



APPENDIX 8-4

**WATER FRAMEWORK
DIRECTIVE ASSESSMENT**

**WATER FRAMEWORK DIRECTIVE ASSESSMENT
PROPOSED MOYGADDY MIXED USE DEVELOPMENT, CO. MEATH**

FINAL REPORT

Prepared for:
SKY CASTLE LTD

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HYDRO-ENVIRONMENTAL SERVICES

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were commissioned by MKO to complete a Water Framework Directive (WFD) Compliance Assessment as an accompanying document for a proposed 'Mixed Use Development' at Moygaddy, Co. Meath.

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 road 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, scout den, public park and internal access roads, approximately 500m of distributor road, pedestrian and cycle improvements, 2 no. cycle bridges, 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 pedestrian & 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.

The 'Proposed Development' consists of six planning applications under the definition of one 'Proposed Development' due to the proximity, timeline and links between the applications. Three planning applications will be submitted to Meath County Council (MCC) (Site A, Site B and MOOR). One planning application will be submitted to An Bord Pleanála (Site C: SHD) as the competent authority. Two planning applications will be submitted to Kildare County Council (KCC) as the proposed development is located on the northern environs of Maynooth town, Co. Kildare, and works are required to connect the Proposed Development to the road network and services and utility infrastructure within Co. Kildare.

The purpose of this WFD assessment is to determine whether specific components or activities associated with the proposed development at Moygaddy, will compromise WFD objectives or result in a deterioration of the status of any waterbodies in the vicinity or downstream of the site. This assessment will provide details of proposed mitigation measures if there is a perceived risk deterioration in the status of any waterbody.

1.2 STATEMENT OF AUTHORITY

Hydro-Environmental Services (HES) are a specialist hydrological, hydrogeological and environmental practice that delivers a range of water and environmental management consultancy services to the private and public sectors across Ireland and Northern Ireland. HES was established in 2005, and our office is located in Dungarvan, County Waterford. We routinely complete impact assessments for hydrology and hydrogeology for a large variety of project types.

This WFD assessment was prepared by Michael Gill, Conor McGettigan and Jenny Law.

Michael Gill (BA, BAI, Dip Geol., MSc, MIEI) is an Environmental Engineer and Hydrogeologist with over 18 years' environmental consultancy experience in Ireland. Michael has completed numerous hydrological and hydrogeological impact assessments for a variety of development types across Ireland. He has substantial experience in surface water drainage design and SUDs design and surface water/groundwater interactions.

Conor McGettigan (BSc, MSc) is a junior Environmental Scientist, holding an M.Sc. in Applied Environmental Science (2020) from University College Dublin. Conor has also completed a B.Sc. in Geology (2016) from University College Dublin. In recent times Conor has assisted in the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

Jenny Law (BSc) is a master's student in Applied Environmental Geoscience. Jenny holds a BSc in Earth and Ocean Science. In recent times Jenny has assisted in the preparation of hydrological and hydrogeological impact assessments for a variety of developments.

1.3 WATER FRAMEWORK DIRECTIVE

The EU Water Framework Directive (2000/60/EC), as amended by Directives 2008/105/EC, 2013/39/EU and 2014/101/EU, was established to ensure the protection of the water environment. The Directive was transposed in Ireland by the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 3002).

The Directive requires that all member states protect and improve water quality in all waters, with the aim of achieving good ecological status by 2027 at the latest WFD aims. Any new development must ensure that this fundamental requirement of the Directive is not compromised.

The WFD is implemented through the River Basin Management Plans (RBMP) which comprises a six-yearly cycle of planning, action and review. RBMPs include identifying river basin districts, water bodies, protected areas and any pressures or risks, monitoring and setting environmental objectives. In Ireland the first RBMP covered the period from 2010 to 2015 with the second cycle plan covering the period from 2018 to 2021.

The River Basin Management Plan (2018 - 2021) objectives, which have been integrated into the design of the proposed development, include:

- Ensure full compliance with relevant EU legislation;
- Prevent deterioration and maintain a 'high' status where it already exists;
- Protect, enhance and restore all waters with aim to achieve at least good status by 2021;
- Ensure waters in protected areas meet requirements; and,
- Implement targeted actions and pilot schemes in focused sub-catchments aimed at (1) targeting water bodies close to meeting their objectives and (2) addressing more complex issues that will build knowledge for the third cycle.

Our understanding of these objectives is that surface waters, regardless of whether they have 'Poor' or 'High' status, should be treated the same in terms of the level of protection and mitigation measures employed, i.e. there should be no negative change in status at all.

2. WATERBODY IDENTIFICATION CLASSIFICATION

2.1 INTRODUCTION

This section identifies those surface water and groundwater bodies with potential to be affected by the proposed development and reviews any available WFD information.

2.2 SURFACE WATERBODY IDENTIFICATION

Regionally, the site is located in the Liffey and Dublin Bay surface water catchment within Hydrometric Area 09 of the Eastern River Basin District (www.epa.ie). 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.

Sites A, B and C are bounded to the south by the Rye Water River, referred to by the EPA as the Rye Water_030 (IE_EA_09R010400). 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. The Blackhall Little stream is a tributary of the Rye water, flowing through the centre of the site from north to south. The Blackhall Little stream also crosses the MOOR at two locations, at the northeast and centre of the site. The Rye Water then flows ~8km to the southeast towards Leixlip, where it then feeds into the River Liffey (IE_EA_09L011900). The River Liffey continues east for approximately 18km before discharging into the Liffey Estuary Upper transitional waterbody, which in turn discharges into the Liffey Estuary Lower transitional waterbody and the Dublin Bay coastal waterbody thereafter.

Figure A below highlights those surface waterbodies located downstream of the proposed development at Moygaddy.

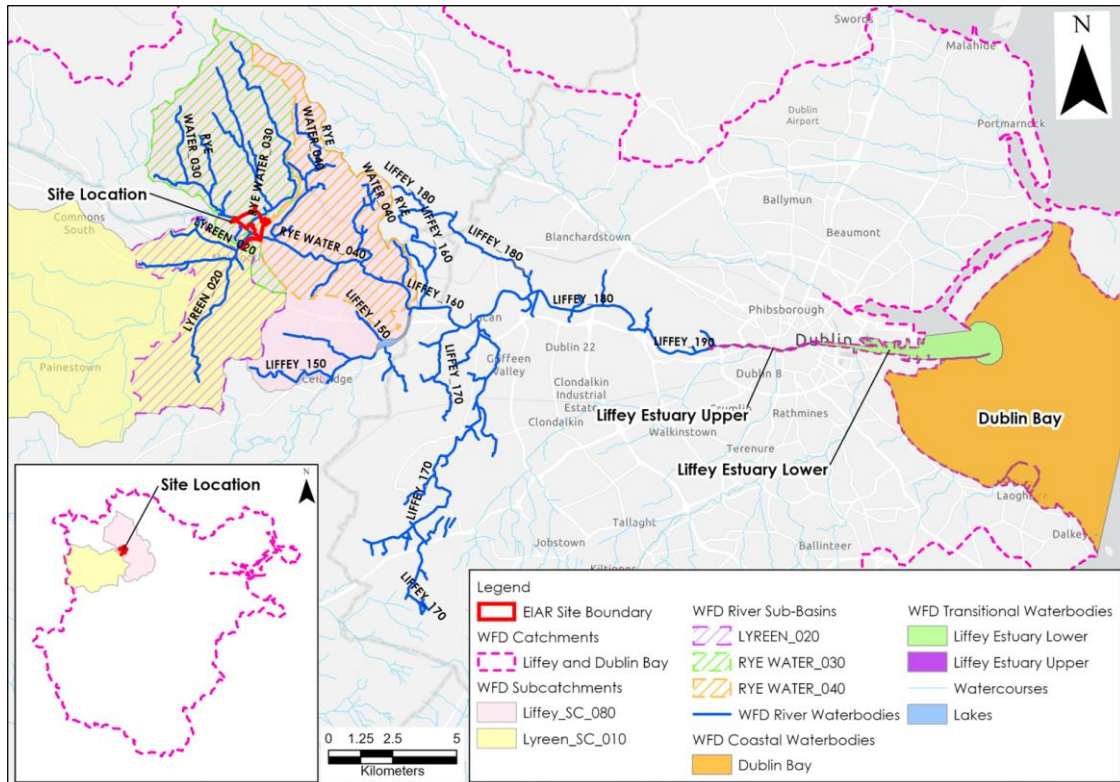


Figure A: Hydrological Setting and Downstream Surface Water Bodies

2.3 SURFACE WATER BODY CLASSIFICATION

A summary of the WFD status and risk result for Surface Water Bodies (SWBs) downstream of the proposed development are shown in **Table A**.

The Rye Water_030 river waterbody (IE_EA_09R010400) that bounds Sites A, B and C to the south and includes the Blackhall Little stream that flows through the centre of the proposed development achieved “Moderate” status in the latest WFD Cycle (2013-2018) (www.catchments.ie). Downstream of the R157 the Rye Water_040 waterbody (IE_EA_09R010600) is of “Poor” status. The Rye Water_040 discharges into the Liffey_150 waterbody (IE_EA_09L011900) at Leixlip which has achieved ‘Good’ status in the latest round (2013-2018). Downstream the Liffey_160 waterbody (IE_EA_09L012040) achieved ‘poor’ status, whilst the lower reach of the River Liffey, including the Liffey_170 (IE_EA_09L012100), Liffey_180 (IE_EA_09L012350) and the Liffey_190 (IE_EA_09L012360) waterbodies all achieved a ‘Moderate’ status in the latest WFD Cycle (2013-2018). Both the Liffey Estuary Upper (IE_EA_090_0400) and Liffey Estuary Lower transitional waterbodies achieved ‘Good’ status, and so too did the Dublin Bay coastal waterbody (IE_EA_090_0000) under the WFD 2013-2018. This status is based on the ecological, chemical and quantitative status of the SWB.

The 2 no. river waterbodies immediately downstream of the proposed development have been deemed to be “at risk” of failing to meet their WFD objectives. The Rye Water_030 in the vicinity of the site is listed as being under significant pressure from agriculture activities and domestic wastewater. Agriculture, urban runoff and domestic wastewater have been identified as significant pressures on the Rye Water_040 waterbody. The risk status for the downstream Liffey_150, Liffey_160 river waterbodies and the Liffey Estuary Upper and Liffey Estuary Lower transitional waterbodies are under review. The Liffey_150 is listed on (www.catchments.ie) as being under significant pressure from urban run-off, whilst the Liffey_160 is listed as being under significant pressure from agriculture. Urban wastewater is identified as a significant pressure for the Liffey Estuary Upper transitional waterbody. The Liffey_170, Liffey_180 and the Liffey_190 river waterbodies are ‘at risk’ of failing to meet their WFD objectives. These lower reaches of the Liffey River are listed as being under significant pressures from urban wastewater and urban run-off. The Dublin Bay coastal waterbody is not at risk of failing to meet its WFD objectives.

SWB status for the 2013-2018 WFD cycle are shown on **Figure B**.

Table A: Summary WFD Information for Surface Water Bodies

SWB	Overall Status	Risk Status	Pressures
Rye Water_030	Moderate	At Risk	Agriculture and domestic wastewater
Rye Water_040	Poor	At Risk	Agriculture urban runoff and domestic wastewater
Liffey_150	Good	Under Review	Urban Run-off
Liffey_160	Poor	Under Review	Agriculture
Liffey_170	Moderate	At Risk	Urban Wastewater and Urban Run-off
Liffey_180	Moderate	At Risk	Urban Wastewater and Urban Run-off
Liffey_190	Moderate	At Risk	Urban Wastewater and Urban Run-off
Liffey Estuary Upper	Good	Review	Urban Wastewater
Liffey Estuary Lower	Good	Review	-
Dublin Bay	Good	Not at Risk	-

2.4 GROUNDWATER BODY IDENTIFICATION

According to data from the GSI database the proposed development is underlain by the Dinantian Upper Impure Limestones of the Lucan Formation and are classified by the GSI as being a Locally Important Aquifer – Bedrock which is Moderately Productive only in Local Zones. The site is underlain by the Dublin Groundwater Body (GWB) (IE_EA_G_008) which is characterised by poorly productive bedrock.

2.5 GROUNDWATER BODY CLASSIFICATION

The site is located within the Dublin Groundwater Body (GWB) (IE_EA_G_008). This GWB achieved “Good” status under the WFD 2013-2018 review cycle (**Table B**). This status is based on the quantitative and chemical status of the GWB.

The risk status of the Dublin Groundwater Body (GWB) (IE_EA_G_008) is currently “under review”. No significant pressures have been identified to be impacting on this GWB.

Table B: Summary WFD Information for Groundwater Bodies

GWB	Overall Status	Risk Status	Pressures
Dublin	Good	Under Review	-

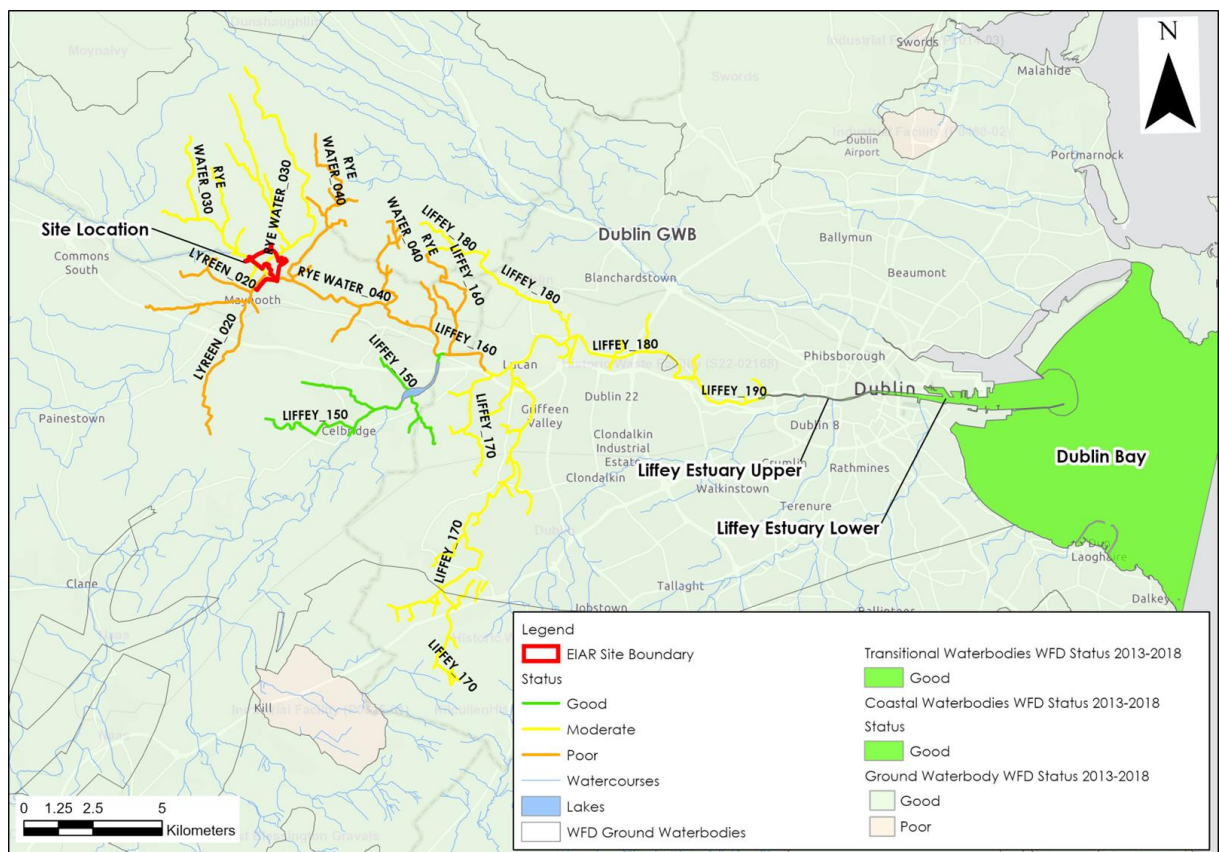


Figure B: WFD Surface Waterbody Status (2013-2018)

3. WFD SCREENING

As discussed in **Section 2**, there are a total of 10 no. surface water bodies that are located in the vicinity or downstream of the proposed development site. In addition, 1 no. groundwater body underlies the proposed development site.

3.1 SURFACE WATER BODIES

As shown in **Figure A** above, there are 7 no. river water bodies, 2 no. transitional waterbody and 1 no. coastal waterbody located in the vicinity or downstream of the proposed development.

With consideration for the construction and operational phases of the proposed development, it is considered that the Rye water _030 and Rye Water _040 that are in the vicinity and downstream of the site are carried through into the WFD Impact Assessment. All sections of the downstream Liffey River (Liffey_150, Liffey_160, Liffey_170, Liffey_180 and Liffey_190) have been screened out due to their distal location from the proposed development site and the large volumes of water within these surface waterbodies. The downstream transitional waterbodies including the Liffey Estuary Upper, Liffey Estuary Lower and the downstream coastal waterbody of Dublin Bay, have been screened out also due to their distal location from the proposed development site, the large volumes of water within these surface waterbodies and the saline nature of these waters.

3.2 GROUNDWATER BODIES

The underlying Dublin groundwater body will be carried through to the WFD Impact Assessment due to its proximal location directly underlying the proposed development site.

3.3 WFD SCREENING SUMMARY

A summary of WFD Screening discussed above is shown in **Table C**.

Table C: Screening of WFD water bodies located within the study area

Type	WFD Classification	Waterbody Name/ID	Inclusion in Assessment	Justification
Surface Waterbody	River	Rye Water_030	Yes	The proposed development is in the vicinity and downstream of the Rye Water_030 River. An assessment is required to consider potential impacts of the proposed development to this SWB.
	River	Rye Water_040	Yes	The proposed development is in the vicinity and downstream of the Rye Water_040 River. An assessment is required to consider potential impacts of the proposed development to this SWB.
	River	Liffey_150	No	The Liffey River waterbody has been screened out due to its distal location from the proposed development site and the large volume of water within the river.
	River	Liffey_160	No	The Liffey River waterbody has been screened out due to its distal location from the proposed development site and the large volume of water within the river.
	River	Liffey_170	No	The Liffey River waterbody has been

				screened out due to its distal location from the proposed development site and the large volume of water within the river.
	River	Liffey_180	No	The Liffey River waterbody has been screened out due to its distal location from the proposed development site and the large volume of water within the river.
	River	Liffey_190	No	The Liffey River waterbody has been screened out due to its distal location from the proposed development site and the large volume of water within the river.
	Transitional	Liffey Estuary Upper	No	The Liffey Estuary Upper transitional waterbody has been screened out due to its distal location from the proposed development site, the large volume of water within the estuary and the saline nature of these waters.
	Transitional	Liffey Estuary Lower	No	The Liffey Estuary Lower transitional waterbody has been screened out due to its distal location from the proposed development site, the large volume of water within the estuary and the saline nature of these waters.
	Coastal	Dublin Bay	No	The Dublin Bay coastal waterbody has been screened out due to its distal location from the proposed development site, the large volumes of water within the surface waterbody and the saline nature of its water.
Groundwater Body	Groundwater	Dublin	Yes	The proposed development site immediately overlies the groundwater body. An assessment is required to consider potential impacts of the proposed development to this GWB.

4. WFD COMPLIANCE ASSESSMENT

4.1 PROPOSED DEVELOPMENT

The proposed development comprises a strategic employment zone (Site A), healthcare facilities (Site B), a strategic housing development (Site C), Maynooth Outer Orbital Road (MOOR) which consists of approximately 1.7km of new distributor road along with upgrade works, a standalone pedestrian and cycle bridge adjacent to the existing Kildare Bridge and the provision of an integral single span bridge (Moyglare Bridge) over the Rye Water River.

Aspects of each of the components of the proposed development include:

The Strategic Employment Zone (**Site A**) will consist of:

- The proposed development comprises 3 no. office blocks and all associated site development works
- The development includes a surface car park which includes 323 no. car parking spaces and 320 no. bicycle car parking spaces.
- Undertaking of road upgrade works on the R157 Dunboyne Road and the construction of a section of the Maynooth Outer Orbital Route and provision of associated pedestrian and cycle infrastructure.
- Vehicular access to the site will be provided via the R157 Dunboyne Road.
- Provision of a new pedestrian & cycle bridge structure at the River Rye Water adjacent to the existing Kildare Bridge.
- Provision of roof mounted solar PV panels on Office Blocks A, B & C.
- Provision of 3 no. ESB Kiosks.
- Provision of bin stores, bike stands, landscaping, boundary treatments and public lighting and all other site development works and services ancillary to the proposed development.

The Healthcare Facilities (**Site B**) will consist of:

- Construction of a new two-storey Nursing Home of 156 no. bedrooms with a Gross Floor Area (GFA) of 8,576m², including vehicular pick up/drop-off area and service road;
- Construction of a new three-storey Primary Care Centre (PCC) with a Gross Floor Area (GFA) of 3,049m²;
- The development includes a shared surface car park providing 161 no. car parking spaces.
- Provision of communal (semi-private) and public open space
- Provision of hard and soft landscaping including amenity equipment, fencing and gates.
- Provision of substation and public lighting.
- Proposed road improvement and realignment works along the R157 Dunboyne Road

The Strategic Housing Development SHD (**Site C**) will consist of:

- Construction of 360 no. residential homes comprising:
 - 196 no houses (including 19 no. 2 beds, 156 no. 3 beds and 21 no. 4 beds).
 - 102 no. duplexes (including 51 no. 1 beds and 51 no. 2 beds) set out in 6 no. blocks.
 - 62 no. apartments (including 26 no. 1 beds and 36 no. 2 beds) set out in 2 no. blocks.
- Provision of a public park and playground with associated 42 no. car parking spaces adjacent to Moygaddy Castle Towerhouse and pedestrian and cyclist links along the Blackhall Little and Rye Water River. The overall public open space (including the High Amenity Lands) equates to 7.98 hectares.

- Provision of private open spaces in the form of balconies and terraces is provided to all individual apartments and duplexes to all elevations.
- Development of a two-storey creche facility (514 sqm), outdoor play area and associated parking of 29 no. spaces.
- Provision of a single storey Scout Den facility, including a hall, kitchen, meeting room and ancillary facilities (220sqm) and associated parking of 6 no. spaces.
- Provision of 500m of distributor road comprising of 7.0m carriageway with turning lane where required, footpaths, cycle tracks and grass verges. All associated utilities and public lighting including storm water drainage with SuDS treatment and attenuation.
- Proposed road improvement and realignment works of the existing L6219 local road
- Provision of 3 no. vehicular and pedestrian accesses from the L6219 local road and an additional vehicular and pedestrian access from the R157 to the Childcare and Scout Den facilities.
- A total of 667 no. car parking spaces are provided on site located at surface level. The car parking provision includes 10 no. Electric Vehicle charging and Universally Accessible spaces allocated for the Apartment & Duplex units. All Houses will be constructed with provision for EV Charging.
- Provision of site landscaping, public lighting, bin stores, 3 no. ESB unit substations, site services and all associated site development works.

The planning application for the Maynooth Outer Orbital Road (**MOOR**) will consist of:

- Provision of approximately 1,700m of new distributor road (MOOR Arc) comprising of 7.0m carriageway with turning lane where required, footpaths, cycle tracks and grass verges. All associated utilities and public lighting including storm water drainage with SuDS treatment and attenuation.
- Proposed road improvement and realignment works including:
 - realignment of a section of the existing L6219 local road, which will entail the demolition of an existing section of the road which extends to circa 2,500 sqm.
 - Provision of pedestrian and cycle improvement measures along the L6219 and L22143 which abuts the boundary of Moygaddy House which is a Protected Structure (RPS ref 91558).
 - Provision of pedestrian and cycle improvement measures along the R157 which abuts the Carton Demense Wall which is a Protected Structure (RPS Ref 91556).
 - Realignment of a section of the existing L22143 local road and R157, which will entail the demolition of an existing section of the road which extends to circa 3,200 sqm.
 - Provision of a new signalised junction at the realigned junction between the L22143 and R157.
 - Provision of a new signalised junction between the L2214 local road and the MOOR with right-turn lanes on approaches.
 - Reconfiguration of the L2214 section within the MOOR arc to a one-way from north to south with right-turn lanes, where applicable.
 - Reconfiguration of the northbound lane of the L2214 within the arc to a shared facility for use by pedestrians and cyclists.
 - Addition of chicanes on the L6219 and L22143 local road to reduce traffic flow and encourage utilisation of the MOOR.
- Provision of site landscaping, public lighting, site services and all associated site development works.

The planning application for the **Kildare Bridge** will consist of:

- Provision of a new bridge structure comprising the following:
 - a pedestrian and cycle bridge structure to be erected adjacent to the upstream/western side of the existing Kildare Bridge, with a 2m clearance, with the infrastructure tying into new infrastructure in Co. Meath.
 - This bridge will be a standalone, independent structure that will also support new water main assets

- New wastewater rising mains to be installed underground adjacent the bridge structure, to the west.
- New walkways and cycle track will tie-in with new infrastructure to be constructed by Cairn Homes and their Agents in County Kildare.
- Provision of site landscaping, public lighting, site services and all associated site development works.

The planning application for the **Moyglare Bridge** will consist of:

- Provision of approximately 200m of new portion of distributor road comprising of 7.0m carriageway with footpaths, cycle tracks and grass verges. All associated utilities and public lighting including storm water drainage with SuDS treatment and attenuation. This new road section with pedestrian and cycle infrastructure will tie in with existing infrastructure which provides access to the Maynooth Community College and Moyglare Hall Estate.
- Provision of a new bridge structure comprising the following:
 - an integral 50m single span bridge at Moyglare Hall over the River Rye Water to connect with existing road infrastructure in County Kildare and associated floodplain works and embankments.
 - The bridge will include pedestrian and cycle facilities
 - Extension of the water main assets to serve new developments in Maynooth Environs
- Provision of site landscaping, public lighting, site services and all associated site development works.

It is proposed that surface water within Sites A, B and C (from roads, roofs and hardstanding areas) will drain via gravity to hydrocarbon interceptors, and infiltration area/attenuation storage areas. 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. Various other SuDS (sustainable drainage systems) have been incorporated into the surface water drainage design including permeable pavements, swales, hydrocarbon interceptors, rainwater harvesting systems, and downstream attenuation/infiltration.

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 proposed to provide an extension to the existing 200mm watermain at Moyglare Close, to serve Site C. The Proposed Development will be subject to a New Connection Agreement with Irish Water, with all details in accordance with their requirements.

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 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. 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.

The proposed development works include works in close proximity to waterbodies. There are a number of potential adverse effects to both surface and groundwater.

The primary risks of degradation of surface water bodies include:

- Changes in surface runoff flow volumes and flow patterns;
- Entrainment of suspended solids in surface waters; and,
- Chemical pollution of surface waters by oil and or fuels.

The primary risks of degradation of groundwaters include:

- Chemical pollution of groundwaters by oils and fuels; and,
- Changes in local groundwater flow patterns.

4.2 POTENTIAL EFFECTS

4.2.1 Construction Phase (Unmitigated)

4.2.1.1 Potential Surface Water Quality Impacts from Earthworks

Construction phase activities including site levelling and excavations for building foundations, and attenuation tanks will require earthworks resulting in the removal of vegetation cover where present and excavation of soil and subsoils. The main risk will be from surface water runoff from bare soil and spoil storage areas during construction works.

These activities can result in the release of suspended solids in surface water runoff and could result in an increase in the suspended sediment load, resulting in increased turbidity. This could affect the water quality and fish stocks of downstream water bodies such as the River Rye Water.

Estimated flow volumes at the EPA gauging station on the Rye Water River at Annes BR (Station Code: 09048) and on the Rye Water at Leixlip (Station Code: 09001) highlight the increase in flow volumes downstream. The EPA estimate that 95% of flows in the Rye Water River, approximately 500m upstream from the proposed development equal or exceed 0.060m³/s while in the Rye Water at Maynooth, 95% of flows equal or exceed 0.133m³/s at Leixlip. Therefore, there is a significant increase in flow volumes from the Rye Water_030 River in the vicinity of the proposed development site to the Rye Water_040 River downstream.

These contaminants have the potential to cause a deterioration in the overall status of the Rye Water_030 and could result in the prevention of the Rye water_030 SWB from achieving 'Good' status in the future, due to its proximal location to the proposed development. Further downstream the status of the Rye Water_040 river waterbody is unlikely to be impacted even in an unmitigated scenario due to the significant increase in flow volumes between the Rye Water_030 and Rye Water_040 Rivers.

A summary of potential status change to SWBs arising from surface water quality impacts from earthworks during the construction phase of the proposed development in the unmitigated scenario are outlined in **Table D**.

Table D: Surface Water Quality Impacts during Construction Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Potential Status Change
Rye Water_030	IE_EA_09R010400	Moderate	Poor
Rye Water_040	IE_EA_09R010600	Poor	Poor

4.2.1.2 Groundwater Quality Impacts

Accidental spillage during refuelling of construction plant with petroleum hydrocarbons is a significant pollution risk to groundwater. The accumulation of small spills of fuels and lubricants

during routine plant use can also be a pollution risk. Chemicals such as paints and detergents also pose a threat to the groundwater environment. Potential accidental wastewater discharges from temporary on-site welfare facilities have the potential to impact on groundwater quality. Runoff from concrete works can impact on surface water and groundwater quality.

These sources of contamination have the potential to impact on groundwater quality in the underlying groundwater bodies.

A summary of potential status change to the GWB arising from potential groundwater quality impacts during the construction phase of the proposed development in the unmitigated scenario are outlined in **Table E**.

Table E: Groundwater Quality Impacts during Construction Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Change
Dublin	IE_EA_G_008	Good	Moderate

4.2.2 Operational Phase (Unmitigated)

4.2.2.1 Reduced Groundwater Flows

Without appropriate mitigation replacement of the existing greenfield surfaces with impermeable hardstanding surfaces can affect and redirect rainfall recharge to the groundwater flow system at the development site, and as a result can alter local groundwater flow patterns. This may have an adverse impact on the quantitative status of the Dublin GWB.

A summary of potential status change to GWBs arising from reduced groundwater flows during the operation stage of the proposed development in the unmitigated scenario are outlined in **Table F**.

Table F: Potential Impact on Groundwater Flows during Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Change
Dublin	IE_EA_G_008	Good	Moderate

4.2.2.2 Groundwater Quality Impacts

Surface water runoff from roads and car parking areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These could alter pH or nutrient concentrations in groundwater. The use of fertilizers (organic and inorganic, which can increase nitrate and phosphate concentrations in groundwater) and pesticides could also impact on groundwater quality. These contaminants have the potential to adversely impact local groundwater quality in the underlying aquifers.

A summary of potential status change to the Dublin GWB arising from groundwater quality impacts during the operation stage of the proposed development in the unmitigated scenario are outlined in **Table G**.

Table G: Groundwater Quality Impacts during Operational Phase (Unmitigated)

GWB	WFD Code	Current Status	Assessed Change
Dublin	IE_EA_G_008	Good	Moderate

4.2.2.3 Surface Water Quality Impacts

Surface water runoff from roads and car parking areas can potentially contain elevated levels of contaminants such as hydrocarbons and suspended solids. These could alter pH or nutrient concentrations in surface water. The use of fertilizers (organic and inorganic, which can increase nitrate and phosphate concentrations in and surface water). These contaminants have the potential to cause a deterioration in the overall status and could result in the prevention of the Rye Water_030 SWB from achieving 'Good' status in the future, due to its proximal location to the proposed development. Further downstream the status of the Rye Water_040 river waterbody is less at risk.

A summary of potential status change to SWBs arising from surface water quality impacts during the operation stage of the proposed development in the unmitigated scenario are outlined in **Table H**.

Table H: Surface Water Quality Impacts during Operational Phase (Unmitigated)

SWB	WFD Code	Current Status	Assessed Change
Rye Water_030	IE_EA_09R010400	Moderate	Poor
Rye Water_040	IE_EA_09R010600	Poor	Poor

4.3 MITIGATION MEASURES

In order to mitigate against the potential adverse effects on surface and groundwater quality, quantity and flow patterns, mitigation measures will be implemented during the construction and operational phases of the proposed development. These are outlined below.

4.3.1 Construction Phase

4.3.1.1 Mitigation Measures for Surface water Quality

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 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 be 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 at a distance of over 30m from nearby watercourses (Rye Water River and Blackhall Little Stream) 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 Section 4.3.1.3 below 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.
- There will be no direct discharge to any water body, and therefore no risk of hydraulic loading or contamination will occur;
- The MOOR stream crossing upgrade works, the Moyglare Bridge and the Kildare Bridge Works 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.

Construction phase activities at Kildare Bridge include 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. The main risk from directional drilling will be from frac-out, therefore the following mitigation measures will be followed:

- 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;

Release of effluent from on-site wastewater systems during the construction phase has the potential to impact on groundwater and surface waters. The proposed mitigation measures relating to wastewater effluent include:

- 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.

4.3.1.2 Mitigation Measures to Protect Groundwater Quality

The potential pollution of groundwater during the construction phase will be mitigated by the provision of appropriate controls and working methods. These include best practice methods for storage and handling of fuels and chemicals and include:

- 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.

The proposed mitigation measures relating to concrete include:

- 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.

4.3.1.3 Mitigation Measures to Protect against 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.

The proposed mitigation measures relating to morphological changes include:

- 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 and Blackhall Little Stream.
- 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 Stream 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 Stream 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,
- All watercourse crossing 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.

4.3.2 Operational Phase

4.3.2.1 Mitigation Measures to Protect Groundwater Flow Regimes

The alteration of local groundwater flow patterns due to the replacement of the greenfield surface with hardstand surfaces will be 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 less than the greenfield rates.

Sites A, B & C will direct surface water from surfaced areas roads, and roofs, via gravity, infiltration area/attenuation storage, hydrocarbon interceptors and filtration drain to outfalls at the River Rye Water/Blackhall Little, just west of the Kildare Bridge and the Blackhall Little stream. The remaining areas are considered green space and will be allowed to drain naturally to ground, with negligible impact on the performance of the surface water network, and groundwater flows and therefore do not contribute to the surface water drainage networks.

Surface water attenuation will be used to control runoff from all hard surfaces in accordance with the Greater Dublin Strategic Drainage Study (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. Attenuation Storage will be provided at strategic locations, in the form of unlined proprietary poly-tunnel storage units (or similar approved). These poly-tunnel storage units will be underground, in proposed green-spaces for both Site A and Site C and in the car parking area for Site B, for the attenuation of rainfall runoff prior to discharge. The attenuation for the proposed MOOR are to comprise of largely enclosed vegetated ponds, and be preceded by a Class 1 bypass fuel separator.

Attenuation Storage will temporarily store excessive surface water, due to the restricted flow rates during rainfall events up to, and including, the design 1% AEP with a 20% additional allowance for climate change. This will allow for the limiting discharge rates to less than greenfield run off rates at the Proposed Development outfall.

Discharge rates at the proposed surface outfalls, that serve Sites A, B and C are to be restricted by using a flow control device, in a chamber upstream of the outfalls, such as Hydro-Brake Optimum Vortex Flow control unit, or similar approved by Meath and Kildare County Councils, downstream of the proposed attenuation systems.

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 run off on the Kildare Bridge and the Moyglare Bridge are to be captured by the proposed drainage features proposed as part of the MOOR.

The proposed surface water network is to be split into 4 no. catchments, in order to optimise the network based on the natural topography of the site.

A series of best practice SuDs drainage design controls have been included in the site drainage design to ensure there is no perceptible impact on groundwater flows. These include rainwater harvesting at Sites A and C, Permeable paving and road gullies.

4.3.2.2 Mitigation Measures to Protect Groundwater Quality

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/Blackhall Little Stream. Discharge will be 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/Blackhall Little Stream will be within the green/ landscaped areas of Site A and so there is no significant source of pollution related to these areas.

These standard drainage design controls will ensure the development will not give rise to any significant surface water or groundwater quality impacts at or downstream of the site.

4.3.2.3 Mitigation Measures to Protect Surface Water Quality

Water quality of the surface water, discharging from site, is to be improved with the following provisions:

- Permeable Paving in all private driveways;
- Intensive landscaping, where practical;
- Trapped road gullies on all road carriageways, to trap silt and gross pollutants;
- Traditional gravity pipe and manhole network will be provided, to convey the collected rainfall runoff as far as the development's outfall. Manholes are provided for maintenance access at branched connections, change in pipe size and gradient, and at intervals no greater than 90m distance.
- Silt traps to be provided on manholes immediately upstream of attenuation systems, as a further preventative measure to trap silt and other gross pollutants;
- Surface water attenuation storage in the form of poly-tunnel installation at both Site A and Site C (green spaces) and Site B (car parking area);
- A Class 1 Bypass Fuel/Oil Separator is to be provided as an additional and final mitigation measure, prior to surface water discharge from the Proposed Development sites.

These standard drainage design controls will ensure the development will not give rise to any significant surface water quantity impacts or increased flood risk downstream of the site.

4.3.3 Potential Effects with the Implementation of Mitigation

In all instances, the mitigation measures described in **Section 4.3** are sufficient to meet the WFD Objectives. The assessment of WFD elements for the WFD waterbodies is summarised in **Table I** below.

Table I: Summary of WFD Status for Unmitigated and Mitigated Scenarios

WFD Element	WFD Code	Current Status	Assessed Status – Unmitigated	Assessed Status – with Mitigation Measures
Rye Water_030 SWB	IE_EA_09R010400	Moderate	Poor	Moderate
Rye Water_040 SWB	IE_EA_09R010600	Poor	Poor	Poor
Dublin GWB	IE_EA_G_008	Good	Moderate	Good

5. SUMMARY AND CONCLUSION

5.1 SUMMARY

WFD status for SWBs (Surface Water Bodies) and GWB (Groundwater Body) hydraulically linked to the proposed development site are defined in **Section 2** above.

The surface water connections from the proposed development site to the Rye Water River/Blackhall Little Stream could transfer poor quality surface water that may affect its WFD status. However, as described in **Section 4.2.1.1**, flow volumes in the Rye Water_040 at Louisa Bridge are significantly greater than those recorded in the Rye Water_030 River upstream from the proposed development.

Nevertheless, a series of mitigation measures, designed for the protection of surface and groundwater quality, have been proposed to ensure the protection of receiving waters during the construction and operational phase of the proposed development.

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 Rye Water River Blackhall Little Stream. 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 Rye Water River/Blackhall Little Stream 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 Rye Water River/Blackhall Little Stream. 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 river/stream.

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

In the event where the current status of the waterbody is Poor (i.e. Rye Water_040) the proposed development will not prevent them 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. Therefore, the proposed development is compliant with the requirements of the Water Framework Directive (2000/60/EC) and the Groundwater Directive (2006/118/EC).

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