

16 MATERIAL ASSETS (BUILT SERVICES)

16.1 Introduction

Atkins examined the material assets (built services) serving the subject lands relating to foul sewer, surface water drainage, water supply, gas electricity and broadband.

16.2 Assessment Methodology

The methodology followed for this section is in accordance with the EPA “Revised Guidelines on the Information to be contained in Environmental Impact Statements, Draft September 2015” and “Advice Notes for Preparing Environmental Impact Statements Draft September 2015”. Information on built assets in the vicinity of the development lands was assembled from the following sources:

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- A desktop review of Irish Water Utility Plans, ESB Networks Utility Plans, Gas Networks Ireland Service Plans, Eir E-Maps and Virgin Media Maps.
- Consultation with Irish Water and Fingal County Council.
- Submission of a Pre-Connection Enquiry Application to Irish Water.
- Review of ESB Network Utility Plans.
- Review of EIR Maps.
- Review of Eir Telecommunications maps.
- Site Inspection / Walkover.

As part of assessing the likely impact of the proposed development, surface water runoff, foul drainage discharge and water usage calculations were carried out in accordance with the following guidelines: -

- Greater Dublin Strategic Drainage Study (GSDSDS).
- CIRIA report C753 The SuDS manual.
- IW Code of Practice for Wastewater Infrastructure ‘IW-CDS-5030-03’ Irish Water Code of Practice for Water Infrastructure ‘IW-CDS-5020-03’.

16.3 Receiving Environment

16.3.1 Surface Water Drainage

There are no onsite streams or rivers (EPA, 2018), and none were identified during the two site walkover surveys completed. A drainage ditch is located within the site; however, this was observed to be dry during both site visits (on the 12 June and 18 September 2018). During a storm event rainfall runoff from across the site is likely to drain primarily to this ditch, with some recharge also occurring to ground.

Overland flow will drain primarily in a south easterly and south westerly direction, to the onsite drainage ditch, which appears to then flow in a southerly direction and is assumed to discharge to the Rathmichael River (also known as the Crinken Stream) immediately south of the site. The Rathmichael River then flows in a southerly and south easterly direction prior to discharging to Bray Strand c.1.2km downstream (and south east) of the site. Rainfall (albeit minor volumes) will infiltrate to ground in the more permeable areas of the site, for example in the eastern portion, and likely flows via discrete permeable zones beneath the surface, prior to discharging to the Irish Sea at Shankill beach.

The western half of the housing development site falls from the north west to the south east towards the drainage ditch to the centre of the site. There is a high point of 20m AOD to the north west and a low point of 15 AOD in the south.

The eastern section of the site falls to the south east towards the drainage ditch from a high point of 24m AOD in the north and a low point of 15m AOD in the south.

The area of the proposed relocated, 2no. golf holes is generally flat.

16.3.2 Foul Water Drainage

The subject site is currently greenfield and therefore has no foul loading at present. The existing foul water drainage network in the vicinity of the development lands is included in the Existing Drainage and Water Services Drawings (5154251/HTR/DR/1570-1576) in Appendix 16.1.

Foul water drainage has been installed along the Eastern boundary to the site on a north south axis. This rising main takes foul water from a pumping station at the north of Bray to Shanganagh WWTP. This existing rising main will not be used for the developed site. Further discussion on foul water discharge for the proposed development is discussed in Section 16.4.2.

16.3.3 Water Supply

A plan showing the location of existing watermains in the vicinity of the site is shown on Existing Drainage and Water Services Drawings (5154251/HTR/DR/1570-1576) in Appendix 16.1.

Two watermains are shown running in a north south axis in the western verge of the Dublin Road to the west of the site.

16.3.4 ESB Supply

The Electricity power system will be designed and installed the current ESB guidelines. A plan showing the location of existing electricity power network in the vicinity of the site is shown on Existing ESB Drawings (5154251/HTR/DR/1540-1546) in Appendix 16.1.

Low voltage overhead cables run in a north south axis along the eastern verge of the Dublin road to the west of the site. A medium voltage underground cable crosses the Dublin Road and enters the site immediately south of St James Church. The medium voltage cable runs underground for approximately 20m. It is subsequently converted to over ground cable and is carried on poles in a south eastern direction across the site.

16.3.5 Gas Supply

On the south-east of the proposed phase 1 residential development, the existing 250mm medium pressure gas pipe (4bar) of polyethylene material located on the right side of the railway, crosses the railway lines with a pipework having a diameter of 125mm. The pipework reduces to a 63mm diameter to feed the existing Woodbrook Golf course.

16.3.6 Telecommunications

Eir

A plan showing the location of the existing EIR network in the vicinity of the site is shown on the Existing EIR Drawings (5154251/HTR/DR/1550-1556) in Appendix 16.1.

An EIR cable runs to the east of the Dublin Road to the west of the site. 2no. EIR cables run to the west of the Dublin road. One of these cables crosses the road to the south of the site and continues in a southerly direction along the eastern verge.

Communication Ducts

A plan showing the location of the existing NTL/UPC/Virgin network in the vicinity of the site is shown on the Existing Virgin Drawings (5154251/HTR/DR/1560-1566) in Appendix 16.1.

1no. communication cable run along the western verge of the Dublin road to the west of the site on a north south axis.

16.3.7 Proposed Development

Phase 1 comprises the development of a 21.9 Ha site (gross site area) for the construction of 685no. housing units and creche at Woodbrook. Housing units will comprise a mixture of houses and duplexes. 2no. golf holes belonging to Woodbrook golf course will be relocated to a 6.2 Ha site to the east of the railway line. The development will include all the water, energy and communication services associated with a housing development. A rising main will be constructed which will link foul water discharge from the site into the main foul water system feeding Shanganagh waste water treatment plant.

16.4 Characteristics of the Proposed Development

16.4.1 Surface Water Drainage

Sustainable drainage systems (SuDS) elements have been designed to allow infiltration or reduction of run-off volumes and rates where possible. Please note, the surface water calculations have been undertaken on the assumption of no infiltration however, as supported by the site investigation for the site partial will occur through a number of SuDS systems. Roads and hard-landscaped areas around the site will drain via road gullies, permeable paving, swales and tree pits to drains into underground cellular attenuation systems. Car parking areas will utilise permeable paving with a stone reservoir in car parking bays. These will discharge into the surface water drainage network. Roof water from the housing blocks will be discharged through filter drains in rear gardens and permeable paving in public areas to the surface water drainage network. Green roofs have been designed to apartment blocks, these will discharge into the surface water drainage network.

The surface water strategy for the residential areas will incorporate SuDs features to reduce run-off and provide biodiversity benefits. On curtilage parking will utilise permeable paving which will utilise a porous aggregate reservoir. This has been sized to ensure the roof water from the corresponding dwelling drains via the porous aggregate, providing an additional element of attenuation. Surface water calculations for the development made use of rainfall values for the Dún Laoghaire area as provided by Met Eireann. Rainfall intensities were increased by a factor of 10% to take account of climate change, as required by the Dún Laoghaire- Rathdown County Council's County Development Plan for attenuation storage design. The surface water network, attenuation storage and site levels are designed to accommodate a 100-year storm event and includes climate change provision.

The development will include the construction of a surface water sewer network throughout the lands, which will collect surface water runoff from all hard-standing areas. The surface water management strategy for the proposed development is outlined in Chapter 8: Water. The management of surface water for the proposed development has been designed to comply with the policies and guidelines outlined in the Greater Dublin Strategic Drainage Study (GDSDS), the requirements of Dún Laoghaire-Rathdown County Council Development Plan 2016-2022, Woodbrook / Shanganagh Local Area Plan (LAP) and CIRIA report C753 The SuDS Manual-v6.

Surface water generated from the proposed development will be conveyed through a new surface water network including SuDS and attenuated at Qbar greenfield run-off rates prior to discharge to receiving Crinkeen / Rathmichael stream. The proposed storm drainage network is as indicated on the Proposed Stormwater Layout Drawings (515425/_EWE/DR/ 0500-0507) in Appendix 16.2.

The principles behind the proposed design were discussed and agreed with Dun Laoghaire Rathdown County Council (DLRCC) Municipal Services Department on multiple occasions in advance of making this application and aspects of the proposed development that were discussed at that meeting have been incorporated within this design.

The proposed measures included within the design proposal are as follows: -

- Swales in park areas adjacent to roads.
- Permeable Paving in light traffic areas (parking bays).
- Green Roofs to retail units and suitable apartments blocks.
- Detention basins within the proposed golf course lands
- Underground Modular system within green corridors / park areas.
- Filter Drains in rear gardens if deemed suitable.
- Flow Control devices including vortex and orifice plates.

Drawings 5154251/EW/DR/050-506 in Appendix 16.2 outline the SuDS proposal for the site.

There are 7No. proposed drainage catchment areas within the proposed phase 1 development excluding the proposed golf course for the purpose of site control as outlined on the planning drawings. The SuDs techniques proposed within the development are as outlined below:

- Swales are to be used within the site as conveyance systems for surface water runoff from sections of road. Discharge into the swale will be via drop kerbs / side inlet gully's.
- Permeable paving will be used in light traffic areas to the front of residential units and courtyards. The permeable paving will allow for attenuation, infiltration to ground, reduction of peak flow rates and improved water quality. Roof run-off from the front of residential units will discharge into the sub base below each permeably paving area.
- A green roof will be provided for the creche and suitable apartment block in accordance with Dun Laoghaire Rathdown County Development Plan, 2016 – 2022 and Woodbrook – Shanganagh LAP. The green roof will provide reduced peak flow rates, attenuation, evaporation and improved water quality.
- Underground modular systems will be used within green corridors / park areas. The Modular systems will allow for storm water attenuation underground for storm events up to 1 in 100-year events. The modular systems will also allow for infiltration to ground where suitable.
- Filter Drains within rear gardens of the housing units allowing for infiltration to ground, reduced peak flow rates and improved water quality. Only roof run-off from the rear of each residential unit will discharge into the filter drain.
- Flow control will be used throughout the site to allow for storm water control and reduce peak runoff.

In keeping with the Woodbrook – Shanganagh LAP requirements, run-off will pass through at least one level of treatment where possible using a SuDS component prior to the final levels of treatment in the public realm areas.

The storm water drainage network will be assessed for compliance with the key design parameters as set out in Table 16.1 below.

Parameter	Value/Requirement
Minimum depth	1.2m cover under highways 0.9m elsewhere
Maximum depth	5m
Minimum sewer size for main drainage	225mm
DLRCC Municipal services agreed co-efficient runoff factors for pipe sizing and storage requirements.	100% - Roads / Cycle tracks / Footpaths / Roofs (when discharging directly to storm drainage network) 75% - Roads / Cycle tracks / Footpaths / Roofs when discharging directly swales, tree pits and filter drains 60% - Roads / Cycle tracks / Footpaths / Roofs when discharging directly to permeable paving 85% - Extensive Sedum Green Roof (> 150mm thk.) 70% - Intensive Green Courtyard (landscape courtyard areas with soil > 500mm thk.)
Max. velocity at pipe full	3.0 m/s
Min. velocity in	0.75 m/s (1 m/s used where achievable)
Roughness	0.6mm
Maximum discharge rate	56.34l/s at discharge location
Level of Service - Critical Storm 1 in 2 yr return period	No Surcharge within the pipe network, no flooding
Level of Service - Critical Storm 1 in 30 yr return period	Surcharge allowed, no flooding
Level of Service - Critical Storm 1 in 100 yr return period	No flooding unless planned and contained within proposed detention basins.

Table 16.1: Key Design Parameters

Without recourse to concrete, absolute minimum cover in roads is 0.9m. Pipes with cover between 0.9m and 1.2m shall be bedded and surrounded in concrete, 150mm thick, Class E, in accordance with Clause 1502 of the Specification for Roadworks.

The outlets from the underground attenuation systems will be controlled. The Qbar drainage rate at the final outfall from the proposed development site will be at the greenfield rate and thus there will be no impact on the drainage volumes from the site.

Surface water from the new golf holes will be collected via a network of herringbone drains across the site, discharging into 225Ø storm drains which will feed into the attenuation pond to the south east of the site as shown on Drawing 5154251/EW/DR/0507 in Appendix 16.2.

A vortex flow control device will be installed at the outlet of the final detention basin for the proposed golf course controlling the discharge volumes during a 1:100 year storm event to 9.2 L/S which is directly comparable the current greenfield discharge rates for the area.

16.4.2 Foul Water Drainage

The proposed foul drainage network comprises a series of pipes ranging between 225mm and 375mm diameter discharging into a proposed waste water pumping station located to the southern end of the site. A 250mm diameter rising main will be constructed within the existing Irish Water wayleave to the eastern boundary of the site. The proposed rising main will travel north through the DLRCC Shanganagh park and discharge on a temporary basis into St. Anne's Housing development to the north. Ultimately foul water from the site will be pumped directly to Shanganagh WWTP via a rising main which will be constructed by Irish Water at a future date.

A daily foul discharge volume from the application site of 277m³ has been estimated with a total BOD loading of 105kg/day. Individual houses will be connected to the proposed foul drainage system via individual 100mm pipe connections as per Irish Water, Connections and Developer Services, "Code of Practice for Wastewater Infrastructure". The foul drainage network for the

proposed development has been designed in accordance with the Building Regulations and specifically in accordance with the principles and methods as set out in the Irish Water Code of Practice.

There will be no foul water infrastructure associated with the proposed 2no. relocated golf holes.

16.4.3 Water Supply

The watermain layout and connections, valves, hydrants, meters etc. are designed in accordance with Irish Water's Code of Practice / Standard Details and the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety". An additional average daily domestic water supply requirement for the application site, is estimated at approximately 277m³. This is based on an average occupancy rate of 2.7 PE (population equivalent) per residential unit and a water usage rate of 150l/hd/day and includes provision of 6m³/day for the proposed creche. The new site watermain network will also adequately serve the firefighting requirements of the development.

The new golf holes will be replacing two existing golf holes on site. The existing golf holes are supplied from wells on the existing golf course site and therefore there is no mains water supply requirements for the new holes.

16.4.4 Power

The existing medium voltage electricity cable will be diverted to run along the west and south boundary of the site in an underground duct.

Power supply, and the requirement for any alterations to the existing power supply network for the development of the subject site, will be agreed with ESB Networks in advance of construction. All power supply related works will be carried out in accordance with ESB Networks relevant guidelines. An Electrical Diversified Load of approximately 2.46MW is required which will be split over ESB Unit Substations which will feed dwellings and duplexes via mini pillars, and ESB MV substation which will feed block apartments and landlord areas.

16.4.5 Gas

Gas supply, and the requirement for any alterations to the existing gas supply network for the development of the subject site, will be agreed in advance of construction with Gas Networks Ireland. All gas supply related works will be carried out in accordance with Gas Networks Ireland relevant guidelines. The residential development is split in two phases with a total gas load of 20MW (1870m³/h). Phase one has a load of 12MW whereas phase two has a load of 8.6MW.

As agreed with IGN, the project new gas network will connect from the same point with a medium pressure gas line having a diameter of 125mm. The 125mm diameter pipe will cross the project on the main access road towards old Dublin road. From the main medium pressure gas line, branches with a 90mm diameter will be used to supply the consumer points. A distance of 3mtr needs to be maintained between the medium pressure line and the residential spaces. Where this distance can't be kept a gas regulator will be used to drop the pressure to a low pressure.

16.5 Potential Impact of the Proposed Development

16.5.1 Construction Phase

Potential impacts of the proposed development during the construction phase include:

Surface Water

The installation of the surface water sewers for the development will be conducted in parallel with the other services. This will mainly involve construction of pipes and manholes using trench

excavation. The potential adverse impact of the proposed development on the local piped/culverted during the construction phase of the development would therefore be short term and minimal. Damage to existing underground and over ground infrastructure resulting in possible contamination of the existing systems (including watercourses) with construction related materials. This likely adverse impact would be temporary, regionally short term and moderate.

Foul Water

The installation of the foul sewers for the development will be conducted in parallel with the other services. This will mainly involve construction of pipes and manholes using trench excavation. The potential adverse impact of the proposed development on the local foul sewerage network during the construction phase of the development would therefore be short term and minimal. The site compound will require a foul connection. This likely adverse impact will be temporary and negligible. Improper discharge of foul drainage from contractor's compound. This could contaminate groundwater and nearby watercourses through seepage. The likely adverse impact would be temporary, regionally short term and moderate.

Watermain

Provision of a new water main distribution network would involve construction activities within the subject lands mainly involving trench excavations conducted in parallel with the other services. The potential adverse impact on the local public water supply network would be short term and imperceptible.

There is a risk of contamination of the public water supply during the construction and in particular the connection of the watermain network for the scheme to the public supply. The site compound will require a water connection. This likely adverse impact will be temporary and slight.

Power, Gas & Telecommunications

The installation of the utilities for the development will be conducted in parallel with the other services. This will mainly involve construction of ducting and chambers using trench excavation. Relocation or diversions to existing overhead ESB lines may lead to loss of connectivity to and / or interruption of supply from the electrical grid to the surrounding areas. Potential loss of connection to the Gas Networks Ireland infrastructure could occur, while carrying out works to provide service connections. This likely adverse impact may be characterised as a temporary, regionally short term, moderate impact. Potential loss of connection to the Telecommunications infrastructure while carrying out works to provide service connections could occur. This likely adverse impact, may be characterised as a temporary, regionally short term, moderate impact. The site compound will require a power and telecommunications connection. This likely adverse impact will be temporary and negligible.

16.5.2 Operational Stage

Potential operational phase impacts on the water infrastructure are noted below: -

Surface Water

Adequate capacity exists in the Rathmichael Stream to cater for development of the subject lands, given the fact that the site will be attenuated and the discharge to the aforementioned stream will be limited. Increased impermeable areas will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate – refer to Chapter 8: Water). Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas) may be a risk to surface water, however the use of permeable paving and other SuDS systems will reduce the risk.

Foul Water

The impact of the proposed development on the public foul sewerage system will be to increase the quantity of wastewater discharging to Shanganagh waste water treatment plant. The Irish water "Pre-Connection Enquiry" letter received on 16 July 2018 confirmed that the predicted volumes of foul water which will be generated from the development can be facilitated at Shanganagh WWTP. A pumping station will be constructed at Woodbrook to pump foul water via rising main from the surrounding catchment to Shanganagh WWTW. Prior to the delivery of the rising main from Woodbrook to Shanganagh WWTW, foul water will discharge into the St Anne's Park waste water treatment network via rising main, on an interim arrangement prior to treatment and disposal at Shanganagh. The estimated loading from completion and occupancy of the proposed Phase 1 development site would be approximately 277m³ /day. The development will add to the environmental and financial costs associated with treatment and disposal before final discharge at the Shanganagh WWTP. There also exists a minor risk associated with the possibility of leakage from damaged foul sewers and drains within the development site. Any foul water leakage could result in minor contamination of groundwater in the area. There is a low probability that the pumps may fail, and the emergency storage tank fills up and effluent discharge to the Rathmichael stream. The potential impact from the operational phase of the development addressed fully in the Water Section (5.4) of the EIAR.

Watermains

The impact of the operational phase of the proposed development on the public water supply is likely to be to increase the demand on the existing supply by approximately 277m³ /day. As such additional water quantities would need to be treated and supplied through the existing network to the site. This will require extra cost as well as increasing pressure from the existing source. The potential adverse impact of the proposed development on the public water supply network is likely to be long term and negligible. Irish Water have confirmed the existing network has sufficient capacity to meet this additional demand.

Power, Gas & Telecommunications

The impact of the operational phase of the proposed development on the power supply network would be the requirement for an electrical diversified load of 2.46MW which will be supplied from a dual substation located to the centre of the residential scheme.

The impact of the operational phase of the proposed development on the gas supply would be the requirement for a gas diversified load of 1.65MW to accommodate the development of the lands. The impact of the operational phase of the proposed development on the telecommunications network would be to increase the demand on the existing network.

16.5.3 Do-Nothing Impact

There are no predicted impacts on these material assets should the proposed development not proceed.

16.5.4 Cumulative – Woodbrook

All relevant developments in the immediate environs of the proposed development, which have been approved but are not yet built or operational, have been reviewed as part of this assessment and key developments are summarised below: -

- D14A/0872 – Church of St. James at Crinken. Planning permission granted on 08/06/2015 for a single storey extension to the ministry centre immediately to the east of the site; and,
- D17A/0065 - Woodbrook Campus Ltd. Planning permission granted on 19/12/2017 for a 56no. inpatient specialist hospital 20-30 south east of the site.

There are no predicted cumulative impacts arising from the construction or operational phase.

16.6 Mitigation Measures

16.6.1 Construction Stage

The construction management of the site will take account of the recommendations of the Construction Industry Research and Information Association (CIRIA) guides 'Control of Water Pollution from Construction Sites' and 'Groundwater control - design and practice' to minimise as far as possible the risk of pollution. With regard to groundwater and surface water protection impacts the following mitigation measures are proposed: -

- Fuels, lubricants and hydraulic fluids for equipment used on the construction site, as well as any solvents, oils, and paints will be carefully handled to avoid spillage, properly secured against unauthorised access or vandalism, and provided with spill containment according to best codes of practice.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the proposed development for disposal or re-cycling.
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the proposed development and properly disposed of.
- All site vehicles used will be refuelled in bunded and adequately sealed and covered areas in the construction compound area.
- Strict supervision of contractors will be adhered to in order to ensure that all plant and equipment utilised on-site is in good working condition. Any equipment not meeting the required standard will not be permitted for use within the site. This will minimise the risk of groundwater becoming contaminated through site activity.
- Stripped soils should be stockpiled a minimum distance of 10m from the drainage ditch and should be appropriately covered. A temporary storm water management system should be implemented by the Contractor.
- All groundwater temporarily dewatered during the construction of the attenuation tanks, wastewater pumping station and any deep building foundations will be treated via the installation of a temporary in-situ water treatment system;
 - This system should be designed and sized to ensure that all pumped groundwater water is treated prior to discharge to the existing drainage ditch onsite, which drains to the Rathmichael River.
 - The contractor will be required to provide a site-specific dewatering plan, clearly setting out proposed excavation methodology, estimated dewatering rates, details of proposed treatment system, and discharge location.

The following standard mitigation measures regarding temporary oil / chemical storage and refuelling are proposed: -

- All oil stored on site for construction vehicles will be kept in a locked and bunded area.
- Generators, pumps and similar plant will be placed on drip-trays to prevent contamination.
- All site vehicles used will be refuelled in bunded areas.
- All temporary construction fuel tanks will also be located in a suitably bunded area and all tanks will be double skinned. In addition, oil absorbent materials will be kept on site in close proximity to any fuel storage tanks or bowsers during proposed site development works.
- All deliveries to on-site oil storage tanks will be supervised.
- Records will be kept of delivery dates and volumes.

- Every piece of equipment associated with the storage of fuel on site will be designed and installed to recognised BS codes.
- All valves should be of steel construction and the open and close positions should be clearly marked.
- The following standard mitigation measures regarding cement handling during construction are proposed: -
 - No mixing of concrete will be carried out on site. The measures detailed below will be employed where poured concrete is being used in the construction process.
 - The production, transport and placement of all cementitious materials will be strictly planned and supervised. Site batching/production of concrete will not be carried out on site and therefore these aspects will not pose a risk to the waterbodies present, namely any temporarily exposed groundwater, or to the onsite drainage ditch or Rathmichael River.
 - Shutters will be designed to prevent failure. Grout loss will be prevented from shuttered pours by ensuring that all joints between panels achieve a close fit or that they are sealed.
 - Any spillages will be cleaned up and disposed of correctly.
 - Where concrete is to be placed by means of a skip, the opening gate of the delivery chute will be securely fastened to prevent accidental opening.
 - Where possible, concrete skips, pumps and machine buckets will be prevented from slewing over water when placing concrete.
 - Surplus concrete will be returned to batch plant after completion of a pour.

The above mitigation measures will form part of the Outline Construction Environmental Management Plan (CEMP) submitted as part of this planning application, and which will be further developed by the Contractor within the project-specific Detailed CEMP which will be in operation during the construction phase.

In order to reduce the risk of defective or leaking sewers, all new sewers should be laid in accordance with Irish Water standards, pressure tested and CCTV surveyed to ascertain any possible defects. The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply.

Foul drainage discharge from the construction compound will be removed off site to a licensed facility until a connection to the public foul drainage network has been established.

The construction compound's potable water supply shall be protected from contamination by any construction activities or materials. Where possible backup network supply to any services will be provided should the need for relocation or diversion or existing services be required otherwise relocation or diversion works will be planned to incur minimal impact, with users notified in advance of any works.

Connections to the existing gas and telecommunications networks will be coordinated with the relevant utility provider and carried out by approved contractors.

16.6.2 Operational Stage

All new drainage lines (foul and surface water) will be pressure tested and will be subject to a CCTV survey to identify any possible defects prior to being made operational.

All surface water will be attenuated in modular underground systems. Controlled discharge will ensure that discharge rates to the Rathmichael River are no greater than the greenfield rate. The network has been designed to cater for further phases that will be subject to agreement with the planning authority.

Water conservation methods such as the use of low flush toilets and low flow taps should be incorporated into dwellings to reduce water volumes and related treatment and abstraction costs of the development. Similarly, water conservation methods would reduce the loading on the foul sewer network and the treatment works at Shanganagh WWTP. The foul water network & pumping station will be constructed in accordance with Irish Water Code of Practice and Standard Details. The pumping station has been designed for the interim solution volume of 24 hours emergency storage for 685no. units.

On completion of the construction phase no further mitigation measures are proposed in relation to the electrical, gas and telecommunications infrastructure.

16.7 Monitoring

Refer to Chapter 8: Water and Chapter 6: Biodiversity for the proposed monitoring in relation to the surface water during the construction phase. There is no specific monitoring proposed in relation to the remaining material assets infrastructure during the construction phase. Proposed monitoring during the operational phase in relation to the water infrastructure include the following: -

- All drainage works will be approved by Dún Laoghaire Rathdown County Council, Sanitary Services Division, and will be carried out in accordance with the GDR COP (Greater Dublin Regional Code of Practice for Drainage Works).
- The surface water and foul drainage systems will be monitored by way of observation of any flooding events if such occur and the establishment of a proper maintenance programme for all sewers / SuDS features etc.
- Regular cleaning of pipe networks within the development taken in charge will ensure no blockage will obstruct any flow from surface and foul networks.
- On-going water usage within the proposed development will be monitored by bulk water meters.
- Water usage will be monitored by the relevant authority to avoid waste and leaks etc.
- Surface drainage works will be approved by Dún Laoghaire Rathdown County Council and will be carried out in accordance with the GDR COP (Greater Dublin Regional Code of Practice for Drainage Works).
- Surface water sewers will be CCTV surveyed prior to being 'taken in charge' by Dún Laoghaire Rathdown County Council.
- Foul drainage works will be approved by Irish Water and will be carried out in accordance the Irish Water Code of Practice.
- Foul water sewers will be CCTV surveyed prior to being 'taken in charge' by Irish Water.
- The Foul Pumping Station will be 'taken in charge' by Irish Water prior to receiving any foul effluent from the development.

16.8 Residual Impact of the Proposed Development

16.8.1 Construction Phase

Implementation of the measures outlined in Section 16.6 will ensure that the potential impacts of the proposed development on the sites material assets do not occur during the construction phase.

16.8.2 Operational Phase

The surface water discharge from the site will be retained at greenfield runoff rates. The overall volume of foul water discharging to the Shanganagh WWTP for treatment and disposal will increase due to the development of the lands. The volume of potable water for treatment and use will increase due to the development of the lands. The demand on power supply, gas supply and telecommunications supply will all increase due to the development of the lands.

Residual impacts will be permanent and imperceptible.