Site M (Loughminane).

Surface water from Site J should be diverted east to Subcatchment 05.

[4] Loughminane Green, Kildare, Co. Kildare - Preliminary report on the existing SW and Foul Drainage Networks (Donnachadh O'Brien & Associates Consulting Engineers, November 2022).

4 CONCLUSION AND RECOMMENDATIONS

This report explores options for sustainably managing surface water in future developments within the Study Area around Kildare Town. Flow route analysis was carried out in the development zones to identify natural drainage paths and potential NBMA sites. A hierarchical approach to managing surface water in discrete subcatchments is proposed with areas reserved in each one for the implementation of nature-based solutions.

The development of green corridors between subcatchments is encouraged, with surface-based conveyances such as swales and open low flow channels utilised to mimic natural drainage processes as closely as possible. Appendix A provides a conceptual overview of the recommended measures throughout the Study Area, including surface water drainage corridor routes. The exact routes of these corridors are flexible and will be subject to the design and landscaping proposals for each development. Similarly, the routes of the proposed wayleaves for future extensions to the surface water network are flexible and will depend on local design considerations.

4.1 Recommendations

- Reserve areas for the proposed NMBAs and corridors outlined in this report in the Kildare Town LAP.
- Pursue opportunities to increase drainage capacity in the town as follows:
  - Utilise the existing surface water siphon pipe under M7 as much as possible. A new surface water network could be extended from this pipe north through the Magee Barracks sites. The condition of the existing pipe should be confirmed with a CCTV survey and by speaking with operational staff at the WWTP.
  - To increase the number of surface water outfall options, a second pipe crossing under the M7 could be located at the potential NBMA in the southeast corner of Employment Site E (Lough Lion). A siphon arrangement would be required to reach the Armour Stream on the south side of the M7. An approximately 150m-long pipe would be required installed by directional drilling.
  - Survey the existing culverted surface water pipe through the town centre and determine its discharge point. Afterwards the feasibility of additional surface water connections can be assessed.
  - Upgrade underperforming infiltration systems identified in Stage 1 report.
- Identify opportunities to integrate surface water management objectives with other KCC-led development projects in the area. For example:
  - New roads and cycleways should include sustainable surface water management proposals in their design and lands made available.
  - The Green Infrastructure Strategy, Biodiversity Action Plan and other relevant strategic assessments should take account of the nature-based solutions proposed for managing surface water.
- Require developers to provide an audited SuDS Strategy with their planning applications which takes account of any future surface water masterplan for the town and any recommendations from this report adopted into the Kildare Town LAP.
- Make provision for maintenance of nature-based surface water management solutions by KCC operations staff.
- Complete a capacity assessment if increasing discharges to existing watercourses.
- The extension of surface water networks from the M7 crossing points will provide options to facilitate surface water separation from the wastewater system. This is an aim that will come more into focus under the imminent revision to the Urban Waste Water Treatment Directive.

Appendix A

Conceptual Overview of Proposed Surface Water Management Measures in Kildare Town

Study Area

Existing Watercourses

SW Management Measures

Potential NBMA

Recommended SW Drainage Corridor

Proposed wayleave for future SW network extension

Development Zoning (as per LAP 2012-2018)

Residential Sites

Employment Sites