8. HYDROLOGY & HYDROGEOLOGY

8.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) identifies, describes, and assesses the potential effects of the 'Proposed Development' on the local hydrological and hydrogeological environment (surface water and ground water). This section of the EIAR has been completed in accordance with the EIA guidance and legislation set out in Chapter 1: Introduction. The full description of the Proposed Development is provided in Chapter 4 of this EIAR.

The '**Proposed Development'** comprises a number of components:

- **Site A** – Strategic Employment Zone, which consists of three office buildings, public road widening, and road realignment works along the existing R157 Regional Road and L22143 Local Road, the delivery of a new public access road under the Maynooth Outer Orbital Road (MOOR) scheme, internal access road and associated car parking;
- **Site B** – Healthcare Facilities which includes a nursing home and primary care centre as well public road widening and rod realignment works along the existing R157 Regional Road, internal access road and associated car parking, and all associated infrastructure;
- **Site C** – Strategic Housing Development which consists of 360 no. residential homes, a creche facility, internal access roads, approximately 500m of distributor road, pedestrian and cycle improvements, a cycle bridge, shared communal and private open space and all associated site development works.
- Maynooth Outer Orbital Road (**MOOR**) which consists of approximately 1.7km of new distributor road, a single span bridge, pedestrian and cycle improvement measures, a cycle bridge, upgrade works to existing road network and all associated utilities.
- The **Kildare Bridge** planning application includes road upgrade works to the existing R157 Regional Road, a proposed pedestrian / cycle bridge adjacent to the existing Kildare Bridge, as well as a proposed wastewater connection to the Maynooth Municipal Wastewater Pumping Station to the southeast of the Proposed Development in County Kildare.
- The **Moyglare Bridge** planning application includes for the provision of an integral single span bridge over the Rye Water River with associated flood plain works and embankments, as well as services and utilities connections.

While there are multiple planning applications, it was considered prudent to consider all six applications together under one EIAR, due to the proximity, construction timelines and shared infrastructure between the developments. **Site A, Site B, Site C, MOOR, Kildare Bridge and Moyglare Bridge** will be collectively referred to as the 'Proposed Development' henceforth.

The Proposed Development site is located on the northern environs of Maynooth town, Co. Kildare. While the development sites are located in County Meath, two planning applications will also be submitted to Kildare County Council due to commonly shared road and utility infrastructure works required to connect the Proposed Development to services and utility infrastructure within Co. Kildare.

This Environmental Impact Assessment Report (EIAR) chapter provides a baseline assessment of the environmental setting of the Proposed Development in terms of hydrology and hydro-geology, and discusses the potential likely significant effects of the construction and operation of this Proposed Development. This chapter also discusses any mitigation measures required to be put in place to limit any identified potentially significantly impacts to hydrology and hydrogeology and provides an assessment of residual impacts and significance of effects.

The objectives of this assessment are to:

- Produce a baseline study of the existing water environment (surface and groundwater) in the area of the Proposed Development;
- Identify likely positive and negative impacts of the development on surface and groundwater during construction and operational phases of the Proposed Development;
- Identify mitigation measures to be implemented to avoid, reduce, or offset significant negative impacts;
- Assess significant residual impacts and effects;
- Assess cumulative and in-combination impacts of the Proposed Development along with other local infrastructure developments.

8.2 Statement of Authority

This section of the EIAR has been prepared by Michael Watson, David Naughton and Daire O'Shaughnessy of MKO. Michael Watson is a professional geologist (PGeo) and full member of IEMA (MIEMA) as well as a Chartered Environmentalist (CEnv). Michael joined McCarthy Keville O'Sullivan Ltd. in 2014 having gained over 15 years' experience in a Cork based environmental & hydrogeological consultancy firm and has 20 years' experience completing hydrological and hydrogeological assessments including EIAR assessments. David is an Environmental Scientist with over five years of consultancy experience with MKO and has been involved in a number of EIAR applications. David has worked as project manager for a number of EIAR applications, providing a pivotal link liaising between the applicant and the EIAR project team to ensure all work is carried out to a high standard. David holds a BSc (Hons) in Environmental Science. Daire O'Shaughnessy is an Environmental Scientist who holds a B.Sc (Hons) in Environmental Science with three years of consultancy experience with MKO and has been involved in a range of EIAR applications.

8.2.1 Scoping and Consultation

The scope for this chapter of the EIAR has also been informed by consultation with statutory consultees, bodies with environmental responsibility and other interested parties. This consultation process is outlined in Section 2.6 of this EIAR. Issues and concerns highlighted with respect to the hydrological and hydrogeological environment are summarised in Table 8-1 below.

Table 8-1 Summary of Water Environment related Scoping Responses

Consultee	Description	Addressed in Section
Geological Survey of Ireland (GSI)	› Recommended use of Groundwater Data Viewer to identify areas of High to Extreme Vulnerability and 'Rock near or at surface'.	8.3.1 & 8.4.4 The Groundwater Data Viewer was used during the desk study of the and has been used for the assessment. As outlined in Section 8.3.1 below.
Health Service Executive (HSE)	› Any natural flood plains or wetlands on or in the vicinity of the Proposed Development should be identified and measures implemented to ensure they	8.4.3 & 8.5.1 The recommendations set out by the HSE have been taken into account in the project design and EIAR & NIS.

Consultee	Description	Addressed in Section
	are protected from the development. › The impact the Prosed Development could have on watercourses further downstream should be identified and assessed. › An integrated approach to surface water management should be implemented on site. › It is recommended that green space and nature-based solutions are provided for the storage and conveyance of rainwater on site to improve flood mitigation as outlined in the Greater Dublin Strategic Drainage Study (SUDS).	
Inland Fisheries Ireland (IFI)	› The Liffey Catchment is regarded as a very important fishery and so requests due consideration to the catchment area. › A buffer zone of 10 meters (minimum) is requested between the Rye Water River and the Proposed Development. › The Blackhall Little Stream which runs through the middle of the site should not be altered or disturbed, and again a buffer zone is requested. › Riparian vegetation should be left undisturbed as much as possible. › Best practice is recommended at all times in relation to activities that may impact surface waters. › Comprehensive surface water management measures must be implemented.	8.4.3.2, 6.4.2& 8.5.1 The project design has taken account of and implemented the IFI requests.
Department of Agriculture, Food & the Marine	› Following initial scoping and consultation the department made no observations or raised any concerns related to the Proposed Development	N/A

Consultee	Description	Addressed in Section
Irish Water (IW)	› No response received at the time of report issue.	N/A
Meath County Council, Water Services	› No response received at the time of report issue.	N/A
National Parks and Wildlife Services (NPWS)	› No response received at the time of report issue.	N/A

8.2.2 Relevant Legislation

This EIAR is prepared in accordance with the requirements of European Union Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (the 'EIA Directive') as amended by Directive 2014/52/EU.

Regard has also been taken of the requirements of the following legislation (where relevant) as it pertains to the water environment:

- S.I. No. 349 of 1989: European Communities (Environmental Impact Assessment) Regulations, and subsequent Amendments (S.I. No. 84 of 1994, S.I. No. 101 of 1996, S.I. No. 351 of 1998, S.I. No. 93 of 1999, S.I. No. 450 of 2000 and S.I. No. 538 of 2001, S.I. 134 of 2013 and the Minerals Development Act 2017), the Planning and Development Act 2000 (as amended), and S.I. 600 of 2001 Planning and Development Regulations and subsequent Amendments. These instruments implement EU Directive 85/337/EEC and subsequent amendments, on the assessment of the effects of certain public and private projects on the environment;
- Directives 2011/92/EU and 2014/52/EU on the assessment of the effects of certain public and private projects on the environment, including Circular Letter PL 1/2017: Implementation of Directive 2014/52/EU on the effects of certain public and private projects on the environment (EIA Directive);
- Planning and Development Act, 2000, as amended;
- S.I. No 296 of 2018: European Union (Planning and Development) (Environmental Impact Assessment) Regulations 2018 which transposes the provisions of Directive 2014/52/EU into Irish law;
- S.I. No. 293 of 1988: European Communities (Quality of Salmonid Waters) Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life;
- S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended by S.I. No. 296/2009; S.I. No. 386/2015; S.I. No. 327/2012; and S.I. No. 77/2019 and giving effect to Directive 2008/105/EC on environmental quality standards in the field of water policy and Directive 2000/60/EC establishing a framework for Community action in the field of water policy) and S.I. No. 722 of 2003 European Communities (Water Policy) Regulations which implement EU Water Framework Directive (2000/60/EC) establishing a framework for the Community action in the field of water policy and provide for implementation of 'daughter' Groundwater Directive (2006/118/EC) on the protection of groundwater against pollution and deterioration. Since 2000 water management in the EU has been directed by the Water Framework Directive (2000/60/EC) (as amended by Decision No. 2455/2011/EC; Directive 2008/32/EC; Directive 2008/105/EC; Directive

2009/31/EC; Directive 2013/39/EU; Council Directive 2013/64/EU; and Commission Directive 2014/101/EU ("WFD"). The WFD was given legal effect in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003
- S.I. No. 684 of 2007: Waste Water Discharge (Authorisation) Regulations 2017, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);S.I. No. 106 of 2007: European Communities (Drinking Water) Regulations 2007and S.I. No. 122 of 2014: European Communities (Drinking Water) Regulations 2014, arising from EU Directive 98/83/EC on the quality of water intended for human consumption (the "Drinking Water Directive") and EU Directive 2000/60/EC;
- S.I. No. 9 of 2010: European Communities Environmental Objectives (Groundwater) Regulations 2010 (as amended by S.I. No. 389/2011; S.I. No. 149/2012; S.I. No. 366/2016; the Radiological Protection (Miscellaneous Provisions) Act 2014; and S.I. No. 366/2016); and,

8.2.3 Relevant Guidance

The water section of the EIAR is carried out in accordance with guidance contained in the following:

- Environmental Protection Agency (2022): Guidelines on the Information to be Contained in Environmental Impact Assessment Reports;
- European Commission (2017) Guidance on Screening;
- European Commission (2017) Guidance on Scoping;
- European Commission (2017) Guidance on the preparation of the Environmental Impact Assessment Report;
- Institute of Geologists Ireland (2013): Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements;
- National Roads Authority (2005): Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes;
- Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (Inland Fisheries Ireland, 2016);
- PPG1 - General Guide to Prevention of Pollution (UK Guidance Note);
- PPG5 – Works or Maintenance in or Near Watercourses (UK Guidance Note);
- CIRIA (Construction Industry Research and Information Association) 2006: Guidance on 'Control of Water Pollution from Linear Construction Projects' (CIRIA Report No. C648, 2006); and,
- CIRIA 2006: Control of Water Pollution from Construction Sites - Guidance for Consultants and Contractors. CIRIA C532. London, 2006.

8.3 Methodology

8.3.1 Desk Study & Preliminary Hydrological Assessment

A desk study and preliminary hydrological assessment of the site of the Proposed Development and the surrounding area was completed in advance of the site walkover. This involved collection of all relevant geological, hydrological, hydrogeological and meteorological data for the area. This included review of the following sources:

- Environmental Protection Agency (EPA) Maps application (https://gis.epa.ie/EPAMaps/);
- Geological Survey of Ireland (GSI) - Groundwater Database (www.gsi.ie);
- GSI – Groundwater Wells and Springs database (https://www.rgsi.ie/en-ie/data-and-maps/Pages/Groundwater.aspx#Wells)

- GSI – 1:500,000 scale bedrock geology map of Ireland (https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx)
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- EPA/Water Framework Directive Map Viewer (www.catchments.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 21 (Geology of Meath - Kildare). Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland (2003) – Groundwater Body Initial Characterization Reports;
- OPW Flood Hazard Mapping (www.floodinfo.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

8.3.2 Impact Assessment Methodology

Please refer to Chapter 1 of the EIAR for details on the impact assessment methodology (EPA, 2002, 2003, 2015 and 2017). In addition to the above methodology, the sensitivity of the water environment receptors was assessed on completion of the desk study and baseline study. Levels of sensitivity which are defined in Table 8-2 are then used to assess the potential effect that the Proposed Development may have on them.

Table 8-2: Receptor Sensitivity Criteria (Adapted from www.sepa.org.uk)

Sensitivity of Receptor	
Not sensitive	Receptor is of low environmental importance (e.g., surface water quality classified by EPA as A3 waters or seriously polluted), fish sporadically present or restricted. Heavily engineered or artificially modified and may dry up during summer months. Environmental equilibrium is stable and is resilient to changes which are considerably greater than natural fluctuations, without detriment to its present character. No abstractions for public or private water supplies. GSI groundwater vulnerability "Low" – "Medium" classification and "Poor" aquifer importance.
Sensitive	Receptor is of medium environmental importance or of regional value. Surface water quality classified by EPA as A2. Salmonid species may be present and may be locally important for fisheries. Abstractions for private water supplies. Environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without altering part of its present character. GSI groundwater vulnerability "High" classification and "Locally" important aquifer.
Very sensitive	Receptor is of high environmental importance or of national or international value i.e., NHA or SAC. Surface water quality classified by EPA as A1 and salmonid spawning grounds present. Abstractions for public drinking water supply. GSI groundwater vulnerability "Extreme" classification and "Regionally" important aquifer

8.4 Receiving Environment

8.4.1 Site Description and Topography

The Proposed Development is located in both County Meath on the northern environs of Maynooth town and Co. Kildare. Please refer to Figure 1-1 of Chapter: Introduction, for the site location.

Site A: Strategic Employment Zone Application

The site boundary for the proposed Site A is approximately 6.8 hectares (ha). the site is bounded by the R157 Regional Road to the east, the L22143 Local Road to the west, and farmland to the north, south and west. Site A is currently a green-field site which supports small-scale agriculture. The site is relatively flat with a topography ranging from approximately 56m OD (Ordnance Datum) in the south of the site to 60m OD in the centre and north of the site. There is an existing drainage ditch around the perimeter of the agricultural field in which the site is located. The drainage ditch was observed to be dry during site visits due to good draining soils (moderate permeability) and flat topography of the site. The Blackhall Little stream is located to the northwest of the site, more than 250m northwest of the proposed office buildings and associated infrastructure. The proposed section of the Maynooth Outer Orbital Road (MOOR) will run in a northwest direction from the office/business park towards the Blackhall Little stream. The MOOR will run right up to the southern boundary of the site where it will cross the stream.

Due to the nature of Site A, there will be a substantial water requirement once operational, primarily for washing and plumbing facilities. The existing Irish Water Mains within the Study Area are reported as having their source as the Dunboyne Water Supply Zone (WSZ). Site A is located entirely within the Liffey and Dublin Bay (09) Water Framework Directive (WFD) Catchment.

Site B: Healthcare Application

The site boundary for the proposed Site B is approximately 6.6 hectares (ha). The site is bounded by the Rye Water River to the south and the R157 regional road to the east. The site is currently a green-field site which supports small-scale agricultural practices. The areas to the north and west of the site are also used for small scale agriculture. The site is relatively flat where infrastructure is proposed although the topography slopes gradually down towards the Rye Water River to the south. The topography ranges from approximately 56m OD (Ordnance Datum) in the north of the site to 46m OD at the southern boundary of the site at the Rye Water River. There is an existing drainage ditch around the western and northern perimeter of the agricultural field in which the site is located. The drainage ditch was observed to be dry during site visits due to good draining soils and relatively flat topography of the site. The Rye Water River is located to the south of the site, more than 45m south of the closest proposed infrastructure.

Due to the nature of Site B, there will be a substantial water requirement once operational, primarily for washing and plumbing facilities. The existing Irish Water Mains within the Study Area are reported as having their source as the Dunboyne Water Supply Zone (WSZ). Site B is located entirely within the Liffey and Dublin Bay (09) Water Framework Directive (WFD) Catchment.

Site C: Strategic Housing Development (SHD)

The site boundary for the proposed Site C (SHD) is approximately 19.5 hectares (ha). The site infrastructure is located approximately 250m west of the R157 Regional Road and is bounded by the L22143 Local Road which runs along the north of the site from east to west with farmland to the north, south and west. Site C is currently a green-field site which supports small-scale agriculture.

The site is relatively flat with a topography ranging from approximately 58m OD (Ordnance Datum) in the west of the site to 47m OD in the south and east of the site. There is an existing drainage ditch around the perimeter of the agricultural field in which the site is located. The drainage ditch was observed to be dry during site visits due to good draining soils (moderate permeability). The Blackhall Little stream runs from north to south through the centre of the site, approximately 55m east of the proposed housing development. The proposed section of the Maynooth Outer Orbital Road (MOOR) will run in a northeast direction from the proposed Moyglare Bridge northeast towards the Blackhall Little stream. The MOOR will run across the western boundary of the Rye Water River which will include a new watercourse bridge crossing, and upgrade works on an existing crossing [un named]over the Blackhall Little will take place to the northeast of the site.

Due to the nature of Site C, there will be a substantial water requirement once operational, primarily for washing and plumbing facilities. The existing Irish Water Mains within the Study Area are reported as having their source as the Dunboyne Water Supply Zone (WSZ). Site C is located entirely within the Liffey and Dublin Bay (09) Water Framework Directive (WFD) Catchment.

MOOR: Maynooth Outer Orbital Road

The site boundary for the proposed Maynooth Outer Orbital Road (MOOR) is approximately 6.6 hectares (ha). The site is bounded by the R157 Regional Road to the east, the site is bounded by the Moyglare Hall road to the southwest, the L22143 Local Road to the west, the L2214 Local Road to the north and the R157 Regional Road to the east and southeast. The MOOR once constructed will provide connectivity from the R157 to the southeast of the site to the L2214 to the north and finally to the Moyglare hall road to the west. The site is relatively flat with a topography ranging from approximately 48m OD (Ordnance Datum) in the south of the site to 62m OD to the north of the site. There is an existing drainage ditch adjacent to the existing roads in which upgrade works will be carried out as part of the MOOR. The drainage ditches were observed to be dry during site visits due to good draining soils (moderate permeability) and flat topography of the site. The Rye Water River travels through the south of the MOOR at two points, one located to the west and one located to the east. Watercourse crossings will be constructed at both locations, to include a new single span vehicular bridge at Moyglare Hall and a pedestrian/cycle bridge adjacent to the existing Kildare bridge. The Blackhall Little stream is located to the north and east of the site and travels through the MOOR at two points, one located to the northeast and one located within the centre. A new watercourse crossing, in the form of a signal span vehicular bridge will be constructed as part of the MOOR over the Blackhall Little stream and upgrade works will also be undertaken on an existing crossing will occur in the centre of the site.

Kildare Bridge Application

The site boundary for the proposed Kildare Bridge application is approximately 1.2 hectares (ha). The site includes upgrade works to the R157 Regional Road to the north of the site along with a standalone pedestrian and cycle bridge across the Rye Water River adjacent to the existing Kildare Bridge. The site boundary is bounded by the L1013 Local Road to the south of the site. The wastewater pumping station (WWPS) which is part of the Proposed Development and the associated rising main will cross the Rye Water River before travelling along the public road and footpath to the Maynooth Municipal WWTP. The Kildare Bridge application is located entirely within the Liffey and Dublin Bay (09) Water Framework Directive (WFD) Catchment.

Moyglare Bridge Application

The site boundary for the proposed Moyglare Bridge application is approximately 0.5 hectares (ha). The site includes a single span bridge over the Rye Water River. The Moyglare Close housing estate is located approximately 5m from the site boundary at its closest point. There are no existing buildings or structures within the site boundary. The site is relatively flat ranging from 48m OD at the north of the

site to 55m OD to the west. The Moyglare Bridge application is located entirely within the Liffey and Dublin Bay (09) Water Framework Directive (WFD) Catchment.

8.4.2 Water Balance

Long term rainfall and evaporation data was sourced from Met Éireann. The 30-year annual average rainfall (AAR) (1981 – 2010) data from the Met Éireann weather station at Casement, Co. Dublin are presented in Table 8-3. The Casement weather station is located approximately 19.3 km southeast of the Proposed Development site and is the closest weather station for which long-term averages are available. The dataset encompasses data from 1981 – 2010, however it is unlikely that there has been any significant change in annual rainfall patters since that time.

Table 8-3: Local Average long-term Rainfall Data (mm)

Station		Easting (IG)		Northing (IG)	Ht (mOD)		Opened	Closed				
Casement		303311		229022	93							
Jan	Feb	Mar		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Mean AAR (mm)**
64	49	51	52	59	62.5	54	72	60	82	74	76	**754**

The closest synoptic weather station[1] where the average potential evapotranspiration (PE) is recorded is also at Casement, Co. Dublin. As mentioned above, this weather station is located 19.3 km southeast of the Proposed Development site. The long-term PE for this station is 530.5 millimetres per year (mm/yr). this value is a best estimate of the site PE. Actual Evaporation (AE) at the site is estimated as 504 mm/yr (which is 0.95 x PE).

The effective rainfall (ER) represents the water available for runoff and groundwater recharge. The ER for the site is calculated as follows:

Effective Rainfall (ER) = AAR – AE

= 754mm/yr – 504 mm/yr

ER = 250 mm/yr

Based on the recharge co-efficient estimates from the GSI (www.gsi.ie), 22.5% recharge is reported for the majority of **Site A** with moderately permeable subsoil, the majority of **Site B** reports a 7.5% recharge for low permeability subsoil, the majority of **Site C** reports a 7.5% recharge for low permeability subsoil, the majority of the **MOOR** reports a 7.5% recharge for low permeability subsoil, the majority, the majority of **the Kildare Bridge** reports a 15% recharge for low permeability subsoil, the majority the majority of **the Moyglare Bridge** reports a 15% recharge for low permeability subsoil.

This means that for **Site A** 22.5% of the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 77.5% of the effective rainfall becoming runoff as surface water into the nearby Blackhall Little stream and drainage network. Based on the recharge coefficient, the annual recharge and runoff rates for Site Aare estimated to be 56mm/yr and 194 mm/yr respectively.

[1] *Meteorological station at which observations are made for synoptic meteorology and at the standard synoptic hours of 00:00, 06:00, 12:00, and 18:00.*

For **Site B** 7.5% of the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 92.5% of the effective rainfall becoming runoff as surface water towards the nearby Rye Water River to the south. Based on the recharge coefficient, the annual recharge and runoff rates for the Site Bare estimated to be 19mm/yr and 231 mm/yr respectively.

For **Site C** 7.5% of the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 92.5% of the effective rainfall becoming runoff as surface water towards the nearby Rye Water River to the south and the Blackhall Little Stream within the centre of the site. Based on the recharge coefficient, the annual recharge and runoff rates for Site C are estimated to be 19mm/yr and 231 mm/yr respectively.

For the **MOOR** 7.5% of the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 92.5% of the effective rainfall becoming runoff as surface water towards the nearby Rye Water River to the south and the Blackhall Little Stream within the centre and north east of the site. Based on the recharge coefficient, the annual recharge and runoff rates for the MOOR are estimated to be 19mm/yr and 231 mm/yr respectively.

For the **Kildare Bridge** application 15% of the the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 85% of the effective rainfall becoming runoff as surface water towards the nearby Rye Water River to the north of the site. Based on the recharge coefficient, the annual recharge and runoff rates for the Proposed Development are estimated to be 38mm/yr and 212 mm/yr respectively.

For the **Moyglare Bridge** application 15% of the effective rainfall in the area infiltrates into the ground and becomes groundwater, with the remaining 85% of the effective rainfall becoming runoff as surface water towards the nearby Rye Water River to the north of the site. Based on the recharge coefficient, the annual recharge and runoff rates for the Proposed Development are estimated to be 38mm/yr and 212 mm/yr respectively.

8.4.3 Surface Water

8.4.3.1 Regional and Local Hydrology

The entire site of the Proposed Development lies within the Eastern River Basin District (RBD). With respect to regional hydrology, under the Water Framework Directive (WFD), the Proposed Development is located entirely within the Liffey and Dublin Bay (09) surface water catchment. Locally the site is located predominantly within the Liffey_SC_080 and the Rye Water_030 sub-basin, whilst the very eastern part of the site is located within the Rye water _040 sub-basin. The south-eastern portion of the site at Kildare Bridge, is situated within the Lyreen_SC_010 sub-catchment and the Lyreen_020 WFD river sub-basin. A regional hydrology map is shown as Figure 8-2.

8.4.3.2 Existing Local and Site Drainage

A visual inspection of the greenfield site where the Proposed Development is located, and the surrounding area, including drainage mapping, was undertaken by MKO on the 5th of August 2021 and 19th August 2022. The purpose of the site investigation was to inspect the site and determine the current state of the environment and to investigate any residual impacts on the hydrology and hydrogeology from the current land use. Water testing was also carried out on this occasion in order to determine a baseline of water quality in the area. A second round of water sampling was undertaken on the 8th of December 2021 to measure any changes to water quality during periods of higher rainfall.

Particular attention was paid to identifying existing site drainage, drainage patterns, watercourses, water flow directions and any other notable hydrological features.

There are no streams or rivers which pass through the site boundary of either Site A or Site B. However, Site B is bounded by the Rye Water River which is within the Liffey_SC_080 sub catchment. The Blackhall Little Stream runs through the centre of Site C, while the site is bounded by the Rye Water River to the south. The MOOR crosses the Rye Water River at 2 no. locations to the west and south east of the site, and crosses the Blackhall Little Stream at 2 no. locations at the centre and north east of the site. The Kildare Bridge and Moyglare Bridge applications crosses the Rye Water River.

Site A is relatively flat with a topography ranging from approximately 56m OD (Ordnance Datum) in the south of the site to 60m OD in the centre and north of the site. The Blackhall Little stream is located to the northwest of the site, more than 250m north of the proposed office buildings and associated infrastructure. The MOOR will run right up to the boundary of the stream, and no new watercourse crossing will be constructed as part of the Site A development [albeit a watercourse crossing does form part of the MOOR component of the Proposed Development]. Surface water at Site A currently drains into the nearby Blackhall Little stream and local field drain along the southern boundary, parallel to the R157 Regional Road. This drain conveys runoff in a southerly direction, ultimately towards the Rye Water River.

Site B is relatively flat where infrastructure is proposed although the topography slopes gradually down towards the Rye Water River to the south. The topography ranges from approximately 56m OD (Ordnance Datum) in the north of the site to 46m OD at the southern boundary of the site at the Rye Water River. Surface water at Site B currently drains into the nearby Rye Water River which is located more than 45m south of the closest proposed infrastructure.

Site C is relatively flat with a topography ranging from approximately 58m OD (Ordnance Datum) in the west of the site to 47m OD in the south and east of the site. There is an existing drainage ditch around the perimeter of the agricultural field in which the site is located. The drainage ditch was observed to be dry during site visits. The Blackhall Little stream runs from north to south through the centre of the site, approximately 55m east of the proposed housing development.

The **MOOR** is relatively flat with a topography ranging from approximately 48m OD (Ordnance Datum) in the south of the site to 62m OD to the north of the site. There are existing drainage ditches adjacent to the existing roads in which upgrade works will be carried out as part of the MOOR. The drainage ditches were observed to be dry during site visits. The Rye Water River travels through the south of the MOOR at two points, one located to the west and one located to the east. Watercourse crossings will be constructed at both locations. The Blackhall Little stream is located to the north and east of the site and travels through the MOOR at two points, one located to the north east and one located within the centre. A new watercourse crossing will be constructed as part of the MOOR over the Blackhall Little stream and upgrade works on an existing crossing will occur in the centre of the site.

A local hydrology map is presented as Figure 8-2 and the existing site drainage aerial photograph presented as Figure 8-3. At the time of the first round of water sampling (mid-August 2021), Blackhall Little stream was observed to be very low, and dry in places. During the second round of water sampling which took place in December 2021, the Blackhall Little stream was observed to be much faster flowing, with a significant volume of water contained within the banks. The Rye Water River was also observed to be higher during the second round of water sampling in December when compared to the first round in August. Photos of these watercourses during site visits can be seen in Plate 8-2 – Plate 8-5 below.

Plate 8-1 Typical drainage channel on site

8.4.3.3 Flood Risk Identification

A detailed Flood Risk Assessment has been prepared by JBA Consulting included as Appendix 8-1 to this EIAR. OPW's indicative river and coastal flood map (www.floodinfo.ie), CFRAM Preliminary Flood Risk Assessment (PFRA) maps which can be accessed at the Department of Environment, Community and Local Government on-line planning mapping (www.myplan.ie), and historical mapping (i.e., 6" & 25" base maps) were consulted to identify those areas as being at risk of flooding.

While there are historic flood incidents recorded along the Rye Water River, to the south of the Proposed Development infrastructure, there are no recorded flood incidents within the Proposed Development footprint from the OPW's indicative river and coastal flood map. Please note that not all local flooding issues are recorded on the OPW database.

The Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie) shows a fluvial flood zone directly south of the Proposed Development infrastructure, identified on the PFRA mapping, associated with the Rye Water River. The Proposed Development infrastructure is sited within Flood Zone C (where the probability of flooding from rivers and sea is low (less than 0.1%AEP for both fluvial and coastal flooding)), to ensure appropriate land use for the *'Highly Vulnerable Development'* (Healthcare Infrastructure) in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities.

The profile of the existing predicted flood extents indicates that the Rye Water River currently floods from its southern bank, as a result of the significant difference in the over-bank levels i.e., the lands to the north of the Rye Water River are significantly higher than to the south. The Proposed Development infrastructure at Site B is located outside the 1% Fluvial AEP Event.

Based on the above information there is a negligible risk of flooding at the Proposed Development.

Map Legend

- EIAR Site Boundary
- Rye Water River
- Rye Water Tributaries
- Flood Extents

Drawing Title: Local Hydrology

Project Title: Moygaddy Mixed-Use Development

Drawn By	Checked By
TM	MW
Project No.	Drawing No.
210414	Figure 8-1
Scale	Date
1:10,000	30.08.2022

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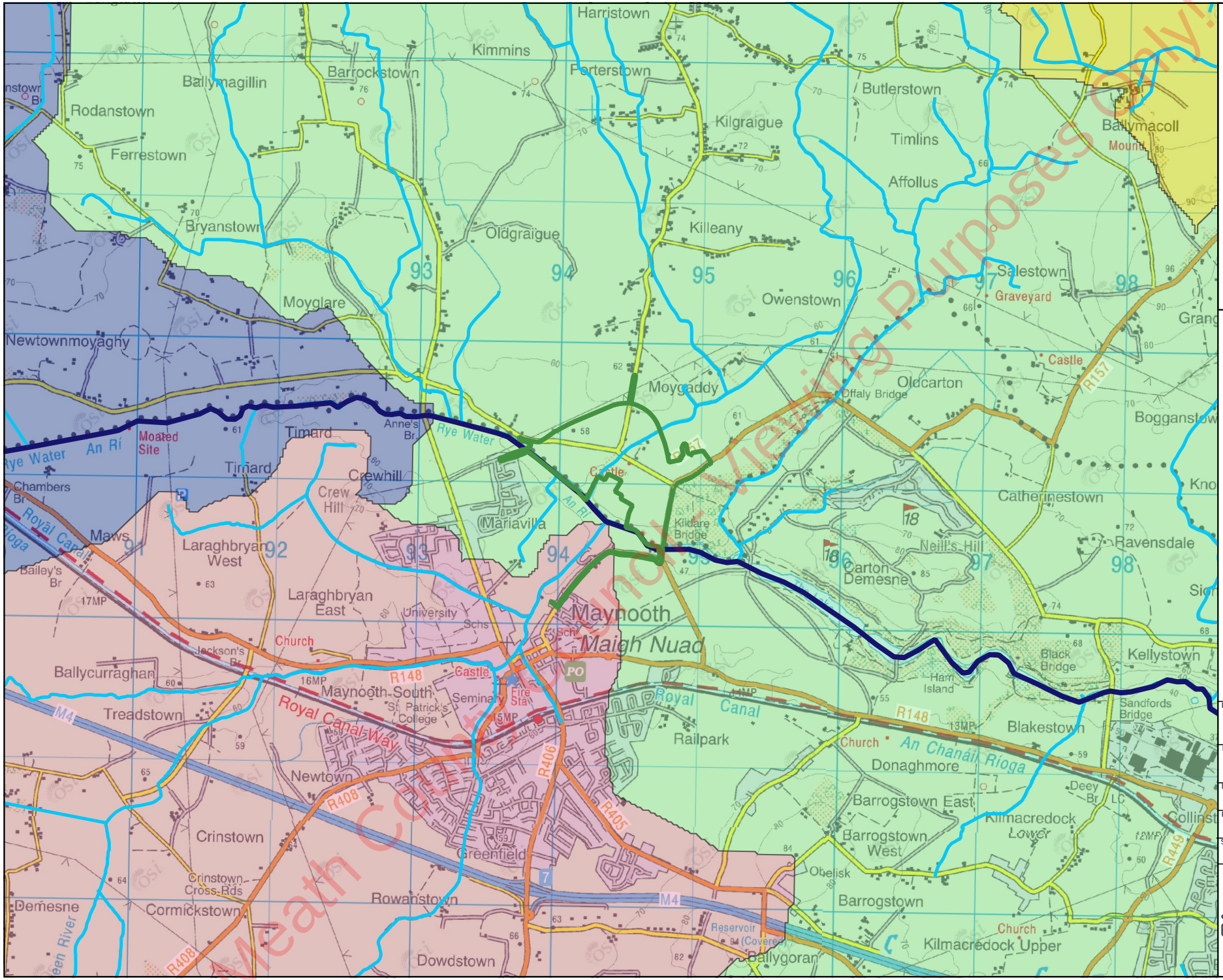

Map Legend

- EIAR Site Boundary
- Rye Water River
- Streams

Water Framework Directive - Subcatchments

- Liffey_SC_080
- Lyreen_SC_010
- RyeWater_SC_010
- Tolka_SC_010

Drawing Title

Regional Hydrology

Project Title

Moygaddy Mixed-Use Development

Drawn By	Checked By
TM	MW
Project No.	Drawing No.
210414	Figure 8-2
Scale	Date
1:35,000	31.08.2022

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Map Legend

- EIAR Site Boundary
- Watercourses
- Flow Direction

N

Drawing Title

Existing Site Drainage

Project Title

Moygaddy Mixed-Use Development

Drawn By	Checked By
TM	MW
Project No.	Drawing No.
210414	Figure 8-3
Scale	Date
1:10,000	31.08.2022

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Surface Water Hydrochemistry

The Environmental Protection Agency's (EPA) Quality Rating System (Q-Rating) is a biotic index used to rate the ecological quality of streams and rivers. The rating system assigns streams a Q-Value of between 1 and 5, with 1 indicating bad ecological quality and 5 indicating the highest ecological quality. The nearest EPA monitoring points to the Proposed Development are located at the Rye Water River, directly to the south of the site. This watercourse is not likely to be affected by the Proposed Development due to the topography of the site. This watercourse currently holds a Q-value of 3.

Surface water sampling was carried out at the Proposed Development site on the 5th of August 2021. The surface water sampling locations are shown on Figure 8-4 below. One of the sampling locations (SW1) was along the Blackhall Little stream which is a tributary of the Rye Water River. The other two sampling locations were located along the Rye Water River, one of which was upstream of the Proposed Development (SW2) while the other was downstream at the Kildare Bridge along the R157 Regional Road (SW3). Surface water levels within the Blackhall Little stream were very low in August 2021, with very little water present in the stream, as can be seen in Plate 8-2 below.

Plate 8-2 Water Levels at SW1 Sample Location (Blackhall Little Stream) on 5th of August 2021

Plate 8-3 Water Levels at SW3 Sample Location (Kildare Bridge) on 5th of August 2021

A second round of surface water sampling was carried out on the 8th of December 2021 from the same sampling locations in order to get a baseline surface water quality representation during a period of high flow (heavy rainfall). Water levels observed during the second round of water sampling were much higher within both the Blackhall Little stream and the Rye Water River, as can be seen in Plate 8-4 and Plate 8-5 below.

Plate 8-4 Water Levels at SW1 Sample Location (Blackhall Little Stream) on 8th of December 2021

Plate 8-5 Water Levels at SW3 Sample Location (Kildare Bridge) on 8th of December 2021

Results of laboratory analysis of water samples from August 2021 are shown in Table 8-4 below alongside relevant Environmental Quality Standards (EQS) values for surface water, while results from December 2021 samples are shown in Table 8-5. Laboratory reports are attached in Volumes 3a, 3b & 3c(ii) in Appendix 8-3 and in Volumes 3d, 3e & 3f in Appendix 8-2.

Table 8-4 Analytical Results of MKO Surface Water Samples from August 2021

Parameter	EQS	Sample ID		
		SW1	SW2	SW3
Total Suspended Solids (mg/L)	25(+)	112	<10	<10
Ammonia – NH_3 (mg/L)	Good Status: ≤0.065 High Status ≤ 0.04(*)	0.12	0.14	0.08
Nitrite NO_2 (mg/L)	-	0.03	<0.02	0.03
Ortho-Phosphate – P (mg/L)	Good Status ≤ 0.035 to High Status: ≤0.025(*)	0.20	<0.03	0.04
Nitrate - NO_3 (mg/L)	-	2.1	3.8	3.1
pH	-	7.97	8.25	8.30
Chloride (mg/L)	-	27.1	24.4	27.6
BOD	Good Status: ≤ 1.5 High Status: ≤ 1.3(*)	<1	<1	<1

(+) *S.I. No. 293 of 1988: Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life.*
(*) *S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009.*

Total suspended solids were <10mg/L in both samples along the Rye Water River which is well below the standard set out in S.I. 293 of 1988. The relatively high amounts of suspended solids in SW1 (Blackhall Little Stream) can likely be attributed to the low flow rate at the time of survey with very little water present in stream.

Ammonia was detected at levels greater than the lower threshold for Good Status of <0.065mg/L in all three samples which is indicative of poor water quality with respect to the Surface Water Regulations (S.I. 272 of 2009). BOD levels for each of the three samples (<1mg/L) achieved a "High Status", while results for orthophosphate achieved a Good Status for SW2 (<0.03mg/L), but a value slightly lower than Good Status (0.04mg/L) for SW3 at Kildare Bridge along the Rye Water River. Orthophosphate levels at SW1 (Blackhall Little Stream) were much higher than the lower threshold for Good Status at (0.20mg/L).

Table 8-5 Analytical Results of MKO Surface Water Samples from December 2021

Parameter	EQS	Sample ID		
		SW1	SW2	SW3
Total Suspended Solids (mg/L)	25(+)	122	108	75

Parameter	EQS	Sample ID		
		SW1	SW2	SW3
Ammonia – NH_3 (mg/L)	Good Status: ≤0.065 High Status ≤ 0.04(*)	0.39	0.12	0.17
Nitrite NO_2 (mg/L)	-	0.08	0.04	0.05
Ortho-Phosphate – PO_4 (mg/L)	Good Status ≤ 0.035 to High Status: ≤0.025(*)	0.85	0.30	0.38
Nitrate - NO_3 (mg/L)	-	17.8	16.2	15.7
pH	-	7.82	8.00	8.05
Chloride (mg/L)	-	20.4	33.9	30.6
BOD	Good Status: ≤ 1.5 High Status: ≤ 1.3(*)	5	3	3

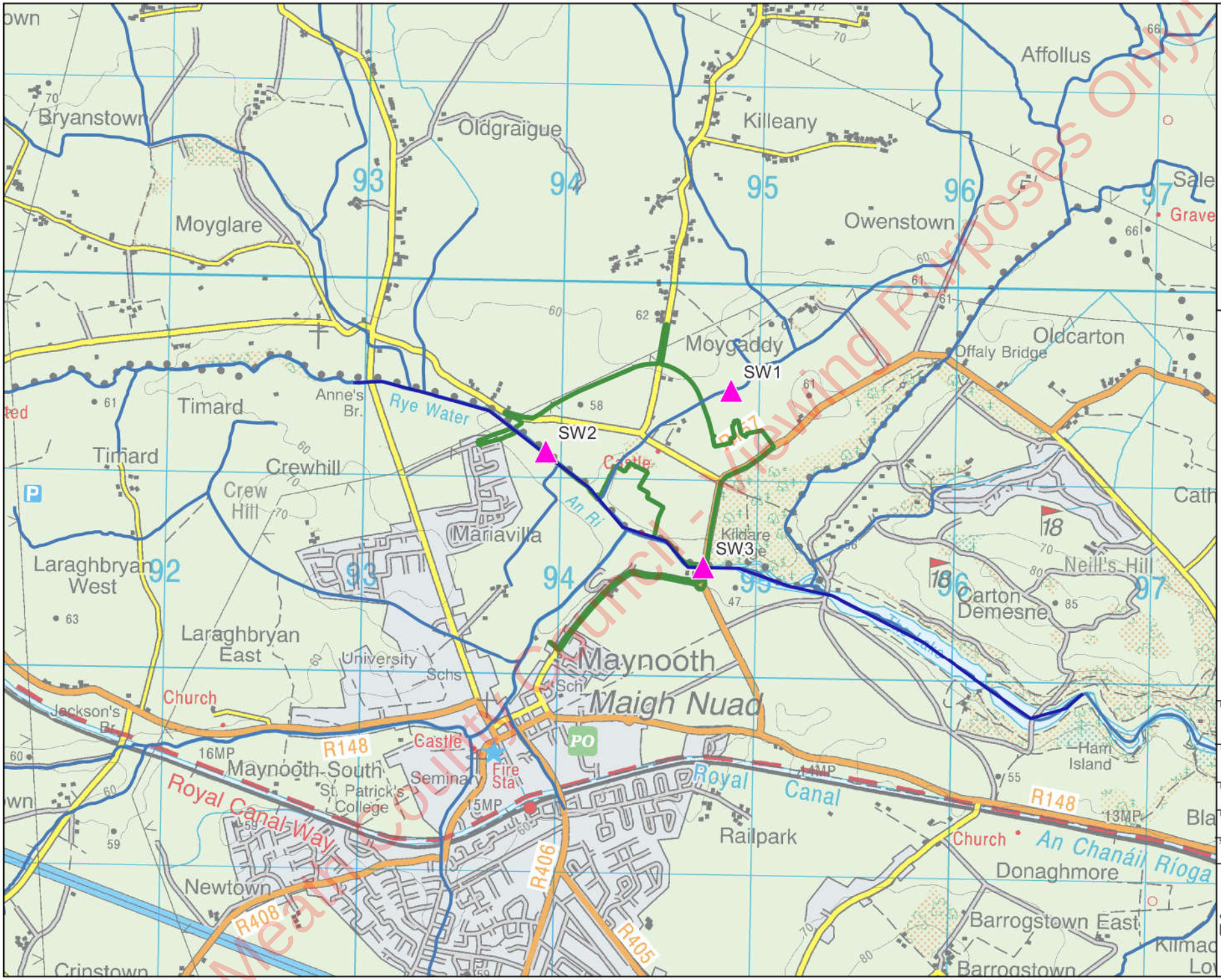
(+) *S.I. No. 293 of 1988: Quality of Salmon Water Regulations, resulting from EU Directive 78/659/EEC on the Quality of Fresh Waters Needing Protection or Improvement in order to Support Fish Life.*
(*) *S.I. No. 272 of 2009: European Communities Environmental Objectives (Surface Waters) Regulations 2009.*

As can be seen from comparison of laboratory analysis from August surface water sampling, the water quality observed during December 2021 was deteriorated, likely due to high levels of rainfall and surface water runoff towards both the Blackhall Little Stream and Rye Water River. The intensive agricultural nature of the site and surrounding areas, coupled with the poor draining soils are likely to lead to temporary negative impacts on water quality for these watercourses during periods of heavy rainfall. None of the parameters recorded at any of three sample locations during December surface water sampling achieved a Good Status.

8.4.4 Groundwater

8.4.4.1 Hydrogeology

Based on the GSI bedrock map of the region, the Proposed Development is underlain by the Lucan Formation (LU) which consists of dark limestone and shale. The Lucan Formation is classified as a moderately productive aquifer in local zones only (Ll). This aquifer classification extends east and west of the Proposed Development, encompassing large swathes of Counties Dublin, Meath, Kildare, Offaly, and Westmeath. A bedrock Aquifer map is shown as Figure 8-5. The Proposed Development is within the poorly productive Dublin Ground Water Body (GWB) catchment area as delineated by the EPA/GSI. A regional groundwater body map is provided as Figure 8-6.



Map Legend

- EIAR Site Boundary
- Watercourse
- SW Sample Locations

Drawing Title	Surface Water Sampling Locations
Project Title	Moygaddy Mixed-Use Development
Drawn By: TM	Checked By: MW
Project No.: 210414	Drawing No.: Figure 8-4
Scale: 1:25,000	Date: 31.08.2022

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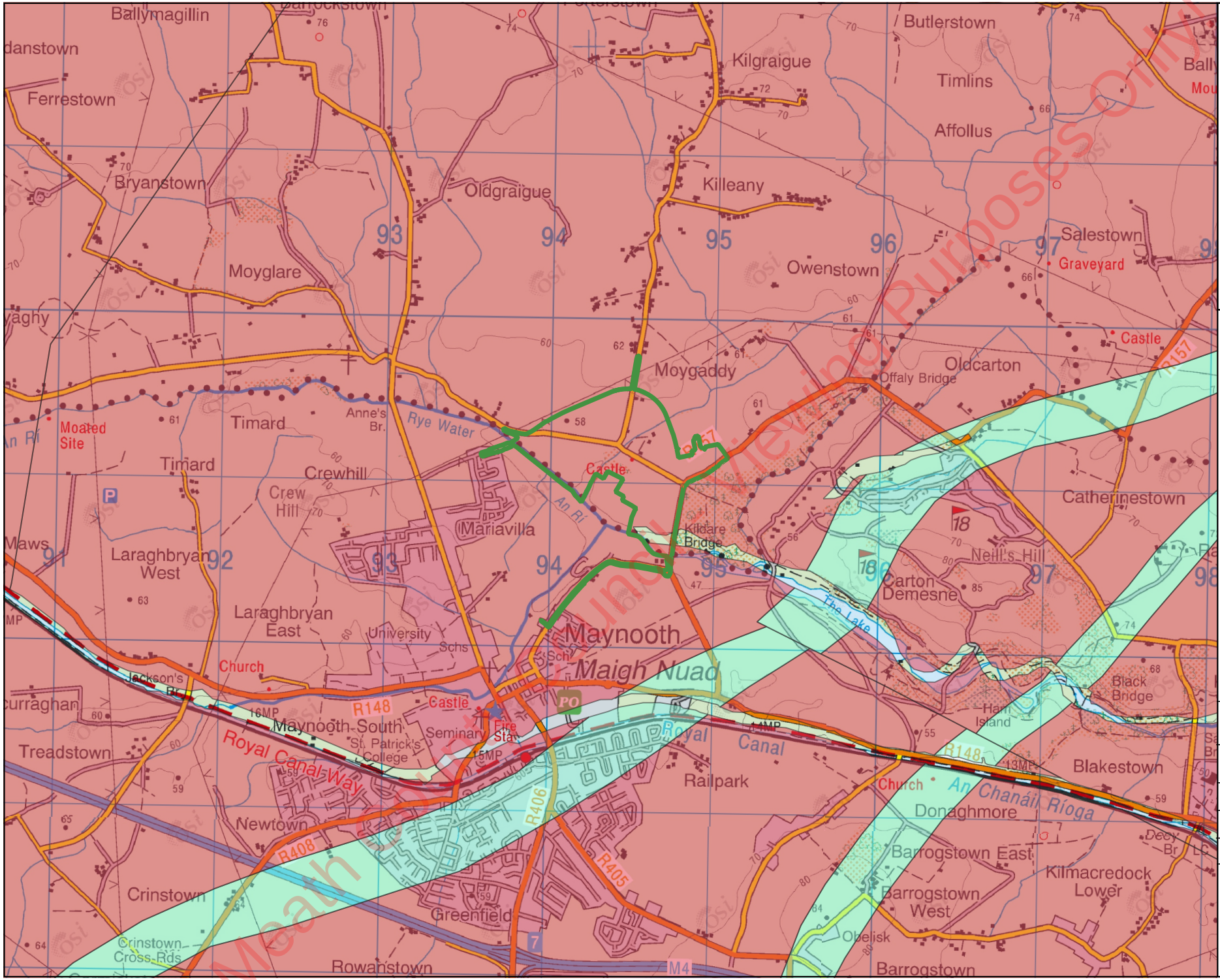

Map Legend

EIAR Site Boundary

Bedrock Aquifer

Locally Important Aquifer - LI

Poor Aquifer - Bedrock Which is Generally Unproductive - Pl

Drawing Title

Bedrock Aquifer Map

Project Title

Moygaddy Mixed-Use Development

Drawn By	Checked By
TM	MW
Project No.	Drawing No.
210414	Figure 8-5
Scale	Date
1:30,000	31.08.2022

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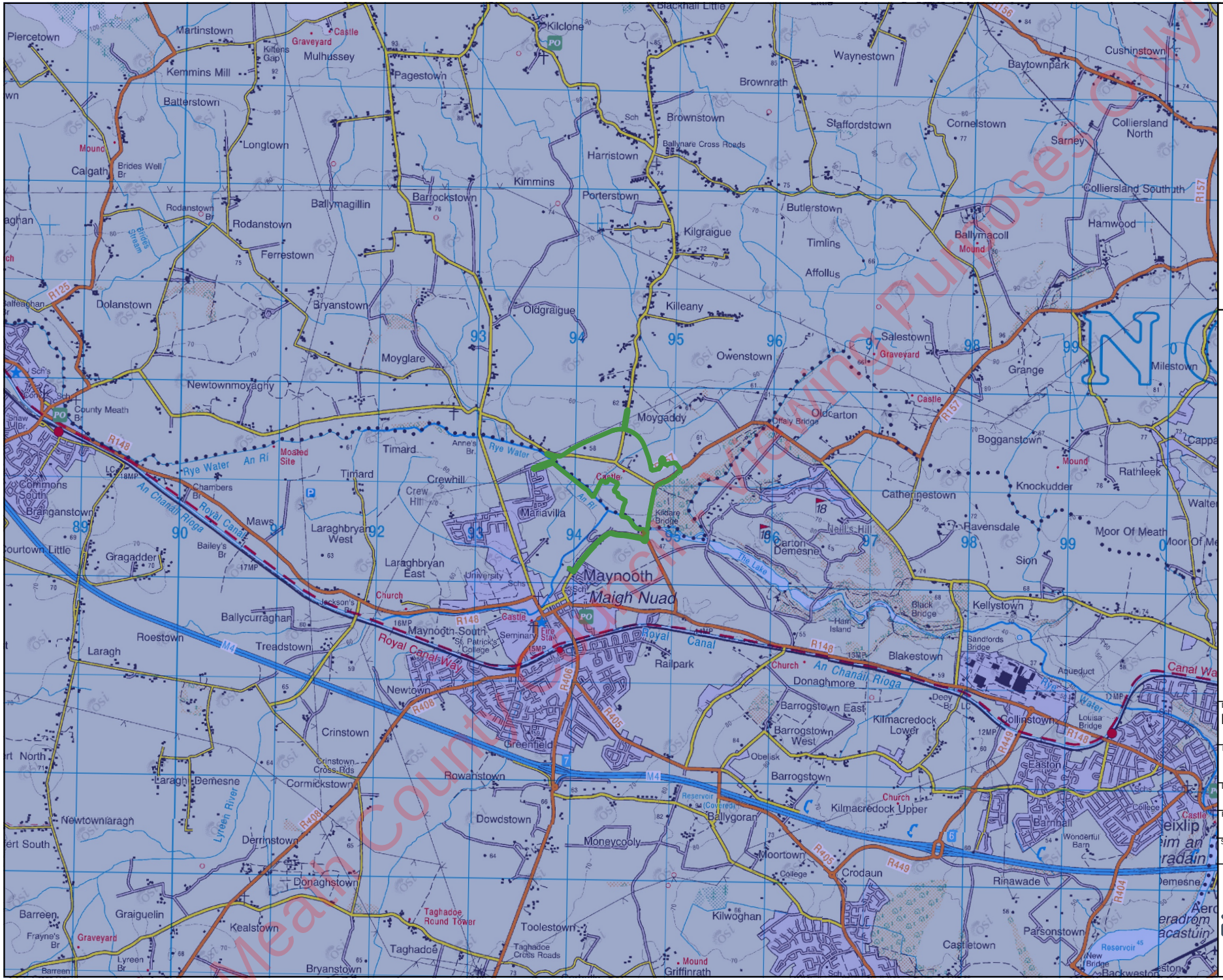
Map Legend
EIAR Site Boundary
Groundwater Body Dublin
'© Ordnance Survey Ireland. All rights reserved. Licence number CYAL50267517'
Drawing Title
Regional Groundwater Body Map
Project Title
Moygaddy Mixed-Use Development
Drawn By
TM
Checked By
MW
Project No.
210414
Drawing No.
Figure 8-6
Scale
1:50,000
Date
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8.4.4.2 Groundwater Vulnerability

Groundwater vulnerability is mapped as being Low (L) (greater than 10m of subsoils present) across the majority of the Proposed Development. A small area to the southeast of the site is mapped as having Moderate (M) (between 5-10m of subsoil present) vulnerability.

8.4.4.3 Site Investigations

Site Investigations were carried out by Site Investigations Ltd. (SIL) between June and July 2021. The scope of works included cable percussive boreholes, rotary coreholes, trial pits, dynamic probes and laboratory testing of field samples. All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. A summary of site investigation works are presented below;

- 18 no. cable percussive boreholes,
- 16 no. rotary coreholes,
- 30 no. trial pits with soakaway tests (21 No),
- 84 no. dynamic probes.

Of the 30 No trial pits completed across the site, 20 No recorded no water seepages or groundwater. Where water was encountered in the remaining trial pits they were predominantly seepages at depths of greater than 1.5m which are not indicative of groundwater levels. Water was not recorded in 13 No of the 18 No Cable percussion boreholes. In general, the information shows that the upper 3-5m of the soils and subsoils are dry. There were water ingresses into 3 No. trial pits within the Proposed Development site, one of which was located within **Site A**, while the remaining two were located within **Site B**. A water ingress was recorded at trial pit no. TP11, located within **Site A** at a depth of 1.80mbgl, with the ingress rate logged as a seepage. Water ingresses were recorded at trial pits no. TP13 and TP21, within **Site B** at a depth of 1.80mbgl and 2.90mbgl respectively, with the ingress rate logged as a seepage at TP13 and at a medium rate at TP21. The photographs in the Site Investigation reports show the nature of the subsoils and the lack of water present in the pits or the soils.

Water was not recorded in 13 No of the 18 No Cable percussion boreholes. What has been described as 'Groundwater' was encountered in five boreholes at depths ranging from 1.50mbgl to 3.60mbgl within the Proposed Development site. Water ingresses were recorded in two boreholes both of which were located within **Site B**, at depths of 3.20mbgl at BH14 and 3.60mbgl at BH17. All ingresses were sealed off by the casing as the drilling advanced and therefore indicates perched water lenses. The remaining boreholes do not record water s

BRE Testing was completed to see if soakaways were an option for the operational phase drainage design. The tests 'failed' as the subsoils are low permeability confirming the information gathered as part of the desk study and the information gathered as part of the Site Investigation. As described previously the hydrological regime comprises shallow subsurface flows to the surface water system locally rather than significant recharge to ground.

A detailed report on Site Investigation works carried out at the Proposed Development site can be found in Volume 3c(i) Appendix 4-9 of this EIAR.

8.4.4.4 Long-term EPA Groundwater Level Monitoring – Carton House

The Environmental Protection Agency record long term groundwater monitoring data at 3 no. monitoring stations based at the nearby Carton House see Figure 8-7 below. These monitoring locations record the elevation of the local shallow groundwater table. The GSI map this region to the north of the river as deep poorly drained mineral soil (BminPD), with a recharge coefficient of 22%.

Map Legend

- EIAR Site Boundary
- Ryewater Groundwater Monitoring Stations

Drawing Title	Ryewater Groundwater Monitoring Stations
Project Title	Moygaddy Mixed-Use Development
Drawn By: TM	Checked By: MW
Project No.: 210414	Drawing No.: Figure 8-7
Scale: 1:30,000	Date: 31.08.2022

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Figure 8-8 shows the recorded groundwater levels from May 2019 to February 2021. As expected, the elevation of the shallow groundwater table decreases to the south and is lowest at RW3, less than 200m from the Rye Water River. Therefore, the local groundwater flow regime is southwards, towards the Rye Water River. A similar flow regime exists at the Proposed Development site where the elevation of the shallow groundwater table decreases to the south towards the Rye Water River and locally to tributary streams.

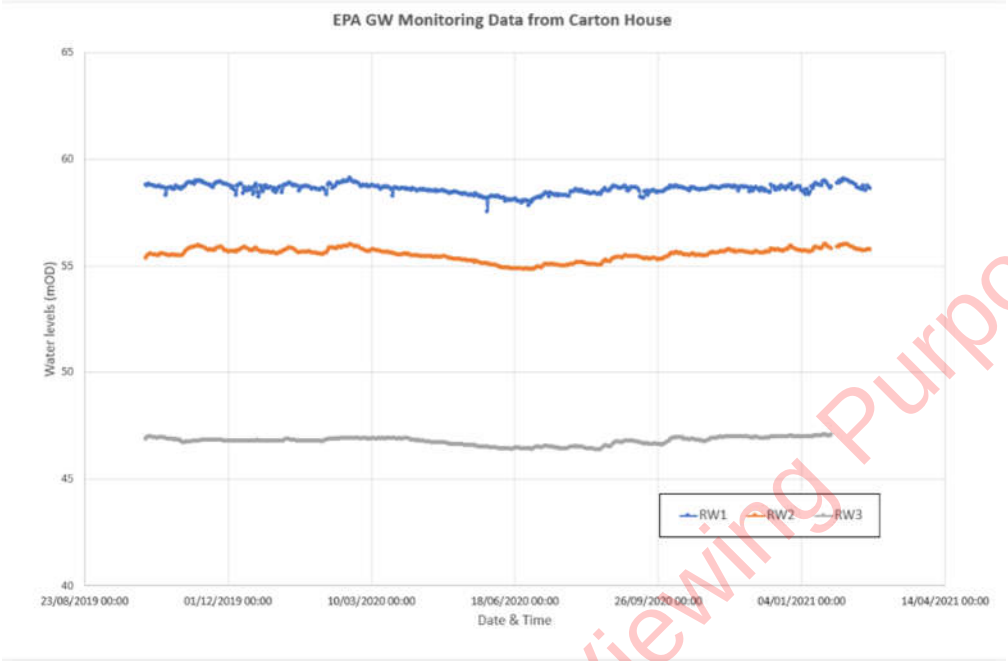


Figure 8-8 EPA Groundwater Monitoring Data from Carton House

Groundwater levels at RW1 – is ranged from 57.55 to 59.08m OD from March 2020 to February 2021. Over the same time period groundwater levels varied from 54.82 to 56.02 at RW2, located less than 50m southeast of the Proposed Development site. Meanwhile groundwater levels ranged between 46.36 and 47.04m OD at EPA monitoring point RW3, located less than 120m east of the Proposed Development site.

Groundwater levels recorded at RW3 are most comparable to the Proposed Development site, (see Figure 8-9). Recorded water levels were greatest in January and February and lowest in June, July and August reflecting seasonal weather changes and level of rainfall. A clear correlation can be identified between groundwater level and precipitation events recorded at Celbridge Mooretown station (www.met.ie), as the shallow groundwater table is quickly recharged. As a consequence of the low permeability soil and subsoil and the poorly permeable bedrock aquifer, a high proportion of recharge will discharge rapidly towards the Rye Water River via surface runoff or shallow groundwater flows. A similar hydrogeological regime exists at the Proposed Development site.

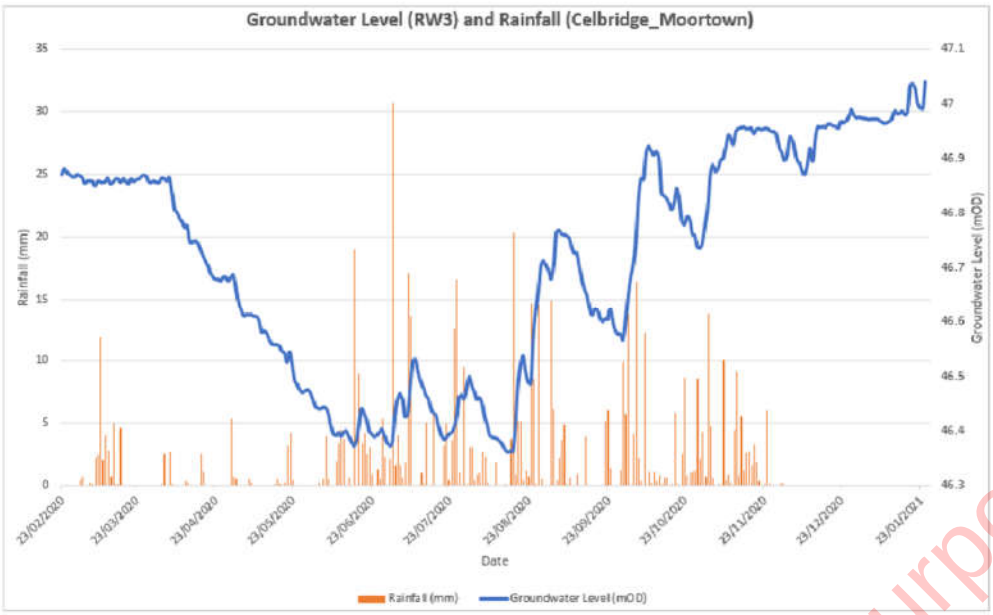


Figure 8-9 Groundwater Levels at Carton House, EPA monitoring point RW3

8.4.4.5 Rye Water Valley/Carton SAC - Louisa Bridge Springs

The Rye Water Valley/Carton SAC is located directly adjacent to the east of the Proposed Development on the eastern side of the R157 Regional Road, see Figure 8-10 below. The SAC is designated for the following qualifying interests, *Petrifying Springs with tufa formation], Narrow mouthed whorl snail (Veritgo angustior) and Desmoulin's whorl snail (Vertigo moulinsiana).* Both species of snail are dependant on the petrifying springs.

While the proposed works are located within close proximity of the SAC site boundary, the only known location of QI habitats and species within the SAC is at Louisa Bridge (north-west of Leixlip), which is approximately 5km east of the Proposed Development.

The Annex I habitat *'petrifying springs with tufa formation'* exists at Louisa Bridge along a series of terraces along the slope from the R148 to the Rye Water River. The flow into the springs comes from the terraces which are further east of the springs themselves. As the proposed Development site is located to the west of the Louisa Bridge springs there is no potential for a contribution from the Proposed Development site to the spring supply.

There are a number of previous hydrological studies of the springs at Louisa Bridge/Leixlip Spa. A hydrological study by Dr Pamela Bartley (Hydro-G, 2008) indicates that the petrifying springs are fed by spring discharges emerging from the underlying bedrock aquifer, and not from overburden or superficial deposits. Dr Bartley states in this report;

> *"The field monitoring and data analysis suggest that water at the Leixlip Spa site originates from a complex groundwater system combining two sources. The main source of water comes from a deeper, older and warmer groundwater system, discharging at the top of the first terrace through the Spa Well. The second is a more recent, shallow groundwater that flows through the karstified limestone bedrock with the main groundwater discharge located in the vicinity of the fen wetland habitat ('filtering ponds') at the most elevated, southern terrace."*

The site specific investigation confirm that rainfall on the Proposed Development site discharges predominantly as overland or shallow sub surface flows to the local surface water drains, streams and rivers. This is consistent with the GSI information, which shows that the subsoils are low permeability and the BRE testing which shows the lack of recharge to groundwater generally. The drainage design for the Proposed Development mimics the existing hydrological regime by directing rainfall runoff to

the surface water system locally rather than groundwater. The Proposed Development is not designed to alter the existing hydrological regime.

Shallow groundwater flow from the Proposed Development site does and will continue to flow to the south and discharge predominantly as baseflow to the Rye Water near the site. Low percentages of rainfall recharge the groundwater aquifer beneath the Proposed Development site which is described as a *Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones* and as can be seen in Figure 8-5 Bedrock Aquifer there is a *Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones* associated with a different rock group immediately east of the site. This rock group is close to the boundary between the Proposed Development site and the SAC generally. Any potential groundwater flows from the Proposed Development site are intercepted by the presence of the lower transmissivity rock group. There is no real pathway for a hydraulic connection between groundwater at the Proposed Development site and groundwater near Louisa bridge, approximately 5km away. In reality, the groundwater supplying the Louisa Bridge springs originates to the east of the springs themselves.

Due to the proximity of the SAC to the sites boundary and applying a precautionary approach it is considered that there is in theory potential for connectivity to this part of the SAC. Irrespective of the presence of the qualifying interests of the SAC within this section of the SAC it is considered, based on the nature of the works, the results of the site investigation and the subsurface geology that there is an imperceptible impact likely on the local hydrological regime associated with the development of the project. For the avoidance of doubt, MKO ecologists have surveyed the SAC from the site boundary and within Carton House and there are no recorded petrifying springs (or associated protected snail species) within this section of the SAC. On this basis, the Proposed Development has no potential for significant negative or adverse effects on the qualifying interests of the SAC.

Designated sites within proximity to the Proposed Development are discussed and assessed further in Chapter 6: Biodiversity of this EIAR, and in the accompanying Appropriate Assessment Screening Report (AASR) and Natura Impact Statement (NIS).

The NIS found that potential for impacts related to surface water deterioration at adjacent designated sites will be prevented by adhering to the mitigation described in Section 8.6 of this EIAR.

8.4.5 Water Framework Directive Water Body Status & Objectives

The Water Framework Directive (WFD) establishes a framework for the protection of ground and surface waters and their dependent habitats and wildlife. Under the directive the EPA is working to classify all waterbodies in the State and to assign a risk status to each of them. The overall objective of the WFD is for all waterbodies to achieve a minimum of 'Good' water quality status.

Local Groundwater Body and Surface Water Body status and risk result are available from (www.catchments.ie). A separate WFD assessment is completed and included as Appendix 8-4.

8.4.5.1 Groundwater Body Status

Groundwater Body (GWB) status information is available (www.catchments.ie). Please refer to Figure 8-6 for the location and extent of associated groundwater bodies.

In terms of the WFD status of the Dublin GWB (IE_EA_G_008) which underlies the Proposed Development site currently is not a risk. This GWB achieved "Good" status under the WFD 2013-2018 review cycle. This status is based on the quantitative and chemical status of the GWB.

8.4.5.2 Surface Water Body Status

Local surface water body status and risk result are available from (www.catchments.ie). The Rye Water River (Rye Water_030) forms a boundary to the site on the south side of Site B. The Rye Water River is denoted as having 'At Risk' status.

The WFD sub-catchment assessment report for Liffey_SC_080 (EPA, 2019) identifies the Rye Water River as being 'At Risk' and being of 'Poor' status. This assessment states that as the Rye Water River is a tributary of the Lyreen River which faces significant pressures from elevated P (phosphorous) levels from agricultural practices.

8.4.5.3 Water Framework Directive Assessment

Mitigation for the protection of surface water during the construction and operational phases of the development will ensure the qualitative status of the receiving waters will not be altered by the proposed development.

There is also mitigation proposed to protect groundwater quality within the Proposed Development scheme during the construction and operational phases of the development. These mitigation measures will ensure the qualitative status of the underlying GWB will not be altered by the proposed development.

There will be no change in GWB or SWB status in the underlying GWB or downstream SWBs resulting from the Proposed Development. There will be no change in quantitative (volume) or qualitative (chemical) status, and the underlying GWB and downstream SWBs are protected from any potential deterioration.

The Proposed Development will not prevent the surface water and groundwater receptors from achieving Good Status in the future.

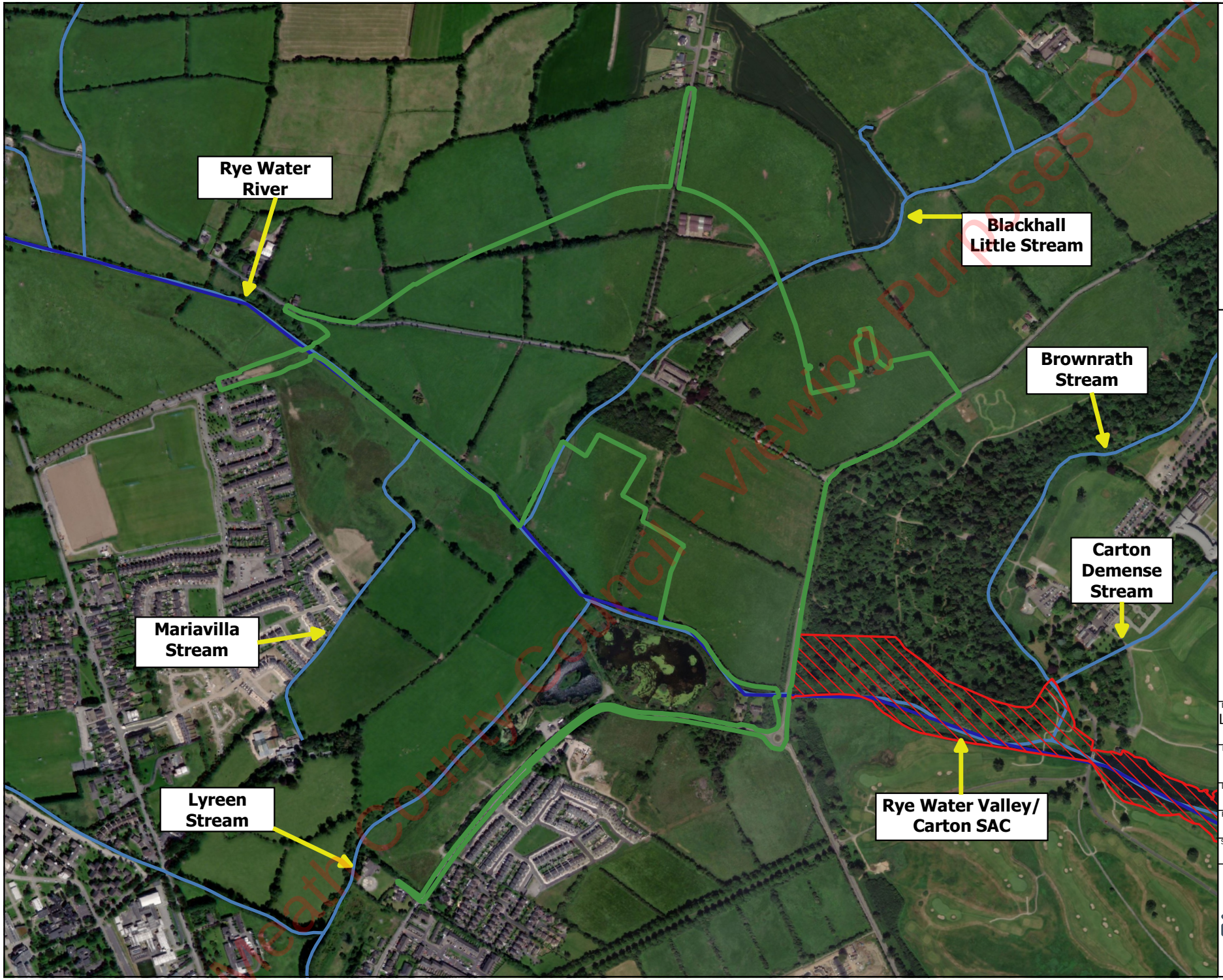
As such, the proposed development will not impact upon any surface water or groundwater body as it will not cause a deterioration of the status of the body and/or it will not jeopardise the attainment of good status. A separate WFD assessment is completed by HES and included as Appendix 8-4.

8.4.6 Water Resources

A search of the Geological Survey of Ireland (GSI) well database (www.gsi.ie) indicates that there is one well mapped within Site B of the Proposed Development. The well in question is a borehole which was created in 1899 with an unknown original source and purpose. This borehole is mapped as overlapping the eastern portion of the site.

There are several other mapped boreholes and wells in the vicinity of the Proposed Development.

The GSI well database is not exhaustive and it is most likely that other private wells exist within the vicinity. Due to aquifer characteristics and topography, it is not likely that groundwater flow towards this well occurs. Based on limited activity proposed during the operational phase of the mixed-use scheme, and the hydrogeological characteristics of the site, no impacts to ground water quality, quantity or flow are likely. Mitigation measures for the construction phase of the Proposed Development are detailed in Section 8.6.3 below.



Map Legend

- EIAR Site Boundary
- Rye Water River
- Watercourses
- Rye Water Valley/Carton SAC

N

Drawing Title
Local Hydrology with Nearby SAC

Project Title
Moygaddy Mixed-Use Development

Drawn By	Checked By
TM	MW
Project No.	Drawing No.
210414	Figure 8-10
Scale	Date
1:10,000	31.08.2022

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8.4.7 Receptor Sensitivity

Due to the nature of the Proposed Development, being near surface construction activities, combined with the nature of the hydrological regime and bedrock aquifer type, impacts on groundwater are generally negligible and surface water is generally the main sensitive receptor assessed during the impact assessment.

Groundwater

The primary risk to groundwater at the site would be from cementitious materials, hydrocarbon spillage and leakages. No interruption of existing groundwater drainage pathways below the site will occur due to the shallow nature of excavations within the development and the depth of subsoils present at the site.

The above are common potential impacts on all construction sites (such as road works and industrial sites). All potential contamination sources are to be carefully managed at the site during the construction and operational phases of the development and mitigation measures are proposed below to deal with these potential minor impacts.

As previously established, the bedrock aquifer which underlies the majority of the Proposed Development is classified as being moderately productive, in local zones only, with the overlying subsoils having low permeability. The groundwater vulnerability mapping and ground investigations show thick tills derived from limestone beneath the site with Low risk and Medium risk areas mapped. Any contaminants which may be accidently released on-site will predominantly discharge via surface water runoff or shallow groundwater flow paths to nearby streams or rivers. Mitigation measures to protect groundwater and ensure no significant effects on groundwater are proposed and described below.

Surface Water

Comprehensive surface water mitigation and controls are outlined below to ensure protection of all downstream receiving waters during construction and operational phases of the Proposed Development. Mitigation measures will ensure that surface runoff from the developed areas of the site will be of a high quality and will therefore not impact on the quality of downstream surface water bodies. Drainage works at the development site will discharge to storm water sewers via attenuation tanks and via oil interceptors which will discharge at controlled flow rates (greenfield rates) to the Rye Water River.

8.5 Proposed Development Services

8.5.1 Proposed Surface Water Site Drainage

The proposed surface water drainage layout and design details for the Proposed Development is shown on OCSC drawings, Engineering Services Report, See Volumes 3a, 3b & 3c(i) Appendix 4-9 and the MOOR Preliminary Design Report in Volume 3d, Appendix 4-6 of this EIAR.

Surface water management for the Proposed Development is designed to comply with the Greater Dublin Strategic Drainage Study (GDSDS) policies and guidelines and the requirements of Meath County Council. The surface water design includes for a climate change factor of 20%

It is proposed that surface water within Site A (from roads, roofs and hardstanding areas) will drain via gravity, and via hydrocarbon interceptors, and infiltration area/attention storage areas, to an existing ditch along the southern boundary, which is to be replaced by a new filter trench as part of the

upgraded and re-aligned R157. This drain conveys surface water runoff in a southerly direction, ultimately towards the Rye Water River at the proposed outfall location described below.

It is proposed that surface water within Site B (from roads, roofs and hardstanding areas) will drain via gravity, and via hydrocarbon interceptors, and infiltration area/attention storage (located in the shared carpark at Site B), to an outfall at the Rye Water River, just west of the Kildare Bridge.

It is proposed that surface water within Site C (from roads, roofs and hardstanding areas) will drain via gravity to hydrocarbon interceptors, and infiltration area/attention storage. The surface water network is to be split into a number of catchments in order to best integrate Sustainable drainage Systems. Each sub-catchment will look to provide treatment to surface water runoff at source or through design. All runoff will be directed to the Blackhall Little and the Rye Water River.

The main Site A, Site B and Site C attenuation systems will comprise underground poly-tunnel systems, to be located within the Proposed Development's green spaces in Site A and within the shared car park area of Site B and within the public open spaces in Site C with adequate drainage to maintain functionality.

The discharge rates for both Site A and Site B are to be restricted to a flow rate less than the current greenfield equivalent runoff rate, to ensure that there is no increase in flow rates and volumes to be discharged from the Proposed Development to the receiving infrastructure and waterbodies. Therefore, there will be no adverse impact on adjoining and other downstream properties

The discharge rate for Site C is to be restricted to a maximum flow rate which is less than greenfield equivalent runoff rate, to ensure that there is no increase in flow rates and volumes to be discharged from the Proposed Development to the receiving infrastructure and waterbodies. Therefore, there will be no adverse impact on adjoining and other downstream properties.

It is proposed that surface water run off on the MOOR is to be captured by adequately spaced trapped road gullies, which connect to a main carrier drain under the road. The rainfall runoff on the aligning footpath and cycle track shall be intercepted by the dividing tree-lined grass verge, with excess runoff only being collected by the road's gully network. Surface water attenuation will be used to control runoff from all hard surfaces in accordance with the GDSDS, with these being restricted to a maximum flow rate which is less than the calculated greenfield runoff equivalent.

Various other SuDS (sustainable drainage systems) have been incorporated into the surface water drainage design of the Proposed Development including permeable pavements, swales, hydrocarbon interceptors, rainwater harvesting systems, and downstream attenuation/infiltration.

The surface water network, attenuation storage and site levels are designed to accommodate a 100-year storm event and includes climate change provision. Floor levels of buildings are set above the 100-year flood levels by a minimum of 0.5m for protection.

Run-off rates from the site are controlled by vortex flow control devices. Surface water management proposals for the development also incorporate the following elements to reduce impacts on downstream water quality:

- The proposed drainage systems have been designed in accordance with GDSDS requirements;
- The proposed drainage systems have incorporated
    - SUDS features, e.g. permeable paving in high risk parking areas;
    - Rainwater harvesting systems are also proposed at each office building to re-use the collected rainwater for welfare facilities, or landscaping purposes and reduce the overall volume of rainfall runoff entering the surface water network.

- On-line attenuation/infiltration facilities with a petrol separator prior to discharge to local watercourses and existing drainage network.

8.5.2 Proposed Wastewater Infrastructure

It is proposed to provide a new underground pumping station constructed to IW standards and specifications to the west of the proposed nursing home building at Site B within the Proposed Development. The Proposed Development (Both Site A to the north and Site B to the east and Site C to the west of the proposed pumping station) will drain by gravity to the new Pumping Station where it will then be pumped to the existing Irish Water network along the L1013 Local Road in County Kildare, approximately 1km south of the proposed pumping station.

It is proposed to provide a gravity wastewater connection from Site C to the new underground wastewater pumping station. Wastewater will cross the Blackhall Little Stream from the proposed residential development and travel to the new underground wastewater pumping station. The wastewater will then travel from the new pumping station via a rising main routed under the Rye Water River to the existing Maynooth WWPS. Refer to Volumes 3a, 3b & 3c(i) Appendix 4-9 for a detailed description on the proposed wastewater infrastructure.

Individual buildings will connect to the 225mm diameter foul drains via individual 100mm diameter connections, as per Irish Water Code of Practice for Wastewater Infrastructure.

The foul sewers are sealed and there will be no discharge of wastewater to ground within the Proposed Development. Wastewater will be pumped from the Proposed Development to the Maynooth pumping station, and onwards from Maynooth pumping station to the Leixlip Wastewater Treatment Plant.

8.5.3 Proposed Water Supply

A proposed new connection to one of the existing watermains local to the site will be made for the Proposed Development. There is a 200mm watermain just south from the Kildare bridge, south of the Proposed Development. An extension from the existing 200mm watermain to be provided along the MOOR road, to the connection point at the site boundaries of Site A & Site B. It is anticipated that a metered 150mm high density polyethylene connection will be required. Internal distribution network of 150mm HDPE watermain will be provided to serve the proposed medical units. It is also proposed to provide an extension to the existing 200mm watermain at Moyglare Close, to serve Site C. Internal distribution networks of 100mm and 150mm watermains will be provided to serve the residential homes, crèche facility and scout den. Further details can be found in Volumes 3a, 3b & 3c Appendix 4-9.

The Proposed Development will be subject to a New Connection Agreement with Irish Water, with all details in accordance with their requirements.

There is no proposed extraction of groundwater at the site for drinking water purposes.

8.5.4 New Bridge Structures as part of the Proposed Development

There will be 5 no. bridge structures constructed as part of the Proposed Development. Further information on construction methodologies can be found in Volumes 3a, 3b & 3c(i) Appendix 4-3 and Volumes 3d, 3e & 3f Appendix 4-2. Further detail can also be found in Volumes 3a, 3b, 3c(i) Appendix 4-6 and Volumes 3d, 3e & 3f Appendix 4-4.

The Proposed Development includes a Road Bridge located to the south west of Site C and forming the Moyglare Bridge application crossing the Rye Water River, and a road bridge located to the north

of Site A forming part of the MOOR crossing the Blackhall Little Stream. A pedestrian/cycle bridge will be constructed to the south east of Site B forming the Kildare Bridge application adjacent to the existing Kildare Bridge crossing the Rye Water River. A pedestrian/cycle bridge will be constructed adjacent to an existing bridge on the L2214-3 Local Road to the north of Site C crossing the Blackhall Little Stream. A pedestrian/cycle bridge will also be located within Site C providing pedestrian and cycle access across the Blackhall Little Stream to the Scout Den, Creche and Public Park.

All bridges which will be constructed as part of the Proposed Development share a number of key characteristics, including:

- Piled foundations;
- Cast in situ abutments
- Precast deck elements
- On deck cast in situ slabs or screeds;
- Post-fix paraphets

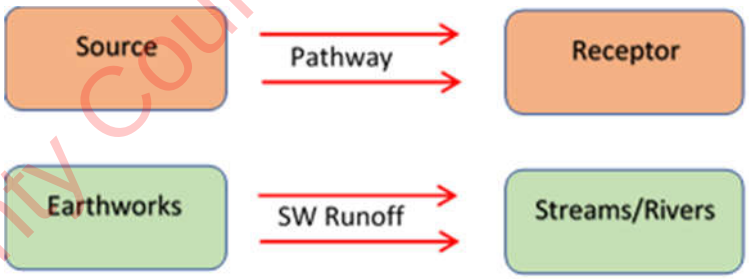
The impact of the proposed road bridge and pedestrian / cycle bridge structure was further assessed by JBA Consulting, as part of a wider flood study of the Moygaddy Environs, with the conclusions indicating that the proposed bridge structures will have 'no impact on flood following its construction'.

8.6 Likely, Significant Impacts and Mitigation Measures Implemented

The potential impacts of the Proposed Development and mitigation measures that will be put in place to eliminate or reduce them are set out below.

8.6.1 Overview of Impact Assessment Process

The conventional source-pathway-target model (see below, top) was applied to assess potential impacts on downstream environmental receptors (see below, bottom as an example) as a result of the Proposed Development.



Where potential impacts are identified, the classification of impacts in the assessment follows the descriptors provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (EPA, 2017); and,
- Advice Notes on Current Practice in the Preparation of Environmental Impact Statements (EPA, 2003).

The description process clearly and consistently identifies the key aspects of any potential impact source, namely its character, magnitude, duration, likelihood and whether it is of a direct or indirect nature.

In order to provide an understanding of the stepwise impact assessment process applied below, we have firstly presented a summary guide that defines the steps (1 to 7) taken in each element of the impact assessment process (refer to Table 8-6). The guide also provides definitions and descriptions of the assessment process and shows how the source-pathway-target model and the EPA impact descriptors are combined.

Using this defined approach, this impact assessment process is then applied to all operation activities which have the potential to generate a source of significant adverse impact on the geological and hydrological/ hydrogeological (including water quality) environments.

Table 8-6: Impact Assessment Steps

Step 1	Identification and Description of Potential Impact Source: This section presents and describes the activity that brings about the potential impact or the potential source of pollution. The significance of effects is briefly described.	
Step 2	Pathway / Mechanism:	The route by which a potential source of impact can transfer or migrate to an identified receptor. In terms of this type of development, surface water and groundwater flows are the primary pathways, or for example, excavation or soil erosion are physical mechanisms by which a potential impact is generated.
Step 3	Receptor:	A receptor is a part of the natural environment which could potentially be impacted upon, e.g. human health, plant / animal species, aquatic habitats, soils/geology, water resources, water sources. The potential impact can only arise as a result of a source and pathway being present.
Step 4	Pre-mitigation Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impact before mitigation is put in place.
Step 5	Proposed Mitigation Measures:	Control measures that will be put in place to prevent or reduce all identified significant adverse impacts. In relation to this type of development, these measures are generally provided in two types: (1) mitigation by avoidance, and (2) mitigation by engineering design.
Step 6	Post Mitigation Residual Impact:	Impact descriptors which describe the magnitude, likelihood, duration and direct or indirect nature of the potential impacts after mitigation is put in place.
Step 7	Significance of Effects:	Describes the likely significant post mitigation effects of the identified potential impact source on the receiving environment.

8.6.2 Do-Nothing Scenario

The 'Do-Nothing Scenario' details what would happen to the site if the Proposed Development were not to be developed. In this scenario, the site would remain as a green-field site for grazing by livestock and the land use would remain as small-scale pastural agriculture. Surface water drainage and infiltration to ground will continue as is occurring currently with no significant impact on either surface or groundwater.

8.6.3 Construction Phase

8.6.3.1 Site A (Strategic Employment Zone)

8.6.3.2 Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters

Construction phase activities including site levelling, service trench construction, levelling/construction and building foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River and downstream water bodies, such as the Rye Water Valley/ Carton SAC. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River and Blackhall Little Stream) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Silt fencing will be constructed around the construction footprint, where there is a surface water receptor, in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint (other than operational surface water outfall installations which are described below) and surface water receptors and associated riparian habitats.
- A silt fence will also be attached to solid boundary fencing where it is in place and where there is a surface water receptor. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;

- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed works.
- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and 8.6.3.4.4 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

Residual Impact

The Proposed Development area will be set back from the Rye Water River and Blackhall Little stream (limiting the potential source of sediments) and runoff controls including silt fences will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.3 Potential Surface Water Quality Impacts from Shallow Excavation Dewatering

Some minor groundwater seepages may potentially occur in building foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River and Blackhall Little stream).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River and Blackhall Little Stream).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.4 Potential Release of Hydrocarbons During Construction Phase

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River and Blackhall Little Stream).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as - Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.4.2 Potential Groundwater and Surface Water Contamination from Wastewater Disposal

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.4.3 Release of Cement-Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye River and Blackhall Little stream).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.

- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be - Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.4.4 *Morphological Changes to Surface Water Courses & Drainage Patterns & Water Quality*

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.4.3 above, a new pedestrian / cycle bridge structure is proposed adjacent to the existing Kildare Bridge, the proposed additional infrastructure at the bridge will required construction activity along the Rye Water River.

Furthermore, Site A will require stormwater discharge to a filter trench along an existing ditch on the R157 where it'll discharge to the Rye Water River at one proposed outfall adjacent to Kildare Bridge. To prevent any potential for significant effects on the Rye Water River during construction, a silt fence will be erected to form a solid barrier between the proposed pipe laying works and the stream. To construct the surface water outfall, the installation of a small precast concrete headwall will be required along the Rye Water River. A non-return valve will be positioned at the outfall. Further information can be found in Volume 3a Appendix 4-9.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of the storm water outfall (between the main construction site and both water courses). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Rye Water River
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Rye Water River will be removed to facilitate the construction of the outfall.

- No instream works will take place outside the period July 31st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Cofferdams will be constructed using one tonne sandbags at the edge of the Rye Water River at the outfall point to create dry working areas.
- A submersible pump will be used to dewater inside the coffer-dammed area and will discharge any waters to land at a location of over 30m from the rivers. The pumped waters will discharge through a silt bag.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt. Following this the dams will be removed.
- The surface water discharge point is likely to take less than one day to install
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- The Kildare Bridge upgrade works will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will all be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at Site A and the proposed outfall location.

8.6.3.4.5 *Potential Water Impacts on Designated Sites and Habitats*

Site A drains into the Rye Water River to the south. The Rye Water Valley/Carton SAC is downstream of Site A, to the southeast, directly adjacent to the site boundary on the opposite side of the R157 Regional Road.

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs). There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from Site A at Louisa Bridge).

Groundwater below Site A will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the northwest. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (*Vertigo angustior* and *Vertigo moulinsiana*), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water

Valley/Carton SAC within proximity of Site A i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of Site A (e.g., silt traps/road gullies, hydrocarbon interceptors, attenuation storage and infiltration, and hydro-brake flow limiters) which have been proven through widespread use in housing and commercial developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for Site A with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for Site A to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, slight, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from Site A areas will be good. All mitigation measures outlined throughout Section 8.6.3.1 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by Site A.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the designated site.

8.6.3.5 Site B (Healthcare Facilities)

8.6.3.5.1 *Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters*

Construction phase activities including site levelling, service trench construction, levelling/construction and building foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River and downstream water bodies, such as the Rye Water Valley/ Carton SAC. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River and Blackhall Little Stream) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Silt fencing will be constructed around the construction footprint, where there is a surface water receptor, in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint (other than operational surface water outfall installations which are described below) and surface water receptors and associated riparian habitats.
- A silt fence will also be attached to solid boundary fencing where it is in place and where there is a surface water receptor. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed works.
- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and 8.6.3.4.4 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

Residual Impact

The Proposed Development area will be set back from the Rye Water River and Blackhall Little stream (limiting the potential source of sediments) and a silt fence will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.5.2 *Potential Surface Water Quality Impacts from Shallow Excavation Dewatering*

Some minor groundwater seepages may potentially occur in building foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River and Blackhall Little stream).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River and Blackhall Little Stream).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.5.3 *Potential Release of Hydrocarbons During Construction Phase*

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River and Blackhall Little Stream).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as – Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.5.4 *Potential Groundwater and Surface Water Contamination from Wastewater Disposal*

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.5.5 *Release of Cement-Based Products*

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye Water River and Blackhall Little stream).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.5.6 *Morphological Changes to Surface Water Courses & Drainage Patterns*

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.4.3 above, a new pedestrian / cycle bridge structure is proposed adjacent to the existing Kildare Bridge, the proposed additional infrastructure at the bridge will required construction activity along the Rye Water River.

Furthermore, Site B will require stormwater discharge to a filter trench along an existing ditch on the R157 where it'll discharge to the Rye Water River at one proposed outfall adjacent to Kildare Bridge. To prevent any potential for significant effects on the Rye Water River during construction, a silt fence will be erected to form a solid barrier between the proposed pipe laying works and the stream. To construct the surface water outfall, the installation of a small precast concrete headwall will be required along the Rye Water River. A non-return valve will be positioned at the outfall. Further information can be found in Volume 3b Appendix 4-9.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of the storm water outfall (between the main construction site and both water courses). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Rye Water River
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Rye Water River will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 31st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Cofferdams will be constructed using one tonne sandbags at the edge of the Rye Water River at the outfall point to create dry working areas.
- A submersible pump will be used to dewater inside the coffer-dammed area and will discharge any waters to land at a location of over 30m from the rivers. The pumped waters will discharge through a silt bag.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt. Following this the dams will be removed.
- The surface water discharge point is likely to take less than one day to install
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- The Kildare Bridge upgrade works will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will all be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at Site B and the proposed outfall location.

8.6.3.5.7 *Potential Water Impacts on Designated Sites and Habitats*

Site B drains into the Rye Water River to the south. The Rye Water Valley/Carton SAC is downstream of Site B, to the east, directly adjacent to the site boundary on the opposite side of the R157 Regional Road.

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs) There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from Site B at Louisa Bridge).

Groundwater below Site B will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the west. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (Vertigo angustior and Vertigo moulinsiana), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site B i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of Site B (e.g., silt traps/road gullies, hydrocarbon interceptors, attenuation storage and infiltration, and hydro-brake flow limiters) which have been proven through widespread use in housing and commercial developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for Site B with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for Site B to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, slight, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from Site B areas will be good. All mitigation measures outlined throughout Section 8.6.3.1 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by Site B.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the designated site.

8.6.3.6 Site C (Strategic Housing Development)

8.6.3.6.1 *Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters*

Construction phase activities including site levelling, service trench construction, levelling/construction and building foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River and downstream water bodies, such as the Rye Water Valley/ Carton SAC. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River and Blackhall Little Stream) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Silt fencing will be constructed around the construction footprint, where there is a surface water receptor, in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint (other than operational surface water outfall installations which are described below) and surface water receptors and associated riparian habitats.
- A silt fence will also be attached to solid boundary fencing where it is in place and where there is a surface water receptor. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed works.

- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and 8.6.3.4.4 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

Residual Impact

Site C infrastructure will be set back from the Rye Water River and Blackhall Little stream (limiting the potential source of sediments) and a silt fence will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.6.2 *Potential Surface Water Quality Impacts from Shallow Excavation Dewatering*

Some minor groundwater seepages may potentially occur in building foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River and Blackhall Little stream).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;

- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River and Blackhall Little Stream).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.6.3 *Potential Release of Hydrocarbons During Construction Phase*

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River and Blackhall Little Stream).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;

- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as – Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.6.4 *Potential Groundwater and Surface Water Contamination from Wastewater Disposal*

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,

- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.6.5 *Release of Cement-Based Products*

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (Ph 11.5) that can physically damage fish by burning their skin and blocking their gills. A Ph range of ≥ 6 ≤ 9 is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a Ph unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye Water River and Blackhall Little stream).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.6.6 *Morphological Changes to Surface Water Courses & Drainage Patterns*

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water

courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.4.3 above, 3 no. new pedestrian / cycle bridge structures are proposed throughout the development. A road bridge is also proposed at the southwest of the site. The proposed additional infrastructure will require construction activity along the Rye Water River and Blackhall Little Stream

Furthermore, Site C will require stormwater discharge to the Rye Water River at one proposed outfall south of the site and another proposed outfall to the Blackhall Little Stream within the centre of the site. To prevent any potential for significant effects on the Rye Water River or the Blackhall Little Stream during construction, a silt fence will be erected to form a solid barrier between the proposed pipe laying works and the stream. To construct the surface water outfall, the installation of a small precast concrete headwall will be required along the Rye Water River and the Blackhall Little Stream. A non-return valve will be positioned at the outfall. Further information can be found in Volume 3c Appendix 4-9.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River & Blackhall Little Stream), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of the storm water outfall (between the main construction site and both water courses). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Rye Water River/Blackhall Little
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Rye Water River/Blackhall Little will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 31st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Cofferdams will be constructed using one tonne sandbags at the edge of the Rye Water River/Blackhall Little at the outfall point to create dry working areas.
- A submersible pump will be used to dewater inside the cofferdammed area and will discharge any waters to land at a location of over 30m from the rivers. The pumped waters will discharge through a silt bag.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt. Following this the dams will be removed.
- The surface water discharge point is likely to take less than one day to install. During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,

- All Bridge works will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will all be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at Site C and the proposed outfall location.

8.6.3.6.7 *Potential Water Impacts on Designated Sites and Habitats*

Site C drains into the Rye Water River to the south and the Blackhall Little within the centre of the site. The Rye Water Valley/Carton SAC is downstream of Site C, to the southeast, directly adjacent to the site boundary on the opposite side of the R157 Regional Road.

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs) There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from Site Cat Louisa Bridge).

Groundwater below Site C will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the east of the housing units. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (Vertigo angustior and Vertigo moulinsiana), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site A i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of Site C (e.g., silt traps/road gullies, hydrocarbon interceptors, attenuation storage and infiltration, and hydro-brake flow limiters) which have been proven through widespread use in housing and commercial developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for Site C with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for Site C to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, slight, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from Site C areas will be good. All mitigation measures outlined throughout Section 8.6.3.3 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by Site C.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the designated site.

8.6.3.7 MOOR (Maynooth Outer Orbital Road)

8.6.3.7.1 *Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters*

Construction phase activities including site levelling, service trench construction, levelling/construction and foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and Blackhall Little Stream and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River, Blackhall Little Stream and downstream water bodies, such as the Rye Water Valley/ Carton SAC.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River and Blackhall Little Stream) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Silt fencing will be constructed around the construction footprint, where there is a surface water receptor, in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint (other than operational surface water outfall installations which are described below) and surface water receptors and associated riparian habitats.
- A silt fence will also be attached to solid boundary fencing where it is in place and where there is a surface water receptor. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.

- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed Kildare Bridge pedestrian/cycle structure upgrade works, the Blackhall Little Bridge and the Moyglare Bridge;
- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and 8.6.3.4.4 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRlA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- The MOOR crossing of the Blackhall Little stream, the Moyglare Bridge and the Kildare Bridge Works and all pedestrian/cycle bridges will all require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will all be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

Residual Impact

The MOOR will be set back from the Rye Water River and Blackhall Little stream where possible (limiting the potential source of sediments) and various controls including silt fence will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.7.2 *Potential Surface Water Quality Impacts from Shallow Excavation Dewatering*

Some minor groundwater seepages may potentially occur in foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River and Blackhall Little stream).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River and Blackhall Little Stream).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.7.3 Potential Release of Hydrocarbons During Construction Phase

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River and Blackhall Little Stream).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution

prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as – Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.7.4 *Potential Groundwater and Surface Water Contamination from Wastewater Disposal*

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.7.5 *Release of Cement-Based Products*

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (Ph 11.5) that can physically damage fish by burning their skin and blocking their gills. A Ph range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a Ph unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye Water River and Blackhall Little stream).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.7.6 *Morphological Changes to Surface Water Courses & Drainage Patterns*

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.5.4 above, 4 no. bridges are to be constructed as part of the MOOR. A pedestrian/cycle bridge adjacent to the existing Kildare Bridge, a pedestrian/cycle bridge located along the L22143 and 2 no. new road bridges, one located to the north of Site A crossing the Blackhall Little Stream and another located to the southwest of Site C crossing the Rye Water River. The proposed bridges will require construction activity along the Rye water River and the Blackhall Little Stream.

All bridges are clear span and have been designed to ensure no alteration of water course morphology or drainage patterns.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River & Blackhall Little Stream), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of the storm water outfall (between the main construction site and both water courses). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Rye Water River/Blackhall Little
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Rye Water River/Blackhall Little will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 31st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Cofferdams will be constructed using one tonne sandbags at the edge of the Rye Water River/Blackhall Little at the outfall point to create dry working areas.
- A submersible pump will be used to dewater inside the cofferdammed area and will discharge any waters to land at a location of over 30m from the rivers. The pumped waters will discharge through a silt bag.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt. Following this the dams will be removed.
- The surface water discharge point is likely to take less than one day to install
- The bridge works will all require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will all be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at the MOOR and the proposed outfall location.

8.6.3.8 Potential Water Impacts on Designated Sites and Habitats

The MOOR drains into the Rye Water River to the south and along the Blackhall Little Stream. The Rye Water Valley/Carton SAC is downstream of the MOOR, to the southeast, directly adjacent to the site boundary on the opposite side of the R157 Regional Road.

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs) There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from the MOOR at Louisa Bridge).

Groundwater below the MOOR will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the centre of the site. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (Vertigo angustior and Vertigo moulinsiana), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site A i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of the MOOR (e.g., silt traps/road gullies, hydrocarbon interceptors, attenuation storage and infiltration, and hydro-brake flow limiters) which have been proven through widespread use in housing and commercial developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for the MOOR with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for the MOOR to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, slight, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from the MOOR will be good. All mitigation measures outlined throughout Section 8.6.3.4 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the MOOR.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the QI of the designated site.

8.6.3.9 Kildare Bridge

8.6.3.9.1 *Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters*

Construction phase activities including service trench construction, levelling/construction and bridge foundation excavation as well as directional drilling which will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works and frac-out from directional drilling.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River and downstream water bodies, such as the Rye Water Valley/ Carton SAC. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- Silt fencing will be constructed around the construction footprint, where there is a surface water receptor, in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint (other than operational surface water outfall installations which are described below) and surface water receptors and associated riparian habitats.
- A silt fence will also be attached to solid boundary fencing where it is in place and where there is a surface water receptor. This will protect the stream from any potential sediment laden surface water run-off generated during construction activities.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled. These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed Kildare Bridge pedestrian/cycle structure upgrade works;
- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and 8.6.3.4.4 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRIA, 2001), which provides information on these issues. This will

ensure that surface water arising during the course of construction activities will contain minimum sediment.

- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.
- For directional drilling the area around the bentonite batching, pumping and recycling plant will be bunded using terram (as it will clog) and sandbags in order to contain any spillages.
- Drilling fluid returns will be contained within a sealed tank / sump to prevent migration from the works area;
- Spills of drilling fluid will be clean up immediately and stored in an adequately sized skip before been taken off-site;
- The drilling fluid/bentonite will be non-toxic and naturally biodegradable (i.e., Clear Bore Drilling Fluid or similar will be used);
- The drilling process / pressure will be constantly monitored to detect any possible leaks or breakouts into the surrounding geology or local watercourse;
- This will be gauged by observation and by monitoring the pumping rates and pressures. If any signs of breakout occur then drilling will be immediately stopped;
- Any frac-out material will be contained and removed off-site;

Residual Impact

The works area will be set back from the Rye Water River whereever possible (limiting the potential source of sediments) and a silt fence will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.10 Potential Surface Water Quality Impacts from Shallow Excavation Dewatering

Some minor groundwater seepages may potentially occur in building foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.10.2 *Potential Release of Hydrocarbons During Construction Phase*

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;

- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as - Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.10.3 *Potential Groundwater and Surface Water Contamination from Wastewater Disposal*

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.10.4 *Release of Cement-Based Products*

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (pH 11.5) that can physically damage fish by burning their skin and blocking their gills. A pH range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a pH unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye Water River).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.
- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be - Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.10.5 Morphological Changes to Surface Water Courses & Drainage Patterns

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.4.3 above, a new pedestrian / cycle bridge structure is proposed adjacent to the existing Kildare Bridge, the proposed additional infrastructure at the bridge will required construction activity along the Rye Water River.

Furthermore, the Kildare Bridge works will require stormwater discharge to a filter trench along an existing ditch on the R157 where it'll discharge to the Rye Water River at one proposed outfall adjacent to Kildare Bridge. To prevent any potential for significant effects on the Rye Water River during construction, a silt fence will be erected to form a solid barrier between the proposed pipe laying works and the stream. To construct the surface water outfall, the installation of a small precast concrete headwall will be required along the Rye Water River. A non-return valve will be positioned at the outfall. Further information can be found in Volume 3a Appendix 4-9.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Prior to the outset of these works, small defined works areas will be fenced off at the location of the storm water outfall (between the main construction site and both water courses). Silt fences will be attached to these fences. The silt fence will provide a solid barrier between the proposed pipelaying works and the Rye Water River
- The necessary pipelaying works will be undertaken within this defined area.
- Following the installation of the pipework and reinstatement of the ground, the small section of the silt fence that protects the Rye Water River will be removed to facilitate the construction of the outfall.
- No instream works will take place outside the period July 31st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Cofferdams will be constructed using one tonne sandbags at the edge of the Rye Water River at the outfall point to create dry working areas.
- A submersible pump will be used to dewater inside the cofferdammed area and will discharge any waters to land at a location of over 30m from the rivers. The pumped waters will discharge through a silt bag.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The banks and channel bed will be reinstated to avoid erosion or run off of silt. Following this the dams will be removed.
- The surface water discharge point is likely to take less than one day to install
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the

construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,

- The Kildare Bridge upgrade works will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at Kildare Bridge works area.

8.6.3.10.6 Potential Water Impacts on Designated Sites and Habitats

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs) There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from Kildare Bridge at Louisa Bridge).

Groundwater below Kildare Bridge will discharge as baseflow to the Rye Water River, flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (Vertigo angustior and Vertigo moulinsiana), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site A i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of the Kildare Bridge works areas which have been proven through widespread use in bridge and pipelaying developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing

greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for Kildare Bridge with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for Kildare Bridge to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, slight, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from the Kildare Bridge areas will be good. All mitigation measures outlined throughout Section 8.6.3.5 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the Kildare Bridge works.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the designated site.

8.6.3.11 Moyglare Bridge

8.6.3.11.1 *Earthworks (Removal of Vegetation Cover, Excavations and Stock Piling) Resulting in Suspended Solids Entrainment in Surface Waters*

Construction phase activities including service trench construction, levelling/construction and bridge foundation excavation will require earthworks resulting in removal of vegetation cover and excavation of any minor local pockets of organic soil/subsoils, and bedrock. Such excavations will be relatively shallow and temporary. The main risk will be from surface water runoff from bare soil and soil storage areas during construction works.

Much of the surface water generally percolates to shallow ground and discharges via shallow subsurface flow to the Rye Water River and this will likely continue during the construction phase. The construction activities have the potential to result in the release of suspended solids to this local drainage feature and could potentially result in an increase in the suspended sediment load, resulting in increased turbidity which, in turn, could affect the water quality and fish stocks of the Rye Water River and downstream water bodies, such as the Rye Water Valley/ Carton SAC. Potential impacts are potentially significant if not mitigated against.

Pathways: Drainage and surface water discharge routes.

Receptors: Down-gradient watercourses (Rye Water River) and dependant ecosystems.

Pre-Mitigation Potential Impact: Direct, negative, moderate, short-term, likely impact.

Proposed Mitigation Measures

Management of surface water runoff and subsequent treatment prior to release off-site will be undertaken during construction work as follows:

- At surface water crossings silt fencing will be constructed around the construction footprint in order to create a defined perimeter for the proposed works, leaving a natural vegetation buffer between the construction footprint and surface water receptors and associated riparian habitats.
- The silt fence will comprise a geotextile membrane that will buried beneath the ground to filter any run-off that may occur as a result of the proposed works. The silt fence will be monitored throughout the proposed works and will remain in place after the works are completed and until the exposed earth has re-vegetated.
- As construction advances there may be a requirement to collect and treat surface water within the site. This will be completed using perimeter swales at low points around the construction areas, and if required water will be pumped from the swales into sediment bags prior to overland discharge allowing water to percolate naturally to ground;
- Discharge onto ground will be via a silt bag which will filter any remaining sediment from the pumped water. The entire discharge area from silt bags will be enclosed by a perimeter of double silt fencing;
- A suitably sized detention basin or settlement area will be installed at the lowest point before discharge to ground where excess run- off must leave the site. Silt curtains or earth berms will be used to channel run-off to locations where it can be controlled.

These may take the form of an open detention area or, where the need arises, a portable skip/s, or similar, where inflow passes through straw bales, gravel etc.
- Any proposed discharge area will avoid potential surface water ponding areas, and will only be located where suitable subsoils are present;
- Daily monitoring and inspections of site drainage during construction will be completed;
- No instream works will take place outside the period July 1st – September 31st in line with Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland is incorporated into the design of the proposed Moyglare Bridge;
- Surface water outfalls will be constructed in accordance with the measures described in Chapter 6 and subject to agreement with IFI.
- Good construction practices such wheel washers and dust suppression on site roads, and regular plant maintenance, which will be implemented, will ensure minimal risk. The Construction Industry Research and Information Association (CIRIA) provide guidance on the control and management of water pollution from construction sites ('Control of Water Pollution from Construction Sites, guidance for consultants and contractors', CIRlA, 2001), which provides information on these issues. This will ensure that surface water arising during the course of construction activities will contain minimum sediment.
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- The Moyglare Bridge and all other watercourse crossings will all require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.
- Preventative measures during construction have been incorporated into the Construction and Environmental Management Plan, which will be updated upon grant of permission and to provide any additional measures required pursuant to planning conditions and agreements with the planning authority.

Residual Impact

The works area will be set back from the Rye Water River where ever possible (limiting the potential source of sediments) and a silt fence will be in place to break the pathway between the works area and the watercourse (receptor). Subject to the implementation of the listed mitigation measures the residual impact will be a negative, indirect, imperceptible and short term.

Significance of Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated following implementation of proposed mitigation measures.

8.6.3.11.2 *Potential Surface Water Quality Impacts from Shallow Excavation Dewatering*

Some minor groundwater seepages may potentially occur in building foundation excavations, however, the likelihood is considered low given the nature of the underlying aquifer and the information from the Site Investigations which show dry shallow subsoils. Dewatering, if undertaken, will create additional volumes of water to be treated by the runoff management system. Inflows will likely require management and treatment to reduce suspended sediments. No contaminated land was noted at the site and therefore historical pollution sources do not arise. Such works will be temporary.

Pathway: Overland flow and site drainage network.

Receptor: Down-gradient surface water bodies (Rye Water River).

Pre-Mitigation Potential Impact: Direct, negative, moderate, temporary, medium probability impact to surface water quality.

Proposed Mitigation Measures:

Management of groundwater seepages and subsequent treatment prior to discharge into the drainage network will be undertaken as follows:

- Silt fencing measures as described above will be installed.
- Appropriate temporary interceptor drainage, to prevent upslope surface runoff from entering excavations will be put in place, as required;
- If required, pumping of excavation inflows will prevent build-up of water in the excavation;
- The pumped water volumes will be discharged to ground within the site through a silt bag at a distance of over 30m from nearby watercourses (Rye Water River).
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;

Residual Impact

The potential for the release of suspended solids to watercourse receptors is a risk to water quality and the aquatic quality of the receptor. Proven and effective measures to mitigate the risk of releases of sediment have been proposed above and will break the pathway between the potential sources and the receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short-term, low probability impact on local surface water quality.

Significance of the Effects

For the reasons outlined above, no significant effects on the surface water quality are anticipated. No impact on groundwater levels or groundwater quality will occur.

8.6.3.11.3 *Potential Release of Hydrocarbons During Construction Phase*

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater, surface water and associated ecosystems, and to terrestrial ecology. The accumulation of small spills of fuels and lubricants during routine plant use can also be a pollution risk. Hydrocarbon has a high toxicity to humans, and all flora and fauna, including fish, and is persistent in the environment. It is also a nutrient supply for adapted micro-organisms, which can rapidly deplete dissolved oxygen in waters, resulting in death of aquatic organisms.

The procedures and infrastructure required for the storage and handling of hydrocarbons or other chemicals on construction sites is well established. There is proven and employed specifically for the handling of hydrocarbons and chemicals in the context of soil and water pollution. In this context, all hydrocarbon and chemical storage and handling will be carried out by trained personnel with appropriate control measures in place at site.

Pathway: Groundwater and surface water flowpaths.

Receptor: Groundwater and surface water (Rye Water River).

Pre-Mitigation Potential Impact: Direct, negative, slight, short term, likely impact to local groundwater quality.

Direct, negative, moderate, short term, unlikely impact to surface water quality.

Proposed Mitigation Measures

Mitigation measures proposed to avoid release of hydrocarbons at the site are as follows:

- All plant and machinery will be serviced before being mobilised to site;
- No plant maintenance will be completed on site, any broken down plant will be removed from site to be fixed;
- Refuelling will be completed in a controlled manner using drip trays at all times;
- Mobile bowsers, tanks and drums will be stored in secure, impermeable storage areas away from open water;
- Fuel containers will be stored within a secondary containment system, e.g. bunds for static tanks or a drip tray for mobile stores;
- Containers and bunding for storage of hydrocarbons and other chemicals will have a holding capacity of 110% of the volume to be stored;
- Ancillary equipment such as hoses and pipes will be contained within the bund;
- Taps, nozzles or valves will be fitted with a lock system;
- Fuel and chemical stores including tanks and drums will be regularly inspected for leaks and signs of damage;
- Drip-trays will be used for fixed or mobile plant such as pumps and generators in order to retain oil leaks and spills;
- Only designated trained operators will be authorised to refuel plant on site;
- Procedures and contingency plans will be set up to deal with emergency accidents or spills; and,
- An emergency spill kit with oil boom, absorbers etc. will be kept on-site for use in the event of an accidental spill. A specific team of staff will be trained in the use of spill containment.

Highest standards of site management will be maintained, and utmost care and vigilance followed to prevent accidental contamination or unnecessary disturbance to the site and surrounding environment during construction. A suitably qualified individual will be given the task of overseeing the pollution prevention measures agreed for the site to ensure that they are operating safely and effectively as well as having responsibility for the implementation of Emergency Procedures for spill control measures.

Residual Impact

The use and storage of hydrocarbons and small volumes of chemicals is a standard risk associated with all construction sites. Proven and effective measures to mitigate the risk of spills and leaks, will be applied during the construction phase. The residual effect is assessed as – Negative, imperceptible, indirect, short-term, low probability effect on groundwater and surface water.

Significance of Effects

For the reasons outlined above, no significant effects on surface water or groundwater quality are anticipated.

8.6.3.11.4 Potential Groundwater and Surface Water Contamination from Wastewater Disposal

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters.

Pathway: Groundwater flowpaths and site drainage network.

Receptor: Down-gradient well supplies, groundwater quality and surface water quality.

Pre-mitigation Impact: Indirect, negative, significant, temporary, unlikely impact to surface water quality. Indirect, negative, slight, temporary, unlikely impact to local groundwater.

Proposed Mitigation Measures

- A self-contained port-a-loo with an integrated waste holding tank will be used at the site compounds, maintained by the providing contractor, and removed from site on completion of the construction works; and,
- No wastewater will be discharged on-site during either the construction or operational phase.

Residual Impact: No impact.

8.6.3.11.5 Release of Cement-Based Products

Concrete and other cement-based products are highly alkaline and corrosive and can have significant negative impacts on water quality. They generate very fine, highly alkaline silt (Ph 11.5) that can physically damage fish by burning their skin and blocking their gills. A Ph range of $\geq 6 \leq 9$ is set in S.I. No. 293 of 1988 Quality of Salmonid Water Regulations, with artificial variations not in excess of ± 0.5 of a Ph unit. Entry of cement-based products into the site drainage system, into surface water runoff, and hence to surface watercourses or directly into watercourses represents a risk to the aquatic environment. Batching of wet concrete on site and washing out of transport and placement machinery are the activities most likely to generate a risk of cement-based pollution.

Pathway: Site drainage network.

Receptor: Surface water and transitional water hydrochemistry.

Pre-Mitigation Impact: Indirect, negative, moderate, short term, likely impact to surface water (Rye Water River).

Proposed Mitigation Measures

- No batching of wet-cement products will occur on site. Ready-mixed supply of wet concrete products and where possible, emplacement of pre-cast elements, will take place.
- No washing out of any plant used in concrete transport or concreting operations will be allowed on-site;
- Where possible pre-cast elements for culverts and concrete works will be used.
- Where concrete is delivered on site, only the chute will be cleaned, using the smallest volume of water practicable. No discharge of cement contaminated waters to the construction phase drainage system or directly to any artificial drain or watercourse will be allowed. Chute cleaning water will be undertaken at lined cement washout ponds.
- Weather forecasting will be used to plan dry days for pouring concrete.

- The pour site will be kept free of standing water and plastic covers will be ready in case of sudden rainfall event.

Residual Impact

Proven and effective measures to mitigate the risk of releases of cement-based products or cement truck wash water have been proposed above and will break the pathway between the potential source and each receptor. The residual effect is considered to be – Negative, imperceptible, indirect, short term, unlikely impact to surface water quality.

Significance of the Effect

For the reasons outlined above, no significant effects on surface water quality are anticipated.

8.6.3.11.6 *Morphological Changes to Surface Water Courses & Drainage Patterns*

Diversion, culverting and bridge crossing of surface watercourses can result in morphological changes, changes to drainage patterns and alteration of aquatic habitats. Construction of structures over water courses has the potential to significantly interfere with water quality and flows during the construction phase. Mitigation by design is the key factor in minimising the potential for effects on water course morphology. It is not proposed to alter or redirect the existing streams and rivers.

As detailed in Section 8.4.3 above, a new road bridge is proposed, the proposed additional infrastructure at the bridge will required construction activity along the Rye Water River.

To prevent any potential for significant effects on the Rye Water River during construction, a silt fence will be erected to form a solid barrier between the road surface construction and the stream. Further information can be found in Volume 3a, 3b & 3c(i) Appendix 4-3 and in Volume 3d, 3e & 3f Appendix 4-2.

Pathway: Drainage Patterns and surface water discharge routes.

Receptors: Surface water flows (Rye Water River), stream morphology and water quality.

Pre-Mitigation Potential Impact: Negative, direct, slight, long term, high probability impact.

Proposed Mitigation Measures

- The proposed design for water course crossings and culverts, which minimises interactions with water courses, ensures that there will be no perceptible effects on the morphology of those watercourses.
- Subject to agreement with IFI, short sections of the Rye Water River may be temporarily dammed with sandbags at times of low water. One dam will be constructed immediately downstream of the outfall point and the other, immediately upstream.
- Machinery will not enter the water, the construction of the outfall will only occur after the dry working area is created.
- The bankside will be excavated and a small pre-cast concrete headwall installed (with outfall pipe included).
- The surface water discharge point is likely to take less than one day to install.
- Biosecurity measures will be strictly adhered to throughout the proposed works. Measures will be in accordance with IFI (2010) Biosecurity Protocol for Field Survey Work. Where staff are working instream, staff footwear and PPE will be inspected on

daily completion of the works and vegetation or debris removed. Footwear will be dipped in or scrubbed with a disinfectant solution (e.g. 1% solution of Virkron Aquatic or another proprietary disinfection product) and thoroughly dried afterwards. Sand bags placed instream will not be re-used in other watercourses.

- All guidance / mitigation measures proposed by the OPW or the Inland Fisheries Ireland[2] will be incorporated into the proposed works.
- As a further precaution, near stream construction work, will only be carried out during the period permitted by Inland Fisheries Ireland for in-stream works according to the Eastern Regional Fisheries Board (2004) guidance document "Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites", i.e., May to September inclusive. This time period coincides with the period of lowest expected rainfall, and therefore minimum runoff rates. This will minimise the risk of entrainment of suspended sediment in surface water runoff, and transport via this pathway to surface watercourses (any deviation from this will be done in discussion with the IFI);
- During the near stream construction work double row silt fences will be emplaced immediately down-gradient of the construction area for the duration of the construction phase. There will be no batching or storage of cement allowed in the vicinity of the crossing construction areas; and,
- The Moyglare Bridge upgrade works will require a Section 50 application (Arterial Drainage Act, 1945). The river/stream crossings will be designed in accordance with OPW guidelines/requirements on applying for a Section 50 consent, where considered necessary by the designer.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on stream flows, stream morphology and surface water quality.

Significance of Effects

For the reasons outlined above, no significant effects on stream morphology or stream water quality are anticipated at Moyglare Bridge

8.6.3.12 Potential Water Impacts on Designated Sites and Habitats

The qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs) There is no connection between groundwater at the development site, and that discharging to any known tufa springs within the SAC (including the mapped spring located approximately 5km from Moyglare Bridge at Louisa Bridge).

Groundwater below Moyglare Bridge will discharge as baseflow to the Rye Water River, flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River and are in fact fed from a source further east of Louisa Bridge.

Two of the qualifying interests of the SAC are two species of vertigo snail (Vertigo angustior and Vertigo moulinsiana), with both species' dependant on the calcareous march habitat which is provided by the tufa formation. The known range of both species within the SAC is also restricted to Louisa

[2] *Inland Fisheries Ireland (2016): Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters*

Bridge (spring). While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site A i.e. Louisa Bridge. An ecological walkover survey of the SAC by MKO to identify any additional tufa springs or potential habitat for vertigo snails downstream of the Proposed Development site has not identified petrifying springs nor their associated qualifying interests in this area of the SAC. Irrespective of this the potential for the occurrence of unmapped petrifying springs within the SAC has also been considered below.

Although there is no potential for effects on the known QI of the SAC the following mitigation will ensure no impact on the SAC generally. Standard mitigation and SuDS drainage controls are proposed during the construction and operational phase of Moyglare Bridge (e.g., silt traps/road gullies, hydrocarbon interceptors, attenuation storage and infiltration, and hydro-brake flow limiters) which have been proven through widespread use in road developments across the country. The proposed SuDs drainage system incorporated into the engineering design of the site are common drainage systems that are used in development sites. They are proposed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS, 2005) and the objectives outlined in the Meath County Development Plan 2021-2027.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground, in particular for Kildare Bridge with is underlain with low permeability subsoils. During the construction phase, the recharge rates won't change materially.

With the implementation of the project as designed and the standard drainage control measures outlined above the potential for Moyglare Bridge to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater flowpaths will be maintained during the construction phase as any excavation proposed will be shallow. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge and the SAC downstream of the Proposed Development site).

Pre-Mitigation Impact

Indirect, negative, not significant, short term, likely impact to water quality and hydrology regime.

Proposed Mitigation Measures

The proposed mitigation measures for protection of surface water and groundwater quality which will include on site drainage control measures (i.e., silt fences, silt bags etc.) will ensure that the quality of runoff from the Moyglare Bridge areas will be good. All mitigation measures outlined throughout Section 8.6.3.5 above provides controls which will be put in place to manage risks associated with sediment, hydrocarbons/chemicals and cement-based products used during construction phase.

The standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the Moyglare Bridge works.

Residual Impact

With the application of the best practice mitigation outlined above, the residual effect will be – Imperceptible, direct, negative, short-term, high probability impact on surface and ground water receptors.

Significance of Effects

For the reasons outlined above, no significant effects will occur on the designated site.

8.6.4 Operational Phase

8.6.4.1 Site A (Strategic Employment Zone)

8.6.4.2 Potential Increased Downstream Flood Risk due to Increased Hardstanding Area

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

Site A has been designed and will be constructed such that all surface water arising on site will drain via the proposed gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge via a filter drain at controlled flow rates to the Rye Water River at a newly proposed outfall located adjacent to Kildare bridge along the southeast boundary of Site A. The outflow will be set to equate to less than pre-development green-field run-off rates. The engineering design for proposed drainage system is included in Volume 3a Appendix 4-9.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If Site A design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage and gravity sewer network, and by using underground attenuation tanks for drainage management which will control discharge to the Rye Water River at less than the pre-development greenfield rates.

Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.6.4.3 Potential Operational Phase Water Quality Impacts

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off and wastewater. In relation to storm water run-off, the surface water drainage system will consist of a gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge at controlled flow rates to the Rye Water River. Discharge will be limited to less than the greenfield equivalent runoff rate. Temporary underground attenuation will also be provided at separate locations in the form of underground cellular storage units. Silt traps will be provided for upstream of the attenuation tanks. Surface water will pass through oil interceptors prior to discharging from the site.

Wastewater from the development will discharge to the proposed onsite underground wastewater pumping station, which will ultimately link up to the existing Maynooth town wastewater network prior to discharging to Leixlip Wastewater Treatment Plant. The wastewater treatment plant is regulated and operates under an EPA licence which controls emissions to acceptable levels.

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River will be within the green/ landscaped areas of Site A and so there is no significant source of pollution related to these areas.

Pathway: Site surface water and foul water drainage network.

Receptor: On-Site, adjacent and downstream water courses and foul water infrastructure

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water to the Rye Water River via, attenuation tanks, filter drain and petrol/oil interceptors as described above. It is also proposed to retain the existing riparian zone which will act as a buffer between the development and the Rye Water.

Wastewater from Site A will be directed to an EPA regulated wastewater treatment plant via a proposed onsite pumping station.

Residual Impact

The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation tank, filter drain and petrol/oil interceptor will break the pathway from the proposed works areas to the watercourse. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Foul water discharges will be directed to the municipal sewer and regulated wastewater treatment plant and so the residual impacts are neutral, indirect, imperceptible, long term, unlikely impact.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.4 Potential Impacts on Hydrologically Connected Designated Sites

Surface water runoff from roads and car parking areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These contaminants have the potential to impact on local downstream groundwater and surface water quality. This is somewhat relevant to this site, due to its proximity to the Rye Water River and the Rye Water Valley/Carton SAC however the QI's for this site relate to ground water dependant species rather than surface water. Ecological surveys also show that there are no mapped petrifying springs or QI's downstream of the site and there is no potential for impacts on the Louisa Bridge Springs.

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to attenuation tanks before discharge to a local watercourse and a connection to a storm water sewer will be installed.
- All road and car parking gullies are designed to intercept and trap road grit and silt. All footpath and road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the watercourse.
- As one of the qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs), the distance between them is seen as a significant factor, and there is no connection between groundwater at the Proposed Development site, and that discharging to any tufa springs within the SAC (including the mapped spring located approximately 5km from the Proposed Development at Louisa Bridge).
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.

- No extensive areas of deep foundations, such as basements, underground carparks etc, will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phase.

While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site A, the potential for the occurrence of unmapped petrifying springs within the SAC has been considered below.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground. Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River will be within the green/ landscaped areas of Site A and so there is no significant source of pollution related to these areas. Rainfall will be directed to the surface water drainage system there by mimicking the existing hydrological regime and so the impact of this is considered to be imperceptible.

With the implementation of the project as designed and the standard drainage control measures outlined above and throughout Section 8.6.4.1 above, the potential for Site A to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater below Site A will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the north. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River.

Groundwater flowpaths will be maintained during the operational phase as existing building foundations and any previous excavation will be shallow. Groundwater flowpaths during the operational phase will be unaltered by Site A. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge).

Pre-Mitigation Impact

Indirect, negative, not significant, long term, likely impact to surface water quality.

Imperceptible impacts on groundwater levels or existing hydrological regime or flowpaths due to operation of Site A.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation tanks, hydrocarbon interceptor and filter drain before discharge to Rye Water River at less than the controlled greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse.

Residual Impact

No impacts on water quality or downstream designated sites are anticipated.

Imperceptible impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Rye Water Valley/ Carton SAC.

Significance of Effects

No significant impacts on groundwater or surface water quality and downstream designated sites are anticipated.

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to the Rye Water Valley/Carton SAC, the Rye Water River or the Blackhall Little Stream.

8.6.4.5 Site B (Healthcare Facilities)

8.6.4.5.1 *Potential Increased Downstream Flood Risk due to Increased Hardstanding Area*

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

Site B has been designed and will be constructed such that all surface water arising on site will drain via the proposed gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge via a filter drain at controlled flow rates to the Rye Water River at a newly proposed outfall located adjacent to Kildare bridge along the southeast boundary of Site B. The outflow will be set to equate to pre-development green-field run-off rates. The engineering design for proposed drainage system is included in Volume 3b Appendix 4-9.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If Site B design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage and gravity sewer network, and by using underground attenuation tanks for drainage management which will control discharge to the Rye Water River at pre-development greenfield rates.

Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.6.4.5.2 *Potential Operational Phase Water Quality Impacts*

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off and wastewater. In relation to storm water run-off, the surface water drainage system will consist of a gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge at controlled flow rates to the Rye Water River. Discharge will be limited to the greenfield equivalent runoff rate. Temporary underground attenuation will also be provided at separate locations in the form of underground cellular storage units. Silt traps will be provided for upstream of the attenuation tanks. Surface water will pass through oil interceptors prior to discharging from the site.

Wastewater from the development will discharge to the proposed onsite underground wastewater pumping station, which will ultimately link up to the existing Maynooth town wastewater network prior to discharging to Leixlip Wastewater Treatment Plant. The wastewater treatment plant is regulated and operates under an EPA licence which controls emissions to acceptable levels.

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River will be within the green/ landscaped areas of Site B and so there is no significant source of pollution related to these areas.

Pathway: Site surface water and foul water drainage network.

Receptor: On-Site, adjacent and downstream water courses and foul water infrastructure

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water to the Rye Water River via, attenuation tanks, filter drain and petrol/oil interceptors as described above. It is also proposed to retain the existing riparian zone which will act as a buffer between the development and the Rye Water.

Wastewater from Site B will be directed to an EPA regulated wastewater treatment plant via a proposed onsite pumping station.

Residual Impact

The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation tank, filter drain and petrol/oil interceptor will break the pathway from the proposed works areas to the watercourse. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Foul water discharges will be directed to the municipal sewer and regulated wastewater treatment plant and so the residual impacts are neutral, indirect, imperceptible, long term, unlikely impact.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.6 Potential Impacts on Hydrologically Connected Designated Sites

Surface water runoff from roads and car parking areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These contaminants have the potential to impact on local downstream groundwater and surface water quality. This is somewhat relevant to this site, due to its proximity to the Rye Water River and the Rye Water Valley/Carton SAC however the QI's for this site relate to ground water dependant species rather than surface water. Ecological surveys also show that there are no mapped petrifying springs or QI's downstream of the site and there is no potential for impacts on the Louisa Bridge Springs.

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to attenuation tanks before discharge to a local watercourse and a connection to a storm water sewer will be installed.
- All road and car parking gullies are designed to intercept and trap road grit and silt. All footpath and road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the watercourse.
- As one of the qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs), the distance between them is seen as a significant factor, and there is no connection between groundwater at the Proposed Development site, and that discharging to any tufa springs within the SAC (including the mapped spring located approximately 5km from the Proposed Development at Louisa Bridge).
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.
- No extensive areas of deep foundations, such as basements, underground carparks etc, will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phase.

While there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site B (following ecological surveys in 2022), the potential for the occurrence of unmapped petrifying springs within the SAC has been considered below.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or

downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground. Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River will be within the green/ landscaped areas of Site B and so there is no significant source of pollution related to these areas. Rainfall will be directed to the surface water drainage system there by mimicking the existing hydrological regime and so the impact of this is considered to be imperceptible.

With the implementation of the project as designed and the standard drainage control measures outlined above and throughout Section 8.6.4.2 above, the potential for Site B to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater below Site B will flow to the south and discharge as baseflow to the Rye Water River. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River.

Groundwater flowpaths will be maintained during the operational phase as existing building foundations and any previous excavation will be shallow. Groundwater flowpaths during the operational phase will be unaltered by Site B. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge).

Pre-Mitigation Impact

Indirect, negative, slight, long term, likely impact to surface water quality.

Imperceptible impacts on groundwater levels or existing hydrological regime or flowpaths due to operation of Site B.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation tanks, hydrocarbon interceptor and filter drain before discharge to Rye Water River at controlled greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse.

Residual Impact

No impacts on water quality or downstream designated sites are anticipated.

Imperceptible impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Rye Water Valley/ Carton SAC.

Significance of Effects

No significant impacts on groundwater or surface water quality and downstream designated sites are anticipated.

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to the Rye Water Valley/Carton SAC or the Rye Water River.

8.6.4.7 Site C (Strategic Housing Development)

8.6.4.8 Potential Increased Downstream Flood Risk due to Increased Hardstanding Area

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River and Blackhall Little Stream could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

Site C has been designed and will be constructed such that all surface water arising on site will drain via the proposed gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge via a filter drain at controlled flow rates to the Rye Water River at a newly proposed outfall located along the southern boundary of Site C, along with another proposed outfall in the centre of the site at the Blackhall Little Stream. The outflow will be set to equate to less than the pre-development green-field run-off rates. The engineering design for proposed drainage system is included in Volume 3c(i) Appendix 4-9.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If Site C design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage and gravity sewer network, and by using underground attenuation tanks for drainage management which will control discharge to the Rye Water River/Blackhall Little at less than the pre-development greenfield rates.

Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.6.4.9 Potential Operational Phase Water Quality Impacts

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off and wastewater. In relation to storm water run-off, the surface water drainage system will consist of a gravity sewer network that will convey runoff from the roofs and paved areas of the development to outfall manholes, which will discharge at controlled flow rates to the Rye Water River and Blackhall Little Stream. Discharge will be limited to less than the greenfield equivalent runoff rate. Temporary underground attenuation will also be provided at separate locations in the form of swales and underground cellular storage units. Silt traps will be provided for upstream of the attenuation tanks. Surface water will pass through oil interceptors prior to discharging from the site.

Wastewater from the development will discharge to the proposed onsite underground wastewater pumping station, which will ultimately link up to the existing Maynooth town wastewater network prior to discharging to Leixlip Wastewater Treatment Plant. The wastewater treatment plant is regulated and operates under an EPA licence which controls emissions to acceptable levels.

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River and Blackhall Little stream will be within the green/ landscaped areas of Site C and so there is no significant source of pollution related to these areas.

Pathway: Site surface water and foul water drainage network.

Receptor: On-Site, adjacent and downstream water courses and foul water infrastructure

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water to the Rye Water River via, attenuation tanks, filter drain and petrol/oil interceptors as described above. It is also proposed to retain the existing riparian zone which will act as a buffer between the development and that stream.

Wastewater from Site C will be directed to an EPA regulated wastewater treatment plant via a proposed onsite pumping station.

Residual Impact

The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation tank, filter drain and

petrol/oil interceptor will break the pathway from the proposed works areas to the watercourse. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Foul water discharges will be directed to the municipal sewer and regulated wastewater treatment plant and so the residual impacts are neutral, indirect, imperceptible, long term, unlikely impact.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.10 Potential Impacts on Hydrologically Connected Designated Sites

Surface water runoff from roads and car parking areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These contaminants have the potential to impact on local downstream groundwater and surface water quality. This is somewhat relevant to this site, due to its proximity to the Rye Water River and the Rye Water Valley/Carton SAC however the QI's for this site relate to ground water dependant species rather than surface water. Ecological surveys also show that there are no mapped petrifying springs or QI's downstream of the site and there is no potential for impacts on the Louisa Bridge Springs

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to attenuation tanks before discharge to a local watercourse and a connection to a storm water sewer will be installed.
- All road and car parking gullies are designed to intercept and trap road grit and silt. All footpath and road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the watercourse.
- As one of the qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs), the distance between them is seen as a significant factor, and there is no connection between groundwater at the Proposed Development site, and that discharging to any tufa springs within the SAC (including the mapped spring located approximately 5km from the Proposed Development at Louisa Bridge).
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.

No extensive areas of deep foundations, such as basements, underground carparks etc, will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phaseWhile there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of Site C (following ecological surveys in 2022), the potential for the occurrence of unmapped petrifying springs within the SAC has been considered below.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at less than the

existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground. Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Blackhall Little/Rye Water River will be within the green/ landscaped areas of Site C and so there is no significant source of pollution related to these areas. Rainfall will be directed to the surface water drainage system there by mimicking the existing hydrological regime and so the impact of this is considered to be imperceptible.

With the implementation of the project as designed and the standard drainage control measures outlined above and throughout Section 8.6.4.3 above, the potential for Site C to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater below Site C will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the centre of the site. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River.

Groundwater flowpaths will be maintained during the operational phase as existing building foundations and any previous excavation will be shallow. Groundwater flowpaths during the operational phase will be unaltered by Site C. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge).

Pre-Mitigation Impact

Indirect, negative, not significant, long term, likely impact to surface water quality.

Imperceptible impacts on groundwater levels or existing hydrological regime or flowpaths due to operation of Site C.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation tanks, hydrocarbon interceptor and filter drain before discharge to Rye Water River/Blackhall Little at less than the controlled greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse.

Residual Impact

No impacts on water quality or downstream designated sites are anticipated.

Imperceptible impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Rye Water Valley/ Carton SAC.

Significance of Effects

No significant impacts on groundwater or surface water quality and downstream designated sites are anticipated.

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to the Rye Water Valley/Carton SAC, the River Rye or the Blackhall Little Stream.

8.6.4.11 MOOR (Maynooth Outer Orbital Road)

8.6.4.11.1 *Potential Increased Downstream Flood Risk due to Increased Hardstanding Area*

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River and Blackhall Little Stream could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

The drainage of the proposed road will be designed such that surface water drainage and sub-grade drainage will be provided for the mainline carriageway and all new sections of minor roads. This discharge will be directed to the existing watercourses and discharged, following attenuation and treatment through fuel separators.

The road drainage for the scheme has been designed in accordance with the GDSDS. The elements of the drainage to be constructed will be constructed in accordance with the Greater Dublin Region Code of Practice for Drainage Works. Any SuDS elements incorporated into the scheme will be designed in accordance with The SuDS Manual, C753 (published by CIRIA, 2007). All drainage designs have been carried out with regard to both Meath and Kildare County Council's respective Development Plans and Frameworks.

The engineering design for proposed drainage system is included in Volume 3d Appendix 4-6.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If the MOOR design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage network, and by using attenuation areas and flow restrictors for drainage management which will control discharges to pre-development greenfield rates.

Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the MOOR.

8.6.4.12 Potential Operational Phase Water Quality Impacts

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off. All rainfall runoff on the new MOOR is to be captured by adequately spaced trapped road gullies, which connect to a main carrier drain under the road. The rainfall runoff on the aligning footpath and cycle-track shall be intercepted by the dividing treelined grass verge, with excess runoff only being collected by the road's gully network.

Surface water attenuation will be used to control surface water runoff rates from all hard surfaces in accordance with the GDSDS, with these being restricted to a maximum flow rate of 5.5 l/s/ha, which is less than the calculated greenfield runoff equivalent. The attenuation systems are to largely comprise enclosed vegetated ponds, and shall be preceded by a Class 1 bypass fuel separator.

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River and Blackhall Little stream within the green/ landscaped areas of the MOOR are not a significant source of pollution related to these areas.

Pathway: Site surface water drainage network.

Receptor: On-Site, adjacent and downstream water courses.

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water via, attenuation systems, filter drains and petrol/oil interceptors as described above.

Residual Impact

The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation systems, filter drains and petrol/oil interceptor will break the pathway from the proposed works areas to the watercourses. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.12.2 Potential Impacts on Hydrologically Connected Designated Sites

Surface water runoff can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These contaminants have the potential to impact on local downstream groundwater and surface water quality. This is somewhat relevant to this site, due to its proximity to the Rye Water River and the Rye Water Valley/Carton SAC however the QI's for this site relate to ground water dependant species rather than surface water. Ecological surveys also show that there are no mapped petrifying springs or QI's downstream of the site and there is no potential for impacts on the Louisa Bridge Springs.

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to attenuation systems before discharge to a local watercourse.
- All road gullies are designed to intercept and trap road grit and silt. All road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the watercourse.
- As one of the qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs), the distance between them is seen as a significant factor, and there is no connection between groundwater at the Proposed Development site, and that discharging to any tufa springs within the SAC (including the mapped spring located approximately 5km from the Proposed Development at Louisa Bridge).
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.

No extensive areas of deep foundations, such as basements, underground carparks etc, will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phaseWhile there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of the MOOR (following ecological surveys completed in 2022), the potential for the occurrence of unmapped petrifying springs within the SAC has been considered below.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground. Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Blackhall Little/Rye Water River will be within the green/ landscaped areas of the MOOR and so there

is no significant source of pollution related to these areas. Rainfall will be directed to the surface water drainage system there by mimicking the existing hydrological regime and so the impact of this is considered to be imperceptible.

With the implementation of the project as designed and the standard drainage control measures outlined above and throughout Section 8.6.4.4 above, the potential for the MOOR to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater below the MOOR will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the centre of the site. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River.

Groundwater flowpaths will be maintained during the operational phase as existing building foundations and any previous excavation will be shallow. Groundwater flowpaths during the operational phase will be unaltered by the MOOR. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge).

Pre-Mitigation Impact

Indirect, negative, slight, long term, likely impact to surface water quality.

Imperceptible impacts on groundwater levels or existing hydrological regime or flowpaths due to operation of Site C.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation system, hydrocarbon interceptor and filter drain before discharge to Blackhall Little/Rye Water River at controlled greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse.

Residual Impact

No impacts on water quality or downstream designated sites are anticipated.

Imperceptible impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Rye Water Valley/ Carton SAC.

Significance of Effects

No significant impacts on groundwater or surface water quality and downstream designated sites are anticipated.

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to the Rye Water Valley/Carton SAC, the River Rye or the Blackhall Little Stream.

8.6.4.13 Kildare Bridge Application

8.6.4.13.1 *Potential Increased Downstream Flood Risk*

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

The Kildare Bridge works are relatively small in scale with the majority of the works occurring in subsurface grounds.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If the Proposed Development design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, imperceptible, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage proposals and the nature of the proposed works in this area.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.6.4.13.2 *Potential Operational Phase Water Quality Impacts*

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River will be within the green/ landscaped areas of the Proposed Development and so there is no significant source

of pollution related to these areas. There is no real likelihood of environmental emissions to water during the operational phase for the pedestrian/cycle bridge.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.13.3 *Potential Impacts on Hydrologically Connected Designated Sites*

There is no potential for significant impacts on any designated sites during the operational phase of the Kildare Bridge works due to their nature and scale. There are no sources of emissions nor any potential effects on the local hydrological regime during the operational phase.

8.6.4.14 Moyglare Bridge Application

8.6.4.14.1 *Potential Increased Downstream Flood Risk due to Increased Hardstanding Area*

In the absence of mitigation, replacement of the greenfield surface with hardstand surfaces would result in an increased risk of pluvial flooding due to low permeability surfaces which will inhibit any downward percolation of rainwater. Furthermore, in the absence of mitigation measures the uncontrolled discharge of water to the Rye Water River could result in an increased risk of downstream fluvial flooding due to increased peak discharges in the river.

The drainage of the proposed road will be designed such that surface water drainage and sub-grade drainage will be provided for the mainline carriageway and all new sections of minor roads. This discharge will be directed to the existing watercourses and discharged, following attenuation and treatment through fuel separators.

The road drainage for the scheme has been designed in accordance with the GDSDS. The elements of the drainage to be constructed will be constructed in accordance with the Greater Dublin Region Code of Practice for Drainage Works. Any SuDS elements incorporated into the scheme will be designed in accordance with The SuDS Manual, C753 (published by CIRIA, 2007). All drainage designs have been carried out with regard to both Meath and Kildare County Council's respective Development Plans and Frameworks.

The Flood Risk Assessment of the green field run-off rates conclude that the development is not at risk of flooding due to pluvial or groundwater flood events.

Pathway: Site Surface water drainage network.

Receptor: Site, adjacent lands and nearby infrastructure.

Pre-Mitigation Impact

If the Proposed Development design did not include mitigation measures to minimise the risk of increased flooding there would be a direct, negative, slight, long term, low probability impact.

Proposed Mitigation Measures

The risk of pluvial and or fluvial flooding is minimised by the incorporation of a properly designed surface drainage and gravity sewer network, and by using underground attenuation tanks areas and flow restrictors for drainage management which will control discharges to the Rye Water River at pre-development greenfield rates. Water quality risks are mitigated by the use of hydrocarbon interceptors and silt traps as described in Chapter 4.

Residual Impact

Direct, neutral, imperceptible, long term, low probability impact in relation to flood risk.

Significance of Effects

No significant impacts in terms of flooding are expected due to the Proposed Development.

8.6.4.15 Potential Operational Phase Water Quality Impacts

Once the construction phase is completed potential emissions to ground and / or surface water include storm water run-off and wastewater. All rainfall runoff on the new Bridge and the MOOR is to be captured by adequately spaced trapped road gullies, which connect to a main carrier drain under the road. The rainfall runoff on the aligning footpath and cycle-track shall be intercepted by the dividing treelined grass verge, with excess runoff only being collected by the road's gully network.

Surface water attenuation will be used to control surface water runoff rates from all hard surfaces in accordance with the GDSDS, with these being restricted to a maximum flow rate of 5.5 l/s/ha, which is less than the calculated greenfield runoff equivalent. The attenuation systems are to largely comprise enclosed vegetated ponds, and shall be preceded by a Class 1 bypass fuel separator

Rainfall allowed to percolate to ground and/or flow via subsurface flow to the Rye Water River within the green/ landscaped areas of the Proposed Development are not a significant source of pollution related to these areas.

Pathway: Site surface water and foul water drainage network.

Receptor: On-Site, adjacent and downstream water courses and foul water infrastructure

Pre-Mitigation Impact: If the measures described above had not been incorporated into the development design there would be potential for direct, negative, slight, long term, low probability impact on water quality

Proposed Mitigation Measures

The risk of uncontrolled emissions is minimized by the collection, treatment and discharge of storm water to the Rye Water River via, attenuation systems, filter drains and petrol/oil interceptors as described above.

Residual Impact

The potential source of pollution can be readily controlled and standard procedures will ensure no significant releases will occur. Mitigation measures, in particular the attenuation systems, filter drains and petrol/oil interceptor will break the pathway from the proposed works areas to the watercourse. The residual impacts are indirect, neutral, imperceptible, long term, unlikely impact.

Therefore, significant effects on surface water or ground water quality will not occur.

8.6.4.16 Potential Impacts on Hydrologically Connected Designated Sites

Surface water runoff areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These contaminants have the potential to impact on local downstream groundwater and surface water quality. This is somewhat relevant to this site, due to its proximity to the

Rye Water River and the Rye Water Valley/Carton SAC however the QI's for this site relate to ground water dependant species rather than surface water. Ecological surveys also show that there are no mapped petrifying springs or QI's downstream of the site and there is no potential for impacts on the Louisa Bridge Springs.

Possible effects during the operational phase continue to include water quality impacts which could occur if ongoing mitigation is not put in place.

There will be no impacts on the local surface water hydrological regime during the operational phase of the development for the following reasons:

- During the operational phase all surface water arising on site will drain to attenuation systems before discharge to a local watercourse.
- All road gullies are designed to intercept and trap road grit and silt. All road drainage water will pass through hydrocarbon interceptors and attenuation systems, prior to controlled/flow limited outfall. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and filter drain prior to discharge to the watercourse.
- As one of the qualifying interests of the SAC is linked to groundwater flows (calcareous tufa springs), the distance between them is seen as a significant factor, and there is no connection between groundwater at the Proposed Development site, and that discharging to any tufa springs within the SAC (including the mapped spring located approximately 5km from the Proposed Development at Louisa Bridge).
- No dewatering will occur during the operational phase of the development.
- All building works will be complete and will have been installed at or very near existing ground levels with minimal ground disturbance having occurred.

No extensive areas of deep foundations, such as basements, underground carparks etc, will have been installed. As such there will be no interruption or blocking of shallow or deep groundwater pathways below the site during the operational phaseWhile there are no known petrifying springs or qualifying interests of the Rye Water Valley/Carton SAC within proximity of the Proposed Development (following ecological surveys carried out in 2022), the potential for the occurrence of unmapped petrifying springs within the SAC has been considered below.

These standard drainage design controls and construction phase mitigation measures will ensure the development will not give rise to any significant surface water or groundwater impacts at or downstream of the site or in the SAC. The majority of runoff from the existing site discharges to the river and stream via shallow subsurface flows as shown by the results of the SI investigations and the ground water level data. The drainage design ensures that these discharges will continue at the existing greenfield rates and therefore the hydrological regime locally and regionally will not be affected by the proposed development.

The project design ensures that there will be no dewatering of the bedrock aquifer during the construction phase and so there will be no obstruction or alteration of existing groundwater flows.

There will be no significant alteration to groundwater recharge. The majority of rainfall will continue to percolate to shallow subsurface and discharge to the surface water systems locally with low levels of recharge to ground and so the impact of this is considered to be imperceptible.

With the implementation of the project as designed and the standard drainage control measures outlined above and throughout Section 8.6.3 above, the potential for the Proposed Development to cause any groundwater drawdown or groundwater quality impacts in the SAC is imperceptible.

Groundwater below the Proposed Development will flow to the south and discharge as baseflow to the Rye Water River and/or the Blackhall Little stream to the east. Groundwater flow from the site will, therefore, have no impact on the Louisa Bridge (spring) groundwater flow (Rye Water Valley/Carton

SAC) as previous site investigations and hydrological assessments (c.f. Section 2.4, (Hydro-G, 2008)) have shown that the flow to these springs is not derived from the Rye Water River.

Groundwater flowpaths will be maintained during the operational phase as existing building foundations and any previous excavation will be shallow. Groundwater flowpaths during the operational phase will be unaltered by the Proposed Development. The SI data shows that dewatering of groundwater from the bedrock aquifer will not occur and so there is no potential for significant effects on the calcareous tufa springs and associated species.

Following an extremely precautionary principle, the potential for other downstream designated sites to be impacted by the proposed works was also considered. On the basis of the Proposed Development design and the mitigation measures proposed to protect the immediate water receptors there will be no impacts on designated sites.

Pathway: Site drainage network and groundwater flowpaths.

Receptor: Rye Water Valley/Carton SAC and any associated Tufa Springs and vertigo snail populations (including the known spring 5km downstream at Louisa Bridge).

Pre-Mitigation Impact

Indirect, negative, not significant, long term, likely impact to surface water quality.

Imperceptible impacts on groundwater levels or existing hydrological regime or flowpaths due to operation of the Proposed Development.

Proposed Mitigation Measures

During the operational phase all surface water arising on site will drain to attenuation systems, hydrocarbon interceptor and filter drain before discharge to Rye Water River at controlled rates that are less than the greenfield rates. Groundwater quality risks are reduced during the operational phase by use of hydrocarbon interceptors and silt traps prior to discharge to the watercourse.

Residual Impact

No impacts on water quality or downstream designated sites are anticipated.

Imperceptible impacts on groundwater levels or existing hydrological regime or groundwater flowpaths relating to the Rye Water Valley/ Carton SAC.

Significance of Effects

No significant impacts on groundwater or surface water quality and downstream designated sites are anticipated.

No significant impacts on groundwater levels, existing hydrological regime, or groundwater flowpaths relating to the Rye Water Valley/Carton SAC, the Rye Water River or the Blackhall Little Stream.

8.6.5 Assessment of Potential Impacts on Water Supplies

Potential health effects are associated with negative impacts on public and private water supplies and potential flooding. There are no mapped public supply group water scheme groundwater protection zones in the area of the Proposed Development.

The proposed site design and mitigation measures outlined in the previous subsections ensures that the potential for impacts on the water environment are not significant and by extension cannot impact significantly on human health.

The flood risk assessment for the development has also shown that the Proposed Development will not increase the risk of flooding elsewhere, and also that there is no significant risk of flooding within the Proposed Development area and it is considered appropriate for the proposed use.

8.6.6 Monitoring Proposals

An inspection and maintenance plan for the on-site drainage systems and mitigation measures will be prepared in advance of commencement of any works and for the duration of construction for each phase of the development. The mitigation measures and monitoring proposals will be dependant on and will be designed for the catchments within which works are proposed. Regular inspections of all installed drainage systems and controls will be undertaken daily, to check that the integrity of silt fencing, for example, is intact. Daily visual checks of the stream will also be carried out and continuous turbidity meters will be installed as required (SONDES).

During the construction phase, field testing and laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken for the adjacent Rye Water River (as per the CEMP).

Field chemistry measurements of unstable parameters, (pH, conductivity, dissolved oxygen, temperature) will be taken at the two surface water monitoring locations on the Rye Water River/Blackhall Little, subject to agreement with Meath and Kildare County Councils. In-situ field monitoring will be completed on a monthly basis.

Baseline laboratory analysis of a range of parameters with relevant regulatory limits and EQSs will be undertaken prior to construction at two locations on the Rye Water River.

The analytical determinants of the monitoring programme will be as set out below and carried out quarterly.

- pH (field measured)
- Electrical Conductivity (field measured)
- Temperature (field measured)
- Dissolved Oxygen (field measured)
- Total Suspended Solids
- Total Phosphorus
- Chloride
- Nitrate
- Nitrite
- Total Nitrogen
- Ortho-Phosphate
- Ammonia N
- Biochemical Oxygen Demand

8.6.7 Cumulative effects resulting from Interactions between various elements of the proposed development

The interaction of the various elements of the Proposed Development was considered and assessed in this EIAR with regards hydrology. The potential for each individual element of the Proposed Development on its own to result in significant effects on water receptors was considered in the impact assessment. The entire project including the interactions between all its elements was also considered and assessed for its potential to result in significant effects on water receptors in the impact assessment presented. The complex interactions between the requirement for site drainage and the requirement to protect the Blackhall Little/Rye Water River and other sensitive receptors were taken into account for the entire project and any impacts avoided through a series of mitigation measures that were fully described. The management and handling of potentially harmful materials across the entire project was assessed with mitigation proposed and described fully.

All interactions between the various elements of the project were considered and assessed both individually and cumulatively within this chapter. Where necessary, mitigation was employed to ensure that no cumulative effects will arise as a result of the interaction of the various elements of the development with one another.

8.6.8 Cumulative In-combination

The potential cumulative effects of the Proposed Development in combination with the other projects described in Chapter 2 of this report have been considered in terms of impacts on hydrology and hydrogeology.

There are a number of proposed or permitted housing developments within the vicinity of the Proposed Development. A description of the developments is provided in Chapter 2, and where appropriate the application documentation, EIAR and NIS for each development have been reviewed.

There are no proposed direct discharges of any substance to the Blackhall Little/Rye Water River or other watercourses from the site during the construction phase of the Proposed Development. The hydrological regime, which includes shallow subsurface flows to the Blackhall Little/Rye Water River and some percolation of rainfall to ground, will not be altered significantly during the construction phase. Potential emissions from the site are therefore related to potential uncontrolled releases and so a range of procedures, management plans and infrastructural mitigation proposals have been identified and described earlier in this chapter and will be implemented to ensure that such uncontrolled releases do not occur. The potential for residual impacts on water and ground water receptors is considered to be imperceptible and so the potential for cumulative effects associated with these receptors is limited. It is highly unlikely that all projects would be constructed at the same time and so the potential for multiple uncontrolled releases to water are also not likely. Should some or all projects be constructed at the same time, the water quality controls at the Proposed Development site will ensure no likely significant cumulative effects will occur. Furthermore, it should be noted that planning and construction standards require that similar water quality controls will be implemented at the other sites, thus further reducing the potential for likely, significant cumulative effects.

During the operational phase, discharges are proposed to the Blackhall Little/Rye Water River and this has been assessed as leading to a potential imperceptible effect as the discharge rate will be as per pre-development rates and water quality will be controlled. Again, the water quality controls at the Proposed Development site will ensure no likely significant effects cumulatively will occur during the operational phase. Mandated water quality controls at the other project sites will further reduce the potential for likely, significant cumulative effects.

Wastewater effluent arising from the operational phase of the proposed development will be piped from the proposed onsite pumping station, to the existing Maynooth pumping station, before being piped to and treated at, the municipal wastewater treatment plant at Leixlip. The Leixlip treatment plan operates under licence from the EPA. The EPA cannot issue a licence in the event that emissions from that facility could lead to unacceptable environmental emissions. In circumstances where Irish Water has confirmed that the wastewater arising from the Proposed Development will be treated at the Leixlip wastewater treatment plant, the potential for cumulative effects associated with the wastewater discharges does not arise.

No significant cumulative impacts on the water environment are anticipated during the construction or operational phases in circumstances where the proposed mitigation measures are implemented effectively. The 3 no. developments in the locality of the Proposed Development have been designed with appropriate water and wastewater services as has the Proposed Development.

8.6.9 Conclusion

During each phase of the Proposed Development (construction and operation) a number of activities will take place on the development site which will have the potential to affect the hydrological regime, hydrogeological regime or water quality at the site or its vicinity. These potential impacts generally arise during the construction stage from sediment input from runoff and other pollutants such as hydrocarbons and cement-based compounds, with the former having the most potential for impact.

Surface water drainage measures, pollution control and other preventative measures have been incorporated into the project design to minimise significant negative or adverse impacts on water quality including the adjacent Blackhall Little/Rye Water River and avoid impact on downstream designated sites. Preventative measures during construction include fuel and concrete management and a waste management plan which have been incorporated into the Construction and Environmental Management Plan. A range of surface water control measures will also be used including silt fencing along the Blackhall Little/Rye Water River and the maintenance of a set back from the watercourse during construction.

During the operational phase, the key surface water control measure is that there will be a gravity fed sewer network, water drainage system with a Hydro-Brake flow restrictor, filter drain and attenuation systems along with petrol / oil interceptors prior to outflow to the Blackhall Little/Rye Water River. The proposed system will control discharge volume and discharge quality to acceptable greenfield levels. It is also proposed to retain the existing riparian zone which will act as a buffer between the development and the two watercourses.

Overall, the proposal presents no real likelihood of significant impacts to surface water or groundwater quality provided the proposed mitigation measures are implemented.

There will be no net impact on the local hydrological regime, groundwater levels, or groundwater flowpaths during the construction and operational phase of the Proposed Development. There will be no perceptible direct or indirect hydrological impacts on designated sites, in particular the Rye Water Valley / Carton SAC.

No significant cumulative impacts on surface water, groundwater or designated sites will occur.