16.0 SITE SERVICES: MATERIAL ASSETS-SITE SERVICES (CIVILS)

This chapter provides; a description of the project associated with the material assets, specifically in connection with the site services, drainage and water supply. A statement of the likely significant impacts associated with both the construction and operation phases of the development have been presented in this chapter including relevant mitigation and monitoring measures. The potential impacts due to the proposed development, if any, are assessed in terms of the following:

- Potable Water Supply Infrastructure;
- Foul Water Drainage Infrastructure;
- Storm Water Drainage Infrastructure.

It should be noted that the impact from and on the surface water infrastructure is detailed in Chapter 10, Water-Hydrology.

A 'do nothing' scenario has also been considered. Mitigation measures are proposed in the form of avoidance, prevention, reduction, offsetting, and reinstatement or remedial measures and recommendations for monitoring are included where appropriate. Predicted residual effects are also described. Assessments for the site services, drainage and water supply, are detailed in this Chapter with relevant technical information included in the Engineering Service Report (ESR), a standalone document submitted with the application.

This chapter has been prepared by Mark Killian, Associate with O'Connor Sutton Cronin Multidisciplinary Consulting Engineers with over 14 years' experience (MSc, Chartered Engineer, CEng MIEI).

16.1 Proposed Development Description

The development, which will have a Gross Floor Area of 49,342 sq m will principally consist of: the demolition of the existing structures on site and the provision of a Build-to-Rent residential development comprising 564 No. apartments (46 No. studio apartments, 205 No. one bed apartments, 295 No. two bed apartments and 18 No. three bed apartments) in 6 No. blocks as follows: Block A (144 No. apartments) is part 10 to part 11 No. storeys over basement; Block B (68 No. apartments) is 8 No. storeys over basement; Block C (33 No. apartments) is 5 No. storeys over lower ground; Block D (103 No. apartments) is part 16 to part 17 No. storeys over lower ground; Block E (48 No. apartments) is 10 No. storeys over semi-basement; and Block F (168 No. apartments) is 14 No. storeys over semi basement.

The development provides resident amenity spaces (1,095 sq m) in Blocks A, C and D including concierge, gymnasium, lounges, games room and a panoramic function room at Roof Level of Block D; a creche (354 sq m); café (141 sq m); a pedestrian thoroughfare from Carmanhall Road to Blackthorn Drive also connecting into the boulevard at Rockbrook to the west; principal vehicular access off Carmanhall Road with servicing and bicycle access also provided off Blackthorn Drive; 285 No. car parking spaces (254 No. at basement level and 31 No. at ground level); 21 No. motorcycle spaces; set-down areas; bicycle parking; bin storage; boundary treatments; hard and soft landscaping; lighting; plant; ESB substations and switchrooms; sedum roofs; and all other associated site works above and below ground.

The site is currently an open yard in the northern and central section with an industrial/commercial building located in the southern section. The southern section is more elevated than the central and northern sections with a ramp located along the eastern boundary linking the areas. The site has a shallow fall from Carmanhall Road to Blackthorn Drive of approximately 4.0m.

16.2 Receiving Environment

The site is situated within the Sandyford Business District which is in the jurisdiction of Dún Laoghaire Rathdown County Council (DLRCC) approximately 5.0km south east of Dublin City Centre. This section identifies the drainage and water supply services within the vicinity of the development, which could be impacted.

16.2.1 Topography & Setting

The regional topography of Dublin City is generally flat being on a low lying coastal plain, and the flood plain of the River Liffey. The regional highpoints are the Dublin Mountains (elev. 540 meters above Ordnance Datum (mOD)) located circa 5.0km to the south of the city and the hills to the north-west (elev. 230mOD).

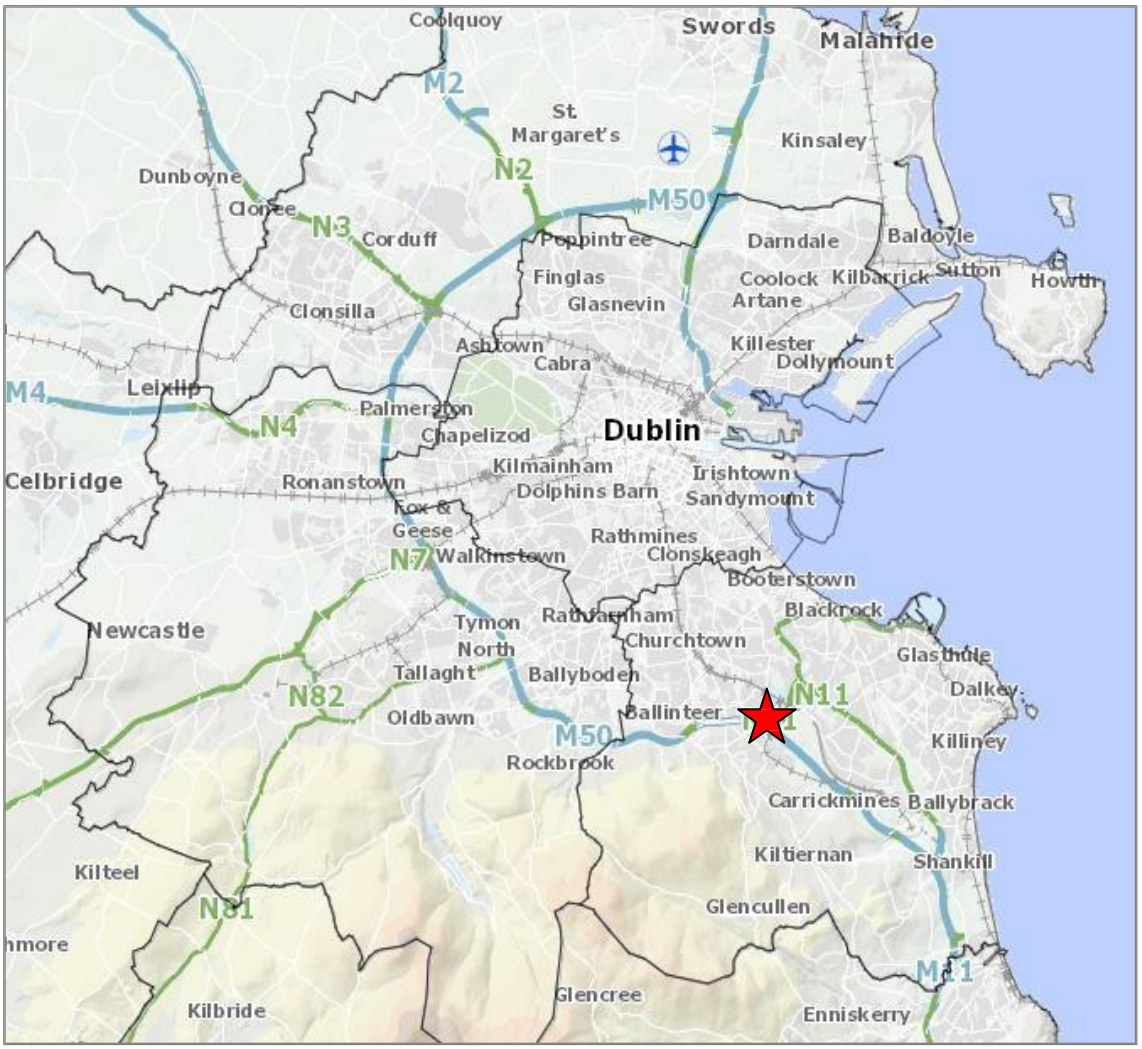

Figure 16.1: Site Location.

Source: Geohive-Website

The site is in Dún Laoghaire Rathdown County Council (DLRCC) which is relatively flat coastal area with a rise of 160mAOD at the Sandyford Business District approximately 5.0km from the Sea. The administrate area is a highly urbanised area with underlying granite rock strata overlaid with Dublin Boulder Clay at varying depth.

The subject site comprises approximately 1.54 hectares. The site is bounded to the northwest by an existing apartment block and remaining vacant parcel of land that was recently granted permission by An Bord Pleanála for a mixed use scheme (Reg. Ref: ABP 304405-19). The north of the site is bounded by Blackthorn Drive, the east by commercial developments zoned for "mixed use inner core" and the southwest by Carmanhall Road.

The site has a shallow fall from Carmanhall Road to Blackthorn Drive of approximately 4.0m. A detailed topographical survey has been carried out for the site and has informed the EIAR and design. The site topography is generally level with an existing concrete slab from a previous warehouse building at a level of approx. 81.3m.

As shown on Figure 16.3, the site's immediate surrounding area is mixed use in nature. The site is located on the junction of Saint Raphaela's Road and Blackthorn Drive in Sandyford, Dublin 18. The site is bounded to the west, south and east by mixed use, commercial and residential buildings, which form park of the Business Park. The site is bounded the north by Blackthorn Drive and the Luas Green Line and residential properties beyond. The Stillorgan Reservoir is located to the north east of the site beyond Blackthorn Drive. Refer to Figure 16.3 for an aerial photograph of the site.

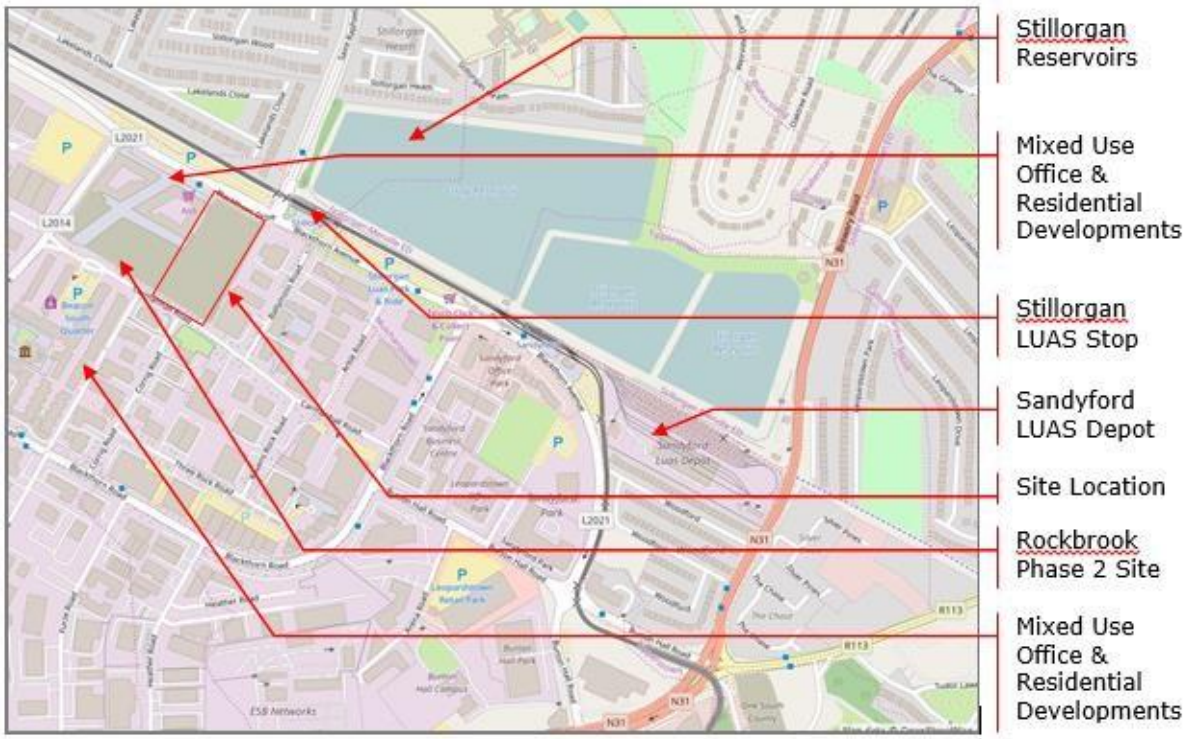

Figure 16.2: Site Context.
Source: Bing Maps.

The site is bounded to the west by Rockbrook Phase 1, a mixed use residential development including a retail unit, Aldi and the Rockbrook Phase 2 site. A Strategic Housing Development (SHD) application has recently been granted by An Bord Pleanála (Reg. Ref ABP-304405-149) for a mixed use scheme.

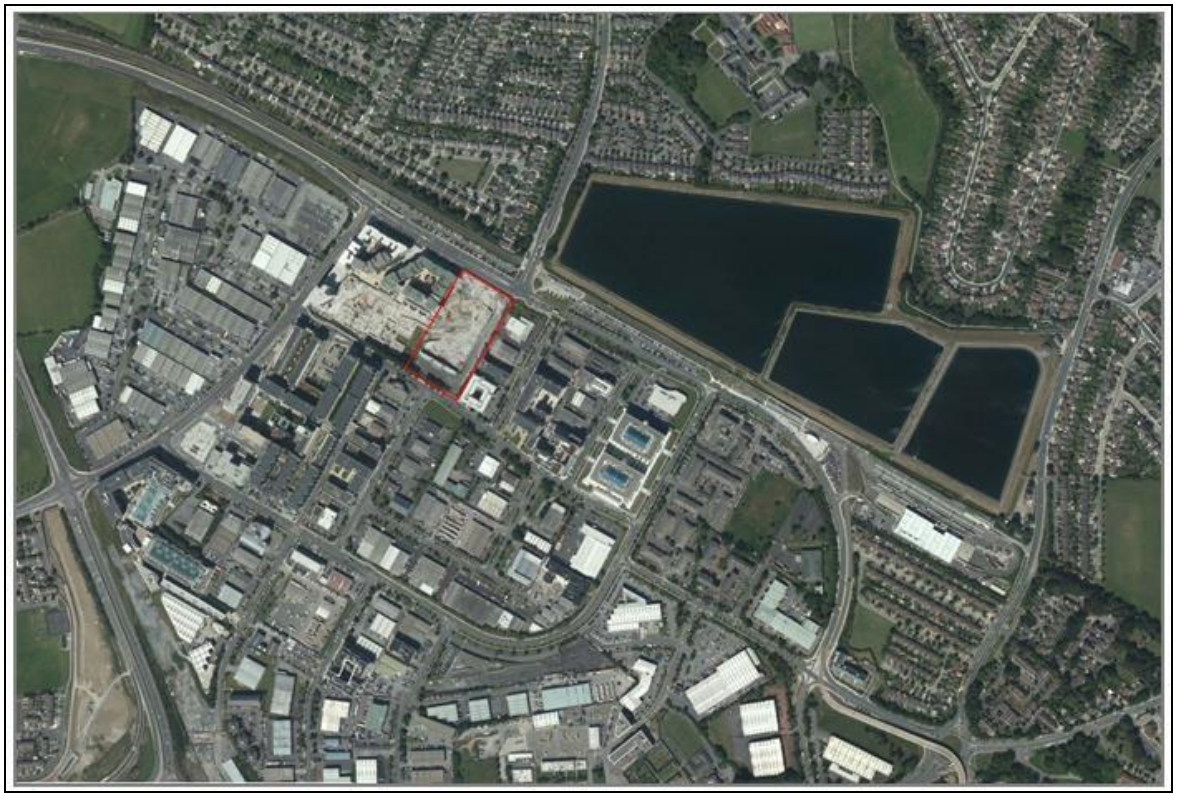

Figure 16.3: Aerial Image of Site.

Source: Bing Maps.

16.2.2 Regional Infrastructure

Potable Water Supply

The regional potable water supply of Dublin City is supplied by the Vartry River at Roundwood in Country Wicklow and supplemented by the Liffey at Ballymore Eustace in Kildare and the Dodder at Ballyboden in South Dublin. The Vartry River supplies water via a 44.0km trunk tunnel to the Stillorgan Reservoir adjacent the site, 100m from the north east corner of the site on Blackthorn Drive. The Stillorgan Reservoir delivers water to 200,000 people in the Dún Laoghaire Rathdown and South Dublin area. The storage requirements are estimated at 160 million litres or approximately 36 hours of future projected short to medium term demand growth (2031). The Stillorgan Reservoir provides 3 No. open water reservoirs and associated buildings as shown in Figure 16.3 above.

Foul Water

The site drains to the Ringsend WwTP via the Dún Laoghaire West Pier – West foul water catchment. Dublin Bay is a high amenity area governed by the Dublin Bay Water Quality Management Plan and the Bathing Water Regulations 1996. Dublin bay is an area of high national and international significance and is designated as a Natural Heritage Area (NHA) and includes The Bull Island SPA, The Dublin SAC, The South Dublin Bay SAC and The South Dublin Bay and Tolka Estuary SPA. There are 4 No. bathing waters in Dublin Bay

designated under EU Directive 2006/7/EC and Bathing Water Quality Regulations, SI No. 79 of 2008 at Dollymount, Sandymount and Merrion Strands and Seapoint in the Dún Laoghaire-Rathdown County Council.

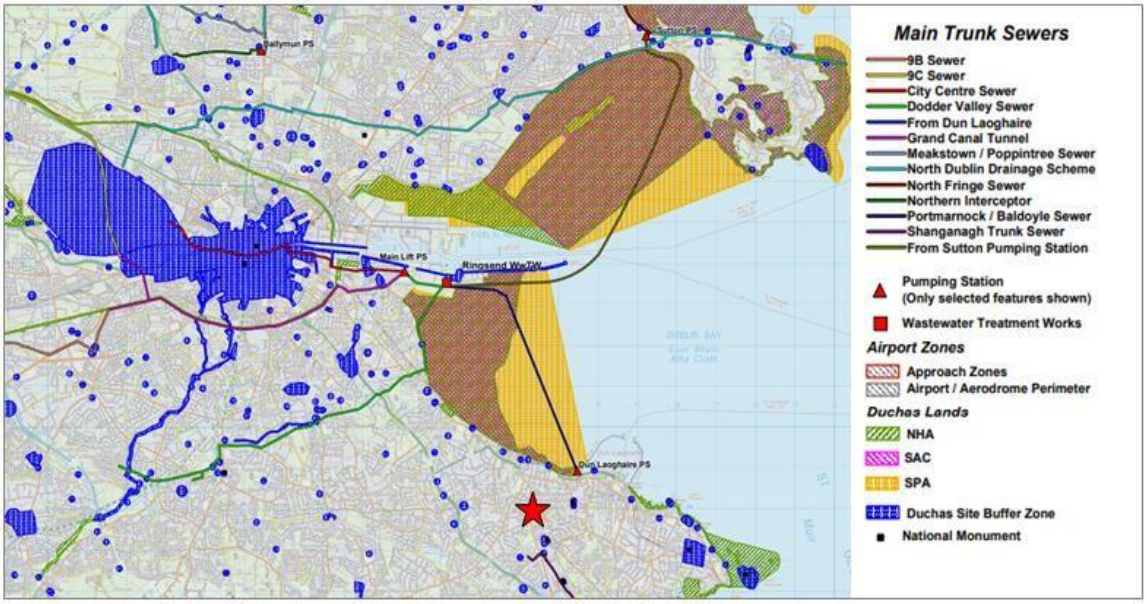

Figure 16.4: Foul Catchments to Ringsend WwTP.

Source: GDSDS Website.

The wastewater network for Dublin City and the greater area is served by the Ringsend WwTP for treatment prior to discharge to Sea. Ringsend WwTP has an annual average influent load of 1.8 million PE for the greater Dublin Region. The Ringsend WwTP has a current capacity of 2.4 million PE based on 2040 catchment projections.

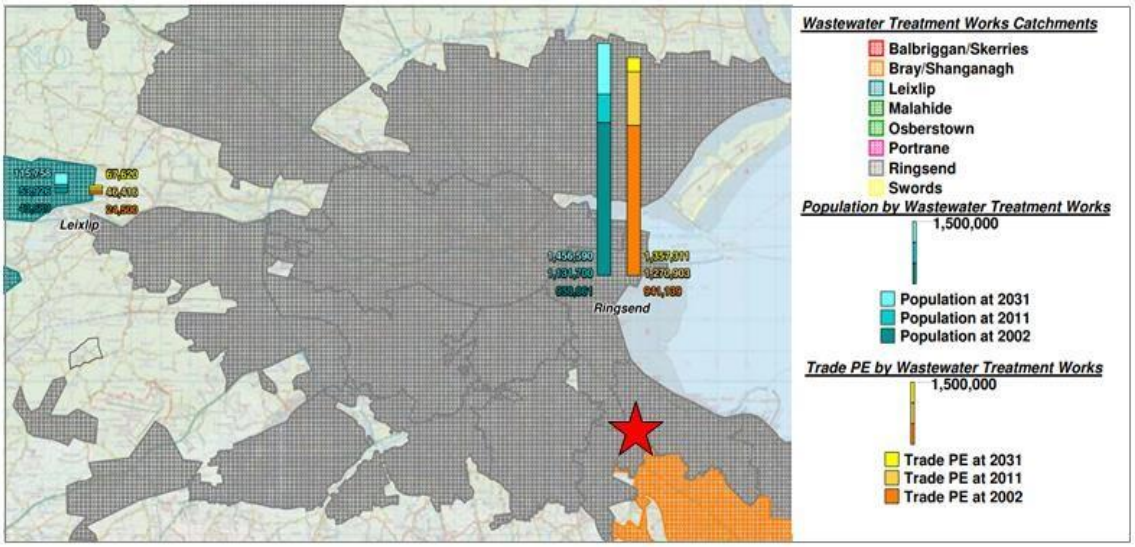

Figure 16.5: Population and Trade PE Ringsend WwTP.

Source: GDSDS Website.

Surface Water

Dublin City and the Greater Dublin Area Drainage network is made up of several local authorities, which are:

- Dublin City Council, the lead Client Council;
- South Dublin County Council;
- Dún Laoghaire County Council;
- Fingal County Council;
- Kildare County Council;
- Meath County Council,
- Wicklow County Council.

The boundaries of the Study and the seven Client Councils are shown in Figure 16.6. Stormwater drainage systems are sparse in the established urban areas including the City Centre, Docklands and Dún Laoghaire, which are served by foul/combined or partially separate sewerage. Most stormwater systems have been constructed as part of the separate systems serving post 1960's developments.

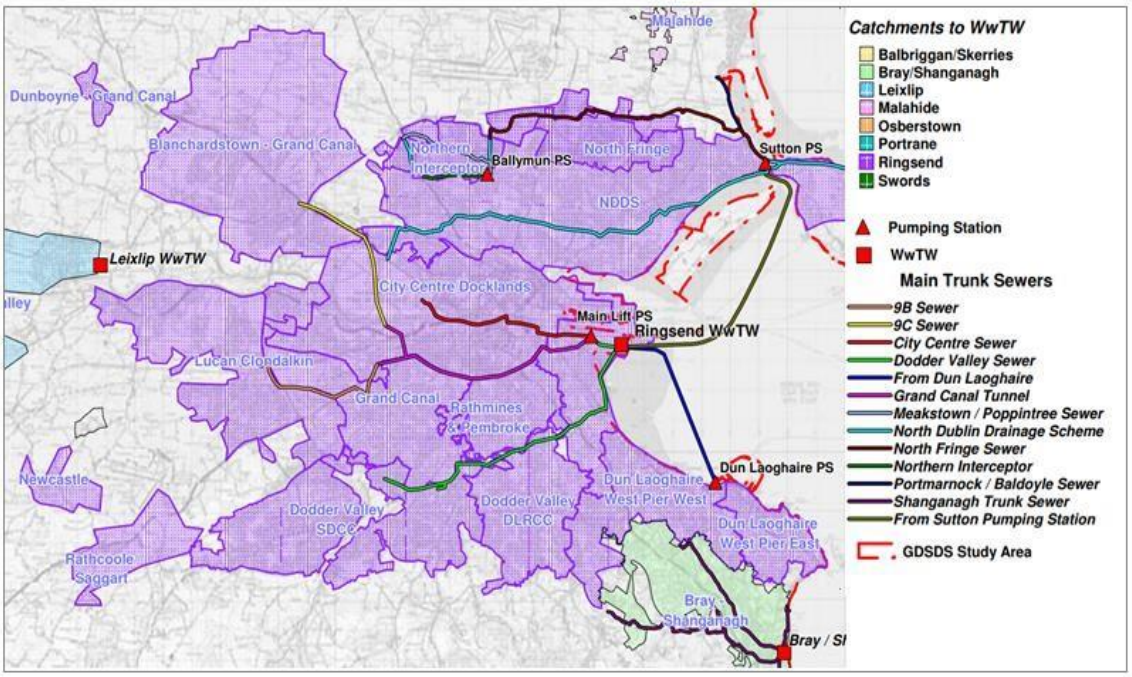

Figure 16.6: Dublin City Foul Catchment Plan.

Source: GDSDS Website.

The site is located within the Dún Laoghaire Rathdown County Council local authority. Dún Laoghaire Rathdown County Council is responsible for the operation and maintenance of both surface water sewer networks within the county. The network flows in a south and northern direction through Sandyford, Stillorgan, and Blackrock before discharging to Dublin Bay at Blackrock east of Dún Laoghaire West Pier Wall.

The regional hydrogeology for the region is the Dublin City and this is covered in depth in Chapter 10 – Water-Hydrology (Section 10.2.5).

16.3 Describing Baseline Information

16.3.1 Local Infrastructure

Potable Water Supply

There is significant existing infrastructure throughout the area, which served the buildings demolished on site. There is an existing 450mm AC main public water network on Carmanhall Road and an existing 6' asbestos watermain which traverses the site and connects to the existing watermain on Blackthorn Drive.

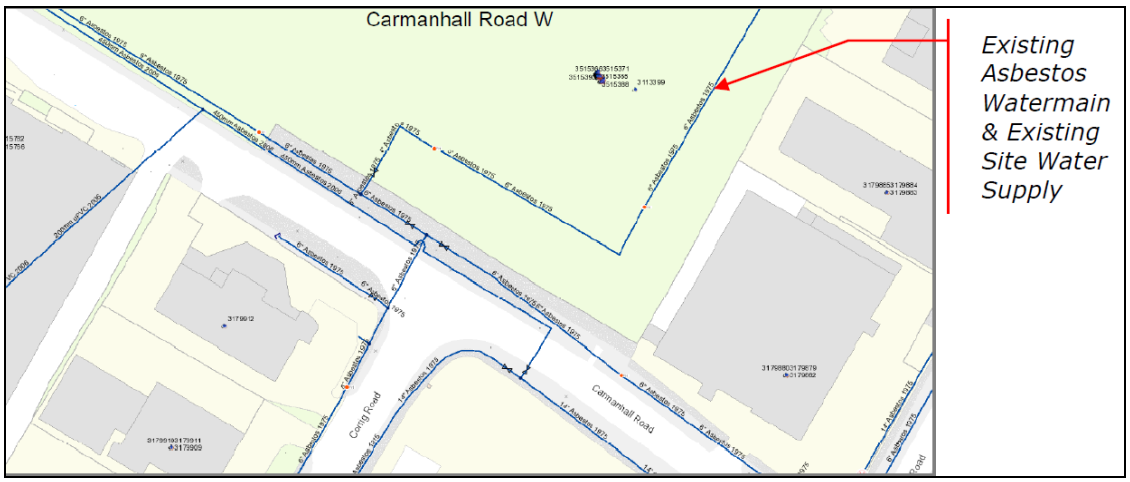

Figure 16.7: Existing Potable Water Supply on Carmenhall Road.

Source: Irish Water Drainage Records.

The local flood risk areas have been identified and are discussed in detail in the Site Specific Flood Risk Assessment (SSFRA) which is submitted as a standalone document. In summary, the available data shows that the site is at negligible risk from Stillorgan Reservoirs and existing watermain infrastructure.

Foul Water

The site is located in the Dún Laoghaire West Pier – West foul water catchment which is approximately 10Km south east of Dublin City Centre. The catchment is a highly urbanised area comprising of the Sandyford, Stillorgan, Monkstown, Blackrock, Dún Laoghaire, Glasthule, Dalkey and Sallynoggin suburban areas. The foul drainage infrastructure drains by gravity to a pumping station at the Dún Laoghaire Harbour West Pier. The foul water is pumped 150m across Dublin Bay from Dún Laoghaire West Pier pumping station to Ringsend WwTP. The network in the catchment is limited in separate storm catchment and is partially combined.

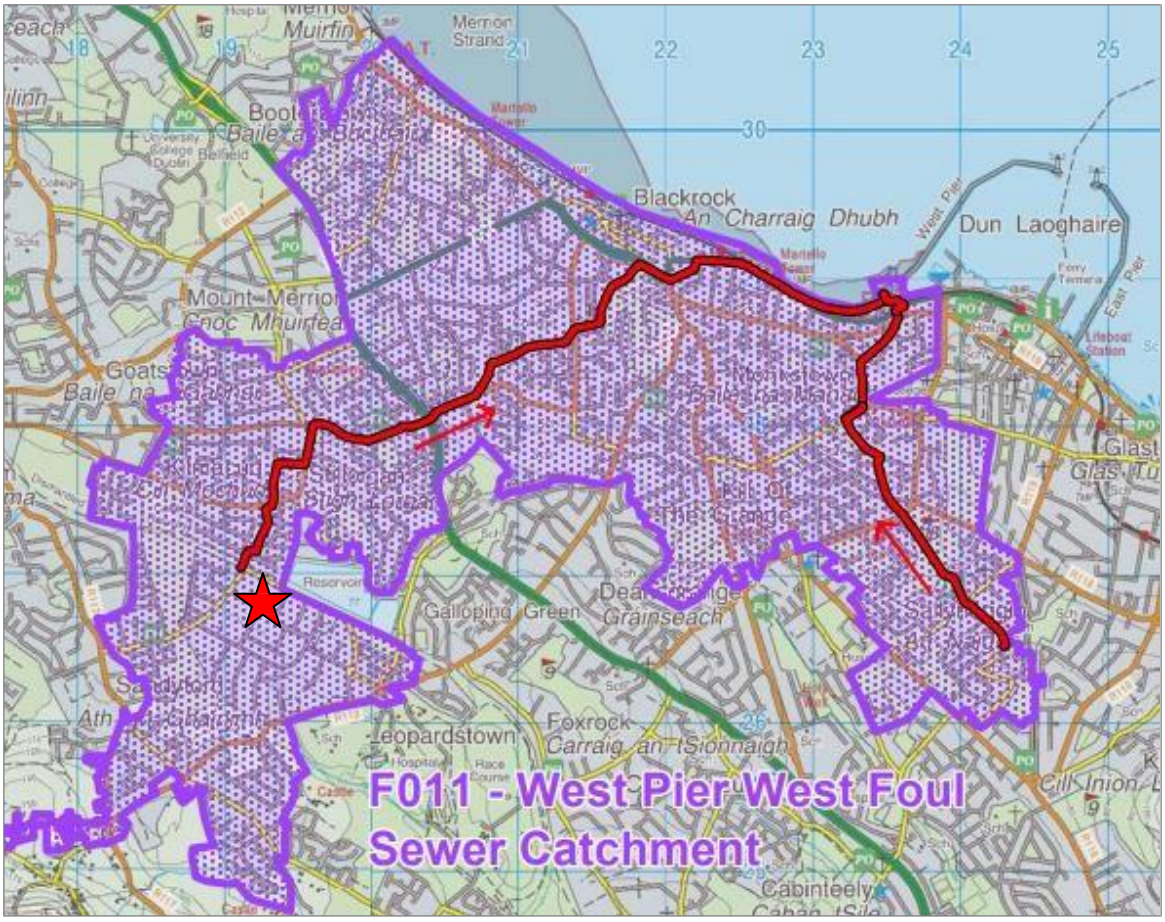

Figure 16.8: Dún Laoghaire West Pier – West Foul Catchment.

Source: GDSDS Website.

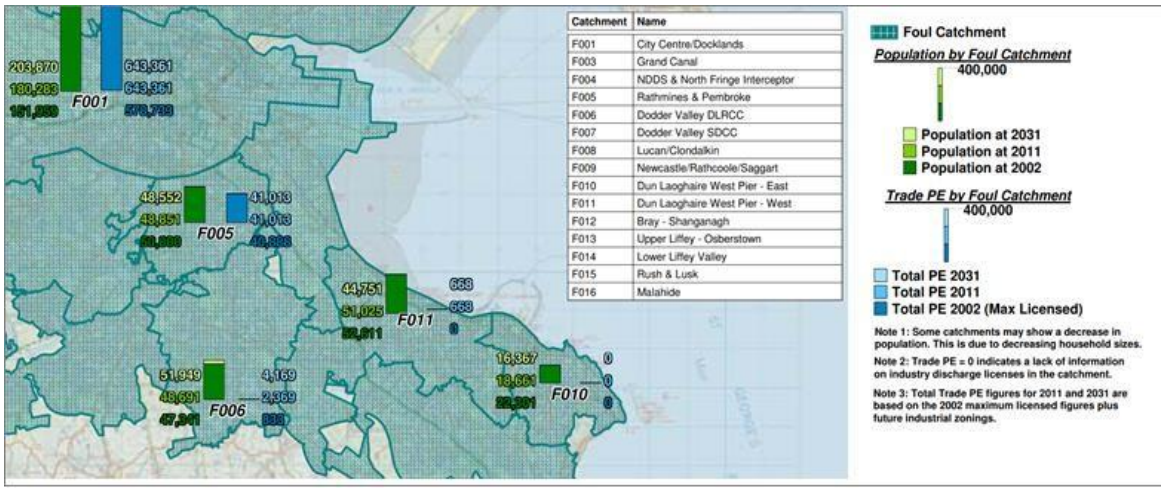

Figure 16.9: Population and Trade PE Dún Laoghaire West Pier – West.

Source: GDSDS Website.

The existing site is drained at the north of the site via 150mm connection to the 525mm public foul water network on Blackthorn Drive. It is proposed to reuse this connection from the site and or complete upgrade works and discharge to the public 525mm

concrete sewer in Blackthorn Drive.

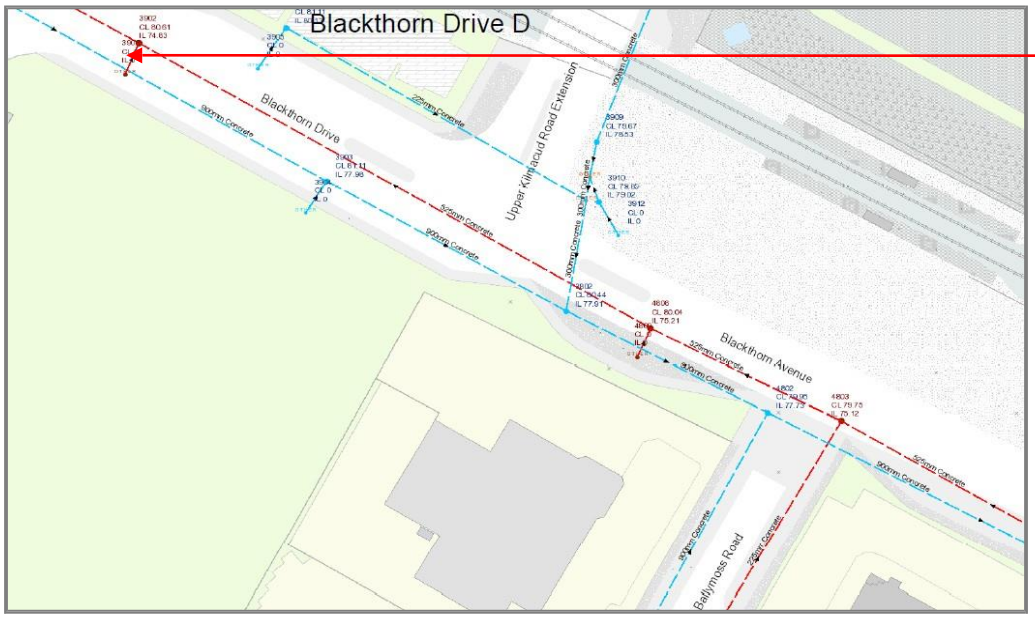

Figure 16.10: Drainage Infrastructure Blackthorn Drive.

Source: Irish Water Drainage Records.

Surface Water

The existing site is brownfield covered with 100% hardstanding. The exiting site is drained at the north of the site via 300mm connection to the 900mm public surface water network on Blackthorn Drive. This sewer drains to Carysfort Maretimo Stream, which is located approx. 880m east of the site at Brewery Road before traveling north towards Blackrock. The drainage network flows in a south and northern direction through Sandyford, Stillorgan, and Blackrock before discharging to Dublin Bay at Blackrock east of Dún Laoghaire West Pier

Wall.

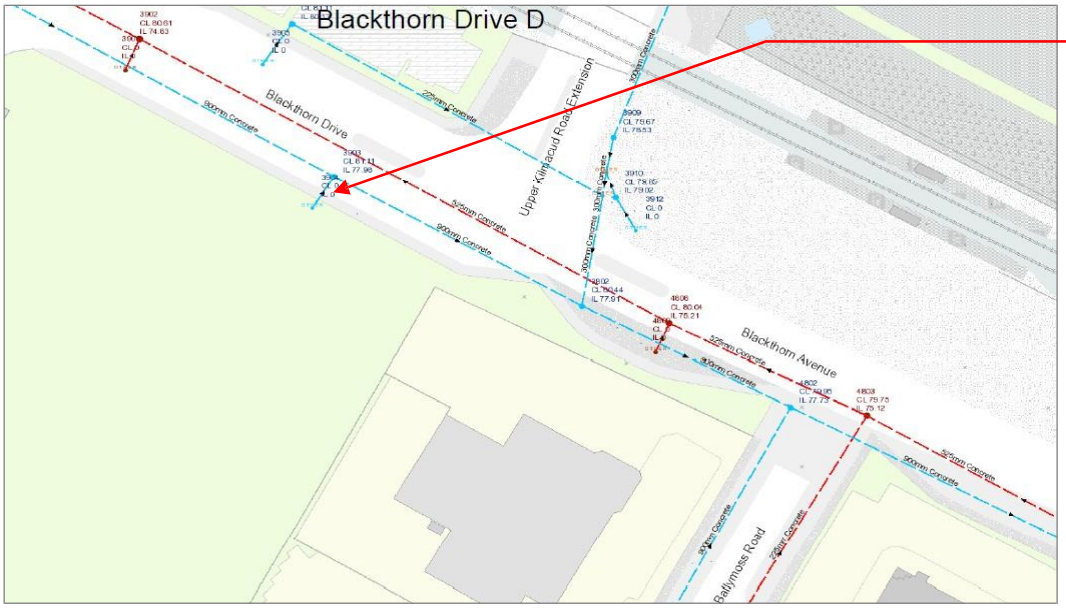

Figure 16.11: Drainage Infrastructure Blackthorn Drive.

Source: Irish Water Drainage Records.

The local hydrogeology for the region is the Dublin City and this is covered in depth in Chapter 10 – Water-Hydrology (Section 10.2.5).

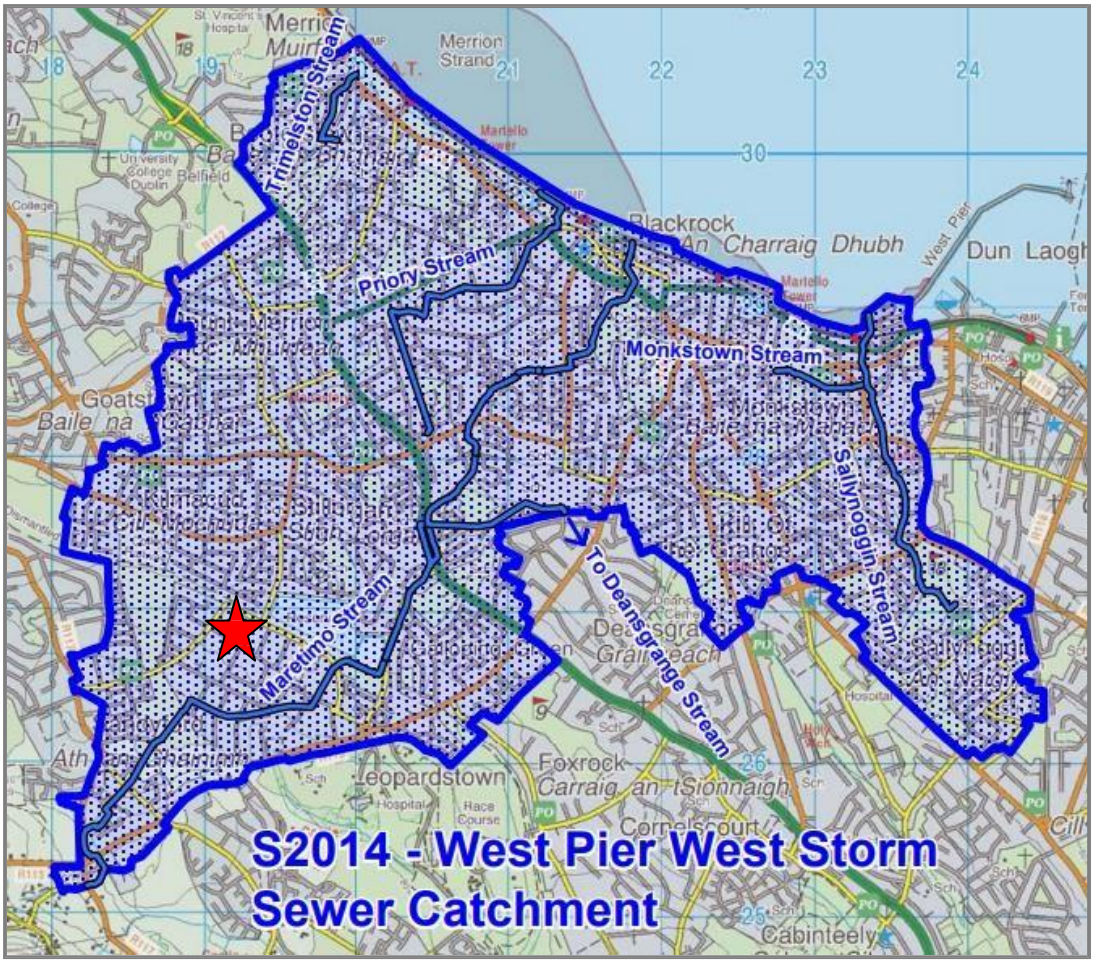

Figure 16.12: Storm Water Catchment / Maretimo Stream Route.

Source: GDSDS Mapping.

The local flood risk areas have been identified and are discussed in detail in the Site Specific Flood Risk Assessment (SSFRA). The available data indicates that the site is within flood Zone B for fluvial and tidal flooding in accordance with The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009.

In summary, available data shows fluvial flooding on Blackthorn Drive, Corrig Road and parts of Carmanhall Road close to the site for the 0.1% AEP event. This flooding relates to the surcharging of the drainage network as a result of inundation of overland flows upstream from the culverted Crayfort Martimo Stream. The Eastern CFRAMs Study HA09 Hydraulic Report describes this flooding as "low level flooding with depths of 100mm or less, as such it is unlikely that properties will be inundated".

16.2 Potential Impacts

There are a number of elements associated with both the construction and operation of the proposed development which have the potential to impact on the environment with respect to site services drainage and water supply. The activities associated with the project which have the potential for impact are detailed in Table 16.1.

Phase	Activity	Description
Construction	Decommissioning of existing services	The removal of existing buried in ground services will require the removal of existing natural and man-made ground.
	Earthworks: Excavation of Superficial Deposits	Minor removal of material to allow formation of subsurface structures including a basement and associated services. Volume of fill likely required. Excavated and stripped soil can be disturbed by site vehicles during the construction.
	Diversion of Existing Potable Water	The proposed water main diversion and associated water supply connection will require the existing watermain to be taken off line while disconnections and re-connection take place.
	Surface Water & Ground Water Management	Dewatering may be required to excavate the basement and to maintain dry working conditions in the excavation (for rainfall only). Pumped water will require discharge offsite.
	Construction of sub-surface structures	Construction of the single storey basement within the superficial deposits to an elevation of c.81.omOD. As this will be founded entirely within the Boulder Clay there will be no impediment to groundwater flow which is within the bedrock.
	Surface Water & Ground Water Management	Dewatering may be required to excavate the basement and to maintain dry working conditions in the excavation (for rainfall only). Pumped water will require discharge offsite.
	Foul Sewer & Surface Water Outfall Connection upgrades	Upgrade connections for the discharge of foul and surface water drainage may be required although it is not proposed.
	Potable Water Connections	Proposed new connections to public potable supply network.
Construction and operation	Storage & Disposal of Hazardous Materials	Fuel and chemical storage during the operation phase, during maintenance works and construction phase.
	Vehicle Movements	Movement of construction vehicles, machinery on site and deliveries during construction phase. General vehicle access to service development, residential car parks, low traffic roads including commercial maintenance vehicle and deliveries.
	Infilling	A degree of fill will be required during the works which will include

Phase	Activity	Description
		the importation of concrete and stone. Construction materials which contain recycled/recovered content should be considered as part of the procurement stage.
	Cleaning Activities	Washing vehicles, windows, bins or pressure Washing which wash into the drainage system.
Operation /unplanned events	Potable Water Demand	Increase in the demand of water resources.
	Foul Water Discharges	Increase in waste water discharge rates to pumping station and WwTP.
	Surface Water	There will be a decrease in the surface water run-off rates.
	Landscaping	Maintenance of landscaped areas such as gardens, parks, Recreation areas.
	Road Maintenance	De-icing / gritting activities.
	Storage & Disposal of Hazardous Material	No fuel oil storage required for operational phase. All heating will be provided by natural gas systems.

Table 16.1: Site Activities Summary

As outlined in Table 16.1 the Construction Phase holds the highest number of activities which could potentially impact on the geological environment. These activities primarily pertain to the excavation and infilling activities required to construct the basement car park and laid new buried drainage runs. The operational phase of the project has few activities which would constitute a risk to the hydrology, water and or hydrogeological environment.

A critical element of the risk assessment process is the establishment of a Conceptual Site Model (CSM) for the site. A CSM describes the potential sources of contamination at a site, the migration pathways it may follow and the receptors it could impact. If complete source- pathway-receptor scenarios exist then there is a potential pollutant linkage that needs to be characterised and assessed (via formal risk assessment). All three elements need to be present for a viable risk to exist (e.g. if a source and receptor exist but no pathway is present then there is no pollutant linkage and hence no risk). A completed CSM is attached in **Appendix 16.1** of this chapter.

Sources

There have been no potential contamination sources identified on site currently;

- The potential contamination sources identified on site are historical uses of the site which may have included fuel storage tanks, imported made ground, chemical use on site, and historic car parking on-site;
- There will be some small source of potential contamination present on site during the construction phase (e.g. machinery oils, fuel, cement etc.);
- Run-off from construction sites can contain minor levels of pollutants (e.g. mineral oils) and high concentrations of suspended solids;
- There will be no significant sources of potential contamination present on site during

the operational phase of the development.

Receptors

- The bedrock aquifer constitutes a potential receptor;
- The surrounding surface water bodies constitute a receptor;
- The surrounding land, soils and geology constitute a receptor.

Pathways

- Migration of contaminants from surface spills to land, soils, geology, groundwater or surface water constitutes a potential pathway;
- Migration of contaminated run-off (e.g. during construction phase or operational phase) to groundwater, surface water or surrounding geology constitutes a potential pathway.

Potential Pollutant Linkages

An environmental risk is only present when a pathway links a source with a receptor. The potential pollutant linkage CSM is summarised in Table 16.2:

Source	Pathway	Receptor	Potential Pollutant Linkage (Y/N)	Discussion
Deleterious materials stored on site during construction	Migration of surface spills/ contaminated run-off	Surrounding Land/Soils or Groundwater in the bedrock aquifer	N	All materials stored on site will be subject to strict control measures and local containment measures (e.g. bunded tanks and pallets. The bedrock aquifer will be protected by the thick depth of clay which is in place and will remain in place post construction.
Contaminated run-off from construction activities			N	Generation of contaminated run-off will be reduced through the Construction Management Plan and control measures implemented during the construction phase. The bedrock aquifer will be protected by the thick depth of clay which is in place and will remain in place post construction including beneath the single level basement.

Source	Pathway	Receptor	Potential Pollutant Linkage (Y/N)	Discussion
Deleterious materials stored on site during construction	Migration of surface spills/ contaminated run-off	Potential surface watercourses	N	All materials stored on site will be subject to strict control measures and local containment measures (e.g. bunded tanks and pallets. Appropriate set back and protection measures to be implemented to ensure no direct discharge to river except where regulated under a Discharge Licence from the Regulating Authority.
Contaminated run-off from construction activities			N	Generation of contaminated run-off will be reduced through the Construction Management Plan and control measures implemented during the construction phase. Appropriate set back and protection measures to be implemented to ensure no direct discharge to river except where regulated under a Discharge Licence from the Regulating Authority.
Illegal disposal of chemicals and oil Cleaning activities Leaks and spillages (eg from vehicles)	Migration of Deleterious materials/contaminated run-off	Surrounding Land/Soils or Groundwater in the bedrock aquifer. Potential surface watercourses	N	The drainage system for this development will contain a range of SuDs treatment methods for surface water including green roofs, permeable paving, biorention, swales, filter drains and treatment via open graded crush rock

Source	Pathway	Receptor	Potential Pollutant Linkage (Y/N)	Discussion
Litter/animal faeces Vegetation/ landscape maintenance Soil erosion De-icing activities Vehicle Deposit Exhausts & Pollutants				(OGCR) below all SUDs measures preventing materials/contaminants discharging the site. A Petrol Interceptor will remove contaminants (oils and sediments) from surface water runoff from the carpark prior to discharge from site.

Table 16.2: Conceptual Site Model Pollutant Linkages Watercourses and Groundwater

The mitigation measures set out in Table 16.2 are discussed in further detail in later sections.

16.3 Data and Survey

The data necessary to carry out the assessment will comprise:

- A Site Specific Flood Risk Assessment (SSFRA) completed by RPS and an Engineering Service Report (ESR) has been completed by OCSC and are included as standalone reports with this submission. The SSFRA and ESR have contributed to the contents of the EIAR, and the assessment below.
- Existing services information was obtained from Irish Water records i.e. surface water sewer, water main and foul water sewer, the Geological Survey of Ireland, the Environmental Protection Agency and the Office of Public Works.
- Information provided from Site Investigations by Ground Investigations Ireland (GII).
- A topographical survey of the site was commissioned and supplied by the client (Sandyford GP Limited) in order to assist in the determination of existing topography for the site.
- Information on the surface water course running to the south of the subject lands was assembled from site inspections, 'Greater Dublin Strategic Drainage Study' (GDSDS) Data and topographical survey information.
- Information on the hydrogeology of the site was assembled from geological survey maps and GSI database information.
- Information for the unmitigated predicted surface water quality and mitigated surface water for SuDS systems from the proposed development has been obtained from the Construction Industry Research and Information Association's publication CIRIA C753-SuDS Manual (2015).
- These objectives were achieved by way of a desk study and baseline data collection. A list of sources for the desk study together with relevant legislation are included below.

The source of knowledge will be based on the following guidelines:

- Dún Laoghaire-Rathdown Council Local Authority Requirements (with liaison with technical departments);
- BS EN 752 – Drainage Outside Buildings;
- The Building Regulations – Technical Guidance Document Part 'H';
- Recommendations for Site Development works for housing Areas, Dept. of Environment, 1998;
- Greater Dublin Strategic Drainage Study (GDSDS);
- BS EN 12056-2:2000 Gravity drainage systems inside buildings;
- EPA Wastewater Treatment Manual, For Small Communities;
- Irish Water Code of Practice for Water Infrastructure;
- Irish Water Code of Practice for Wastewater Infrastructure.

Additional information has been compiled through consultation and feedback from stakeholders and the project / EIAR Team and from the following sources:

- Geological Survey of Ireland (GSI);
- Environmental Protection Agency (EPA);
- Site Investigation Report completed by GII Ltd.;
- Site Visit completed by OCSC;
- Geological Survey of Ireland (GSI) online maps and databases;
- EPA online maps and databases;

- Ordnance Survey of Ireland (OSI) and National Parks;
- Wildlife Service (NWPS)
- Correspondence and meetings with Dún Laoghaire-Rathdown Council.
- Public Foul Drainage (Irish Water and DLRCC Records);
- Public Water Main Networks (Irish Water and DLRCC Records);
- Public Surface Water Drainage (Irish Water and DLRCC Records);
- Office of Public Works flood mapping data (www.floodmaps.ie);
- The Planning System and Flood Risk Management – Guidelines for Planning Authorities - Department of the Environment, Heritage and Local Government (DoEHLG) and the Office of Public Works (OPW);
- Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors (CIRIA 532, 2001);
- The Geological Survey of Ireland (GSI) well card and groundwater records for the area were inspected, with reference to hydrology and hydrogeology;
- Base maps – Ordnance Survey of Ireland.

16.4 Assessment Methodology

16.4.1 Approach

The assessment followed a phased approach as outlined in Chapter 4.4 of the Advice Note (EPA, 2015). A Conceptual Site Model (CSM) was developed in order to identify any likely Source-Pathway-Receptor linkages relating to the site and the proposed development. The phases of assessment are outlined below.

Phase 1: Initial Assessment

An initial assessment was carried out which; defined the project in terms of location, type and scale; established the baseline conditions; established the type of hydrology environment; established the activities associated with the project and; initial assessment and impact determination.
The information sources were utilised to establish the baseline conditions for the site and all available information was compiled into a preliminary Conceptual Site Model (CSM). The CSM is based on the accepted Source-Pathway-Receptor model for assessing environmental impacts. The CSM went through iterative reviews and was updated with site specific data obtained through site investigations and studies.

Phase 2: Direct and Indirect Site Investigations and Studies

Ground Investigations Ireland (GII) undertook a site investigation in February 2019. A report based on the site investigation and sampling exercise is documented in the GII report and consisted of the following work:

- 2 No. silt trenches to locate existing watermain.

The site investigation is attached in Appendix 9.1 of Chapter 9 – Land and Soils.

Phase 2: Refinement of the Conceptual Site Model

Throughout the detailed site investigations and studies the CSM was continually updated, tested and refined with new site specific information. The outcome of this refinement is presented in this Chapter and the associated figures and technical reports.

Phase 2: Detailed Assessment and Impact Determination

A Detailed Assessment and Impact Determination was carried out which incorporates the full range of site investigations and studies, the refined CSM and a full assessment of any potential impacts.

The design approach adopted is as per the Irish Water Code of Practice for Water Infrastructure, Irish Water Code of Practice for Wastewater Infrastructure and Greater Dublin Strategic Drainage Study (GDSDS) each of the potential effects of the development have been described in terms of Quality, Significance, Extent, Probability and Duration.
The classification of impacts / effects in this chapter follows the definitions provided in the Draft Guidelines (EPA, 2017).

Additional guidance and EIA definitions are contained in NRA Guidelines (NRA, 2009). These guidelines provide useful matrices outlining how additional assessment criteria based on the Importance of a feature to be protected and the Magnitude of the potential impact. This approach has been adopted where appropriate.

Where the Initial Impact Determination concluded that the level of potential impact is capable of measureable and noticeable consequences it is carried into the next assessment phase.

Phase 3: Mitigation, Residual and Final Impact Assessment

Phase 3 builds on the outcome of the initial assessment and detailed site assessments, by identifying mitigation measures to address the identified impacts. Mitigation measures which have been built into the project design have also been considered in this process. Design depths of proposed infrastructure have been optimised to ensure that excessive excavations are avoided, where possible, and by association a reduction in resultant waste and machinery operation time. Prior to construction, it will be suggested that products and materials are supplied locally, where practicable and available; in order to reduce carbon footprint of travel and production.

Adequate surveys will be undertaken to ascertain the exact location of all infrastructure to mitigate any expected conflict. The development including all identified mitigation measures (assumed implemented) is then subject to impact assessment, to identify any residual impacts.

The Final Impact Assessment presented in this Chapter incorporates the outputs from the Detailed Assessment and Impact Determination, Mitigation Measures and Residual Impact Assessment.

Phase 4: Completion of the EIAR Section

The final phase of work was the completion of this EIAR Section with associated Figures and Appendices. The format follows the EPA Guidance Note and Design Team Template.

16.4.2 Assumptions and Limitations

The description of existing conditions is based on the available desk study, surveys and public service records information as outlined in Section 16.3. Given the site history and site activities it is not envisaged that any other significant existing services exist other than the potable water main identified within the project site.

The exact location of the existing services infrastructure is reliant upon the public records obtained, which are indicative, and the results of the topographical. This information gives a good indication of the approximate location of the various built services; however, their exact location remains unknown and is subject to a GPR survey and additional silt trenching. The exact location of site services can only be determined by an intrusive survey investigation such as slit trenching; for accuracy and completeness of information.

The details of the sites pervious usage for the existing waste water and water flow rates is unknown, with no further records available either before or after those provided. Therefore, it is considered that there is not enough sample data available to accurately determine the historical waste water and water supply flow rates and that the figures supplied should be used as an informative guidance only.

16.5 Mitigation Measures

16.5.1 Pre-Mitigation Impact

Assessment Likelihood of Impacts

The proposed development will not give rise to any likely significant long term impacts. Slight negative impacts will be experienced during the construction phase with disruptions to supply caused by local connections which will be temporary in nature. The impacts due to the increase in the demand of water resources and waste water discharge rates during the operation phase are within reasonable bounds.

Risks to human health

There is no apparent risk to human health, due to changes in the geological environment, resulting from this project.

Cumulative Effects with other existing/approved developments

The cumulative impacts takes into account the combined effects of the proposed development and other proposed projects in the surrounding area. Cumulative impacts occur as a result of actions taking place in the same area and within the same timeframe as the proposed 'Sandyford Central' development.

The site is located within the Sandyford Urban Framework Plan 2016-2022 which was adopted as Appendix No. 15 to the County Development Plan 2016-2022. According to the Plan, the site is zoned 'Zone 1: Mixed Core Area – Inner Core'.

Planning permission has been granted by An Bord Pleanála (Reg Ref ABP-304405-19) for a mixed use scheme on the adjacent site, Rockbrook, by IRES Residential Properties Limited

for Strategic Housing Development. The development, which is known as RB Central compromises a total gross floor area of c. 41,347 sq m (excluding basements) will consist of 428 no. apartments comprising two blocks arranged around two courtyards ranging in height from five to fourteen storeys (including ground floor mezzanine, all over three existing part-constructed basement levels) comprising 32 no. studio apartments; 122 no. 1 bedroom apartments; 251 no. 2 bedroom apartments and 23 no. 3 bedroom apartments. The development will also include a crèche (486 sq m) with ancillary outdoor play areas; 4 no. ground floor local/neighbourhood retail units (862 sq m); communal community residents' facilities (934 sq m in total).

The cumulative impact are considered not to be significant. Slight negative impacts will be experienced during the respective construction phases with disruptions to supply caused by local connections which will be temporary in nature.

The cumulative impacts due to the increase in the demand of water resources and waste water discharge rates during the operation phase are within reasonable bounds.

Interactions – General Points

- Excavated and stripped soil can be disturbed and eroded by site vehicles during the construction. Rainfall and wind can also impact on non-vegetated / uncovered areas within the excavation or where soil is stockpiled. This can lead to run-off with high suspended solid content which can impact on water bodies. The potential risk from this indirect impact to water bodies and/or habitats from contaminated water would depend on the magnitude and duration of any water quality impact.
- There is a potential for dust from excavations or stockpiles to impact on air quality. This is discussed further in Chapter 11 Air Quality and Climate.
- Construction phase dewatering may be required to excavate the basement and to maintain dry working conditions in the excavation (for rainfall only). Pumped water will require discharge offsite and will be contaminants will be managed by silt traps and petrol interceptors.
- Noise and vibration will be generated through the construction phase particularly during excavation work. Given that no rock excavation is required it is anticipated that conventional excavation techniques (i.e. hard digging) will suffice. Noise and vibration impacts are considered in detail in Chapter 12, Noise and Vibration.
- The construction phase and any import or export of material to the site (as part of excavation or infilling works) will have implications for traffic in the surrounding road network. These impacts are considered further in Chapter 14 Transportation.
- As with all construction projects there is potential for water (rainfall and/or groundwater) to become contaminated with pollutants associated with construction activity. Contaminated water which arises from construction sites can pose a significant short-term risk to groundwater quality for the duration of the construction if contaminated water is allowed to pollute ground water, watercourses and soils. The potential main contaminants include:
    - Suspended solids (muddy water with increase turbidity) – arising from excavation and ground disturbance;
    - Cement/concrete (increase turbidity and pH) – arising from construction materials;
    - Hydrocarbons (ecotoxic) from oils/diesel – accidental spillages from construction plant or onsite storage;
    - Wastewater (nutrient and microbial rich) – arising from poor on-site toilet and washrooms.

16.5.2 Systematic Description of Impacts - Construction Phase

In line with EIA guidance, each potential impact for the development should be described in terms of its Quality, Significance and Duration. The potential impacts, mitigation measures and resulting residual impacts have been combined in a Detailed Assessment Table presented in Appendix 16.1.

Below is the summary of the potential impacts throughout the construction stage:

Potable water

- Accidental pollution of the existing potable water

- Accidental pollution of ground water/watercourses/soils by oils/diesel from temporary storage areas and machinery and;
- Minor traffic congestion when connecting to existing potable water;
- Temporary disruption of existing services in the vicinity of the development.

Foul Sewer

- Accidental discharge of surface water in to the existing foul network;
- Accidental pollution of ground water/watercourses/soil by foul effluent;
- Accidental pollution of groundwater/watercourses/soils by oils/diesel from temporary storage areas and machinery and;
- Minor traffic congestion when connecting to existing foul sewers.

Surface Water

- Accidental pollution of ground water/watercourses/soils by oils/diesel from temporary storage areas and machinery.

The potential hydrological impacts during the construction phase are presented in Table 16.1 and are outlined below. These impacts also relate to and interact with other chapters within the EIAR specifically. These impacts also relate to and interact with other chapters within the EIAR specifically:

- Chapter 5, Population & Human Health;
- Chapter 6, Archaeological and Cultural Heritage;
- Chapter 7, Biodiversity;
- Chapter 8, Landscaping & Visual impact;
- Chapter 9, Lands, Soils & Geology;
- Chapter 10, Water-Hydrology;
- Chapter 11, Air Quality & Climate;
- Chapter 12, Noise and Vibration;
- Chapter 14, Material Assets: Traffic and Transportation.

Although we acknowledge that interactions listed above occur between the aforementioned chapters the significant interaction are discussed above at Section 16.5.1 and within Chapter 18 – Interactions and Cumulative Impacts.

16.5.3 Systematic Description of Impacts – Operational Phase

The proposed development will take place on a site area of 1.54ha and it is currently proposed that the development will consist of a total of c. 564 residential units along with a crèche and café. The proposed development will not give rise to any likely significant long term impacts once construction has been completed. An increase in the discharge rates to receiving water bodies is expected with the completion of the development.

Potable water

It is proposed to provide a potable water supply in accordance with Irish Water Code of Practice for Water Infrastructure and connect to the existing 450mm AC main public water network on Carmanhall Road. The new development will be serviced with a new 100mm dia. HDPE Class 'C' watermain. It is not proposed to abstract water from ground and the underlying aquifer. The total water demand required to supply the 564 No. residential units will be:

Average Domestic Daily Demand:	564 No. units @ 2.7 ppl/unit X 150 l/hd/day = 228,420 l/day
Average Daily Demand:	228,420 l/day x 1.25 = 285,525 l/day = 3.30 l/s
Peak Daily Demand:	285,525 l/day x 5.0 = 1,427,625 l/day = 16.52l /s

Crèche water demand has been assumed as 1 child per 5 square meters and 1 staff per 5 children with a working day of 10 hours. A demand of 50 litres per head was assumed.

Average Daily Demand:	69 people @ 50 l/hd/day = 3450 l/day
Average Daily Demand:	3450 l/day x 1.25 = 4312 l/day = 0.12 l/s
Peak Daily Demand:	4312 l/day x 5 = 21560 l/day = 0.59 l/s

Café water demand has been assumed as 20 meals per hour at peak hour with a demand of 12 litres per meal, as outlined in the Irish Water Code of Practice for Wastewater Infrastructure.

Average Daily Demand:	20 meals x 12 l/meal = 240 l/hour = 0.06 l/s
Peak Daily Demand:	240 l/day x 5 = 1200 l/day = 0.3 l/s

All calculations carried out in accordance with Irish water Code of Practice for Water Infrastructure IW-CDS-5020-03.

The proposed development will result in an additional potable water demand of 232 cubic metres per day. This additional demand can be catered for in the existing network.

A pre-connection enquiry for has been submitted for 600 units to Irish Water (Connection Reference No CDS19000358). Irish Water have confirmed that the existing sewer has adequate capacity to facilitate sewage from this development.

Foul Water

It is proposed to reuse this connection from the site and or complete upgrade works and discharge to the public 525mm concrete sewer in Blackthorn Drive. It is not proposed to discharge foul water to ground via percolation areas.

The total foul water for 564 No. residential units along with a crèche and café will be:

Average Discharge: 564 No. units @ 446 l/unit/day = 251,544 l/day = 2.91 l/s Peak Discharge: 564 No. units @ 2.7 = 1,523 Peak Factor = 3
3 x DWF = 3 x 251,544 l/day = 754662 l/day = 8.73 l/s
Crèche wastewater demand has been calculated based on an occupancy of 57 children and 1 staff per 5 children with an assumed working day of 10 hours. A demand of 50 litres per head was assumed.

Average Discharge: 69 people @ 50 l/hd/day x 1.1 = 3795 l/day = 0.105 l/s
Peak Discharge: Peaking factor of 6 x DWF (taken from Irish Water Code pf Practice).
3795l/day x 6 = 22770 l/day = 0.63 l/s

Café water demand has been assumed as 20 meals per hour at peak hour with a demand of 12 litres per meal, as outlined in the Irish Water Code of Practice for Wastewater Infrastructure.

Average Discharge: 20 meals x 12 l/meal = 240 l/hour = 0.06 l/s
Peak Discharge: Peak factor of 6 x DWF (taken from Irish Water Code of Practice)
240 l/day x 6 = 1440 l/day = 0.4 l/s

All calculations carried out in accordance with Irish water Code of Practice for Water Infrastructure IW-CDS-5030-03.

The proposed development will result in the discharge of 256 cubic meters of foul water per day.

A pre-connection enquiry for has been submitted for 564 units to Irish Water (Connection Reference No CDS19000358). Irish Water have confirmed that the existing sewer has adequate capacity to facilitate sewage from this development.

Surface Water

The implementation of a range of SuDS methods including surface water attenuation will result in an improvement in the potential impact the surface water receiving waters being slight and long term. The proposed integrated surface water drainage network has been discussed and agreed with DLRCoCo, whom have accepted the proposed strategy.

The existing site area is 100% impermeable surface area with no known information on SuDs components. It is assumed that the site is currently discharging attenuated to the local surface water network.

The proposed SUDS strategy also includes the limiting of flow from the site to Greenfield runoff levels and the storage of same within detention basins etc. There will be no adverse increase in the discharge rates to receiving water bodies during and following completion

of the development as there will decrease the surface water flows and the increase the quality of the surface water discharging from the site. These measures are set out in more detail in Chapter 10 – Hydrology and Hydrogeology.

16.5.4 Mitigation

General Measures- Construction

The following mitigation measures are recommended for the construction phase of the development:

- Control of Soil Excavation and Export from Site;
- Sources of fill and aggregates for the project;
- Fuel and Chemical handling, transport and storage;
- Control of Water during Construction;
- Intrusive testing by the appointed contractor to establish the location of underground services in advance of works commencing on site;
- Consultation with relevant services providers in advance of works to ensure works are carried out to relevant standards and specifications including procedures to ensure safe working practices are implemented for works in the vicinity of services such as live gas mains, works in the vicinity of overhead electricity lines and live electricity lines and works to distribution watermains;
- Neighbouring sites are to be advised of construction methodologies in advance of works, in situations which may affect them;
- Protection in place of all underground services for which diversions are not required;
- All decommissioned infrastructure to be sent to a suitably licenced waste management facility;
- Construction methods used by the contractor are to be tailored to reduce, where possible, dust noise and air pollution; to minimise interference with the environment and the neighbouring areas;
- Any spoil or waste material generated from the construction process is to be temporarily stored at an approved location on site, before being removed to a suitably licenced waste management facility;
- All new infrastructure is to be installed and constructed to the relevant codes of practice and guidelines;
- Potable water supply networks and waste water infrastructure are to be pressure tested by an approved method during the construction phase and prior to connection to the public networks, all in accordance with Irish Water Requirements;
- Connections to the service providers are to be carried out to the approval and / or under the supervision of the Local Authority or relevant utility service provider, prior to commissioning;
- All new sewers are to be inspected by CCTV survey post construction; to identify any possible physical defects for rectification prior to operational phase.
- Prior to the commencement of excavations in public areas, all utilities and public services are to be identified and checked; to ensure that adequate protection measures are implemented to minimise the risk of service disruption;
- All excavations within the public area are to be back-filled in a controlled manner and surface re-instated to the satisfaction of the Local Authority.

With the implementation of these mitigation measures, the severity of the impact of the proposed development on the built services will be minimised, with tie-ins to existing

services and installation of new services completed in a satisfactory manner for the relevant service providers.

General Measures- Operational

The design and construction of the required services infrastructure in accordance with the relevant guidelines and codes of practice is likely to mitigate any potential impacts during the operational phase of the development, with the exception of any routine maintenance of the site services.

Any additional mitigation measures required for the proposed built services, if required, during the operational phase will be as advised by the relevant service provider.

Potable Water

The following mitigation measures shall be implemented with the construction of the potable water network:

- Provide a potable water supply in accordance with Irish Water Code of Practice for Water Infrastructure;
- The potable site supply connection will be metered with ABB Magmaster electromagnetic flow meters or similar approved;
- The proposed network connection will be metered and provided with associated hydrants and valves as per Irish Water requirements;
- Provision of a water meter will be fitted on the incoming watermain into each block and individual properties will be fitted with a Talbot Matrix meter box for monitoring purposes,
- New water saving devices (low water usage appliances and aerated taps etc.) will be fitted as standard into the proposed new units;
- All new potable water networks will be tested by means of an approved pressure test during the construction phase and prior to connection to the public sewer system in accordance to Irish Water requirements;
- The connections to the public sewer will be carried out under the supervision of the Local Authority and will be checked prior to commissioning;
- Prior to commencement of excavations in public areas all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase;
- All excavations within the public roads will be back-filled in a controlled manner and the public road will be reinstated to the satisfaction of the Local Authority;
- Traffic Management Plans and Method Statements for all works to be carried out will be prepared and assessed prior to commencement of the works. All construction methods used will be tailored to reduce, where possible, dust and noise and interference with residents in neighbouring developments;
- All spoil and waste material will be removed to an approved location and storage of construction materials in public areas will be minimised;
- All oil/diesel stored on-site will be in suitable containers which will be located in a purposed built bonded area which will provide containment in the event of accidental spills;
- All plant will be maintained in a designated maintenance area.

The completed potable water network will not require further mitigation measured upon

completion.

Foul Water

The following mitigation measures shall be implemented with the construction of the foul sewer network:

- All foul pipes to be designed and laid at gradients for self-cleansing velocities so drainage can be maintained under normal operating conditions;
- The proposed internal network pipes are to be slung to the underside of the podium slab and will be in accordance with TGD H – Drainage specifications;
- All new foul sewers will be tested by means of an approved pressure test during the construction phase and prior to connection to the public sewer system in accordance to Dublin City Councils requirements;
- All foul sewers will be inspected by closed circuit cameras (CCTV) to identify possible physical defects;
- The connection of the new foul sewers to the public sewer will be carried out under the supervision of the Local Authority and will be checked prior to commissioning;
- Prior to commencement of excavations in public areas all utilities and public services will be identified and checked, to ensure that adequate protection measures are implemented during the construction phase;
- All excavations within the public roads will be back-filled in a controlled manner and the public road will be reinstated to the satisfaction of the Local Authority;
- Traffic Management Plans and Method Statements for all works to be carried out will be prepared and assessed prior to commencement of the works. All construction methods used will be tailored to reduce, where possible, dust and noise and interference with residents in neighbouring developments;
- All spoil and waste material will be removed to an approved location and storage of construction materials in public areas will be minimised;
- All oil/diesel stored on-site will be in suitable containers which will be located in a purposed built bonded area which will provide containment in the event of accidental spills;
- All plant will be maintained in a designated maintenance area.

No other mitigation measures are deemed to be necessary after completion of the development, other than normal maintenance of the foul sewer system.

Surface Water

The following mitigation measures shall be implemented with the construction of the surface water sewer network:

- The filtering of surface water that is likely to be contaminated by soil particles in order to reduce the silting effects of these particles in the receiving downstream watercourse;
- Construction of suitable silt traps prior to the surface water out-falling to the existing watercourse;
- Locating existing services, methods statements, etc.

The following surface water design measures will be implemented in accordance with The Greater Dublin Strategic Drainage Study (GDSDS) will mitigation impacts during the operation phase to the receiving surface water network;

- The improved water quantity with reduced peak runoff rates and reduced runoff volumes for Interception / Large Events to the receiving downstream watercourse;

- Improved water quality to the receiving downstream watercourse;
- The provision of amenity; and
- The provision of increased biodiversity.

These measures are set out in detail in Section 10.5.2. of Chapter 10 – Hydrology and Hydrogeology.

No other mitigation measures are deemed to be necessary after completion of the development, other than normal maintenance of the surface water system.

16.5.5 Monitoring

In advance of work starting on site the works Contractor will author a Construction Methodology document taking into account their approach and any additional requirements of the Design Team or Planning Regulator. The Contractor will also prepare a Construction Management Plan and Environmental Plan. The Construction Management Plan sets out the overarching vision of how the construction of the project will be management in a safe and organised manner by the Contractor with the oversight of the Developer. The CMP is a living document and it will go through a number of iterations before works commence and during the works. It will set out requirements and standards which must be met during the construction stage and will include the relevant mitigation measures outlined in the EIAR and any subsequent conditions relevant to the project. The Construction Management Plan and the Construction and Demolition Waste Management Plan are included in the main submission. Monitoring shall be carried out as specified in any Discharge Licence associated with the construction phase of the project.

16.6 Residual Impacts

It is considered that once the mitigation measures discussed above are employed, the potential for residual impacts on this aspect of the environment is negligible.

16.7 "Do Nothing Scenario" Impact

In the 'Do Nothing' scenario, the site will remain unoccupied, resulting in no increase usage rates of the existing foul and water services. Existing surface water services would continue to see increased usage as a result of the unattenuated flow from the development site which would also be untreated.

16.8 Difficulties Encountered in Compiling

No notable difficulties were encountered in the preparation of this chapter.

16.9 Section Summary

16.9.1 Summary of Likely Significant Environmental Effects

The proposed development will not give rise to any likely significant long term effects. Slight negative effects will be experienced during the construction phase with disruptions to supply caused by the drainage and water supply diversion and connections to local infrastructure which will be temporary in nature.

During the Operational Phase there will be an increase in potable water demand and foul water discharge. These impacts are unavoidable given the nature, requirement and design of the proposed development.

Potable Water

The proposed development will result in an additional potable water demand of 243 cubic metres per day. This additional demand can be catered for in the existing network and has been confirmed by Irish Water.

Foul Water

The foul drainage infrastructure drains by gravity to a pumping station at the Dún Laoghaire Harbour West Pier which is pumped to Ringsend WwTP for treatment before discharging to Dublin Bay.
The proposed development will result in the discharge of 267 cubic meters of foul water per day.

Irish Water have confirmed that the existing sewer network has adequate capacity to facilitate sewage from this development.

16.9.2 Summary of Proposed Mitigation and Monitoring Measures and their Influence on Design

Potable Water Supply & Foul Water

It is proposed to construction the potable network in accordance best practice and with the Dún Laoghaire-Rathdown County Council and Irish Water regulations.

During the operational phase of the Sandyford Central development site is limited in site activities to impact on the drainage and water supply of the area.

Surface Water

It is proposed to reuse the existing surface water network on Blackthorn Drive. This

connection and discharge attenuated flowed in accordance with the Local Authority requirements and the Greater Dublin Strategic Drainage Study (Dublin City Council, 2005). This will have a positive impact on the surface water runoff from site.

16.10 References

Greater Dublin Strategic Drainage Study (2005) – Fingal County Council, Dublin City Council, Dún Laoghaire-Rathdown County Council, South Dublin County Council, Wicklow County Council, Kildare County Council, Meath County Council

The Greater Dublin Region Code of Practice for Drainage Works (2012) – Fingal County Council, Dublin City Council, Dún Laoghaire-Rathdown County Council, South Dublin County Council, Wicklow County Council, Kildare County Council, Meath County Council

I.S. EN752: 2008 Drain & Sewer Systems outside Buildings (2008) – National Standards Agency Ireland

Recommendations for Site Development Works for Housing Areas (1998) – Department of the Environment and Local Government

Guidelines on Procedures for the Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (2009) – National Roads Authority

Control of Water Pollution from Construction Sites (2001) – Construction Industry Research and Information Association

Environmental Handbook for Building and Civil Engineering Projects (2000) – Construction Industry Research and Information Association
South Dublin Bay SAC Conservation objectives supporting document (2013) – National Parks and Wildlife Service